

# **USER'S GUIDE**

## **LSI8751D PCI to SCSI Host Adapter**

*Version 3.0*

**August 2001**

**LSI LOGIC®**



## 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 LSI8751D 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.

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラス B 情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。  
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

---

This document contains proprietary information of LSI Logic Corporation. The information contained herein is not to be used by or disclosed to third parties without the express written permission of an officer of LSI Logic Corporation.

LSI Logic products are not intended for use in life-support appliances, devices, or systems. Use of any LSI Logic product in such applications without written consent of the appropriate LSI Logic officer is prohibited.

Document DB15-000102-03, Fourth Edition (August 2001)

This document describes LSI Logic Corporation's LSI8751D PCI to SCSI Host Adapter and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

LSI Logic Corporation reserves the right to make changes to any products herein at any time without notice. LSI Logic does not assume any responsibility or liability arising out of the application or use of any product described herein, except as expressly agreed to in writing by LSI Logic; nor does the purchase or use of a product from LSI Logic convey a license under any patent rights, copyrights, trademark rights, or any other of the intellectual property rights of LSI Logic or third parties.

Copyright © 2001 by LSI Logic Corporation. All rights reserved.

#### TRADEMARK ACKNOWLEDGMENT

The LSI Logic logo design and SDMS are trademarks or registered trademarks of LSI Logic Corporation. All other brand and product names may be trademarks of their respective companies.

MH

**To receive product literature, visit us at <http://www.lsillogic.com>.**

**For a current list of our distributors, sales offices, and design resource centers, view our web page located at**

**[http://www.lsillogic.com/contacts/na\\_salesoffices.html](http://www.lsillogic.com/contacts/na_salesoffices.html)**



# Preface

---

This book is the primary reference and user's guide for the LSI Logic LSI8751D PCI to SCSI Host Adapter. It describes how to install and configure the LSI8751D 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 is 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, Describing the LSI8751D](#), defines the interfaces and characteristics of the LSI8751D.
- [Chapter 2, Installing the LSI8751D](#), provides both quick and detailed installation instructions.

- [Chapter 3, Technical Specifications](#), describes the physical and operational environments of the LSI8751D.
- [Appendix A, Glossary of Terms and Abbreviations](#), 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	6/95	Final version.
2.0	3/99	Document converted to LSI format.
2.1	11/00	All product names changed from SYM to LSI.
3.0	8/01	Updated Table 3.4 SCSI Connector J2 and J3; Removed the chapter about the SCSI BIOS Configuration Utility; Moved Appendix A to Chapter 3. Other minor updates made to installation instructions in Chapter 2.

# Contents

---

<b>Chapter 1</b>	<b>Describing the LSI8751D</b>	
1.1	General Description	1-1
1.2	Features	1-2
1.2.1	PCI Interface	1-2
1.2.2	SCSI Interface	1-2
1.2.3	Board Characteristics	1-3
1.2.4	Ultra SCSI	1-3

---

<b>Chapter 2</b>	<b>Installing the LSI8751D</b>	
2.1	Quick Installation Procedure	2-1
2.2	Detailed Installation Procedure	2-2
2.2.1	Before You Start	2-2
2.2.2	Inserting the Host Adapter	2-3
2.2.3	Connecting the SCSI Peripherals	2-5
2.2.4	SCSI Bus Termination	2-14
2.2.5	Setting SCSI IDs	2-19
2.3	Completing the Installation	2-21

---

<b>Chapter 3</b>	<b>Technical Specifications</b>	
3.1	Physical Environment	3-1
3.1.1	Physical Characteristics	3-1
3.1.2	Electrical Characteristics	3-2
3.1.3	Thermal, Atmospheric Characteristics	3-3
3.1.4	Electromagnetic Compliance	3-3
3.1.5	Safety Characteristics	3-3
3.2	Operational Environment	3-3
3.2.1	The PCI Interface	3-3
3.2.2	The SCSI Interface	3-5
3.2.3	The LED Interface	3-6

**Customer Feedback**



---

## Figures

2.1	Hardware Connections for the LSI8751D	2-3
2.2	Inserting the Host Adapter	2-4
2.3	SCSI Cables	2-6
2.4	Internal SCSI Ribbon Cable to Host Adapter Connection	2-7
2.5	Internal SCSI Ribbon Cable to Internal SCSI Device Connection	2-8
2.6	Connecting Additional Internal SCSI Devices	2-8
2.7	Multiple Internal SCSI Devices Chained Together	2-9
2.8	SCSI LED Connector	2-10
2.9	External Cable to Host Adapter	2-11
2.10	External Cable to External SCSI Device	2-12
2.11	Multiple External SCSI Devices Chained Together	2-13
2.12	Internal SCSI Device Termination	2-15
2.13	External SCSI Device Termination	2-16
2.14	Internal and External SCSI Device Termination	2-18
3.1	LSI8751D Mechanical Drawing	3-2



---

## Tables

2.1	SCSI Bus Widths and Speeds	2-5
2.2	SCSI ID Record	2-20
3.1	Maximum Power Requirements	3-2
3.2	PCI Connector J1 (Top)	3-4
3.3	PCI Connector J1 (Bottom)	3-5
3.4	SCSI Connectors J2 and J3	3-6
3.5	LED Connector J4	3-6



# Chapter 1

## Describing the LSI8751D

---

This chapter describes how the LSI8751D PCI to SCSI Host Adapter interfaces to PCI computer systems and includes these topics:

- [Section 1.1, "General Description," page 1-1](#)
  - [Section 1.2, "Features," page 1-2](#)
- 

### 1.1 General Description

The LSI8751D provides a SCSI-3, Ultra SCSI interface to PCI computer systems. Installing this adapter in your PCI system allows you to connect SCSI devices over a SCSI bus.

The LSI8751D is a 16-bit, High Voltage Differential (HVD), Ultra SCSI solution for your computer, using only one PCI slot. This board can support both legacy Fast SCSI devices and the newest Ultra SCSI devices. It is also backward compatible with the existing LSI8251D host adapter.

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

This guide and the *PCI Storage Device Management System SDMS 4.0 User's Guide* contain product information and installation instructions. This information helps you gain the full benefits of the LSI8751D for your computer system.

---

## 1.2 Features

This section provides an overview of the PCI interface, the SCSI interface, and board characteristics for the LSI8751D.

BIOS support for this host adapter is incorporated on the board in an 8 x 64 Kbytes Flash BIOS.

### 1.2.1 PCI Interface

PCI is a high-speed standard local bus for interfacing a number of I/O components to the processor and memory subsystems in a high-end PC. The PCI functionality for the LSI8751D is contained within the LSI53C875J PCI to SCSI I/O Processor chip. The LSI53C875J connects directly to the PCI bus and generates timing protocol that complies with the PCI specification.

The PCI interface on the LSI8751D supports these features:

- Full 32-bit DMA bus master
- Zero wait-state bus master data bursts
- Universal 5 V or 3.3 V PCI bus voltage
- *PCI Local Bus Specification, Revision 2.1* compliance

### 1.2.2 SCSI Interface

The SCSI functionality for the LSI8751D is contained within the LSI53875 controller chip. The LSI53C875 connects directly to the SCSI bus and generates timing and protocol in compliance with the SCSI standard.

The SCSI interface on the LSI8751D operates as a 16-bit, synchronous or asynchronous, HVD bus, and supports Ultra SCSI protocols and 16-bit arbitration. The LSI8751D provides HVD SCSI termination as a pluggable terminator. This terminator plugs into either the internal or external 68-pin high density connector (J2 or J3).

The SCSI interface for this board supports these features:

- 16-bit HVD
- External plug-in termination supplied with board

- 68-pin high density external dual connector
- 68-pin high density internal dual connector
- Fast and Ultra SCSI data transfer capability
- SCSI termination power (TERMPWR) source with autoresetting circuit breaker
- Flash EEPROM for BIOS storage
- Serial NonVolatile Random Access Memory (NVRAM) for user configuration utility.
- SCSI activity LED connector

### 1.2.3 Board Characteristics

The board characteristics are

- PCI host adapter dimensions –  
5.00 x 3.25 inches (127 X82.552 mm)
- Universal 32-bit card edge connector

### 1.2.4 Ultra SCSI

The LSI8751D has full support for Ultra SCSI and simultaneously supports Fast SCSI. Ultra SCSI is an extension of the SCSI-3 family of standards that expands the bandwidth of the SCSI bus, allowing faster synchronous data transfers. Special SCSI cables are specified for operation with Ultra SCSI devices, and you must consider the total number of devices and the length of your SCSI bus when setting up your system. See [Section 1.2.3, "Connecting the SCSI Peripherals," page 1-5](#) for a more detailed explanation of SCSI bus connections.





# Chapter 2

## Installing the LSI8751D

---

This chapter provides instructions on how to install the LSI8751D and includes these topics:

- [Section 2.1, “Quick Installation Procedure,” page 2-1](#)
  - [Section 2.2, “Detailed Installation Procedure,” page 2-2](#)
  - [Section 2.3, “Completing the Installation,” page 2-21](#)
- 

### 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 LSI8751D, please follow the instructions in [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 this host adapter board, then remove the cabinet cover on your computer to access the PCI slots.

Note: The use of a static ground strap is recommended.

Step 2. Remove the LSI8751D from the packing and check that it is not damaged.

Step 3. Turn off and unplug your system.

Step 4. Open your PC cabinet.

Step 5. Locate the slots for installing a PCI plug-in board.

Step 6. Insert the LSI8751D board into the selected PCI slot.

- Step 7. Connect the internal and external SCSI peripherals.  
Optional: Connect the LED cable on your SCSI host adapter.
- Step 8. Terminate the SCSI bus.  
The SCSI bus requires proper termination and no duplicate SCSI IDs.
- Step 9. Set the peripheral SCSI IDs.
- Step 10. Make any configuration changes.
- Step 11. Replace your PC cabinet cover.
- Step 12. Plug in your computer and peripherals.
- Step 13. Turn on the peripherals, and then your computer.  
The host adapter installation is complete.

Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software you will use) to load the driver software for your particular operating system. Additionally, this guide contains documentation about the SCSI BIOS Configuration Utility, which provides a means to change system configuration.

---

## 2.2 Detailed Installation Procedure

This section provides step-by-step instructions for installing the LSI8751D and connecting it to your SCSI peripherals. If you are experienced in these tasks, you may prefer to use the instructions in the preceding [Section 2.1, "Quick Installation Procedure."](#)

### 2.2.1 Before You Start

Before starting, read through the steps defined within the detailed installation procedure. If you are not confident that you can perform the tasks as described in this section, LSI Logic suggests getting assistance.

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 are referred to as a SCSI bus.

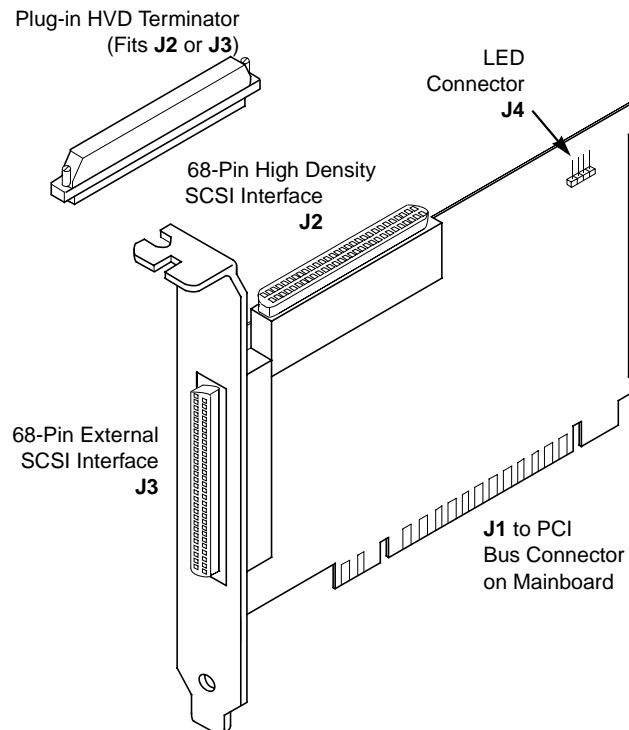
Each channel on your SCSI host adapter can act as host for up to 15 peripheral devices, not including the adapter itself.

## 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. *Ground yourself* before handling this host adapter board. Remove the LSI8751D from the packing and check that it is not damaged. [Figure 2.1](#) shows an example of this board.

**Figure 2.1 Hardware Connections for the LSI8751D**



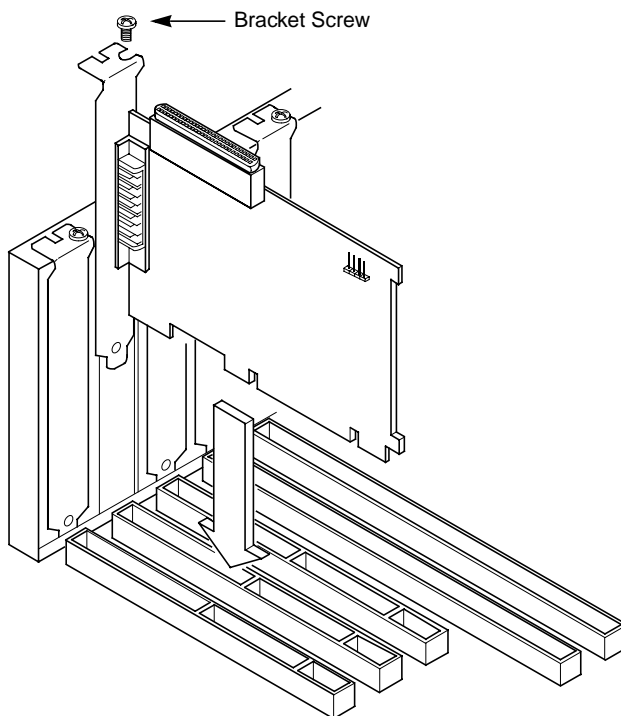
- Step 2. Switch off and unplug power cords for all components in your system.
- Step 3. Remove the cabinet cover on your computer to access the PCI slots.

**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 PCI plug-in board installation. Refer to the user's manual for your computer to confirm the location of the PCI slots. The LSI8751D requires a PCI slot which allows bus master operation.
- Step 5. Remove the blank panel on the back of the computer aligned with the PCI slot you intend to use. Save the bracket screw.
- Step 6. Carefully insert the 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](#). You may notice that the components on a 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.

**Figure 2.2 Inserting the Host Adapter**



Step 7. The bracket around the connectors J3 (see [Figure 2.1](#)) should fit in the slot where you removed the blank panel. Secure the bracket with the bracket screw (see [Figure 2.2](#)) before making the internal and external SCSI bus connections.

## 2.2.3 Connecting the SCSI Peripherals

SCSI bus connections to the LSI8751D inside your computer are made with an unshielded, 68-conductor ribbon cable (see [Figure 2.3](#)). One side of this cable is marked with a color to indicate the pin-1 side. Sometimes the connectors on this cable are keyed to ensure proper pin-1 connection.

All external SCSI bus connections to the LSI8751D are made with shielded, 68-conductor cables (see [Figure 2.3](#)). The connectors on this cable are always keyed to ensure proper pin-1 connection.

[Table 2.1](#) lists the SCSI bus widths and speeds as established by the SCSI Trade Association (STA).

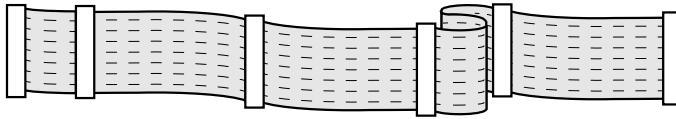
**Table 2.1 SCSI Bus Widths and Speeds**

STA Terms	SCSI Bus Width, Bits	SCSI Bus Speed Maximum Data Rate, Mbytes/s
SCSI-1	8	5
Fast SCSI	8	10
Fast Wide SCSI	16	20
Ultra SCSI	8	20
Wide Ultra SCSI	16	40
Ultra2 SCSI	8	40
Wide Ultra2 SCSI	16	80

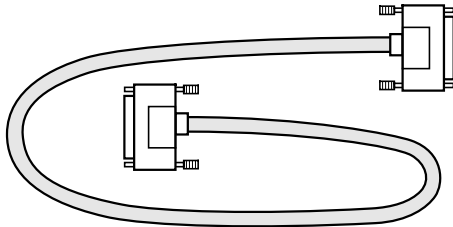
Important: Use only cables designed and specified for operation with Ultra SCSI devices to make connections to the LSI8751D. See [Figure 2.3](#) for an example of the required cables.

## Figure 2.3 SCSI Cables

SCSI Cable for Internal Connections



SCSI Cable for External Connections

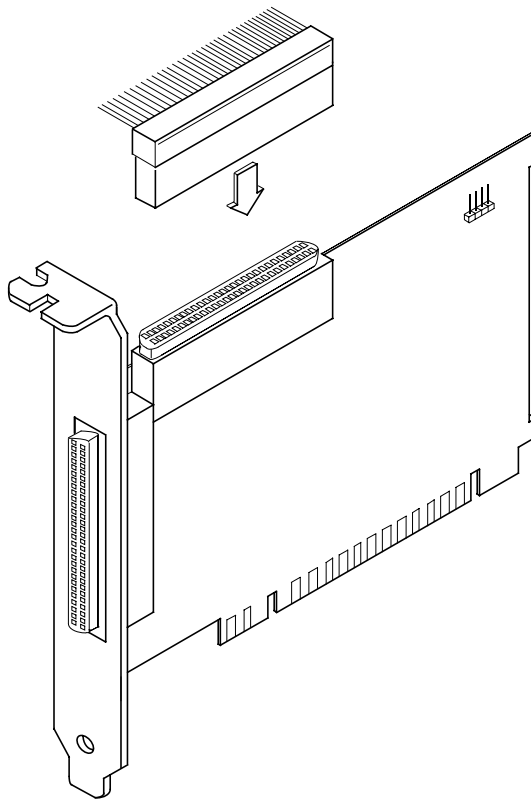


### 2.2.3.1 Making Internal SCSI Bus Connections

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

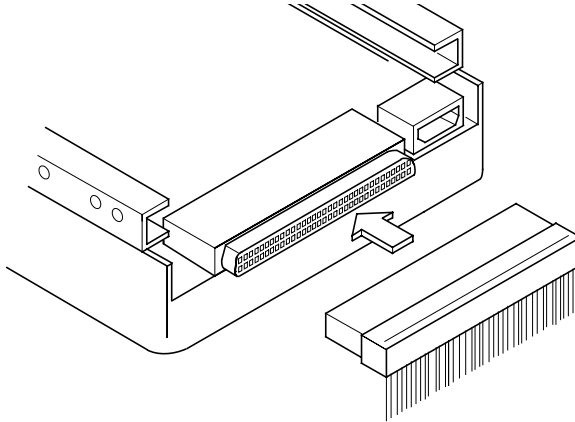
- Step 1. To connect an internal SCSI device, plug the 68-pin connector on one end of the internal SCSI ribbon cable into the connector J2. Make certain to match pin 1 on both connectors. [Figure 2.4](#) shows an example of this connection.

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



Step 2. Plug the 68-pin connector on the other end of the internal SCSI ribbon cable into the SCSI connector on your internal SCSI device. (See [Figure 2.5.](#)) Make sure to match pin 1 on all connections.

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



Step 3. Connect additional internal SCSI devices by using an internal SCSI ribbon cable with the required number of 68-pin connectors attached along its length as shown in [Figure 2.6.](#)

**Figure 2.6 Connecting Additional Internal SCSI Devices**

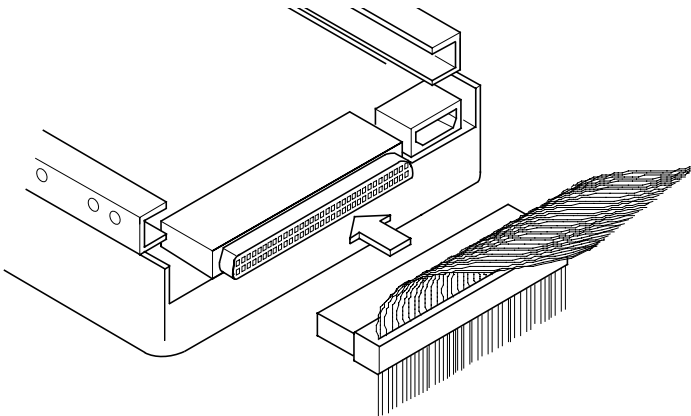
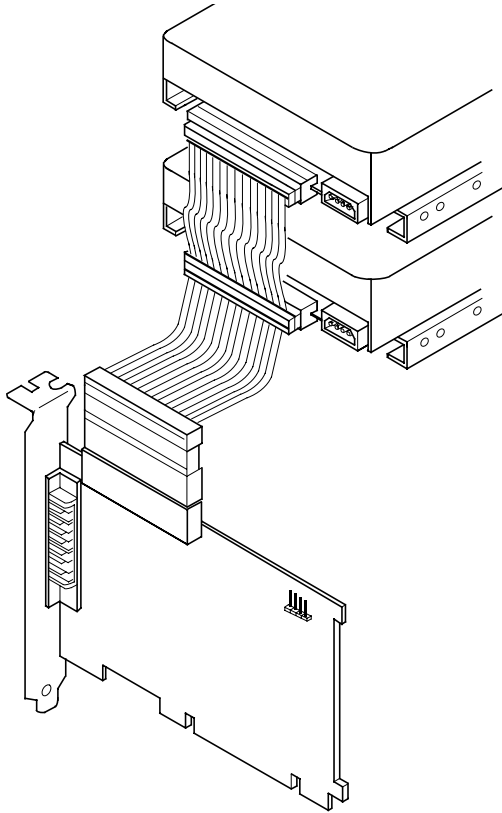




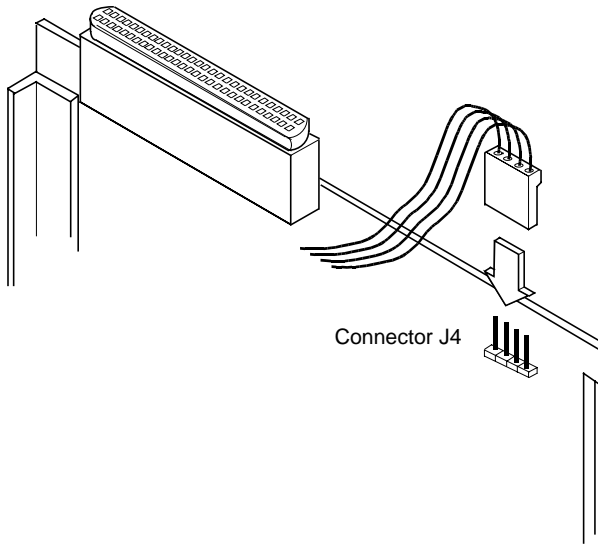
Figure 2.7 shows an example of this type of chained connection. Make sure to match pin 1 on all connections.

**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 drive. Connect this LED cable to connector J4 on the host adapter, as shown in [Figure 2.8](#). This allows the front panel LED to indicate activity on the SCSI bus. Connector J4 is not keyed. The orientation of the LED cable does not matter as long as all four pins are connected.

**Figure 2.8 SCSI LED Connector**



Some LED cables have only two wires. In this case, place the connector on one end or the other of J4. If the LED does not light during SCSI bus activity from this host adapter, you may have to rotate the LED cable 180° on J4.

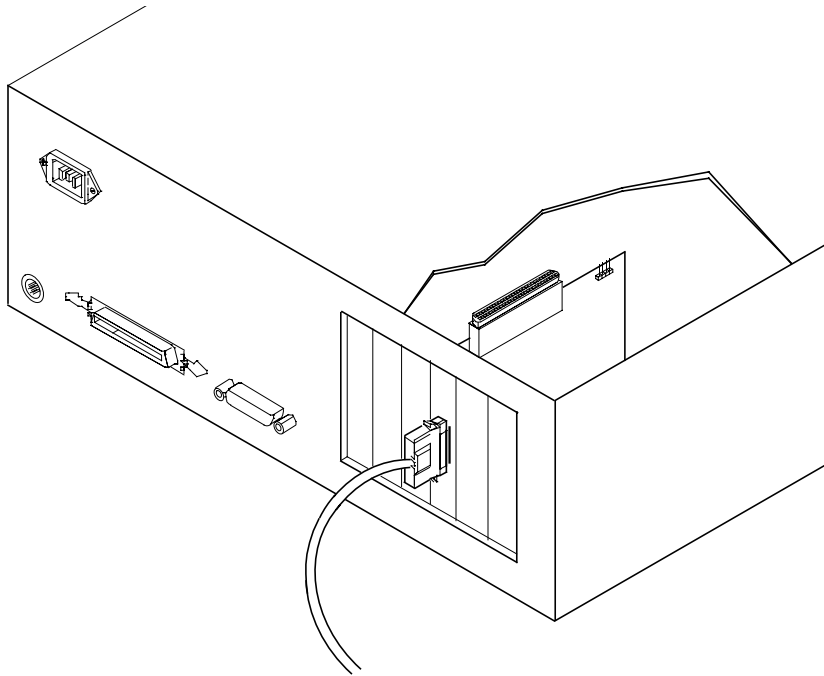
### 2.2.3.2 Making External SCSI Bus Connections

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

Step 1. To connect external SCSI devices to the LSI8751D, plug the 68-pin connector on one end of a shielded external SCSI cable (see [Figure 2.3](#)) into the host adapter connector J3 (see [Figure 2.1](#)).

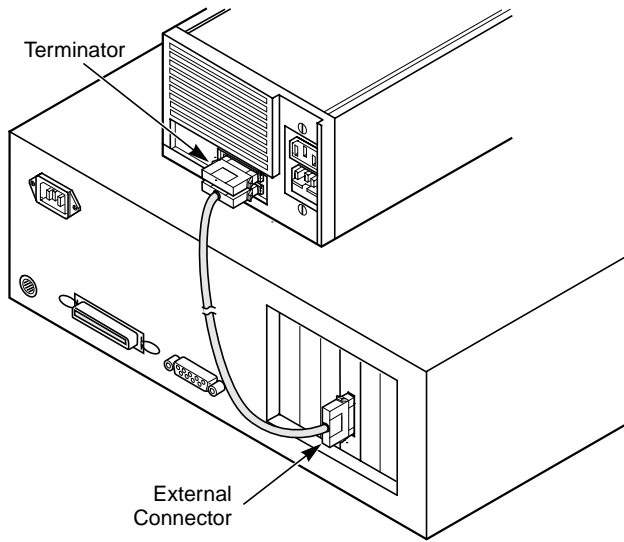
This connector is now bracketed to the back panel of your computer. [Figure 2.9](#) shows how this connection is made.

**Figure 2.9 External Cable to Host Adapter**



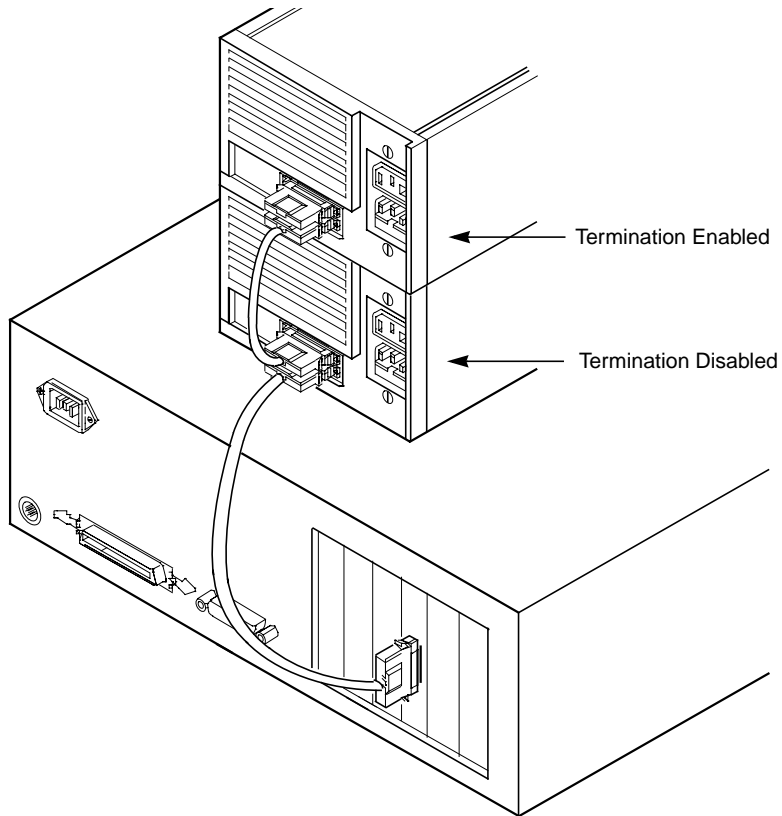
Step 2. Plug the 68-pin connector on the other end of the shielded external SCSI cable into the SCSI connector on the external SCSI device. [Figure 2.10](#) shows an example of this connection.

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



Step 3. To connect more than one external SCSI device to the host adapter, you must chain them together with shielded external SCSI cables. [Figure 2.11](#) shows an example of these chained connections.

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



## 2.2.4 SCSI Bus Termination

The devices making 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 have a set of resistors connected on the ends of the SCSI bus must have a set of resistors called terminators. All other SCSI devices on the bus must have their terminators removed or disabled. Remember that the LSI8751D is also on the SCSI bus; if you position the host adapter at the end of the SCSI bus, you must place the supplied HVD terminator on the unused connector (J2 or J3).

The peripheral device terminators are usually set with jumpers, resistor modules, or a switch on the peripheral. Refer to the peripheral manufacturer's instructions and to the user's manual for your computer for information on how to identify the terminator setting of each device and how to change it.

The LSI8751D automatically covers SCSI bus termination for three different bus configurations, depending on the use of the connectors J2 and J3 on the LSI8751D (see [Figure 2.1](#)). The three bus configurations are

- only for internal SCSI connections to connector J2
- only for external SCSI connections to connector J3
- for SCSI connections to both J2 and J3 connectors

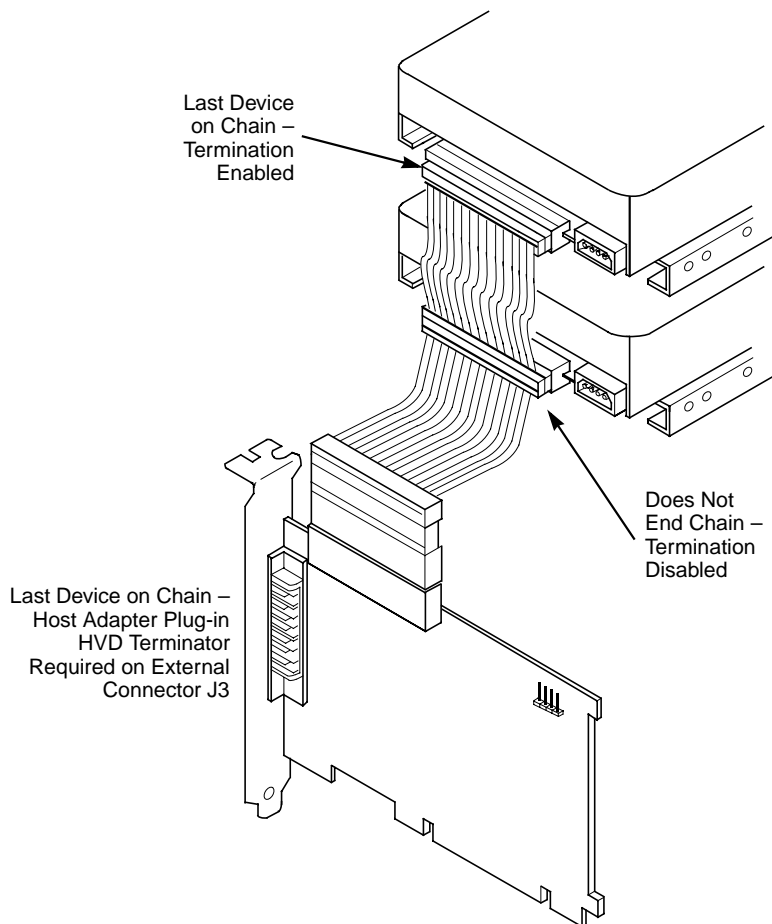
Termination on the LSI8751D for these three different bus configurations is discussed in the following sections.

### 2.2.4.1 Internal SCSI Connections

If you make only internal SCSI device connections to the host adapter, you must terminate the last internal device on the SCSI bus. You must disable the termination on all other devices. Termination on the host adapter is required in this case. Insert the plug-in HVD terminator into the external connector J3 on the host adapter.

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

**Figure 2.12 Internal SCSI Device Termination**

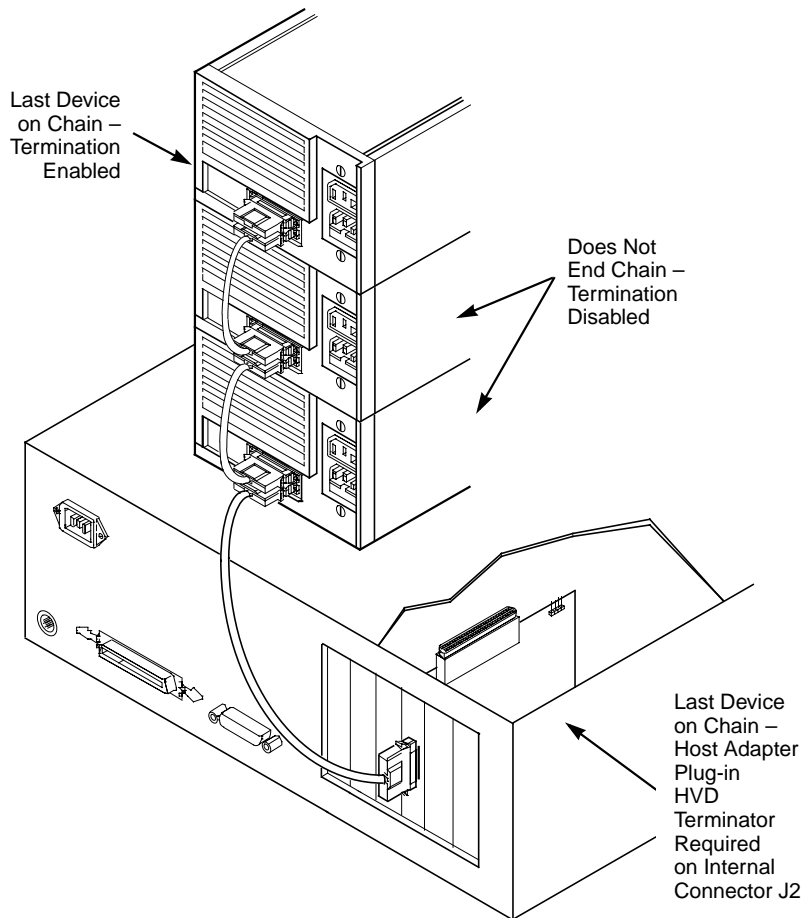


## 2.2.4.2 External SCSI Connections

If you make only external SCSI device connections to the host adapter, you must terminate the last external device on the SCSI bus. You must disable the termination on all other devices. Termination on the host adapter is required in this case. Insert the plug-in HVD terminator into the internal connector J2 on the host adapter.

Figure 2.13 shows you how to enable or disable termination for this SCSI bus configuration.

**Figure 2.13 External SCSI Device Termination**



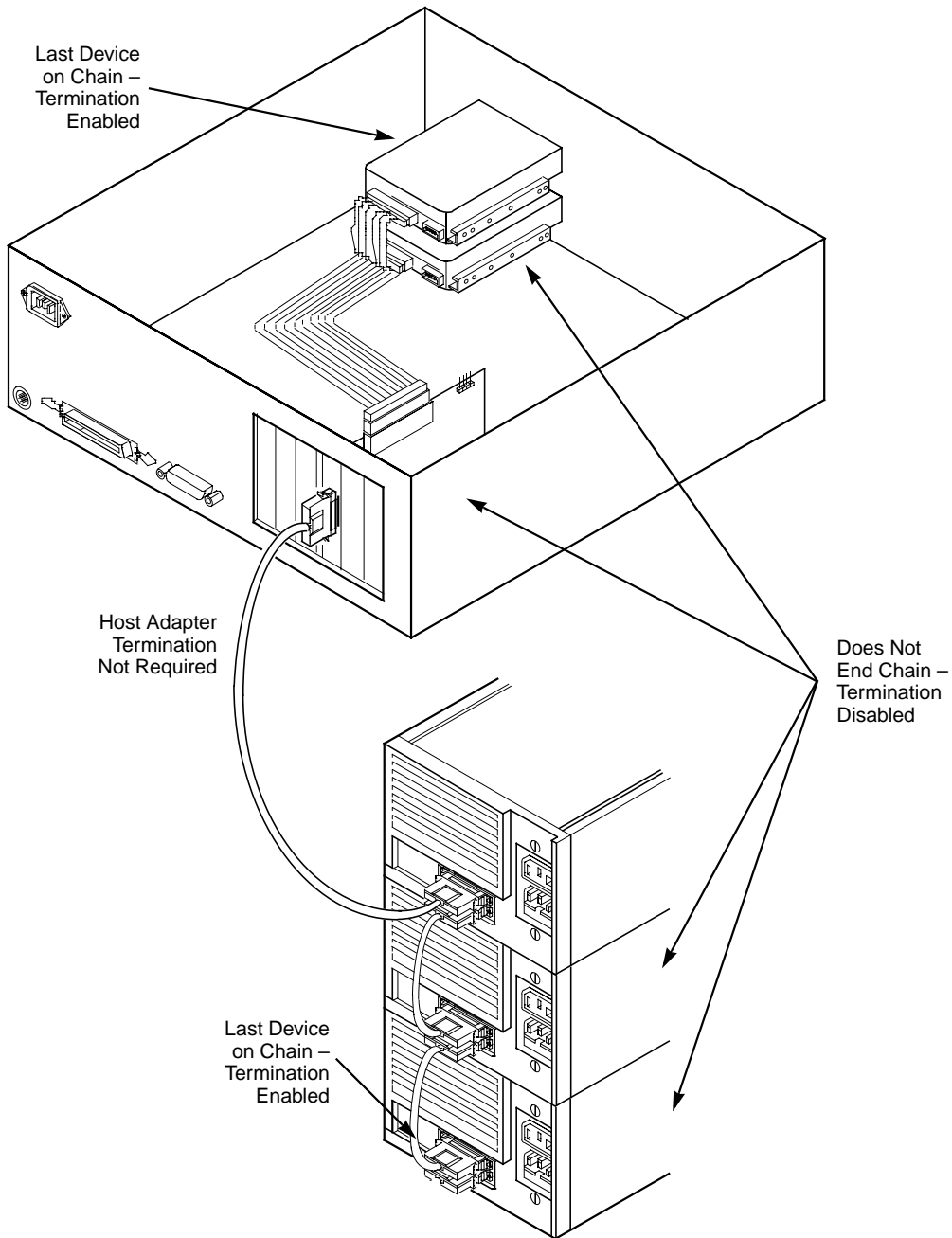


### 2.2.4.3 Internal and External SCSI Connections

If you make internal and external SCSI device connections to the host adapter, you must terminate the last internal device and external device on the SCSI bus. You must disable the termination on all other devices. Termination on the host adapter is not required in this case. Save the plug-in HVD terminator so you can change the SCSI bus configuration in the future.

[Figure 2.14](#) shows you how to enable or disable termination for this SCSI bus configuration.

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



## 2.2.5 Setting SCSI IDs

Each SCSI device and the host adapter must have a separate SCSI ID, 0 through 15. 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 SCSI hard disk drive on the SCSI bus, that drive should have SCSI ID 0, or the lowest SCSI ID on the bus. The *PCI Storage Device Management System SDMS 4.0 User's Guide* explains how to set your host adapter ID using the 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. No duplication of SCSI IDs is allowed on a SCSI bus. Follow these steps for setting SCSI IDs:

- Step 1. Determine the SCSI ID of each device on the SCSI bus. Note any duplications.
- Step 2. Make any necessary changes to the SCSI IDs and record the IDs for future reference. Correct any duplications at this time. [Table 2.2](#) is provided as a place to keep this record.

**Table 2.2 SCSI ID Record**

SCSI ID	SCSI Device
15	
14	
13	
11	
10	
9	
8	
7	LSI8751D (default)
6	
5	
4	
3	
2	
1	
0	

---

## 2.3 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 cabinet cover on your computer.
- 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. Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software you plan to use) to load the driver software for your particular operating system. To change the configuration of your host adapter, if needed, refer to this same guide.



# Chapter 3

## Technical Specifications

---

This section discusses the physical environment associated with the LSI8751D. The LSI8751D mechanical drawing is shown in [Figure 1.1](#). This section also includes these topics:

- [Section 1.1, "Physical Environment," page 1-1](#)
  - [Section 1.2, "Operational Environment," page 1-3](#)
- 

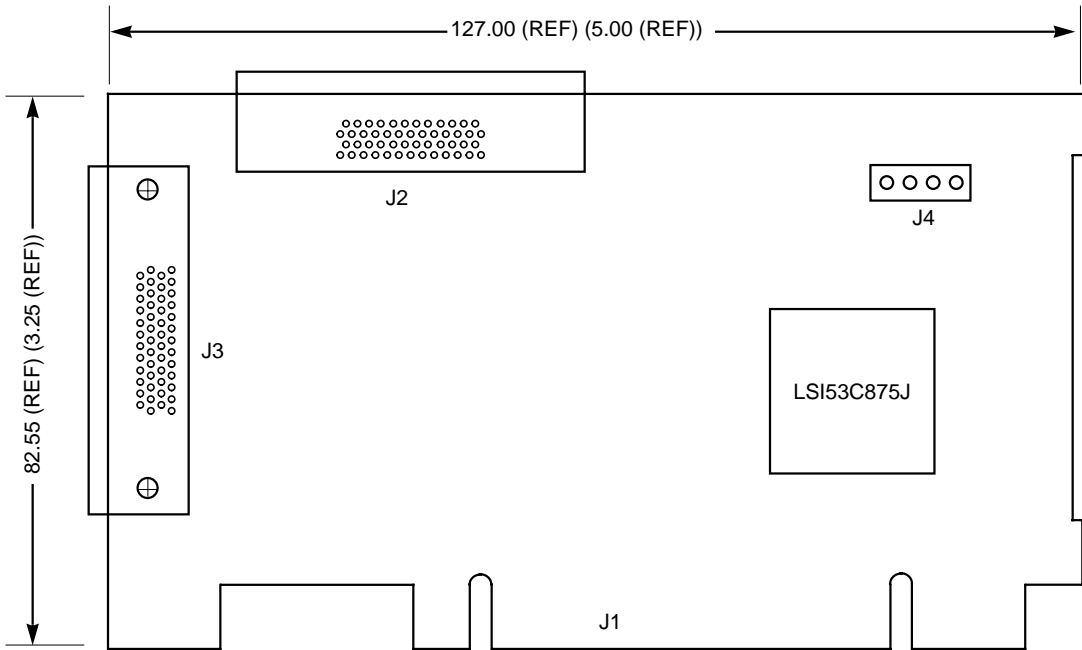
### 3.1 Physical Environment

This section discusses the physical, electrical, thermal, and safety characteristics of the LSI8751D. This board complies with electromagnetic standards set by the FCC.

#### 3.1.1 Physical Characteristics

The dimensions of the LSI8751D are 5.00 x 3.25 inches (127 x 82.552 mm). PCI connection is made through the edge connector J1. Internal SCSI connection is made through the 68-pin high density connector J2. External SCSI connection is made through the 68-pin high density connector J3. The J3 connector extends through the standard bracket, which is attached to the face of the connector outside of the cabinet where the LSI8751D is installed. The bracket is a standard type with a cutout to accommodate connector J3. The J4 connector is for the Busy LED connection using a 4-pin, one-row right-angle header. The component height on the top and bottom of the board follows the PCI specification.

**Figure 3.1 LSI8751D Mechanical Drawing**



All dimensions are given in millimeters and (inches).

### 3.1.2 Electrical Characteristics

The LSI8751D maximum power requirements, including SCSI TERMPWR, under normal operation, are shown in [Table 1.1](#):

**Table 3.1 Maximum Power Requirements**

+5 V DC	±5%	1.5 A	Over the operating range 5 °C to 55 °C
+3.3 V DC	±0.3 V	130 mA	Over the operating range 5 °C to 55 °C when operating in a 3.3 V PCI slot

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.



The PCI PRSNT1/ and PRSNT2/ pins are set to indicate a 7.5 W maximum configuration.

### 3.1.3 Thermal, Atmospheric Characteristics

The board operates in an environment defined by the following parameters:

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

### 3.1.4 Electromagnetic Compliance

The board minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electromagnetic discharge. The board meets the requirements of FCC and CISPR Class B limits and is marked with the FCC Class B ID: B8J8251AD.

### 3.1.5 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. 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 LSI8751D is designed for PCI computer systems with a standard bracket. The SDMS software operates the board, but the design of the board does not prevent the use of other software.

### 3.2.1 The PCI Interface

The PCI interface operates as a 32-bit DMA bus master. The connection is made through the edge connector J1, which provides connections on both the top and bottom of the board. The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.1 standard. The signal assignments are shown in [Table 1.2](#) and [Table 1.3](#).

**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 LSI53C875J chip is powered from the 3 V/5 V pins.

**Table 3.2 PCI Connector J1 (Top)**

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

1. Shaded signals are not connected.

**Table 3.3 PCI Connector JI (Bottom)**

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

1. Shaded signals are not connected.

### 3.2.2 The SCSI Interface

The SCSI interface operates as 16-bit, synchronous or asynchronous, High Voltage Differential (HVD) bus, and supports SCSI-3 protocols and 16-bit arbitration. The signal definitions conform to the SCSI-2 differential standard. The interface is made through connectors J2 and J3. Connector J2 is a 68-pin, high density, right-angle receptacle used for internal connections. Connector J3 is a 68-pin, high density, right-angle receptacle that protrudes through the back panel bracket. SCSI termination is provided through a HVD plug-in terminator. SCSI termination power is also supplied by the board. [Table 1.4](#) shows the signal assignments for J2 and J3 SCSI HVD connectors.

**Table 3.4 SCSI Connectors J2 and J3**

Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin
+DB(12)	1	TERMPWR	18	-DB(12)	35	TERMPWR	52
+DB(13)	2	RESERVED	19	-DB(13)	36	RESERVED	53
+DB(14)	3	+ATN	20	-DB(14)	37	-ATN	54
+DB(15)	4	GND	21	-DB(15)	38	GND	55
+DB(P1)	5	+BSY	22	-DB(P1)	39	-BSY	56
GND	6	+ACK	23	GND	40	-ACK	57
+DB(0)	7	+RST	24	-DB(0)	41	-RST	58
+DB(1)	8	+MSG	25	-DB(1)	42	-MSG	59
+DB(2)	9	+SEL	26	-DB(2)	43	-SEL	60
+DB(3)	10	+C/D	27	-DB(3)	44	-C/D	61
+DB(4)	11	+REQ	28	-DB(4)	45	-REQ	62
+DB(5)	12	+I/O	29	-DB(5)	46	-I/O	63
+DB(6)	13	GND	30	-DB(6)	47	GND	64
+DB(7)	14	+DB(8)	31	-DB(7)	48	-DB(8)	65
+DB(P)	15	+DB(9)	32	-DB(P)	49	-DB(9)	66
DIFFSENS	16	+DB(10)	33	GND	50	-DB(10)	67
TERMPWR	17	+DB(11)	34	TERMPWR	51	-DB(11)	68

### 3.2.3 The LED Interface

The LED interface on the LSI8751D is a four-wire arrangement that allows the user to connect an LED harness to the board. The GPIO0\_FETCH line (maximum output low voltage 0.4 V and minimum output low current 16 mA) is pulled low to complete the circuit when a harness with an LED is attached. The connector on the LSI8751D is J4.

**Table 3.5 LED Connector J4**

Signal Name	Pin
LED+	1
LED-	2
LED-	3
LED+	4

# Appendix A

## Glossary of Terms and Abbreviations

---

<b>Active Termination</b>	The electrical connection required at each end of the SCSI bus, composed of active voltage regulation and a set of termination resistors. Ultra and Ultra2 SCSI require active termination.
<b>Address</b>	A specific location in memory, designated either numerically or by a symbolic name.
<b>Asynchronous Data Transfer</b>	One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer.
<b>BIOS</b>	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 your host adapter acts as an extension of the system BIOS.
<b>Bit</b>	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.
<b>Bus</b>	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 by way of taps on the lines.
<b>Bus Mastering</b>	A high-performance way to transfer data. The host adapter controls the transfer of data directly to and from system memory without interrupting the computer's microprocessor. This is the fastest way for multitasking operating systems to transfer data.
<b>Byte</b>	A unit of information consisting of eight bits.
<b>CISPR</b>	A special international committee on radio interference (Committee, International and Special, for Protection in Radio).

<b>Configuration</b>	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.
<b>CPU</b>	Central Processing Unit. The “brain” of the computer that performs the actual computations. The term Microprocessor Unit (MPU) is also used.
<b>DMA</b>	Direct Memory Access.
<b>DMA Bus Master</b>	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.
<b>Device Driver</b>	A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.
<b>Differential SCSI</b>	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). Two types of differential signals in the industry are High Voltage Differential (HVD) and Low Voltage Differential (LVD).
<b>Dword</b>	A double word is a group of four 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.
<b>EEPROM</b>	Electrically Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information. See NVRAM.
<b>EISA</b>	Extended Industry Standard Architecture. An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers.
<b>External SCSI Device</b>	A SCSI device installed outside the computer cabinet. These devices are connected in a continuous chain using specific types of shielded cables.
<b>Fast-20</b>	The SCSI Trade Association (STA) supports the use of “Ultra SCSI” over the term “Fast-20”. Please see Ultra SCSI.
<b>Fast-40</b>	The SCSI trade association (STA) supports the use of “Ultra2 SCSI” over the term “Fast-40”. Please see Ultra2 SCSI.

<b>Fast SCSI</b>	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.
<b>FCC</b>	Federal Communications Commission.
<b>File</b>	A named collection of information stored on a disk.
<b>Firmware</b>	Software that is permanently stored in ROM. Therefore, it can be accessed during boot time.
<b>Hard Disk</b>	A disk made of metal and permanently sealed into a drive cartridge. A hard disk can store very large amounts of information.
<b>Host</b>	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.
<b>Host Adapter</b>	A circuit board or integrated circuit that provides a SCSI bus connection to the computer system.
<b>Internal SCSI Device</b>	A SCSI device installed inside the computer cabinet. These devices are connected in a continuous chain using an unshielded ribbon cable.
<b>IRQ</b>	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.
<b>ISA</b>	Industry Standard Architecture. A type of computer bus used in most PCs. It allows devices to send and receive data up to 16-bits at a time.
<b>Kbyte</b>	Kilobyte. A measure of computer storage equal to 1024 bytes.
<b>Local Bus</b>	A way to connect peripherals directly to computer memory. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.
<b>Logical Unit</b>	A subdivision, either logical or physical, of a SCSI device (actually the place for the device on the SCSI bus). Most devices have only one logical unit, but up to eight are allowed for each of the eight possible devices on a SCSI bus.
<b>LUN</b>	Logical Unit Number. An identifier, zero to seven, for a logical unit.

<b>LVD SCSI</b>	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.
<b>Mainboard</b>	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 expansion boards.
<b>Main Memory</b>	The part of a computer's memory which is directly accessible by the CPU (usually synonymous with RAM).
<b>Mbyte</b>	Megabyte. A measure of computer storage equal to 1024 kilobytes.
<b>Motherboard</b>	See Mainboard. In some countries, the term Motherboard is not appropriate.
<b>Multitasking</b>	The executing of more than one command at the same time. This allows programs to operate in parallel.
<b>Multithreading</b>	The simultaneous accessing of data by more than one SCSI device. This increases the data throughput.
<b>NVRAM</b>	NonVolatile Random Access Memory. Actually an EEPROM (Electrically Erasable Read Only Memory chip) used to store configuration information. See EEPROM.
<b>Operating System</b>	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.
<b>Parity Checking</b>	A way to verify the accuracy of data transmitted over the SCSI bus. The parity 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, the information may be retransmitted or an error message may appear.
<b>Passive Termination</b>	The electrical connection required at each end of the SCSI bus, composed of a set of resistors. It improves the integrity of bus signals.
<b>PCI</b>	Peripheral Component Interconnect. A local bus specification that allows connection of peripherals directly to computer memory. It bypasses the slower ISA and EISA buses.



<b>Peripheral Devices</b>	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.
<b>Pin-1 Orientation</b>	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 always keyed to insure proper alignment, but internal SCSI ribbon cables sometimes are not keyed.
<b>PIO</b>	Programmed Input/Output. A way the CPU can transfer data to and from memory using the computer's I/O ports. PIO is usually faster than DMA, but requires CPU time.
<b>Port Address</b>	Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.
<b>Port Number</b>	See Port Address.
<b>Queue Tags</b>	A way to keep track of multiple commands that allow for increased throughput on the SCSI bus.
<b>RAM</b>	Random Access Memory. 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.
<b>RISC Core</b>	LSI Logic SCSI chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode scripts.
<b>ROM</b>	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.
<b>SCAM</b>	SCSI Configured AutoMatically. A method to automatically allocate SCSI IDs using software when SCAM compliant SCSI devices are attached.
<b>SCSI</b>	Small Computer System Interface. A specification for a high performance peripheral bus and command set. The original standard is referred to as SCSI-1.
<b>SCSI-2</b>	The current SCSI specification which adds features to the original SCSI-1 standard.
<b>SCSI-3</b>	The SCSI specification which adds features to the SCSI-2 standard.

<b>SCSI Bus</b>	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.
<b>SCSI Device</b>	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.
<b>SCSI ID</b>	A way to uniquely identify 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 usually gets the highest ID, (7 or 15) giving it priority to control the bus.
<b>SDMS</b>	Storage Device Management System. An LSI Logic software product that manages SCSI system I/O.
<b>Single-Ended SCSI</b>	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).
<b>STA</b>	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.
<b>Synchronous Data Transfer</b>	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.
<b>System BIOS</b>	Controls the low level POST (Power-On Self-Test), and basic operation of the CPU and computer system.
<b>Ultra SCSI</b>	A standard for SCSI data transfers. It allows a transfer rate of up to 20 Mbytes/s over a 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".
<b>Ultra2 SCSI</b>	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 (SCSI Trade Association) supports using the term "Ultra2 SCSI" over the term "Fast-40".

<b>VCCI</b>	Voluntary Control Council for Interference.
<b>VDE</b>	Verband Deucher Elektroniker (Association of German Electrical Engineers).
<b>Virtual Memory</b>	Space on a hard disk that can be used as if it were RAM.
<b>Wide SCSI</b>	A SCSI-2 feature allowing 16-bit or 32-bit transfers on the SCSI bus. This dramatically increases the transfer rate over the standard 8-bit SCSI bus.
<b>Wide Ultra SCSI</b>	The STA term for a SCSI bus width of 16 bits, with the SCSI bus speed maximum data rate of 40 Mbytes/s.
<b>Wide Ultra2 SCSI</b>	The STA term for a SCSI bus width of 16 bits, with the SCSI bus speed maximum data rate of 80 Mbytes/s.
<b>Word</b>	A 2-byte (or 16-bit) unit of information.



# Index

---

## B

board characteristics [1-3](#)

## C

chained connection [2-9](#), [2-13](#)  
completing the LSI8751D installation [2-21](#)  
connecting the SCSI peripherals [2-5](#)

## D

detailed installation procedure [2-2](#) to [2-12](#)  
duplication of SCSI IDs [2-19](#)

## E

edge connector [2-4](#)  
electrical characteristics [3-2](#)  
electromagnetic compliance [3-3](#)  
external SCSI bus connections [2-11](#)

## F

features [1-2](#)  
front panel LED [2-10](#)

## I

inserting the host adapter [2-3](#)  
installation procedure [2-2](#)  
installation procedure check list [2-21](#)  
internal SCSI bus connections [2-7](#)

## L

LED connector J4 [3-6](#)  
LED interface [3-6](#)  
LSI8751D host adapter  
board characteristics [1-3](#)  
features [1-2](#)  
installing [2-2](#) to [2-21](#)  
termination [1-2](#)  
Ultra SCSI [1-3](#)

## O

operational environment [3-3](#)

## P

PCI connector J1 (bottom) [3-5](#)  
PCI connector J1 (top) [3-4](#)  
PCI interface [1-2](#), [3-3](#)  
peripheral device SCSI IDs [2-19](#)

## Q

quick installation procedure [2-1](#) to [2-2](#)

## R

ribbon cable [2-5](#)

## S

safety characteristics [3-3](#)  
SCSI bus connections [2-5](#)  
SCSI bus termination [2-14](#)  
SCSI connector J3 [3-5](#)  
SCSI ID record table [2-20](#)  
SCSI IDs [2-19](#)  
SCSI interface [1-2](#), [3-5](#)  
SCSI peripherals [2-5](#)  
setting SCSI IDs [2-19](#)  
storage device management system (SDMS) [1-1](#)

## T

termination  
SCSI bus [2-14](#) to [2-18](#)  
thermal, atmospheric characteristics [3-3](#)

## U

Ultra SCSI [1-3](#)



# Customer Feedback

---

We would appreciate your feedback on this document. Please copy the following page, add your comments, and fax it to us at the number shown.

If appropriate, please also fax copies of any marked-up pages from this document.

Important: Please include your name, phone number, fax number, and company address so that we may contact you directly for clarification or additional information.

Thank you for your help in improving the quality of our documents.

---

## Reader's Comments

Fax your comments to: LSI Logic Corporation  
Technical Publications  
M/S E-198  
Fax: 408.433.4333

Please tell us how you rate this document: *LSI8751D PCI to SCSI Host Adapter*. Place a check mark in the appropriate blank for each category.

	Excellent	Good	Average	Fair	Poor
Completeness of information	_____	_____	_____	_____	_____
Clarity of information	_____	_____	_____	_____	_____
Ease of finding information	_____	_____	_____	_____	_____
Technical content	_____	_____	_____	_____	_____
Usefulness of examples and illustrations	_____	_____	_____	_____	_____
Overall manual	_____	_____	_____	_____	_____

What could we do to improve this document?

---

---

---

---

If you found errors in this document, please specify the error and page number. If appropriate, please fax a marked-up copy of the page(s).

---

---

---

Please complete the information below so that we may contact you directly for clarification or additional information.

Name \_\_\_\_\_ Date \_\_\_\_\_  
Telephone \_\_\_\_\_ Fax \_\_\_\_\_  
Title \_\_\_\_\_  
Department \_\_\_\_\_ Mail Stop \_\_\_\_\_  
Company Name \_\_\_\_\_  
Street \_\_\_\_\_  
City, State, Zip \_\_\_\_\_



You can find a current list of our U.S. distributors, international distributors, and sales offices and design resource centers on our web site at

**[http://www.lsilogic.com/contacts/na\\_salesoffices.html](http://www.lsilogic.com/contacts/na_salesoffices.html)**

# Headquarters

---

## Sales Offices

LSI Logic Corporation  
North American Headquarters  
Milpitas CA  
Tel: 408.433.8000  
Fax: 408.433.8989

LSI Logic Europe Ltd  
European Headquarters  
Bracknell England  
Tel: 44.1344.426544  
Fax: 44.1344.481039

LSI Logic K.K.  
Headquarters  
Tokyo Japan  
Tel: 81.3.5463.7821  
Fax: 81.3.5463.7820

## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>