User's Guide

LSI21003
PCI to Dual Channel SCSI Host Adapter

Version 1.0

October 2000

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 LSI21003 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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This document describes Version 1.0 of the LSI Logic Corporation LSI21003 PCI to Dual Channel SCSI Host Adapter and will remain the official reference source for all revisions/releases of this product until rescinded by an update.

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

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Preface

This book is the primary reference and user's guide for the LSI Logic LSI21003. It describes how to install and configure the LSI21003 in a PCI computer system.

LSI Logic Technical Support

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

Before calling or sending an e-mail, 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 appendix:

- Chapter 1, **Using the LSI21003**, defines the interfaces and characteristics of the LSI21003.
- Chapter 2, **Installing the LSI21003**, provides quick and detailed installation instructions.

- Chapter 3, **Technical Specifications**, describes the physical and operational environments of the LSI21003.
- Appendix A, **Glossary of Terms and Abbreviations**, provides definitions of various terminology that is referenced throughout this user's guide.

Related Publications

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

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

Revision Record

Revision	Date	Remarks
0.1	7/00	Initial version for engineering review.
0.2	8/00	Signoff copy.
1.0	10/00	Final version.

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Tables

Chapter 1
Using the LSI21003

This chapter provides an overview of the LSI Logic LSI21003 PCI to Dual Channel SCSI Host Adapter board and its interfaces to PCI computer systems. These topics are discussed:

1.1 General Description

The LSI21003 provides internal and external SCSI interfaces to PCI computer systems that require BIOS support on the add-in SCSI adapter. Installing this host adapter in your PCI system allows connection of SCSI devices over a SCSI bus.

The LSI21003 provides 16-bit Low Voltage Differential (LVD) and Single-Ended (SE) SCSI solutions for your computer. It supports legacy Fast, Ultra, Ultra2, and the newest Ultra160 SCSI devices. Channel A supports only the SE mode. Channel B supports SE and LVD modes of operation.

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

This guide, along with the *PCI Storage Device Management System SDMS 4.0 User’s Guide*, contains product information and installation instructions to help you gain the full benefits of the LSI21003.

1.2 Features

This section provides a high level overview of the PCI Interface, the SCSI Interface, and Board Characteristics for the LSI21003.

1.2.1 PCI Interface

The PCI interface includes these features:

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

1.2.2 SCSI Interface

The SCSI interface includes these features:

- Two separate SCSI channels
- Ultra160 SCSI LVD synchronous transfers as fast as 160 Mbytes/s (Channel B)
- Wide Ultra SCSI SE synchronous transfers as fast as 40 Mbytes/s (Channel A)
- SCSI synchronous offset up to 31
- Supports variable block size and scatter/gather data transfers
- 16-bit SE/LVD
- Four connectors:
  - 50-pin high density for the external Channel A
  - 50-pin narrow (ribbon) for internal Channel A
  - 68-pin high density for internal Channels A and B

- Fast, Ultra, Ultra2, and Ultra160 data transfer capability
- SCSI Termination Power (TERMPWR) source with autoresetting circuit breaker
- Supports SE and LVD signaling with automatic termination
  - Channel A is SE only with autosense termination
  - Channel B is SE or LVD with termination permanently enabled
- Performs complex bus sequences without interrupts, including restore data pointers
- SCSI Plug and Play
- Flash ROM for BIOS storage
- Serial EEPROM for each channel for user configuration utility
- SCSI activity connector for external LED
- LSI53C1010-33 PCI Dual Channel SCSI Multifunction Controller includes 8 Kbytes internal RAM per channel for SCRIPTS instruction storage

1.2.3 Board Characteristics

The board characteristics are:

- PCI board dimensions: approximately 177.8 x 83.8 mm (7.0 x 3.3 inches)
- Universal 32-bit PCI card edge connector
- ISA/EISA bracket

1.3 Interface Descriptions

This section provides an overview of the PCI Interface, the SCSI Interface, and the SCSI Activity LED Interface. It also provides information about cabling.

1.3.1 The PCI Interface

PCI is a high-speed standard local bus for interfacing a number of I/O components to a PC processor and memory subsystem. The PCI

functionality for the LSI21003 is contained within the LSI53C1010-33. The chip connects directly to the PCI bus and generates timing protocol in compliance with the PCI specification.

The PCI interface operates as a 32-bit DMA bus master. The connection is made through edge connector J1 (see Figure 2.1). The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.2 standard. The LSI21003 conforms to the PCI universal signaling environment for a 5 V or 3.3 V PCI bus.

1.3.2 The SCSI Interface

The SCSI functionality for the host adapter is also contained within the LSI53C1010-33. The chip connects directly to the two SCSI buses for SE or LVD SCSI applications and generates timing and protocol in compliance with SCSI standards. One SCSI interface operates at a burst transfer rate of up to 40 Mbytes/s for wide Ultra SCSI transfers, and the other up to 160 Mbytes/s for wide Ultra160 SCSI transfers.

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

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

See Figure 2.1 on page 2-5 for the location of these connectors.

The LSI21003 supplies SCSI bus TERMPWR through a blocking diode and self-resetting 1.5 A short circuit protection device.

A 40 MHz oscillator on the host adapter provides the clock frequency to the LSI53C1010-33 that is necessary to support SCSI transfers.

1.3.3 SCSI Activity LED Interface

The SCSI activity LED interface is a four-wire arrangement that allows connection of an LED harness to the board. The connector on the host adapter is J6 for both channels. See Table 3.8 on page 3-12 for the signal name and pin numbers on this interface.

1.3.4 Cabling

The cable provided in the kit is matched for a Fast/Ultra/Ultra2/Ultra160 SE or LVD operation. This cable also has built-in multimode (SE/LVD) termination since most Ultra160 hard disk drives are not made with on-board LVD termination.

Table 1.1 lists standard cable specifications.

Table 1.1 Standard Cables

Maximum Bus Length, Meters[1]			
STA Term	**SE**	**LVD**	**Maximum Devices**
Wide Ultra SCSI	1.5	see note[2]	8
Wide Ultra SCSI	3	see note[2]	4
Wide Ultra2 SCSI	see note[3]	12	16
Ultra160	see note[3]	12	16

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

Chapter 2
Installing the LSI21003

This chapter describes installing the LSI21003 into PCI computer systems and includes these topics:

2.1 Quick Installation Procedure

This section provides quick setup instructions for the experienced computer user with prior host adapter installation and SCSI bus setup experience. If you prefer more detailed guidance for installing the LSI21003, please follow the instructions in Section 2.2, “Detailed Installation Procedure.”

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

Step 1. *Ground yourself* before handling the host adapter board.

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

Step 2. Remove the LSI21003 from the packing and check that it is not damaged.

Step 3. Switch off and unplug the system.

Step 4. Remove the cabinet cover on your computer to access the PCI slots.

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

A 32-bit slot should be used. The LSI21003 will work in a 64-bit slot, but only 32 bits are used. The host adapter requires a PCI slot that allows bus master operation. See Figure 2.2 on page 2-6.

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 for securing the installed board.

Step 7. Carefully insert edge connector J1 of the host adapter into the PCI slot. Make sure the edge connector is properly aligned before pressing the board into place. See the example in Figure 2.2.

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

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

Step 9. If you are connecting any internal SCSI devices, plug the end of an appropriate internal SCSI ribbon cable into the connector that provides the performance/features your system needs (see Figure 2.1 on page 2-5).

Make certain you match pin 1 on both connectors. Chain your internal devices on this cable.

Step 10. Connect the LED cable to J6 if desired.

This is designed to drive the front panel LED found on most PC cabinets to indicate activity on the SCSI bus. See Table 3.8 for the signal name and pin numbers for the LED interface.

Step 11. Make all external SCSI bus connections.

Step 12. Terminate the SCSI bus.

Step 13. Set SCSI IDs as required.

You must not have duplicate SCSI IDs.

Step 14. Replace the cabinet cover.

Step 15. Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* (or the guide for the software that you will use) to load the driver software for your particular operating system.

2.2 Detailed Installation Procedure

This section provides step-by-step instructions for installing your LSI21003 and connecting it to your SCSI peripherals. If you are experienced in these tasks, you may prefer to use Section 2.1, "Quick Installation Procedure." If you are not confident that you can perform the tasks as described here, LSI Logic suggests getting assistance.

2.2.1 Before You Start

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

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

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

Each SCSI host adapter that you install can act as host for up to 15 peripheral devices (depending on the SCSI bus speed), 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 removing the host adapter board from its package.

Note: 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 2. Remove the LSI21003 from its packing and verify that it is not damaged.

An example of this host adapter board is shown in Figure 2.1.

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.

Make sure you are adequately grounded.

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

A 32-bit slot should be used. The LSI21003 will work in a 64-bit slot, but only 32 bits are used. The host adapter requires a PCI slot that allows bus master operation. See Figure 2.2.

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.

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 can only be inserted one way.

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

Figure 2.1 Hardware Connections for the LSI21003

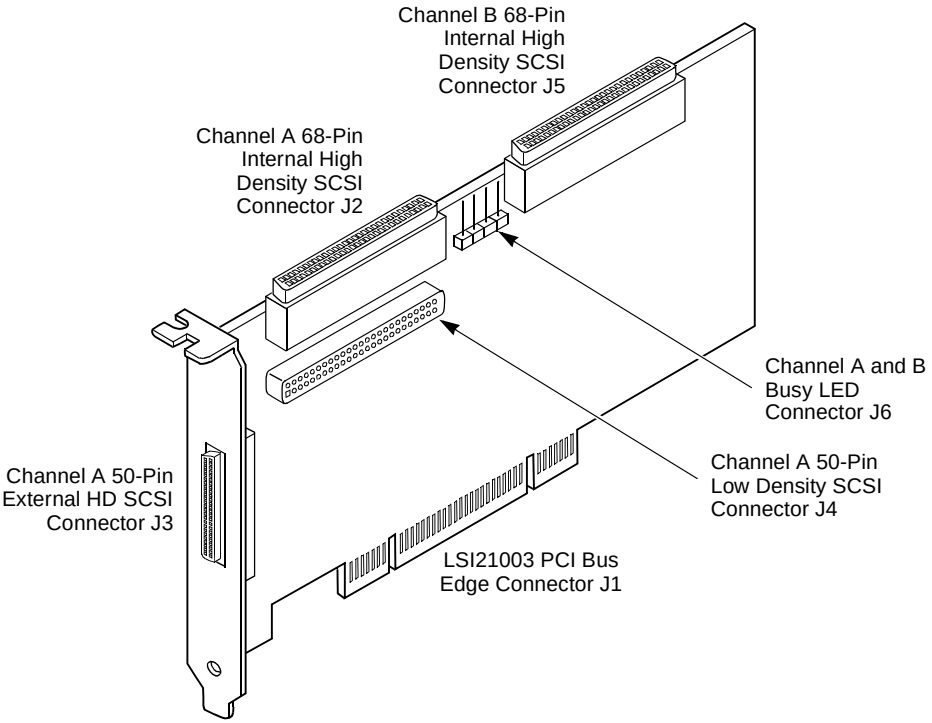
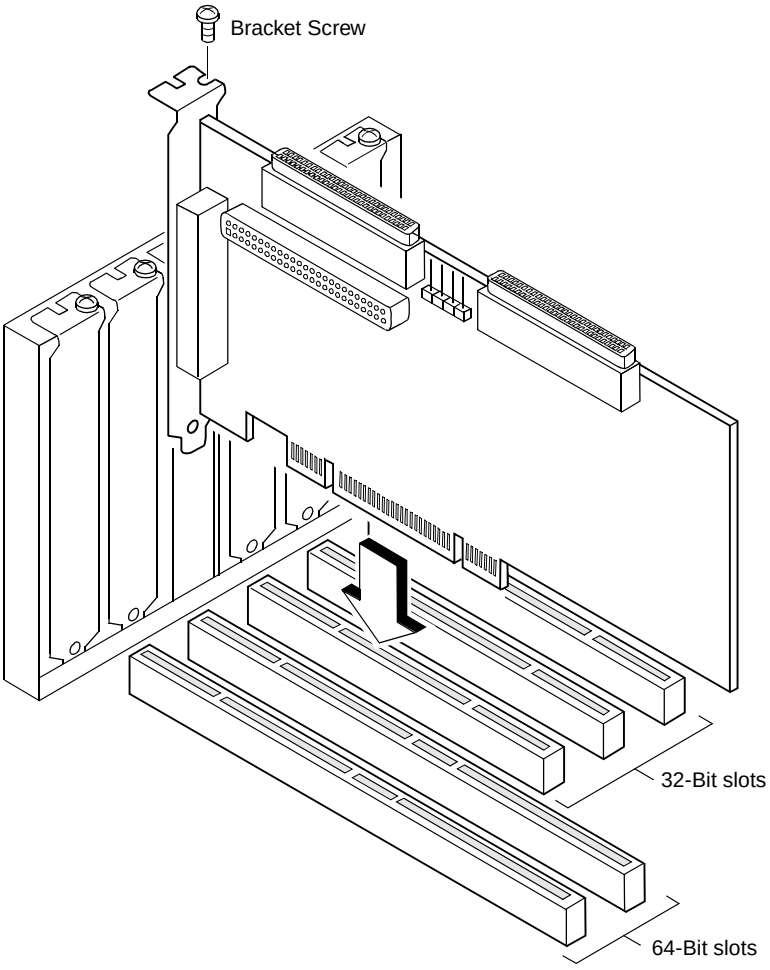


Figure 2.2 Inserting the Host Adapter



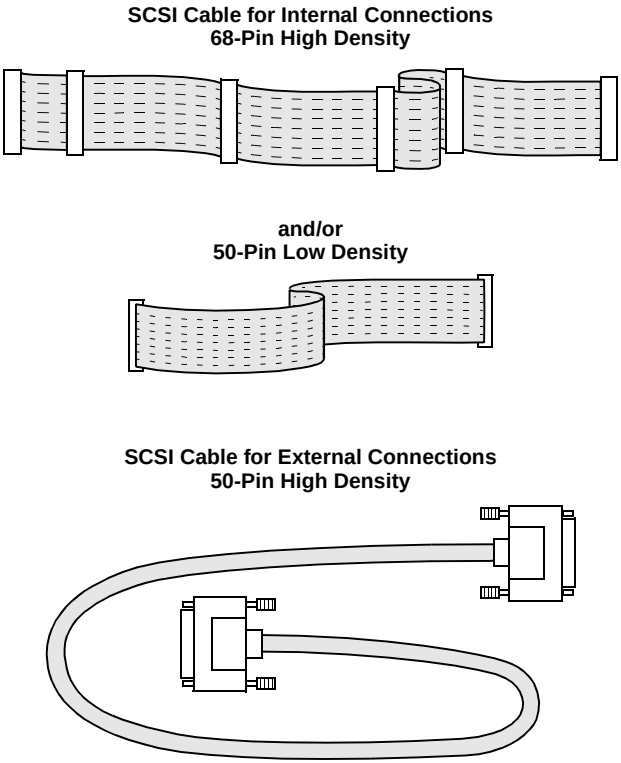
2.2.3 Connecting the SCSI Peripherals

All internal SCSI bus connections to the LSI21003 are made with an unshielded, 68- or 50-conductor ribbon cable (see Figure 2.3). One side of this cable is marked with a color to indicate the pin-1 side. The connectors on this cable are keyed to ensure a proper pin-1 connection. Use Ultra/Ultra2/Ultra160 rated cables for these bus speeds. (See Table 1.1 in Chapter 1.)

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

All external SCSI bus connections to the LSI21003 are made with a shielded, 50-pin high density cable (see Figure 2.3). The connectors on this cable are always keyed to ensure a proper pin-1 connection.

Figure 2.3 SCSI Cables



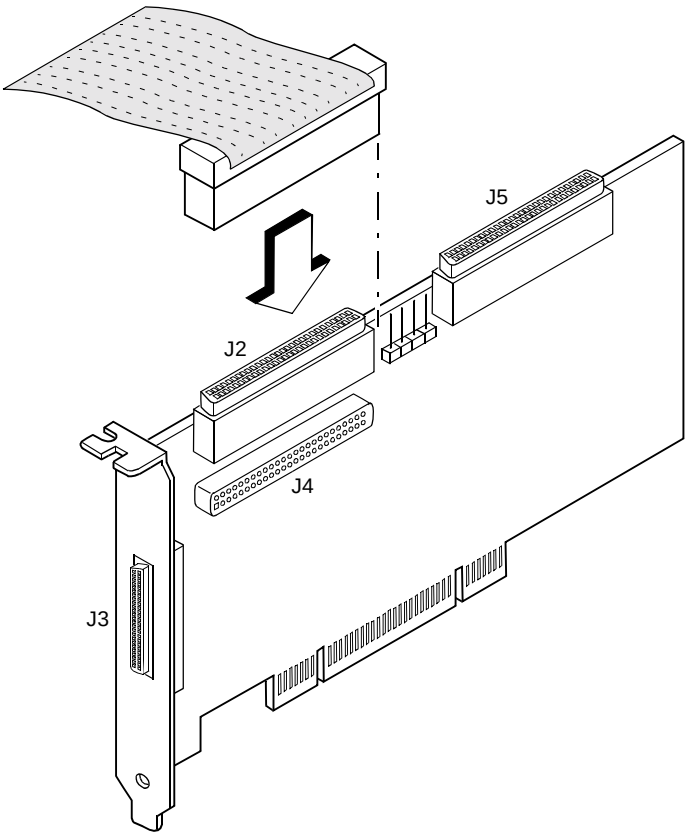
2.2.3.1 Making Internal SCSI Bus Connections

This section provides step-by-step instructions about making internal SCSI bus connections. If you have no internal devices to connect, proceed to Step 4.

Step 1. Plug one end of a SCSI ribbon cable into an appropriate connector, J2, J4, or J5. The example in Figure 2.4 shows a wide cable.

Channel A (J2 and J4) supports SE mode. Channel B (J5) supports SE and LVD modes.

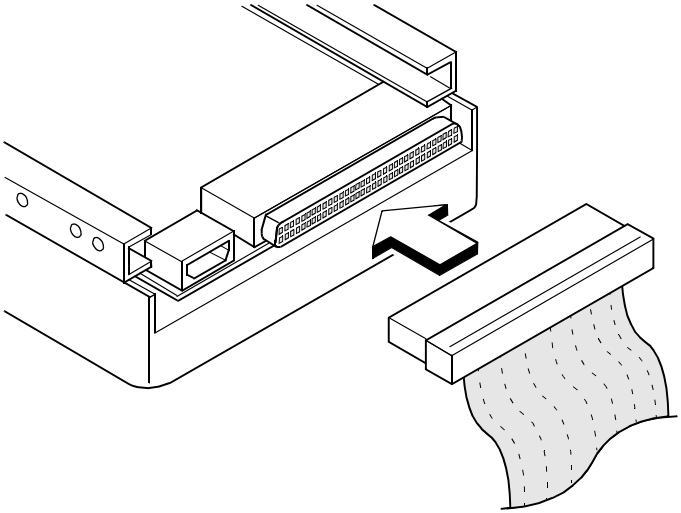
Figure 2.4 Internal SCSI Ribbon Cable to Host Adapter



Step 2. Plug the other end of the cable into the connector on the internal SCSI device.

An example of this connection appears in Figure 2.5.

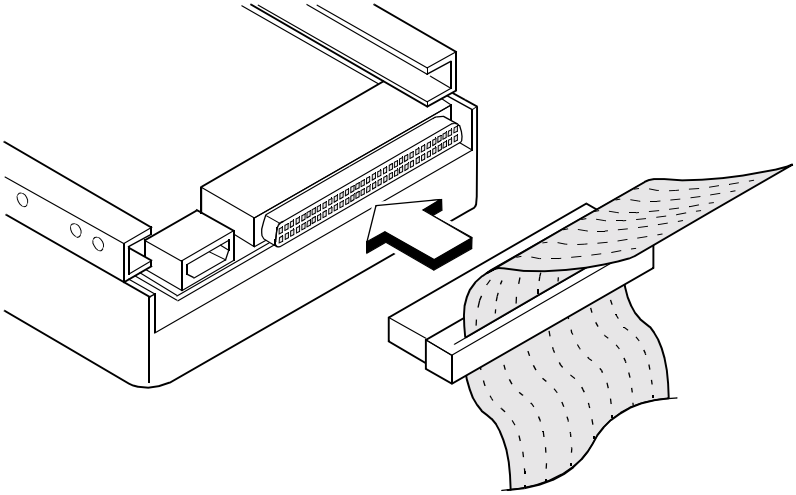
Figure 2.5 Internal SCSI Ribbon Cable to Internal SCSI Device Connection



If this is the only internal device on the bus, proceed to Step 4. 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 Step 3.

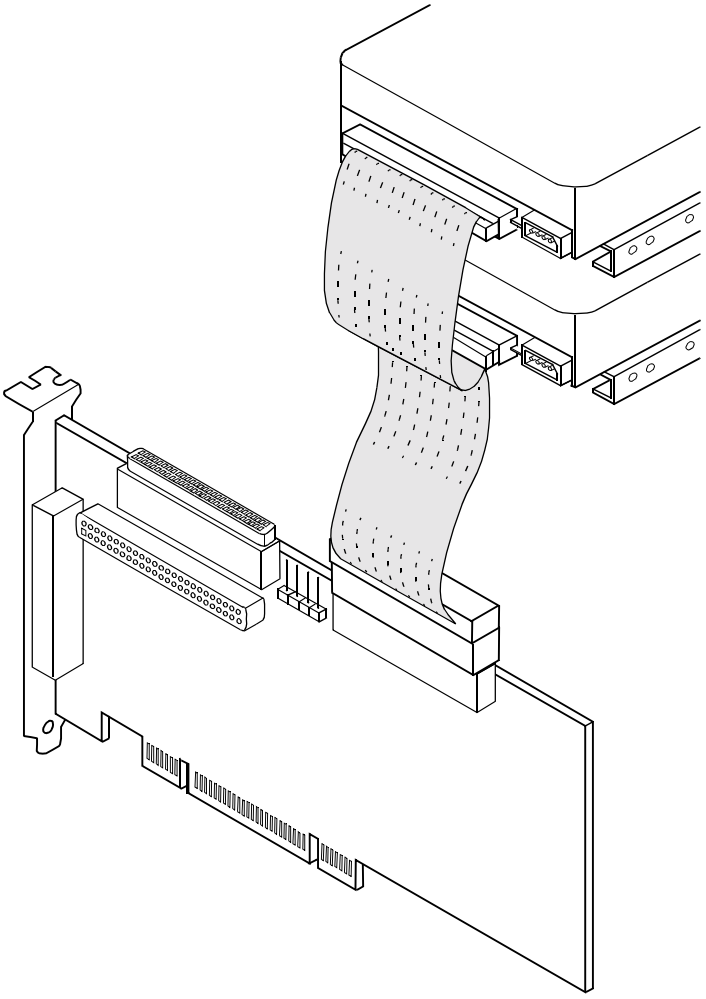
Step 3. Plug the cable into each additional device as illustrated in Figure 2.6.

Figure 2.6 Connecting Additional Internal SCSI Devices



An example of multiple internal SCSI devices chained together is shown in Figure 2.7.

Figure 2.7 Multiple Internal SCSI Devices Chained Together



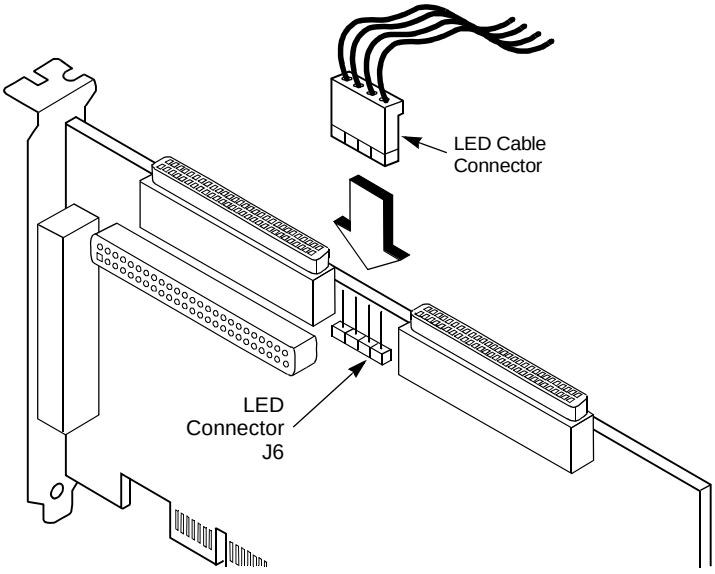
Most PC cabinets are designed with a front panel LED. If you wish to enable this feature, follow Step 4.

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. If your connector has only two wires, refer to Table 3.8 on page 3-12 for connector pinout information.

Figure 2.8 SCSI LED Connector



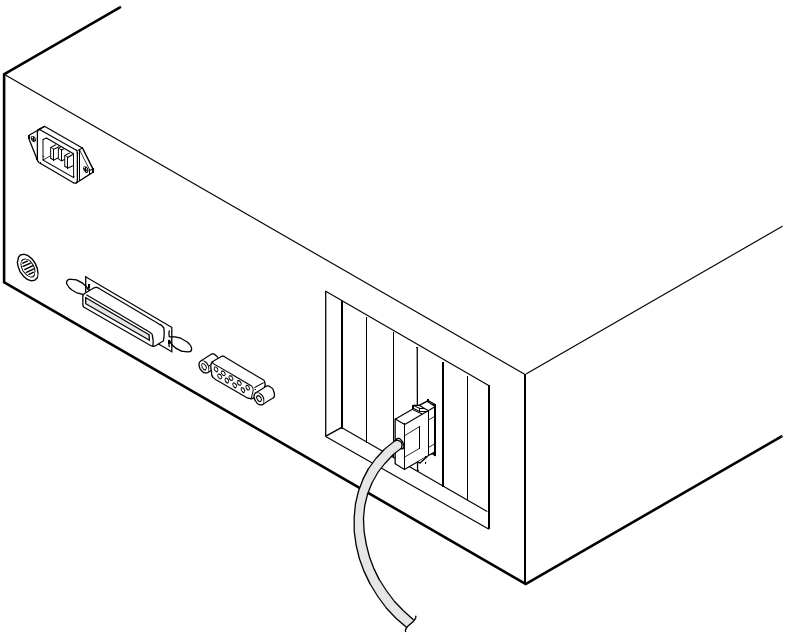
2.2.3.2 Making External SCSI Bus Connections

This section provides step-by-step instructions for making external SCSI bus connections. If you have only internal devices, proceed to Section 2.2.4, “SCSI Bus Termination,” page 2-15. To connect external SCSI devices to the LSI21003:

Step 1. Plug the 50-pin HD connector on one end of a shielded external SCSI cable into the host adapter connector J3 (see Figure 2.1).

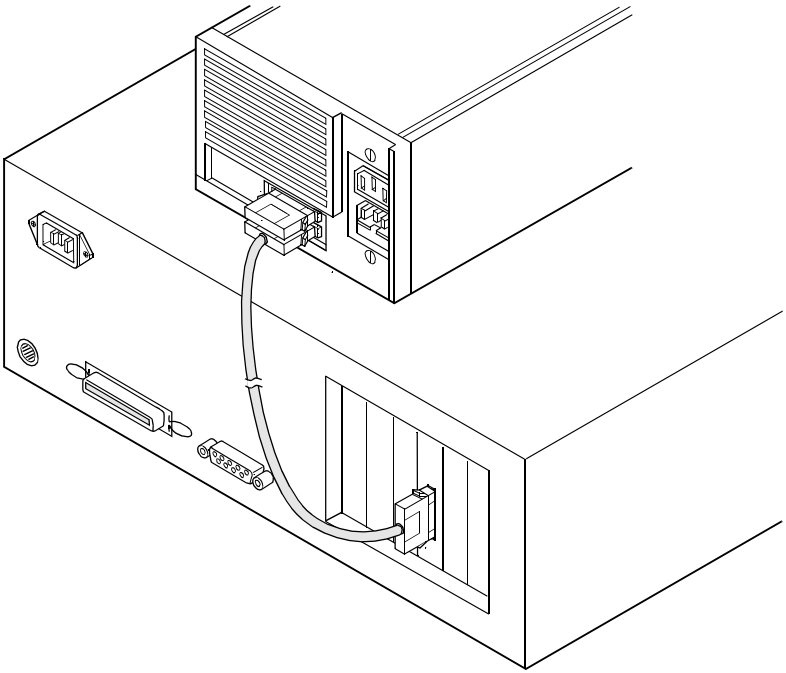
This connector is in the bracket attached to the back panel of your computer. Figure 2.9 shows how this connection is made.

Figure 2.9 External Cable to Host Adapter



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

Figure 2.10 External Cable to External SCSI Device

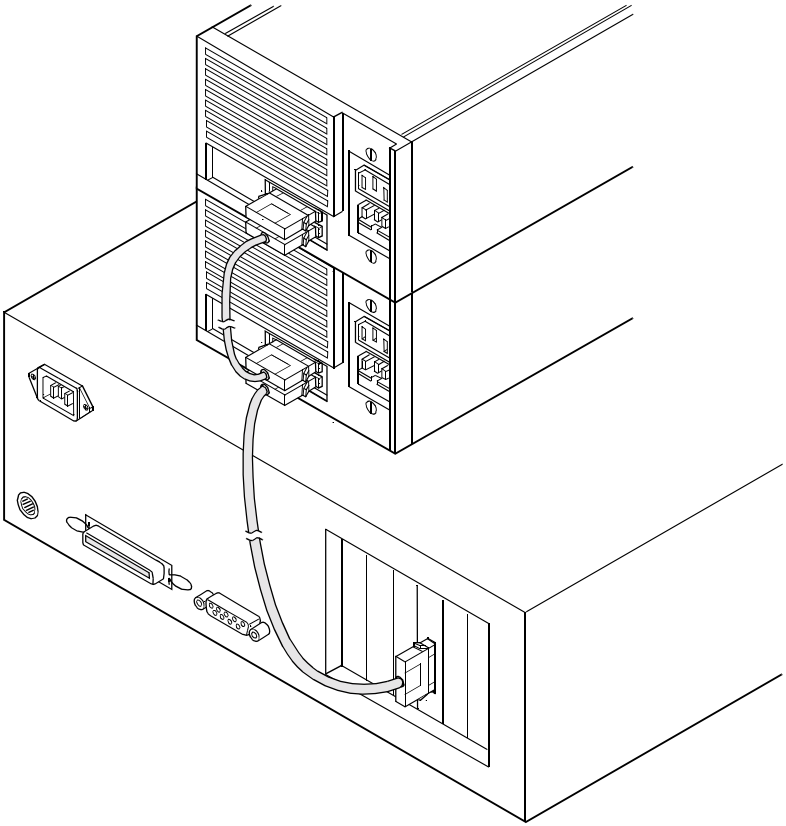


If this is the only external SCSI device on your system, proceed to Section 2.2.4, “SCSI Bus Termination,” page 2-15, for termination instructions. If you have multiple external devices, proceed to page 2-15.

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

An example of these chained connections is shown in Figure 2.11.

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 their terminators active. All other SCSI devices on the bus must have their terminators removed or disabled. Remember that your LSI21003 is also on the SCSI

bus and its termination is automatically enabled when it is connected to the end of the bus.

Important: To utilize Ultra160 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.

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

Caution: The autoenable/disable sensing feature on your LSI21003 may enable termination erroneously if it is directly cabled to another SCSI device or host adapter using the same sensing method. The LSI21003 senses SCSI devices by detecting the ground signal on conductor 22 of a 50-conductor internal cable, conductor 36 of a 50-conductor external cable, or conductor 50 of a 68-conductor cable.

The LSI21003 automatically controls SCSI bus termination for four different bus configurations. The four bus configurations are:

- Connections for high density internal SCSI connections
- Connections to high and low density internal connectors
- Connections for external SCSI connection
- Connections to both internal and external SCSI connectors

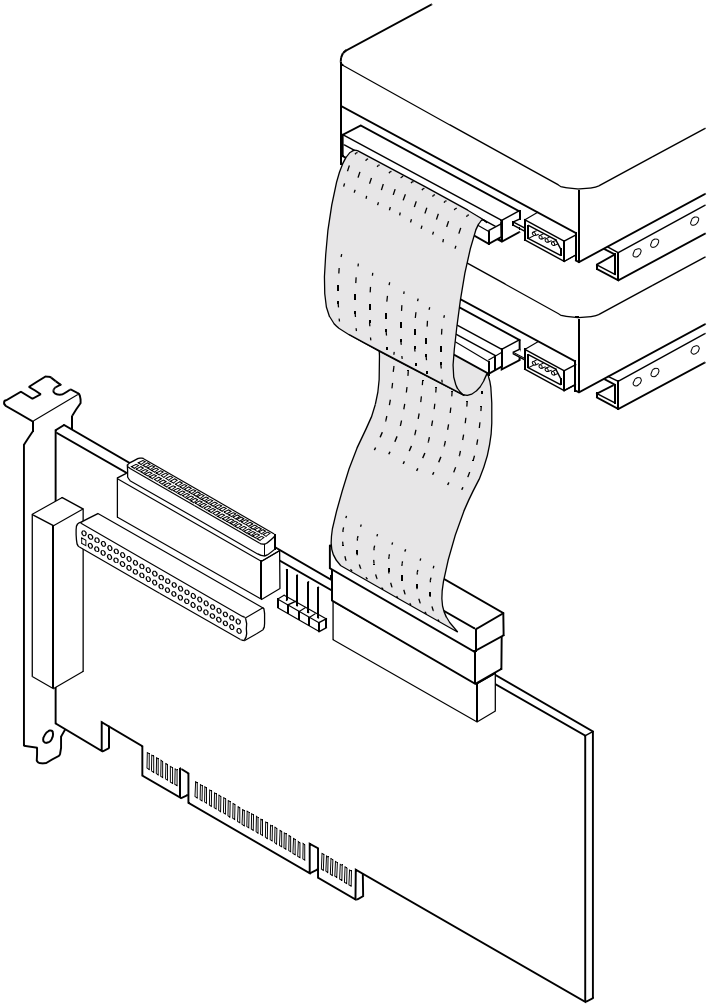
These terminations are discussed below. Please note that only SE termination control is allowed on Channel A.

2.2.4.1 High Density Internal SCSI Connections

If only internal SCSI device connections on the host adapter have been made, then terminate the last internal device on the SCSI bus. You must disable the termination on all other devices. Termination on the LSI21003 is automatically enabled for Channel A. The termination for Channel B is enabled all the time.

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

Figure 2.12 High Density Internal SCSI Device Termination

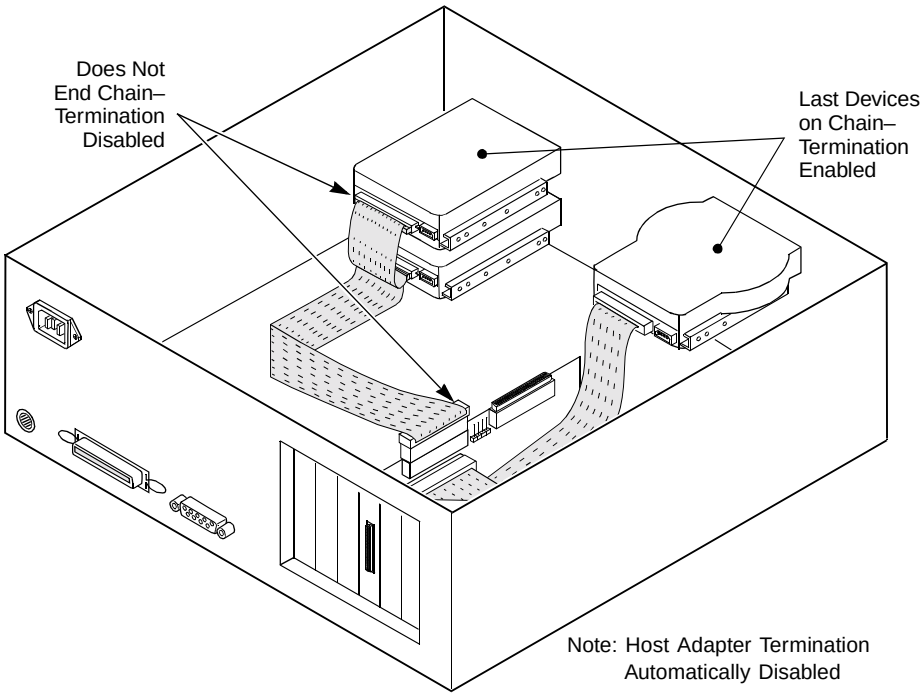


2.2.4.2 Internal SCSI Connections for Both Internal Connectors

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

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

Figure 2.13 Internal and Internal SCSI Device Termination

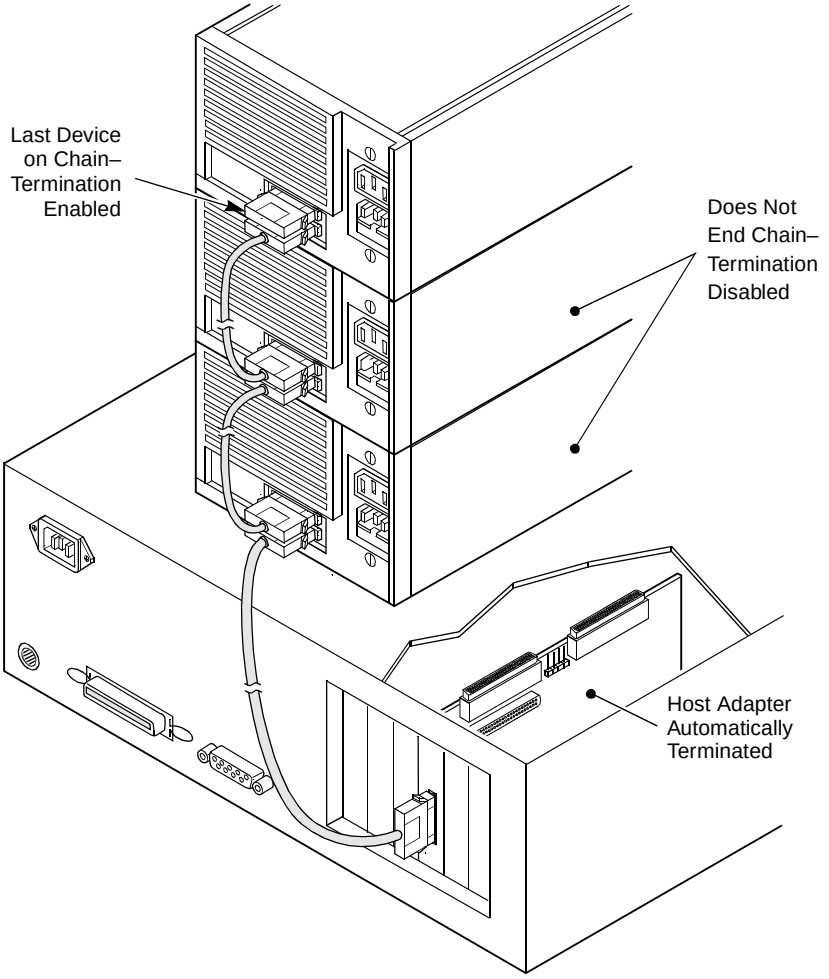


2.2.4.3 External SCSI Connections

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

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

Figure 2.14 External SCSI Device Termination

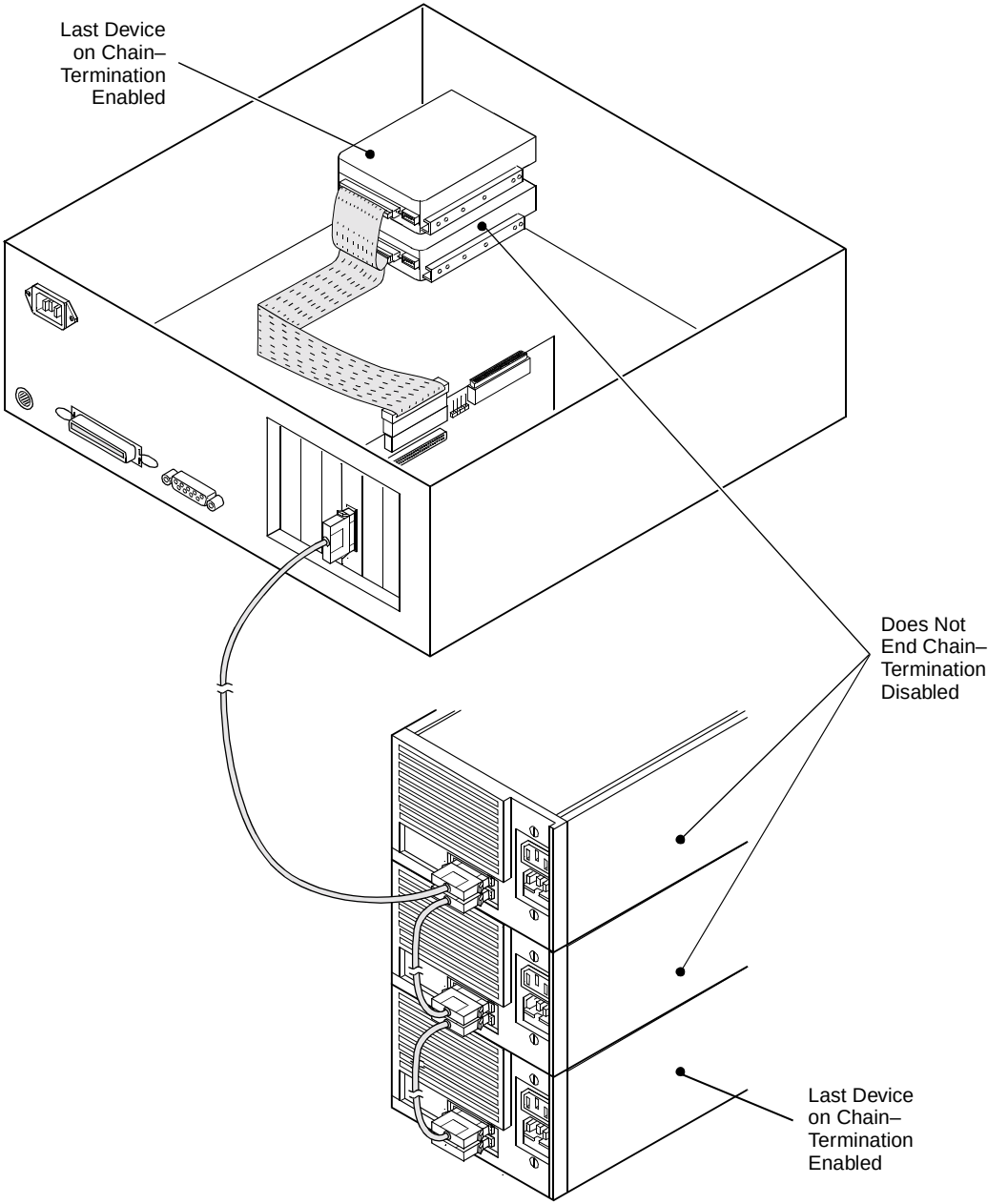


2.2.4.4 Internal and External SCSI Connections

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

Figure 2.15 shows an example of how termination is determined for this SCSI bus configuration on the host adapter internal Channel A and external Channel A.

Figure 2.15 Internal and External SCSI Device Termination



2.3 Setting SCSI IDs

Set each SCSI device and the host adapter to a separate SCSI ID, 0 through 15. SCSI ID 7 is the preset host adapter setting, giving it the highest priority on the bus. If you plan to boot your computer from a hard disk drive on the SCSI bus, that drive should have SCSI ID 0, or the lowest SCSI ID on the bus. Chapter 2 “SCSI BIOS” of 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.

Note: Devices on a narrow (8-bit) bus only respond to SCSI IDs 0–7. Also, they will not be able to respond to the host adapter if the host adapter ID is set higher than 7.

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 computer’s users manual to determine the ID of each device and how to change it. No duplication of SCSI IDs is allowed on a SCSI bus.

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

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

Table 2.1 is provided to keep this record.

Table 2.1 SCSI ID Record

SCSI ID	SCSI Device Channel A	SCSI Device Channel B
15		
14		
13		
12		
11		
10		
9		
8		
7	LSI21003 (default)	LSI21003 (default)
6		
5		
4		
3		
2		
1		
0		

2.4 Setting Interrupts (Exceptional Cases)

Normally, you do not change the default interrupt routing for the LSI21003, since performance is usually increased by having two separate interrupts.

However, if your system does not support two separate interrupts, the INTA/INTB/ jumper is provided to change the interrupt routing. This capability requires enabling the INTA/INTB/ to act as a jumper for special configuration purposes. This feature is not packaged with the standard LSI21003, as the default interrupt routing is sufficient for most systems.

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

Table 2.2 Setting Interrupts

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

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

2.5 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 to your computer.

Step 4. Wait for your computer to boot up.

Step 5. To change the configuration of the host adapter, refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide,* for information on the BIOS software and its operation.

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

Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* or to the guide for the software you plan to use.

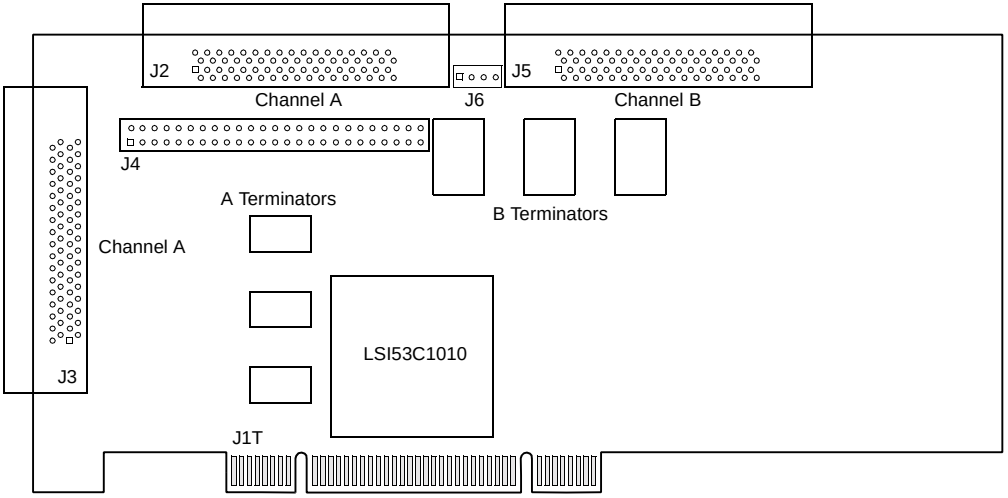
Chapter 3
Technical Specifications

This chapter discusses the physical environment associated with the LSI21003 and includes a mechanical drawing of the host adapter (Figure 3.1).

3.1 Physical Environment

The LSI21003 has specific physical, electrical, thermal, and safety characteristics, which are described in the next sections. Additionally, the board is compliant with electromagnetic emissions.

Figure 3.1 LSI21003 Mechanical Drawing



Note: all dimensions in inches

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

3.1.1 Physical Characteristics

The dimensions of the LSI21003 are approximately 177.8 x 83.8 mm (7.0 x 3.3 inches). PCI connection is made through edge connector J1. The component height on the top and bottom of the LSI21003 follows the PCI specification.

Internal SCSI connections can be made in two ways:

- 68-pin high density connectors J2 for Channel A or J5 for Channel B (16-bit).
- 50-pin low density connector J4 for Channel A (8-bit).

External SCSI connection is made to Channel A through the 50-pin high density connector J3. Connector J3 extends through the ISA/EISA bracket.

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

3.1.2 Electrical Characteristics

The LSI21003 maximum power requirements, which include SCSI TERMPWR, under normal operation are listed in Table 3.1:

Table 3.1 Maximum Power Requirements

+5 V DC	±5%	1.5 A	Over the operating range 5 °C to 55 °C

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

Under abnormal conditions, such as a short on SCSI TERMPWR, +5 V current may be higher. At temperatures of at least 25 °C, a current of 3 A is sustained no longer than ten seconds before the self-resetting TERMPWR short circuit protection device opens.

3.1.3 Thermal, Atmospheric Characteristics

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

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

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

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

3.1.4 Electromagnetic Compliance

The board is designed and implemented so as to minimize electromagnetic emissions, susceptibility, and the effects of electrostatic discharge. The board carries the CE mark, C-Tick mark, FCC Self Certification logo, Canadian Compliance Statement, and meets the requirements of FCC and CISPR Class B.

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

The LSI21003 is designed for use in PCI computer systems with an ISA/EISA bracket type. The SDMS software operates the board; however, the design of the board does not prevent the use of other software.

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

3.2.1 The PCI Interface

The PCI interface operates as a 32-bit DMA bus master. The connection is made through edge connector J1, which provides connections on both the front and back of the board. The signal definitions and pin numbers conform to the PCI Local Bus Specification Revision 2.2 standard. The signal assignments appear in Tables 3.2 and 3.3.

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 LSI53C1010 is powered by 3.3 volts from the on-board regulator.

Table 3.2 PCI Connector J1 Front Side Signals

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

Note: Shaded pins are not connected.

Table 3.3 PCI Connector J1 Back Side Signals

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

Note: Shaded pins are not connected.

3.2.2 The SCSI Interface

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

The SCSI interface operates as two 16-bit, SE or LVD channels, and supports Fast, Ultra, Ultra2, and Ultra160 SCSI protocols. The interface is made through connectors J2, J3, and J4 for Channel A and J5 for Channel B.

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

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

SCSI TERMPWR is supplied by the board.

Tables 3.4, 3.5, 3.6, and 3.7 document the signal assignments for J2, J3, J4 and J5 respectively.

Table 3.4 SCSI Connector J2, Channel A, Internal

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

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

Table 3.5 SCSI Connector J3, Channel A, External

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

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

Table 3.6 SCSI Connector J4, Channel A, Internal

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

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

Table 3.7 SCSI Connector J5, Channel B, Internal

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

3.2.2.1 SCSI Activity LED Interface

The LED interface allows an LED harness to be connected to the board. J6 is the connector for both channels. Table 3.8 lists the signals and pin numbers for Connector J6.

Table 3.8 Connector J6 Signals

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

3.3 Subsystem and Subsystem Vendor ID

The Subsystem ID and System Vendor ID for the LSI21003 are provided in Table 3.9. The EEPROM of the LSI21003 contains the ID numbers. During system initialization, the ID numbers are loaded into the Subsystem Vendor ID and Subsystem ID registers of the imbedded 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 3.9 Subsystem and Subsystem Vendor ID

Subsystem	ID Number
Subsystem Vendor ID	1000
Subsystem ID	1050

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.

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.

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

DMA Direct Memory Access.

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.

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

Differential SCSI A hardware configuration for connecting SCSI devices. It uses a pair of lines for each signal transfer (as opposed to SE SCSI which references each SCSI signal to a common ground).

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 doubleword 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.
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.

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 LSI53C1010-33 device. These SCRIPTS reside in the host computer system memory.

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 device.

SDMS Storage Device Management System. An LSI Logic software product that manages SCSI system I/O.

Single-Ended (SE) 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.
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.
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.
Wide Ultra160 SCSI	The SCSI Trade Association (STA) term for SCSI bus width 16-bits, SCSI bus speed maximum data rate 160 Mbytes/s.
Word	A two byte (or 16-bit) unit of information.

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