USER'S GUIDE

LSI21040
PCI to Dual Channel
Ultra160 SCSI
Host Adapter

Version 1.1

November 2000

LSI LOGIC®

S14043.B

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 LSI21040 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.

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Document DB15-000148-02, Second Edition (November 2000).
This document describes the LSI Logic LSI21040 PCI to Dual Channel Ultra160 SCSI Host Adapter and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

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

Preface

This book is the primary reference and user's guide for the LSI Logic LSI21040 PCI to Dual Channel Ultra160 SCSI Host Adapter. It contains a complete functional description for the LSI21040 as well as complete physical and electrical specifications.

Audience

This document assumes that you have some familiarity with SCSI protocol and related support devices and will benefit persons installing and using the LSI21040.

Organization

This document has the following chapters and appendix:

- Chapter 1, **Using the LSI21040**, defines the interfaces and characteristics of the LSI21040.
- Chapter 2, **Installing the LSI21040**, provides both quick and detailed installation instructions.
- Chapter 3, **Specifying the Technical Characteristics**, describes the physical and operational environments of the LSI21040.
- 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

SCSI SCRIPTS Processors Programming Guide, Order Number S14044.A

LSI53C1010-33 PCI to Dual Channel Ultra3 SCSI Multifunction Controller Technical Manual, Order Number S14025.C

Revision Record

Revision	Date	Remarks
1.0	5/00	Final version.
1.1	11/00	All product names changed from SYM to LSI.

Contents

Tables

Chapter 1
Using the LSI21040

This chapter describes the LSI21040 PCI to Ultra160 SCSI Dual Channel Host Adapter interface to PCI computer systems and includes these topics:

1.1 General Description

The LSI21040 provides an Ultra160 SCSI interface to PCI computer systems. It is referred to as the LSI21040 throughout this guide. Installing this adapter in your PCI system allows connection of up to 15 SCSI devices per channel. The LSI21040 uses the LSI53C1010 PCI to Ultra160 Multifunction Controller chip.

The dual channel LSI21040 provides 16-bit Low Voltage Differential (LVD) and Single-Ended (SE) SCSI solutions for your computer, using only one PCI slot. This board supports legacy Fast SCSI, Ultra SCSI, Ultra2 SCSI, and the newest Ultra160 SCSI devices.

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

The Storage Device Management System (SDMS™) software operates the board. You may also use SCSI software provided by other vendors

that works with the LSI53C1010. The flash memory device on the board can incorporate the BIOS support for this host adapter. The LSI21040 has a serial EEPROM device for storing your SCSI bus configuration.

The LSI53C1010 also contains a SCSI SCRIPTS™ processor that permits both DMA and SCSI commands to be fetched from host memory or internal SCRIPTS RAM. Algorithms written in SCSI SCRIPTS control the actions of the SCSI and DMA cores. The SCRIPTS processor executes complex SCSI bus sequences independently of the host CPU. For more information on the SCSI SCRIPTS Instruction Set used to write these algorithms, refer to the *SCSI SCRIPTS Processors Programming Guide.*

The *PCI Storage Device Management System SDMS 4.0 User's Guide* and this user's guide contain a complete library of product information and installation instructions. With this information, the full benefits of your LSI21040 are available to you.

1.2 Features

This section provides an overview of the PCI Interface, the SCSI Interface, and Board Characteristics for the LSI21040.

1.2.1 PCI Interface

PCI interfaces I/O components to the processor and memory subsystems in equipment ranging from PCs to servers. The PCI interface operates as a 64-bit DMA bus master capable of 64-bit addressing. The LSI53C1010 contains the PCI functionality for the LSI21040.

The PCI interface includes these features:

- Complies with PCI 2.2 specification
- Complies with PCI Bus Power Management Specification Rev 1.1
- Complies with PC99
- Supports up to 64-bit/33 MHz PCI interface for 264 Mbytes/s bandwidth that:
  - Supports 64-bit DMA bus mastership with 64-bit addressing
  - Operates at 33 MHz

  - Supports dual address cycle generation for all SCRIPTS
  - Presents a single electrical load to the PCI Bus (True PCI Multifunction Device)
- Bursts 2 to 128 Dwords across the PCI bus
- Supports 32-bit or 64-bit word data bursts with variable burst lengths
- Supports the PCI Cache Line Size register
- Prefetches up to 8 Dwords of SCRIPTS instructions
- Supports PCI Write and Invalidate, Read Line, and Read Multiple commands
- Bursts SCRIPTS opcode fetches across the PCI bus
- Supports universal 3.3 V and 5 V PCI signaling environment

1.2.2 SCSI Interface

The SCSI interface on the LSI21040 operates as an 8-bit or 16-bit interface. It supports 8-bit or 16-bit, synchronous and asynchronous, LVD or SE, Fast, Ultra, Ultra2, and Ultra160 SCSI protocols in various combinations.

The LSI53C1010 contains the SCSI functionality for the LSI21040. This chip is a PCI to Ultra160 SCSI Controller with LVD Link™ Universal Transceivers. It connects directly to the SCSI bus and generates signal timing and bus protocol in compliance with SCSI standards.

The SCSI interface includes these features:

- Performs wide, Ultra160 SCSI synchronous data transfers as fast as 160 Mbytes/s using Double Transition (DT) clocking for Channel A
- Performs wide, Ultra SCSI SE synchronous transfers as fast as 40 Mbytes/s for Channel B
- Enables LVD or SE termination on Channel A automatically
- Enables SE termination on Channel B automatically
- Contains internal 68-pin high density connectors for Channel A and Channel B
- Contains internal ribbon connector 50-pin for Channel B
- Contains external connector 68-pin high density for Channel A

- Provides SCSI termination power (TERMPWR) source with autoresetting circuit protection device
- Includes 8 Kbytes internal RAM for SCRIPTS instruction storage for each channel
- Supports SCSI Plug and Play
- Supports variable block size and scatter/gather data transfers
- Performs complex bus sequences without interrupts, including restore data pointers
- Contains a serial EEPROM for user configuration utility
- Provides SCSI bus activity LED connector for each channel on one connector

1.2.3 Board Characteristics

The LSI21040 characteristics are:

- PCI board dimensions: 152.4 x 88.90 mm (6.875 x 3.99 inches)
- PCI Universal 64-bit card edge connector
- One high density 68-pin external connector
- Two high density 68-pin internal connectors
- One 50-pin internal ribbon connector
- SCSI Bus Activity LED connector

In Chapter 3, “Specifying the Technical Characteristics,” Figure 3.1 illustrates the mechanical drawing for this host adapter board.

1.2.4 SCSI Bus Activity LED Connector

A SCSI Bus Activity LED connector indicates the status of the SCSI bus when an LED is attached. This LED lights when the SCSI bus is transferring information.

1.3 Benefits of Ultra160 SCSI

Ultra160 SCSI delivers data up to two times faster than Ultra2 SCSI. Ultra160 SCSI is a subset 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 per second 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. This advantage is most noticeable in heavily loaded systems or large block size applications, such as video on-demand and image processing.

1.3.1 Double Transition (DT) Clocking

Ultra160 SCSI includes DT clocking in order to double data transfer speeds without increasing the clock rate. As a result, data is clocked on both rising and falling edges of the Request and Acknowledge signals.

1.3.2 Cyclic Redundancy Check (CRC)

Ultra160 SCSI includes CRC to provide data bus protection. CRC 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, all double bit errors, or any combination of errors within a single 32-bit range.

1.3.3 Domain Validation

Ultra160 SCSI also includes Domain Validation to provide basic integrity checking. Domain Validation is a procedure that allows a host computer and target SCSI peripheral to negotiate and find the optimal transfer speed. This procedure improves overall reliability of the system. SURElink™ extends this feature by providing three levels of integrity checking. Refer to Section 1.6, “Benefits of SURElink (Extended Domain Validation),” on page 1-7 for more detailed information.

1.3.4 Asynchronous Information Protection (AIP)

The LSI53C1010 supports AIP to protect all non-data phases, including command, status, and messages. CRC, along with AIP, provides end-to-end protection of the SCSI I/O.

1.4 Benefits of LVD Link Technology

To support greater device connectivity and a longer SCSI cable, the LSI21040 features LVD Link technology, the LSI Logic implementation of Universal LVD SCSI. LVD Link transceivers provide the inherent reliability of differential SCSI, and a long-term migration path to faster SCSI transfer rates.

The LVD Link transceivers reduce the power needed to drive the SCSI bus, so that the I/O drivers can be integrated directly into the chip. LVD Link technology lowers the amplitude of noise reflections and allows higher transmission frequencies.

The LVD Link transceivers operate in LVD and SE modes. They also allow the chip to detect a High Voltage Differential (HVD) signal when the chip is mistakenly connected to external HVD transceivers. When connected, the LSI53C1010 automatically detects signal type, based on the voltage detected. It automatically switches to the SE or LVD mode, as appropriate.

Important: All bus devices must be LVD or SE. If a HVD device is detected, the board puts the SCSI bus in the high impedance state and shuts down.

1.5 Benefits of TolerANT® Technology

The LSI53C1010 features TolerANT technology, which includes active negation on the SCSI drivers and input signal filtering on the SCSI receivers. Active negation causes the SCSI Request, Acknowledge, Data, and Parity signals to be actively driven HIGH rather than passively pulled up by terminators.

TolerANT receiver technology improves data integrity in unreliable cabling environments where other devices would be subject to data corruption. TolerANT receivers filter the SCSI bus signals to eliminate unwanted transitions, without the long signal delay associated with RC-type input filters. This improved driver and receiver technology helps eliminate double clocking of data, which is the single biggest reliability issue with SCSI operations. TolerANT input signal filtering is a built-in feature of the LSI53C1010 and all LSI Logic Fast SCSI, Ultra SCSI, Ultra2 SCSI, and Ultra160 SCSI devices.

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 technology protects other devices on the bus from data corruption. When it is used with the LVD Link 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 American National Standards Institute.

1.6 Benefits of SURElink (Extended Domain Validation)

SURElink represents the very 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 is the software control for the manageability enhancements in the LSI53C1010. Fully integrated in the SDMS software solution, SURElink provides Domain Validation at boot time as well as throughout system operation. SURElink extends to the Distributed Management Interface (DMI) based System Management components of SDMS, providing the network administrator remote management capability.

SURElink Domain Validation provides three levels of integrity checking: Basic (level 1), Enhanced (level 2), and Margined (level 3). The basic check consists of an inquiry command to detect gross problems. The

enhanced check sends a known data pattern using the Read and Write Buffer commands to detect additional problems. The margined check verifies that the physical parameters have some degree of margin.

By varying LVD drive strength and REQ/ACK timing characteristics, level 3 verifies that no errors occur on the transfers. These altered signals are only used during the diagnostic check and not during normal system operation. Should errors occur with any of these checks, the system can drop back to a lower transmission speed, on a per-target basis, to ensure robust system operation.

Chapter 2
Installing the LSI21040

This chapter provides instructions on how to install the LSI21040 and includes these topics:

2.1 Quick Installation Procedure

This section provides an overview of the installation procedure. If you are an experienced computer user with prior host adapter installation and SCSI bus setup experience, this section may sufficiently describe the procedure for you. If you prefer a more detailed guidance for installing the LSI21040, proceed 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 removing this host adapter board.

Step 2. Remove the LSI21040 from the packing and check that it is not damaged.

Figure 2.1 illustrates an example of this host adapter board. Also refer to Figure 3.1 to see a more detailed drawing of this board.

Step 3. Open your PC cabinet and select an appropriate open PCI slot.

Step 4. Insert the host adapter board.

Step 5. Connect the internal and external SCSI peripherals.

Step 6. Terminate the SCSI bus.

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

Step 7. Set the peripheral SCSI IDs.

Step 8. Make any configuration changes.

Step 9. Close your PC cabinet cover.

Step 10. Make all external SCSI bus connections.

Step 11. 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.

2.2 Detailed Installation Procedure

This section provides step-by-step instructions for installing the LSI21040, and connecting it to your SCSI peripherals. If you are experienced in these tasks, you may prefer to use Section 2.1, "Quick Installation Procedure."

2.2.1 Before You Start

Before starting, look through the following task list to get an overall idea of the steps you will be performing. If you are not confident you can perform the tasks as described here, LSI Logic recommends 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. They are referred to as a SCSI bus.

Each SCSI host adapter that you install can act as host for up to 15 peripheral devices, not including the adapter itself. Follow the detailed instructions in the next section to successfully install your host adapter board.

2.2.2 Inserting the Host Adapter

For safe and proper installation, you will need the user's manual supplied with your computer. Perform the following steps to install the LSI21040.

Step 1. *Ground yourself* before removing this host adapter board.

Step 2. Remove the LSI21040 from the packing and check that it is not damaged.

Figure 2.1 illustrates an example of this host adapter board. Also refer to Figure 3.1 to see a more detailed drawing of this board.

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.

Caution: *Ground yourself* by touching a metal surface before removing the cabinet top. 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 5. Locate the slots for PCI plug-in board installation.

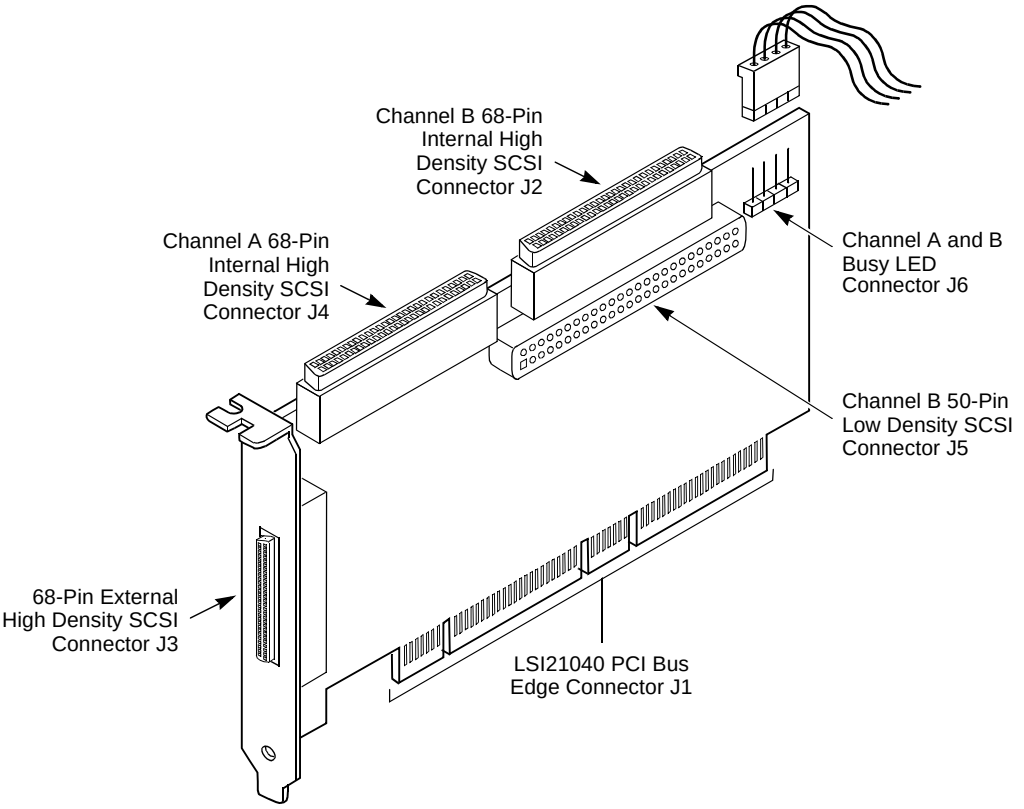
Refer to the user's manual for your computer to confirm the location of the PCI slots.

The LSI21040 requires a 32-bit or 64-bit PCI slot that allows bus master operation. If a 32-bit PCI slot is used, bits [31:0] of the J1 connector are inserted while bits [63:32] remain uninserted. See Figure 2.2.

Note: For the LSI21040 to function as a 64-bit device, it must be inserted in a 64-bit PCI slot. If the LSI21040 is inserted in a 32-bit PCI slot, it will function as a 32-bit device.

Step 6. Remove the blank bracket panel on the back of the computer aligned with the PCI slot you intend to use. Save the bracket screw.

Figure 2.1 Hardware Connections for the LSI21040

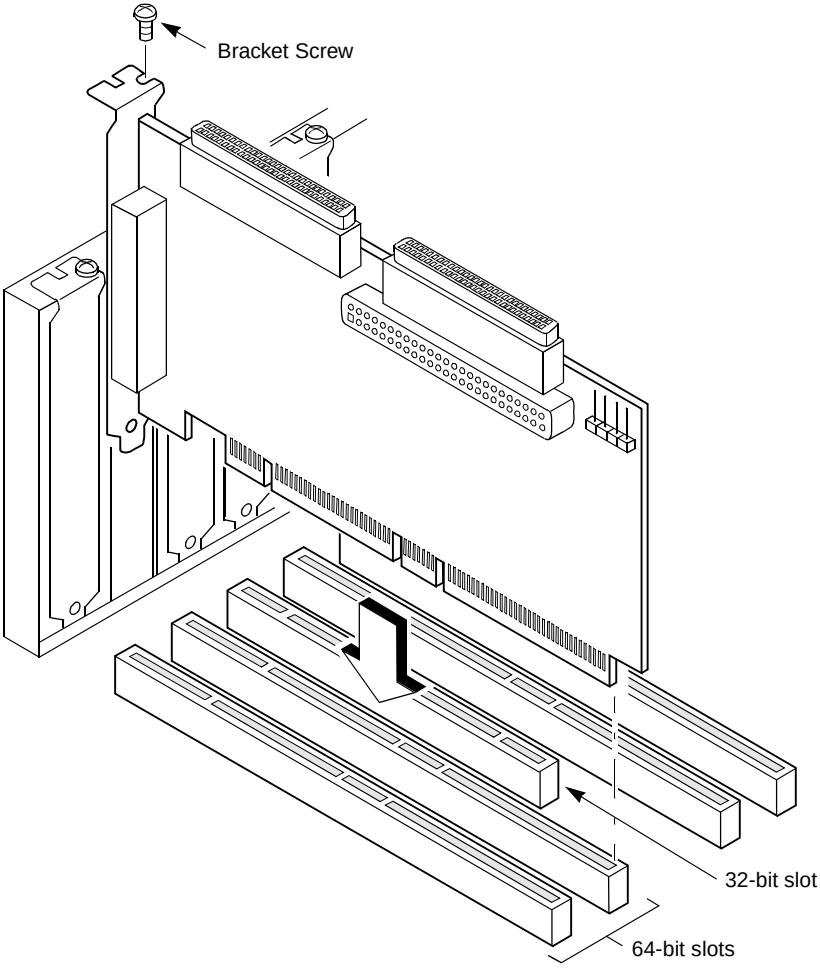


Step 7. Carefully insert edge connector J1 (see Figure 2.1) of the host adapter into the PCI slot.

Make sure the edge connector is properly aligned before pressing the board into place as shown in Figure 2.2. The bracket around connector J3 should fit where you removed the blank panel.

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 will only go in one way.

Figure 2.2 Inserting the Host Adapter



Step 8. Secure the board with the bracket screw (see Figure 2.2) before making the internal and external SCSI bus connections.

2.2.3 Connecting the SCSI Peripherals

All internal SCSI bus connections to the LSI21040 are made with an unshielded 68 conductor Ultra SCSI TPE ribbon cable (see Figure 2.3) and also a 50-pin ribbon cable. The lead connected to pin 1 on the cable is marked with a colored stripe. The connectors on this cable may also be keyed to ensure proper pin connection.

All external SCSI bus connections to the LSI21040 are made with high quality shielded 68 conductor cables (see Figure 2.3). The connectors on this cable are always keyed to ensure proper pin connection.

Note: All the cables shown in Figure 2.3 are included in the LSI Logic Adapter Board Kit for the LSI21040.

Table 2.1 provides a list of the SCSI bus width and maximum data transfer rate for various SCSI definitions.

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
Wide Ultra2 SCSI	16	80
Ultra160 SCSI	16	160

You can connect up to eight SCSI, Fast SCSI, and Ultra SCSI devices on an SE Ultra SCSI bus only if they are evenly spaced on a 1.5-meter Ultra SCSI cable (0.19 m between devices).

You can connect up to four devices if they are evenly spaced on a 3-meter Ultra SCSI cable (0.75 m between devices). Your SE SCSI bus should not exceed 3 meters (total internal and external cable lengths), even with fewer than four devices.

For LVD applications, you can connect up to 16 devices including the host adapter if they are evenly spaced on a 12-meter Ultra SCSI cable (0.19 m minimum between devices). Table 2.2 provides a list of the maximum bus lengths and the maximum number of devices for various SCSI definitions.

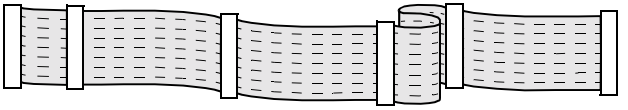
Table 2.2 SCSI Bus Lengths

	Maximum Bus Length, Meters[1]			
	SE	**Differential**	**LVD**	**Maximum # of Devices**
SCSI-1	6	25	12	8
Fast SCSI	3	25	12	8
Fast Wide SCSI	3	25	12	16
Ultra SCSI	1.5[2]	25	12	8
Ultra SCSI	3[2]	–	–	4
Wide Ultra SCSI	–	25	12	16
Wide Ultra SCSI	1.5	–	–	8
Wide Ultra SCSI	3	–	–	4
Ultra2 SCSI	Note[3]	Note[3]	12	8
Wide Ultra2 SCSI	Note[3]	Note[3]	12	16
Ultra160 SCSI	Note[3]	Note[3]	12	16

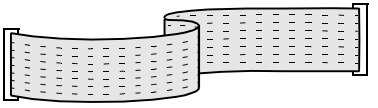
1. This parameter may be exceeded in point-to-point and engineered applications.
2. Additional spacing rules apply.
3. SE and high power differential are not defined at Ultra2 or Ultra160 speeds.

Figure 2.3 SCSI Cables

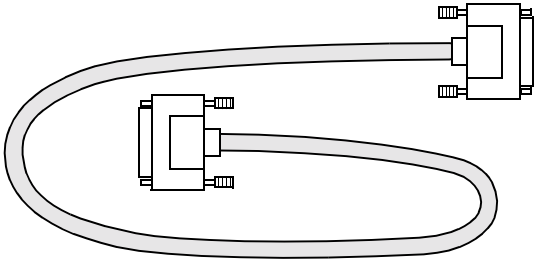
SCSI Cable for Internal Connections
68-Pin High Density



and/or
50-Pin Low Density



SCSI Cable for External Connections
68-Pin High Density



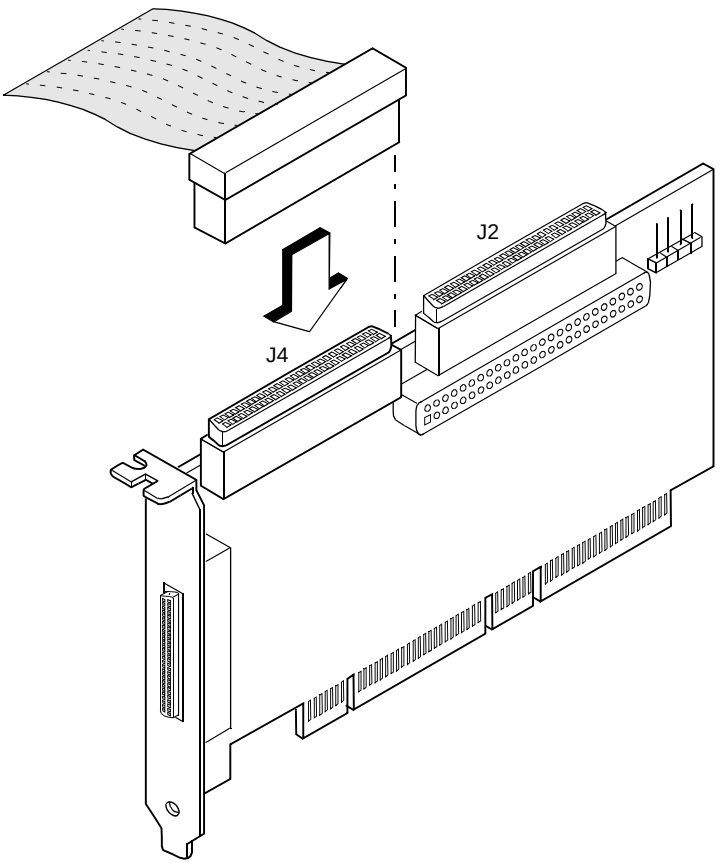
2.2.4 Making Internal SCSI Bus Connections

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

Step 1. Plug one end of the 68-pin internal SCSI ribbon cable into connector J4 or J2. Figure 2.4 illustrates an example for this step.

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

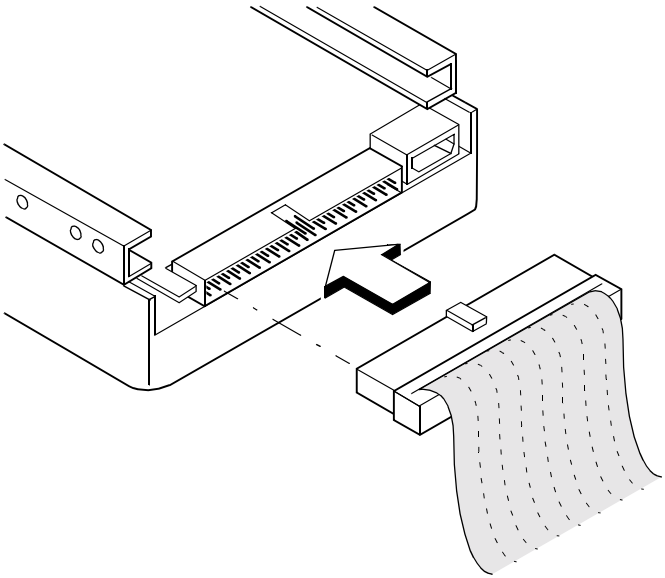
Figure 2.4 Internal SCSI Ribbon Cable to Host Adapter Connection



Step 2. If you have only two internal devices to connect, plug the other end of the internal SCSI ribbon cable into the SCSI connector on your internal SCSI device. Figure 2.5 illustrates an example of this connection.

Note: For nonterminated internal SCSI devices, a terminated cable will be required. This connector must be on the end of the SCSI cable.

Figure 2.5 Internal SCSI Ribbon Cable to Internal SCSI Device Connection



If you have more than one internal device to connect, use an internal SCSI ribbon cable with the required number of connectors attached along its length and proceed to the next step. Figure 2.6 illustrates this type of a connection. If you have only one internal device, proceed to Step 4 on page 2-13.

Step 3. Plug the cable into each additional device as needed.

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

Figure 2.6 Connecting Additional Internal SCSI Devices

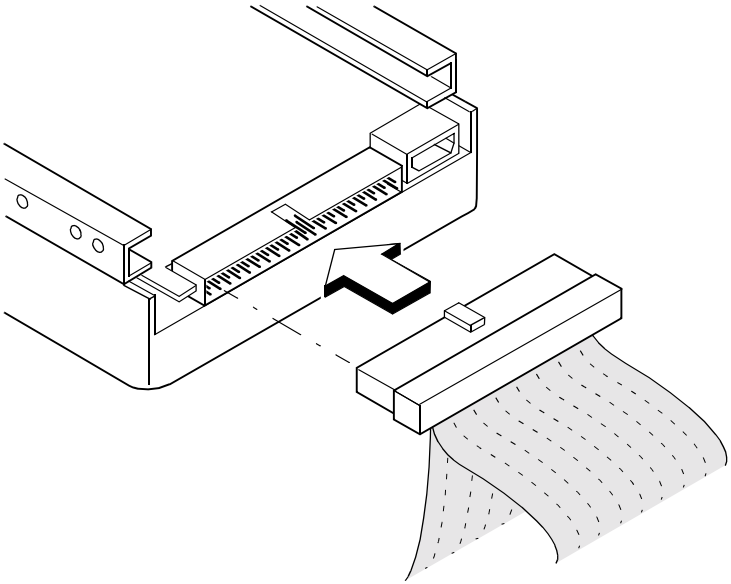
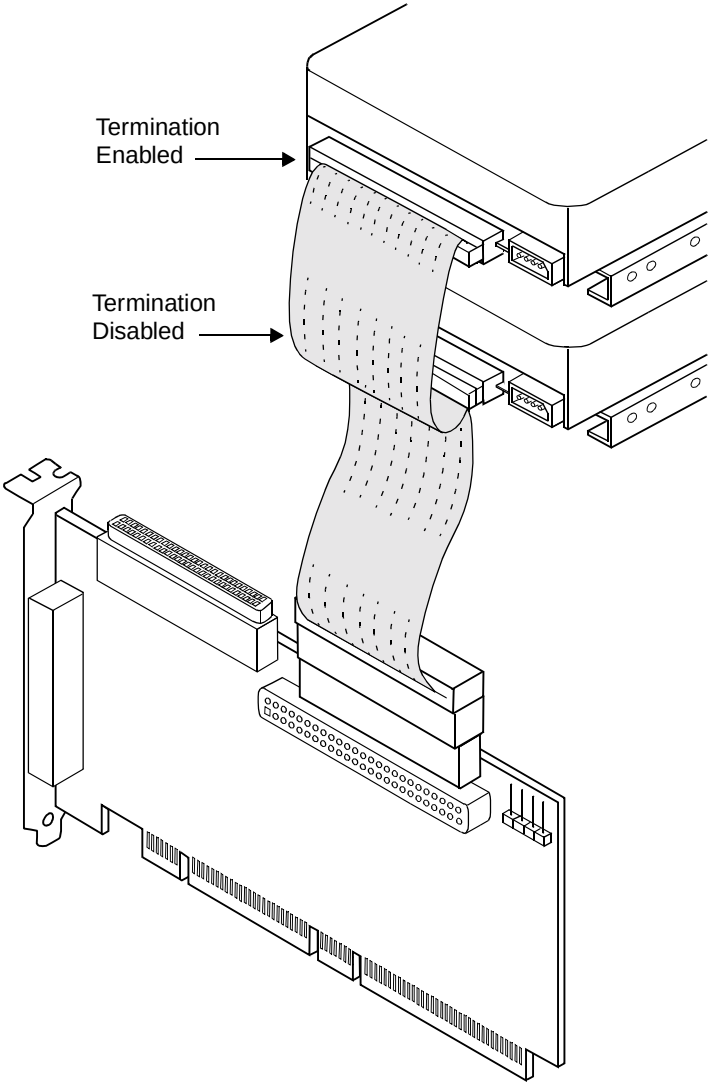


Figure 2.7 Multiple Internal SCSI Devices Chained Together



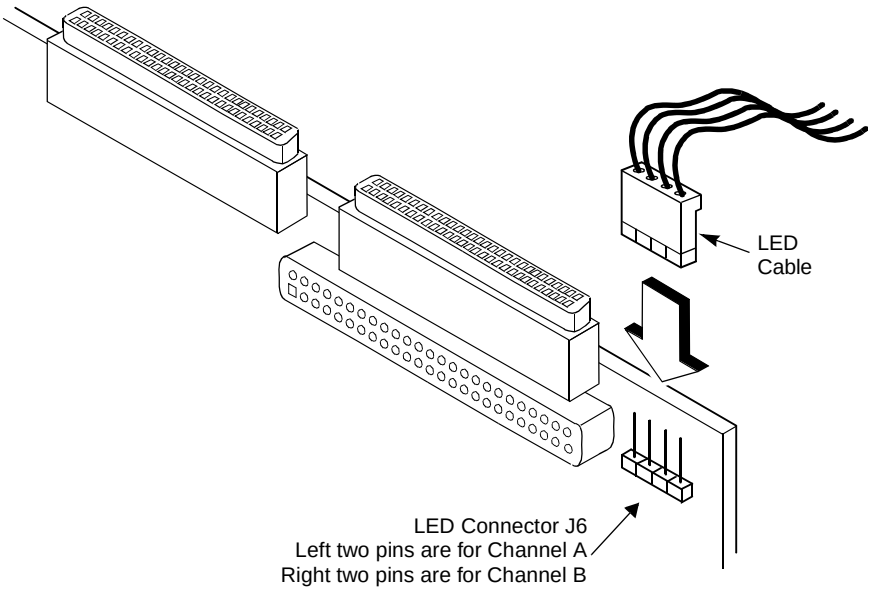
Most PC cabinets are designed with a front panel LED.

Step 4. Connect the LED cable to connector J6 on the host adapter, as shown in Figure 2.8.

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

Connector J6 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° on J6.

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 J6. If the LED does not light when there is SCSI activity, put the connector on the other half of J6.

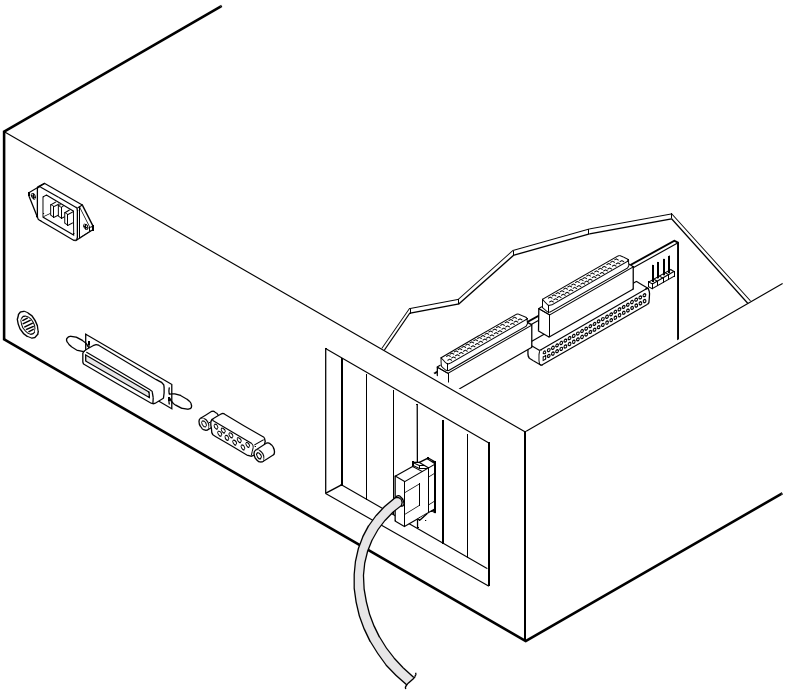
2.2.5 Making External SCSI Bus Connections

This section provides step-by-step instructions about making external SCSI bus connections. To connect external SCSI devices to the LSI21040, follow these steps:

Step 1. Plug the 68-pin HD connector on one end of a shielded external SCSI cable into the host adapter connector J3. (Figure 2.3 provides examples of SCSI cables to use.)

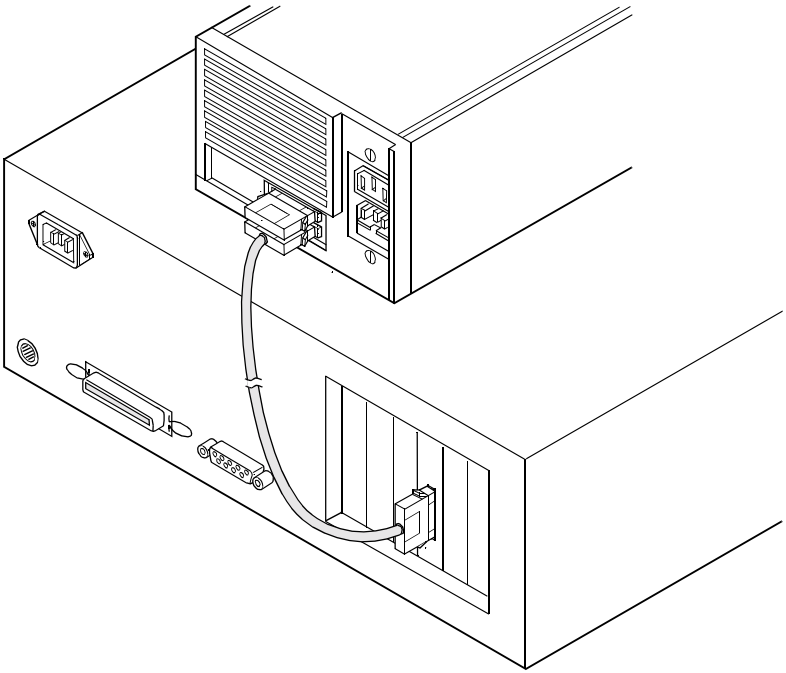
This connector is in the bracket attached to the back panel of your computer. Figure 2.9 shows how this connection is made.

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 your external SCSI device. Figure 2.10 illustrates an example of this connection.

Figure 2.10 External SCSI Device Cable

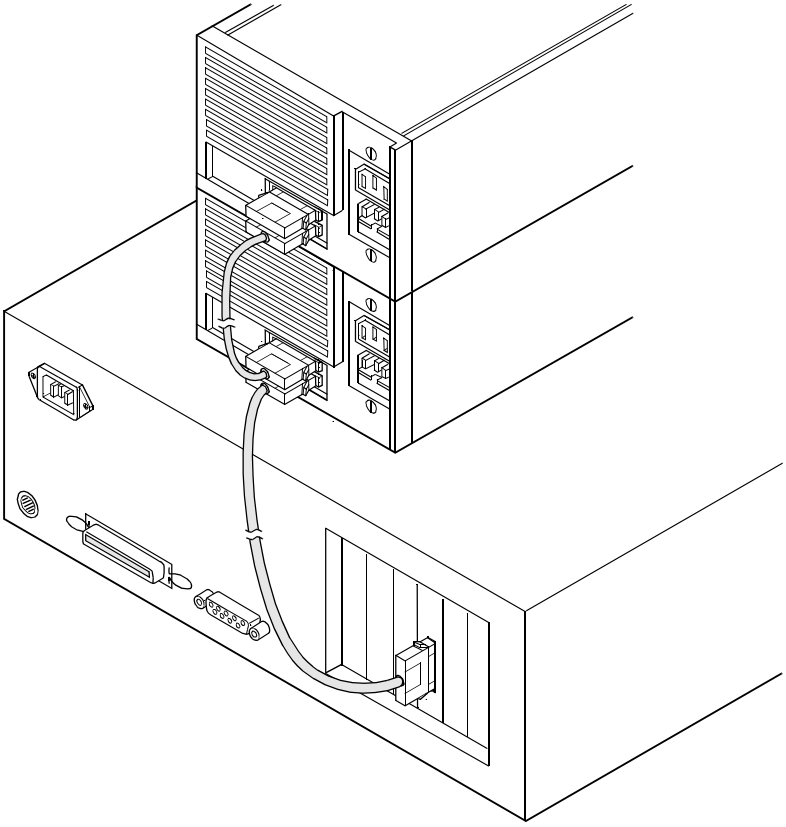


If this is the only external SCSI device on your system, proceed to Section 2.2.6, “SCSI Bus Termination,” on page 2-17 for termination instructions. If you have multiple SCSI devices, proceed to the next page.

Step 3. Chain multiple devices together with shielded external SCSI cables.

Figure 2.11 illustrates an example of these chained connections.

Figure 2.11 Multiple External SCSI Devices Chained Together



After you have connected all of your internal and external devices, proceed to Section 2.2.6, "SCSI Bus Termination."

2.2.6 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 their terminators active. All other SCSI devices on the bus must have their terminators removed or disabled. Remember that the LSI21040 is also on the SCSI bus—its termination is automatically enabled when it is connected to the end of the bus.

Important: To utilize Ultra2 and faster SCSI performance, you must only have LVD devices on the bus. Do not mix any SE devices with LVD devices or the entire bus will drop to SE, limiting bus performance to Ultra SCSI levels.

The peripheral device terminators are usually set with jumpers, resistor modules, or with 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 type/setting for each device and how to set/change it.

Caution: The autoenable/disable sensing feature on the LSI21040 may enable termination erroneously if it is directly cabled to another SCSI device or host adapter using the same sensing method. The LSI21040 senses the presence of SCSI devices by detecting the ground signal on conductor 50 of the 68-pin SCSI cable and conductor 22 on the 50-pin SCSI cable.

The LSI21040 automatically controls SCSI bus termination for three different bus configurations, depending on how it is connected (see Figure 2.1). The three bus configurations are:

- Section 2.2.6.1, "Internal Bus Connections"
- Section 2.2.6.2, "External Bus Connections"
- Section 2.2.6.3, "Internal and External Bus Connections"

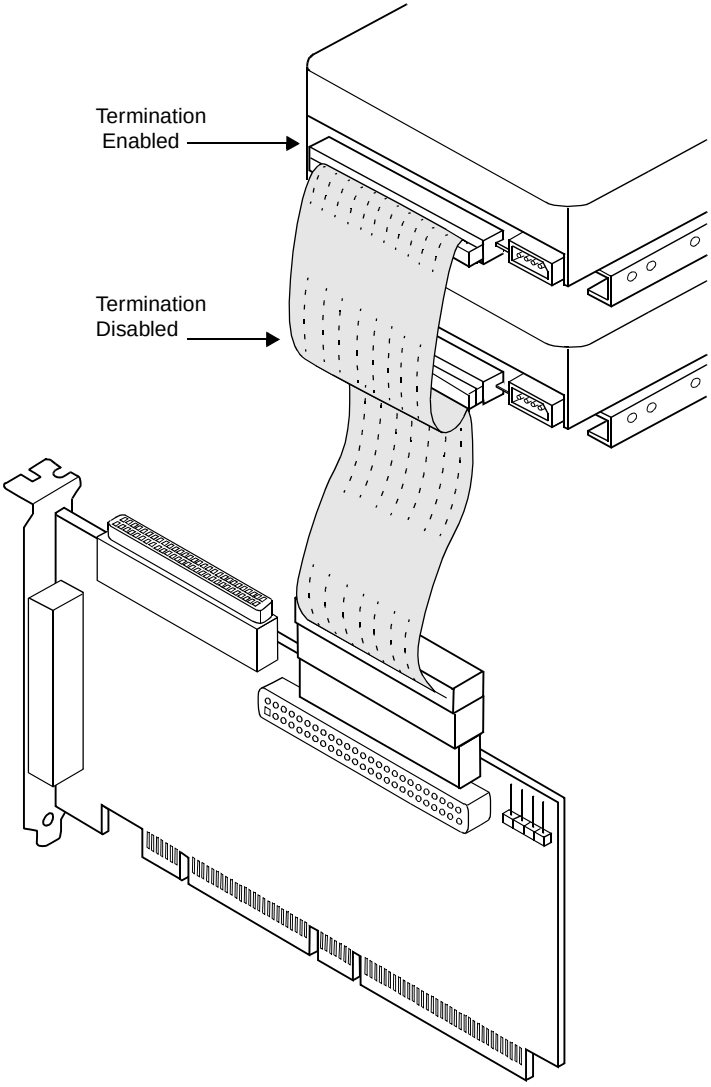
Termination on the LSI21040 for these three different bus configurations is discussed below.

2.2.6.1 Internal Bus Connections

If only internal SCSI device connections to your host adapter have been made, you must terminate the last internal device on the SCSI bus. You must disable the terminators on all other devices. Termination on your host adapter is automatically enabled in this case.

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

Figure 2.12 Internal SCSI Device Termination

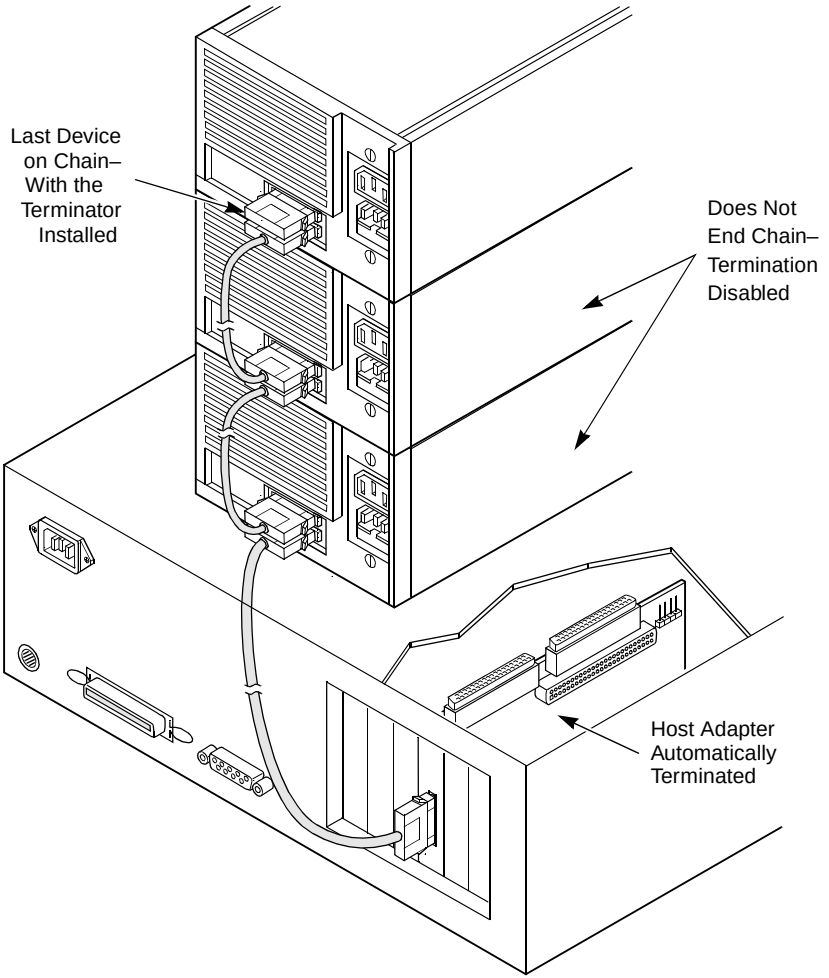


2.2.6.2 External Bus Connections

If only external SCSI device connections to your host adapter have been made, you must terminate the last external device on the SCSI bus. You must disable the terminators on all other devices. Termination on the host adapter is automatically enabled in this case.

Figure 2.13 shows an example of how termination is determined for this SCSI bus configuration.

Figure 2.13 External SCSI Device Termination

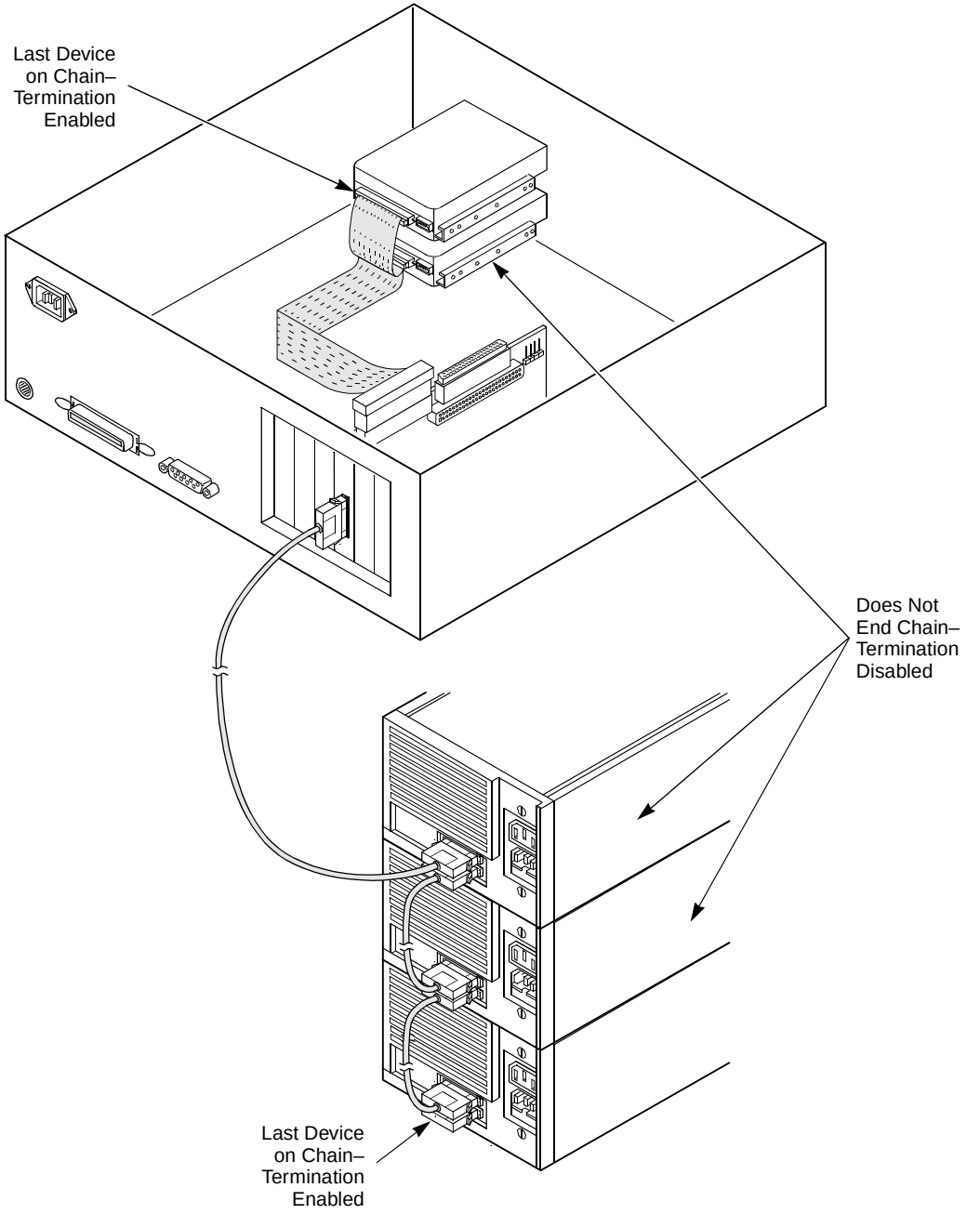


2.2.6.3 Internal and External Bus Connections

If you have both internal and external SCSI device connections to your host adapter, you must terminate the last internal and last external devices on the SCSI bus. You must also disable the termination on all other devices. Termination on the host adapter is automatically disabled in this case.

Figure 2.14 shows an example of how termination is determined for this SCSI bus configuration.

Figure 2.14 Internal and External SCSI Device Termination



2.2.7 Setting SCSI IDs

You must 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 SCSI bus. If you plan to boot your computer from a SCSI hard disk drive on the SCSI bus, that drive should have the lowest SCSI ID on the bus. Typically, SCSI ID 0 is used; however, for system performance optimization, an ID other than 0 (zero) can be used. Refer to Chapter 2 “SCSI BIOS” of the *PCI Storage Device Management System SDMS 4.0 User’s Guide* about how to set the host adapter ID using the LSI Logic SCSI BIOS Configuration Utility.

The peripheral device SCSI IDs are usually set with jumpers or with a switch on the peripheral. Refer to the peripheral manufacturer’s instructions and to the user’s manual for your computer to determine the ID of each device and how to change it.

Note: You must not have any duplication of SCSI IDs on a SCSI bus.

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 to eliminate duplicates and record the IDs for future reference.

Table 2.3 provides a place to keep this record.

Table 2.3 SCSI ID Record

SCSI ID	SCSI Device Channel A	SCSI Device Channel B
15		
14		
13		
12		
11		
10		
9		
8		
7	LSI21040 (default)	LSI21040 (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.

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

Step 4. Wait for your computer to boot up.

Step 5. To change the configuration of the host adapter, refer to Chapter 2 “SCSI BIOS” of the *PCI Storage Device Management System SDMS 4.0 User’s Guide.*

Use this guide for LSI Logic software and driver information for various operating systems (or the user’s guide for non-LSI Logic software you will be using).

Step 6. Load the software and drivers suitable to your application and system.

2.4 Troubleshooting

Check these hardware items if problems arise:

- **Cabling** – Use an unshielded 68 conductor Ultra SCSI TPE ribbon cable and a 50-pin ribbon cable for internal connections. Ensure the pin-1 orientation is correct for internal cables. Use a 68-pin high density SCSI cable for external connections.
- **SCSI Devices** – Set each SCSI device and the host adapter to a separate SCSI ID 0 through 15. You must not have any duplication of SCSI IDs on a SCSI bus. The default SCSI ID for the host adapter is SCSI ID 7.
- **Termination** – Automatic termination is enabled when the LSI21040 is connected to the end of the bus. For internal and/or external bus connections, terminate the last internal and/or external device on the SCSI bus.

Chapter 3
Specifying the Technical Characteristics

This chapter provides specific details about the physical environment associated with the LSI21040. This chapter includes these topics:

3.1 Physical Environment

This section provides information about the physical, electrical, thermal, and safety characteristics of the LSI21040. Additionally, this board is compliant with electromagnetic standards set by the FCC.

3.1.1 Physical Characteristics

The dimensions of the LSI21040 are 6.875 x 3.99 inches. Edge connector J1 makes the PCI connection.

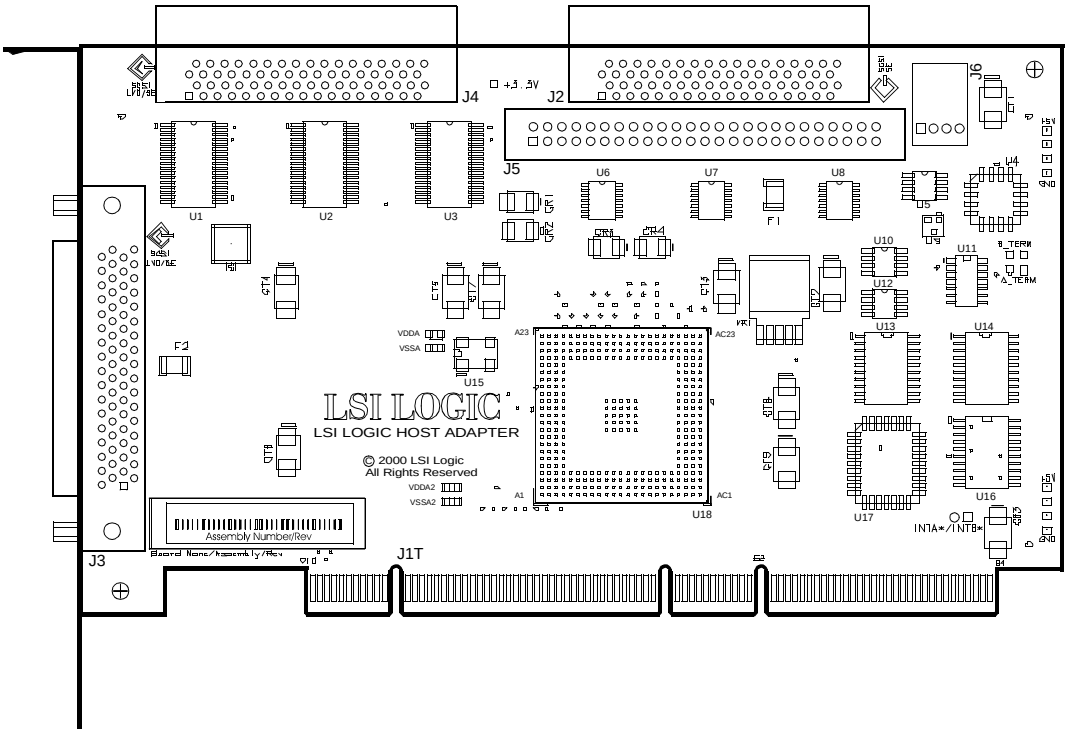
Connectors J4 for Channel A and J2 for Channel B are the 68-pin high density connectors that make the internal SCSI connections. J5 is a 50-pin low density vertical connector for Channel B.

Connector J3 is a 68-pin high density connector that makes the external SCSI connection. The J3 connector extends externally to the cabinet through a bracket attached to the board and the face of the connector. The bracket is a standard ISA type with a cutout to accommodate connector J3.

Connector J6 provides connection to the computer’s drive activity LED. This connector is a 4-pin one row right angle header. The left two pins are for Channel A SCSI activity, while the right two pins are for Channel B SCSI activity.

The component height on the top and bottom of the board conforms to the PCI Local Bus Specification Revision 2.2. Figure 3.1 illustrates the details of the LSI21040 mechanical drawing.

Figure 3.1 LSI21040 Mechanical Drawing



3.1.2 Electrical Characteristics

Under normal conditions, the LSI21040 maximum power requirement that includes SCSI TERMPWR is: +5 V DC, ±5%, 3.0 A, and over the operating range 0 °C to 55 °C.

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 (F1) opens.

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

3.1.3 Thermal, Atmospheric Characteristics

The thermal, atmospheric characteristics of the LSI21040 are:

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

The following parameters define the storage and transit environment for the LSI21040:

- Storage Temperature: –45 °C to +105 °C (dry bulb)
- Relative Humidity Range: 5% to 90% noncondensing

3.1.4 Electromagnetic Compliance

The board is designed and implemented to minimize electromagnetic emissions, susceptibility, and the effects of electromagnetic discharge. The board carries the CE mark, VCCI, Canada mark, and meets the requirements of FCC Class B. The board is marked with the FCC self-certification logo.

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

3.2 Operational Environment

Use the LSI21040 in PCI computer systems with an ISA/EISA bracket type. The SDMS operates the board, but the design of the board does not prevent the use of other software. An on-board flash memory device is provided to allow BIOS code and open boot code support through PCI and a serial EEPROM for each channel.

3.2.1 The PCI Interface

The PCI interface operates as a 64-bit DMA bus master. Edge connector J1 makes the PCI connection, which provides connections on both the front and back of the board. The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.2 standard. Table 3.1 and Table 3.2 show the signal assignments. The on-board +3.3 V regulator provides power to the PCI portion of the LSI53C1010 device.

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 board derives power from the +5 V pins, directly and through a 3.3 V voltage regulator. The PCI +3 V/+5 V pins are used to differentiate between a 5 V or a 3.3 V PCI environment.

Table 3.1 PCI Connector J1 (Front)

Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin
–12 V	1	+3.3 V	25	M66EN	49	AD59	71
TCK	2	C_BE3/	26	KEYWAY	50	AD57	72
GND	3	AD23	27	KEYWAY	51	GND	73
TDO	4	GND	28	AD08	52	AD55	74
+5 V	5	AD21	29	AD07	53	AD53	75
+5 V	6	AD19	30	+3.3 V	54	GND	76
INTB/	7	+3.3 V	31	AD05	55	AD51	77
INTD/	8	AD17	32	AD03	56	AD49	78
GND (PRSNT1/)	9	C_BE2/	33	GND	57	+3 V / +5 V	79
RESERVED	10	GND	34	AD01	58	AD47	80
GND (PRSNT2/)	11	IRDY/	35	+3 V / +5 V	59	AD45	81
KEYWAY	12	+3.3 V	36	ACK64/	60	GND	82
KEYWAY	13	DEVSEL/	37	+5 V	61	AD43	83
RESERVED	14	GND	38	+5 V	62	AD41	84
GND	15	LOCK/	39	KEYWAY	xx	GND	85
CLK	16	PERR/	40	KEYWAY	xx	AD39	86
GND	17	+3.3 V	41	RESERVED	63	AD37	87
REQ/	18	SERR/	42	GND	64	+3 V / +5 V	88
+3 V / +5 V	19	+3.3 V	43	C_BE6/	65	AD35	89
AD31	20	C_BE1/	44	C_BE4/	66	AD33	90
AD29	21	AD14	45	GND	67	GND	91
GND	22	GND	46	AD63	68	RESERVED	92
AD27	23	AD12	47	AD61	69	RESERVED	93
AD25	24	AD10	48	+3 V / +5 V	70	GND	94

Note: Highlighted signals are not connected.

Table 3.2 PCI Connector J1 (Back)

Signal Name	Pin	Signal Name	Pin	Signal Name	Pin	Signal Name	Pin
TRST/	1	AD24	25	AD09	49	AD58	71
+12 V	2	IDSEL	26	KEYWAY	50	GND	72
TMS	3	+3.3 V	27	KEYWAY	51	AD56	73
TDI	4	AD22	28	C_BE0/	52	AD54	74
+5 V	5	AD20	29	+3.3 V	53	+3 V / +5 V	75
INTA/	6	GND	30	AD06	54	AD52	76
INTC/	7	AD18	31	AD04	55	AD50	77
+5 V	8	AD16	32	GND	56	GND	78
RESERVED	9	+3.3 V	33	AD02	57	AD48	79
+3 V / +5 V	10	FRAME/	34	AD00	58	AD46	80
RESERVED	11	GND	35	+3 V / +5 V	59	GND	81
KEYWAY	12	TRDY/	36	REQ64/	60	AD44	82
KEYWAY	13	GND	37	+5 V	61	AD42	83
RESERVED	14	STOP/	38	+5 V	62	+3 V / +5 V	84
RST/	15	+3.3 V	39	KEYWAY	xx	AD40	85
+3 V / +5 V	16	SDONE	40	KEYWAY	xx	AD38	86
GNT/	17	SBO/	41	GND	63	GND	87
GND	18	GND	42	C_BE7/	64	AD36	88
RESERVED	19	PAR	43	C_BE5/	65	AD34	89
AD30	20	AD15	44	+3 V / +5 V	66	GND	90
+3.3 V	21	+3.3 V	45	PAR64	67	AD32	91
AD28	22	AD13	46	AD62	68	RESERVED	92
AD26	23	AD11	47	GND	69	GND	93
GND	24	GND	48	AD60	70	RESERVED	94

Note: Highlighted signals are not connected.

3.2.2 The SCSI Interface

The SCSI interface conforms to ANSI X 3T10.11/1142. The SCSI interface operates as 16-bit, synchronous or asynchronous, SE or LVD, and supports Ultra160 SCSI protocols. Arbitration is supported for 8-bit (at lower SCSI speeds) and 16-bit. Active SE or LVD SCSI termination is provided automatically. SCSI termination power is supplied by the board.

Connectors J3 and J4 for Channel A and J2 and J5 for Channel B make the SCSI interface. Refer to Figure 2.1 on page 2-4 to see an example of this interface. J2 and J4 are 68-pin high density right angle connectors for internal SCSI connections. J5 is a 50-pin low density vertical connector. External connector J3 is a shielded 68-pin high density right angle connector exposed in the back panel bracket.

LVD/SE dual mode, active termination is provided on the LSI21040 for Channel A. SE SCSI termination is provided for Channel B. The LSI21040 supplies SCSI bus TERMPWR through a blocking diode and a self-resetting 1.5 A short circuit protection device. A 40 MHz oscillator is installed on the LSI21040. This oscillator provides the clock frequency necessary to support Ultra160 SCSI transfers of up to 160 Mbytes/s.

Table 3.3 and Table 3.4 show the signal assignments for J2 and J5. Table 3.5 and Table 3.6 show the signal assignments for J4 and J3.

Table 3.3 Internal Channel B SCSI Connector J2

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

Note: *NC* pins are not connected.

Table 3.4 Internal Channel B SCSI Connector J5

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

Note: *NC* pins are not connected.

Table 3.5 Internal Channel A SCSI Connector J4

Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin
SD12+	1	TERMPWR	18	SD12–	35	TERMPWR	52
SD13+	2	N/C	19	SD13–	36	N/C	53
SD14+	3	GND	20	SD14–	37	GND	54
SD15+	4	SATN+	21	SD15–	38	SATN–	55
SDP1+	5	GND	22	SDP1–	39	GND	56
SD00+	6	SBSY+	23	SD00–	40	SBSY–	57
SD01+	7	SACK+	24	SD01–	41	SACK–	58
SD02+	8	SRST+	25	SD02–	42	SRST–	59
SD03+	9	SMSG+	26	SD03–	43	SMSG–	60
SD04+	10	SSEL+	27	SD04–	44	SSEL–	61
SD05+	11	SC_D+	28	SD05–	45	SC_D–	62
SD06+	12	SREQ+	29	SD06–	46	SREQ–	63
SD07+	13	SI_O+	30	SD07–	47	SI_O–	64
SDP+	14	SD08+	31	SDP–	48	SD08–	65
GND	15	SD09+	32	GND	49	SD09–	66
DIFFSENS	16	SD10+	33	CPRSNT/	50	SD10–	67
TERMPWR	17	SD11+	34	TERMPWR	51	SD11–	68

Note: *NC* pins are not connected.

Table 3.6 External SCSI Connector J3

Signal	Pin	Signal	Pin	Signal	Pin	Signal	Pin
SD12+	1	TERMPWR	18	SD12–	35	TERMPWR	52
SD13+	2	N/C	19	SD13–	36	N/C	53
SD14+	3	GND	20	SD14–	37	GND	54
SD15+	4	SATN+	21	SD15–	38	SATN–	55
SDP1+	5	GND	22	SDP1–	39	GND	56
SD00+	6	SBSY+	23	SD00–	40	SBSY–	57
SD01+	7	SACK+	24	SD01–	41	SACK–	58
SD02+	8	SRST+	25	SD02–	42	SRST–	59
SD03+	9	SMSG+	26	SD03–	43	SMSG–	60
SD04+	10	SSEL+	27	SD04–	44	SSEL–	61
SD05+	11	SC_D+	28	SD05–	45	SC_D–	62
SD06+	12	SREQ+	29	SD06–	46	SREQ–	63
SD07+	13	SI_O+	30	SD07–	47	SI_O–	64
SDP+	14	SD08+	31	SDP–	48	SD08–	65
GND	15	SD09+	32	GND	49	SD09–	66
DIFFSENS	16	SD10+	33	CPRSNT/	50	SD10–	67
TERMPWR	17	SD11+	34	TERMPWR	51	SD11–	68

Note: *NC* pins are not connected.

3.2.3 SCSI Activity LED Interface

The SCSI activity LED interface on the LSI21040 is a four-wire arrangement that allows you to connect an LED harness to the board. The buffered 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. Connector J6 is the SCSI busy LED connector. Table 3.7 provides the signal definitions for the SCSI Busy LED connector.

Table 3.7 LED Connector J6

Signal Name	Pin
Channel A LED+	1
Channel A LED–	2
Channel B LED–	3
Channel B LED+	4

3.3 Subsystem and Subsystem Vendor ID

The Subsystem ID and System Vendor ID for the LSI21040 are provided in Table 3.8. The EEPROM of the LSI21040 contains the ID numbers. During system initialization, the ID numbers are loaded into the Subsystem Vendor ID and Subsystem ID registers of the LSI21040 SCSI Controller (the LSI53C1010). For more information on the operation of the Subsystem Vendor ID and Subsystem ID registers, refer to the *LSI53C1010-33 PCI to Dual Channel Ultra3 SCSI Multifunction Controller Technical Manual*.

Table 3.8 Subsystem and Subsystem Vendor ID

Subsystem	ID Number
Subsystem Vendor ID	1000
Subsystem ID	1040

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.
Active Termination	The electrical connection required at each end of the SCSI bus, composed of active voltage regulation and a set of termination resistors. Ultra, Ultra2, and Ultra160 SCSI require active termination.
Address	A specific location in memory, designated either numerically or by a symbolic name.
AIP	Asynchronous Information Protection provides error checking for asynchronous, nondata phases of the SCSI bus.
Asynchronous Data Transfer	One of the ways data is transferred over the SCSI bus. It is slower than synchronous data transfer.
BIOS	Basic Input/Output System. Software that provides basic read/write capability. Usually kept as firmware (ROM based). The system BIOS on the mainboard of a computer is used to boot and control the system. The SCSI BIOS on the host adapter acts as an extension of the system BIOS.
Bit	A binary digit. The smallest unit of information a computer uses. The value of a bit (0 or 1) represents a two-way choice, such as on or off, true or false, and so on.
Bus	A collection of 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.

Bus Mastering 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.

Byte A unit of information consisting of eight bits.

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.

CPU Central Processing Unit. The "brain" of the computer that performs the actual computations. The term Microprocessor Unit (MPU) is also used.

CRC Cyclic Redundancy Check is 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.

Device Driver A program that allows a microprocessor (through the operating system) to direct the operation of a peripheral device.

DMA Direct Memory Access.

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 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 Domain Validation is 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 Double Transition (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.

Dword	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.
EEPROM	Electronically Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information. See NVRAM.
EISA	Extended Industry Standard Architecture. An extension of the 16-bit ISA bus standard. It allows devices to perform 32-bit data transfers.
External SCSI Device	A SCSI device installed outside the computer cabinet. These devices are connected in a continuous chain using specific types of shielded cables.
Fast-20	The SCSI Trade Association (STA) supports the use of “Ultra SCSI” over the term “Fast-20”. Please see Ultra SCSI.
Fast-40	The SCSI Trade Association (STA) supports the use of “Ultra2 SCSI” over the term “Fast-40”. Please see Ultra2 SCSI.
Fast SCSI	A standard for SCSI data transfers. It allows a transfer rate of up to 10 Mbytes/s over an 8-bit SCSI bus and up to 20 Mbytes/s over a 16-bit SCSI bus.
FCC	Federal Communications Commission.
File	A named collection of information stored on a disk.
Firmware	Software that is permanently stored in ROM. Therefore, it can be accessed during boot time.
Hard Disk	A disk made of metal and permanently sealed into a drive cartridge. A hard disk can store very large amounts of information.
Host	The computer system in which a SCSI host adapter is installed. It uses the SCSI host adapter to transfer information to and from devices attached to the SCSI bus.
Host Adapter	A circuit board 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.

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

ISA Industry Standard Architecture. A type of computer bus used in most PCs. It 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.

Local Bus A way to connect peripherals directly to computer memory. It bypasses the slower ISA and EISA buses. PCI is a local bus standard.

Logical Unit A subdivision, either logical or physical, of a SCSI device (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.

LUN Logical Unit Number. An identifier, zero to seven, for a logical unit.

LVD Link Low Voltage Differential Link allows greater Ultra2 SCSI device connectability and longer SCSI cables. LVD Link lowers the amplitude of noise reflections and allows higher transmission frequencies. Detailed information may be found in Section 1.4, "Benefits of LVD Link Technology," on page 1-6.

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

Main Memory The part of a computer's memory which is directly accessible by the CPU (usually synonymous with RAM).

Mbyte Megabyte. A measure of computer storage equal to 1024 kilobytes.

Motherboard See Mainboard. In some countries, the term Motherboard is not appropriate.

Multitasking The executing of more than one command at the same time. This allows programs to operate in parallel.

Multithreading The simultaneous accessing of data by more than one SCSI device. This increases the data throughput.

NVRAM	NonVolatile Random Access Memory. Actually an EEPROM (Electronically Erasable Read Only Memory chip) used to store configuration information. See EEPROM.
Operating System	A program that organizes the internal activities of the computer and its peripheral devices. An operating system performs basic tasks such as moving data to and from devices, and managing information in memory. It also provides the user interface.
Parity Checking	A way to verify the accuracy of data transmitted over the SCSI bus. 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.
Passive Termination	The electrical connection required at each end of the SCSI bus, composed of a set of resistors. It improves the integrity of bus signals.
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.
Peripheral Devices	A piece of hardware (such as a video monitor, disk drive, printer, or CD-ROM) used with a computer and under the computer's control. SCSI peripherals are controlled through a SCSI host adapter.
Pin-1 Orientation	The alignment of pin 1 on a SCSI cable connector and the pin-1 position on the SCSI connector into which it is inserted. External SCSI cables are always keyed to insure proper alignment, but internal SCSI ribbon cables sometimes are not keyed.
PIO	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.
Port Address	Also Port Number. The address through which commands are sent to a host adapter board. This address is assigned by the PCI bus.
Port Number	See Port Address.
Queue Tags	A way to keep track of multiple commands that allow for increased throughput on the SCSI bus.

RAM 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.

RISC Core LSI Logic SCSI chips contain a RISC (Reduced Instruction Set Computer) processor, programmed through microcode SCRIPTS.

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

SCAM SCSI Configured AutoMatically. A method to automatically allocate SCSI IDs using software when SCAM compliant SCSI devices are attached.

SCRIPTS Processor The SCRIPTS processor allows users to fine tune SCSI operations with regard to unique vendor commands or new SCSI specifications. The SCRIPTS processor fetches SCRIPTS instructions from system memory to control operation of the LSI53C8XX or LSI53C10XX device.

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

SCSI-3 The current SCSI specification which adds features to the SCSI-2 standard.

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

SCSI Device Any device that conforms to the SCSI standard and is attached to the SCSI bus by a SCSI cable. This includes SCSI host adapters and SCSI peripherals.

SCSI ID A way to uniquely identify each SCSI device on the SCSI bus. Each SCSI bus has 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.

SCSI SCRIPTS	A SCSI programming language that works with the SCRIPTS processor that is embedded on the LSI53C8XX or LSI53C10XX device. These SCRIPTS reside in host computer system memory.
SDMS	Storage Device Management System. An LSI Logic software product that manages SCSI system I/O.
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).
STA	SCSI Trade Association. A group of companies that cooperate to promote SCSI parallel interface technology as a viable mainstream I/O interconnect for commercial computing.
SURElink	The domain validation method developed and used by LSI Logic. SURElink 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.
System BIOS	Controls the low-level POST (Power-On Self-Test), and basic operation of the CPU and computer system.
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. SCSI Trade Association (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. 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.
VDE	Verband Deucher Elektroniker (Association of German Electrical Engineers).
Virtual Memory	Space on a hard disk that can be used as if it were RAM.
Wide SCSI	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.
Wide Ultra SCSI	The SCSI Trade Association (STA) term for SCSI bus width 16-bits, SCSI bus speed maximum data rate 40 Mbytes/s.
Wide Ultra2 SCSI	The SCSI Trade Association (STA) term for SCSI bus width 16-bits, SCSI bus speed maximum data rate 80 Mbytes/s.
Word	A two byte (or 16-bit) unit of information.

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