**USER'S
GUIDE**

Ultra160
SCSI to PCI
Host Adapters

October 2001

Version 1.1

LSI LOGIC ®

FC CE

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 Ultra160 SCSI PCI Host Adapters (LSI20160, LSI20160L, LSI22903, LSI22915A, ITI6200U3LP, LSI21003, and LSI21040) are 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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> を目的としていますが、この装置がラジオやテレビジョン受信機に近接して
> 使用されると、受信障害を引き起こすことがあります。
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This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

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Milpitas, CA
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The PCI interface is compatible with the PCI Local Bus Specification, Revision 2.1 and 2.2. The SCSI interface is compatible with the ANSI draft standard X3T10.11/1142.

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

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

http://www.lsilogic.com/contacts/na_salesoffices.html

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Preface

This book is the user's guide for all LSI Logic Ultra160 SCSI to PCI Host Adapters. It contains a functional description for the Ultra160 SCSI boards as well as physical and electrical specifications.

Audience

This document assumes that you have some familiarity with SCSI protocol and related support devices. This document benefits people installing and using the various Ultra160 SCSI to PCI Host Adapter Boards.

Organization

This document has the following chapters and appendixes:

- Chapter 1, **Quick Installation Procedures**, provides quick installation instructions for installing your Ultra160 SCSI host adapter and Windows NT or Windows 2000 device driver.

- Chapter 2, **Detailed Host Adapter Installation**, provides detailed installation instructions for installing your Ultra160 SCSI host adapter.

- Chapter 3, **Ultra160 SCSI to PCI Host Adapter Characteristics**, illustrates the various LSI Logic Ultra160 SCSI to PCI Host Adapters and provides PCI and SCSI interface information.

- Appendix A, **Glossary of Terms and Abbreviations**, provides definitions of terms used in this book.

Related Publications

PCI Storage Device Management System SDMS™ 4.0 User's Guide, Version 1.2, LSI Logic Corporation (only available in PDF format from LSI Logic Web Site `http://www.lsilogic.com`)

LSI53C1000 PCI to Ultra160 SCSI Controller Technical Manual, Version 2.1, LSI Logic Corporation, Order No. S14050.A

LSI53C1010-33 PCI to Dual Channel Ultra160 SCSI Multifunction Controller Technical Manual, Version 3.2, LSI Logic Corporation, Order No. S14025.B

LSI53C1010-66 PCI to Dual Channel Ultra160 SCSI Multifunction Controller Technical Manual, Version 2.1, LSI Logic Corporation, Order No. S14049.A

Revision Record

Revision	Date	Remarks
1.0	7/01	Contains all Ultra160 SCSI PCI Host Adapters produced by LSI Logic.
1.1	10/01	Added LED information in Chapter 3 to ITI6200U3LP board. Changed title to Ultra160 SCSI to PCI Host Adapters and other references to same throughout the book.

Contents

Figures

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Chapter 1
Quick Installation Procedures

This chapter contains general information about Ultra160 SCSI controllers and host adapters. It provides quick host adapter installation instructions for *experienced computer users* and instructions for SCSI bus setup. It also provides quick installation instructions for Windows NT or Windows 2000 device drivers. This chapter describes these topics:

- Section 1.1, "General Description," page 1-1

- Section 1.2, "Obtaining Windows NT/Windows 2000 Drivers," page 1-2

- Section 1.3, "Quick Host Adapter Installation," page 1-3

- Section 1.4, "Quick Windows NT/Windows 2000 Driver Installation," page 1-4

1.1 General Description

LSI Logic provides high-performance, cost-effective Ultra160 SCSI controllers and host adapters. The LSI Logic controllers and their associated host adapters that support Ultra160 SCSI are:

Controllers	Host Adapters
LSI53C1000	LSI20160, LSI20160L
LS53C1010	LSI21040, LSI21003, LSI22903, LSI22915A, 6200U3LP

Installing any of these adapters into your PCI system allows you to connect SCSI devices over a SCSI bus. You can use the Ultra160 SCSI boards in PCI computer systems with either a standard or Low Profile PCI (LPPCI) bracket type.

For specific information about the Ultra160 SCSI controllers, refer to the related publications section in the Preface.

1.2 Obtaining Windows NT/Windows 2000 Drivers

Before you begin the Ultra160 SCSI host adapter installation, create a Windows NT or Windows 2000 driver diskette by copying the driver files from either the LSI Logic SDMS CD-ROM or from the LSI Logic web site at `http://www.lsilogic.com`. If you obtain the driver software from the LSI Logic web site, the zipped package that you download contains the appropriate files. To obtain the driver software from the SDMS Software Device Drivers and Utilities CD-ROM Release 4.x, copy all the files starting from the `I386` subdirectory through the `MINIPORT` subdirectory (`I386/WINNT/MINIPORT`) to the root directory of a clean diskette. You will use the driver diskette during installation process.

`{CDROM Drive}:\DRIVERS\8XX-1010\WINNT\ULTRA3NT\I386`

or

`{CDROM Drive}:\DRIVERS\8XX-1010\WIN2K\ULTRA32K\I386`

Additionally, Channel Marketing provides the driver software on their SDMS Software Device Drivers and Utilities CD-ROM, Release 1.x. Copy all the files from the `Ultra160` subdirectory to the root directory of a clean diskette. You will use this SDMS driver diskette during installation.

`{CDROM Drive}:\DRIVERS\8XX-1010\WINNT\ULTRA160`

or

`{CDROM Drive}:\DRIVERS\8XX-1010\WIN2K\ULTRA160`

Contact the LSI Logic technical support team for LSI Logic Storage I/O Components if you have any questions. In the U.S., customers may contact us at (719) 533-7230.

1.3   Quick Host Adapter Installation

If you are an experienced computer user with prior host adapter installation and SCSI bus setup experience, this section may sufficiently describe the installation procedure for you. If you prefer more detailed instructions and guidance, refer to .

To install an LSI Logic Ultra160 SCSI to PCI Host Adapter, follow these steps:

Step 1.   *Ground yourself* before handling the host adapter board to discharge static electricity.

Step 2.   Remove the host adapter board from its packing and examine it for any damage. Retain the packing for future use.

Step 3.   Turn off and unplug your computer and peripherals.

Step 4.   Open your PC cabinet by removing its cover.

Step 5.   Locate the slot for installing PCI plug-in boards.

Step 6.   Insert your Ultra160 SCSI host adapter board into the selected PCI (32 or 64 bit) slot.

Step 7.   Connect the internal and external SCSI peripherals.

Optional: Connect the LED cable on your SCSI host adapter.

Step 8.   Terminate the SCSI bus.

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

Step 9.   Set the peripheral SCSI IDs. *Do not* duplicate the SCSI IDs.

Step 10. Make any configuration changes.

Step 11. Replace your PC cabinet cover.

Step 12. Plug in all power cords, turn on the peripherals, and then turn on your computer.

The host adapter installation is complete.

1.4   Quick Windows NT/Windows 2000 Driver Installation

To load the SYM_U3.SYS miniport driver during a new Windows NT or Windows 2000 system installation, you can boot directly from the Microsoft installation CD-ROM. The Windows NT 4.0 and Windows 2000 drivers are not interchangeable, however the instructions are very similar.

To install a new Windows NT or Windows 2000 operating system and its appropriate device driver, follow these steps:

Step 1.   Have the Windows NT driver diskette or Windows 2000 driver diskette available for inserting into the A: drive when prompted.

Step 2.   Boot the computer from the Microsoft Windows NT 4.0 or Windows 2000 CD-ROM.

Step 3.   Press the F6 key when the words Setup is inspecting your computer's hardware configuration appear, or when prompted by Windows 2000 for nonsupported drivers.

Important: You must press the F6 key for the new driver to be recognized. Otherwise, the system does not recognize the devices controlled by the driver during the Windows setup.

Step 4.   Follow the instructions until a screen displaying the words Setup could not determine the type of one or more mass storage device… appears.

Step 5.   Choose S to Specify Additional Devices.

Step 6.   Follow the prompts and insert the Windows NT Driver Diskette or Windows 2000 Driver Diskette when prompted.

Step 7.   Follow the Microsoft Windows NT 4.0 or Windows 2000 installation procedure to complete the installation. Microsoft provides documentation with their installation CD-ROM.

Step 8.   Install the Windows NT 4.0 Service Packs 5 or higher after Windows NT 4.0 has been installed.

Note: Refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide* for device driver installation instructions that fully support Windows, UNIX, and Netware operating systems.

Chapter 2
Detailed Host Adapter Installation

This chapter provides detailed instructions on how to install the LSI Logic Ultra160 SCSI to PCI host adapters and includes these topics:

2.1   Installing your Ultra160 SCSI Host Adapter

This section provides detailed instructions for installing your host adapter board and connecting it to your SCSI peripherals. The following illustrations depict the LSI21003 PCI to Dual Channel Ultra160 SCSI Host Adapter. However, these illustrations are applicable to all boards.

2.1.1   Selecting a PCI Slot

Step 1.   *Ground yourself* before removing the host adapter board from its package to discharge static electricity.

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

Step 2.   Remove your Ultra160 SCSI host adapter from its packing and verify it is not damaged.

Step 3.   Turn off and unplug your computer and peripherals.

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

Step 5.   Locate the PCI slots on your computer.

Use a 32-bit slot for 32-bit host adapters and a 64-bit slot for 64-bit host adapters. You may insert a 64-bit host adapter into a 32-bit slot if not 64-bit slots are available. Refer to the user's manual supplied with your computer to confirm the location of the PCI slots.

2.1.2   Inserting the Host Adapter

Perform the following steps to install your Ultra160 SCSI Host Adapter in your PC mainboard.

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

Save the bracket screw.

Step 2.   Carefully insert the edge connector J1 of the host adapter into the PCI slot.

Step 3.   Make sure the edge connector is properly aligned before pressing the board into place. The bracket around connector J3 should fit where the blank bracket panel was removed.

Figure 2.1 illustrates the hardware connections. All the connectors in this example pertain to the LSI21003. Other Ultra160 SCSI host adapters will have different connector labels depending on the board design. Refer to Chapter 3, "Ultra160 SCSI to PCI Host Adapter Characteristics," for more information.

Figure 2.1   Hardware Connections for the Host Adapter

J5
Channel B 68-Pin
Internal High Density
SCSI Connector

J2
Channel A 68-Pin
Internal High Density
SCSI Connector

J3
Channel A 50-Pin
External High Density
SCSI Connector

J6
Busy LED
Connector

J4
Channel A 50-Pin
Internal Low Density
SCSI Connector

J1
Ultra160 SCSI PCI Bus
Edge Connector
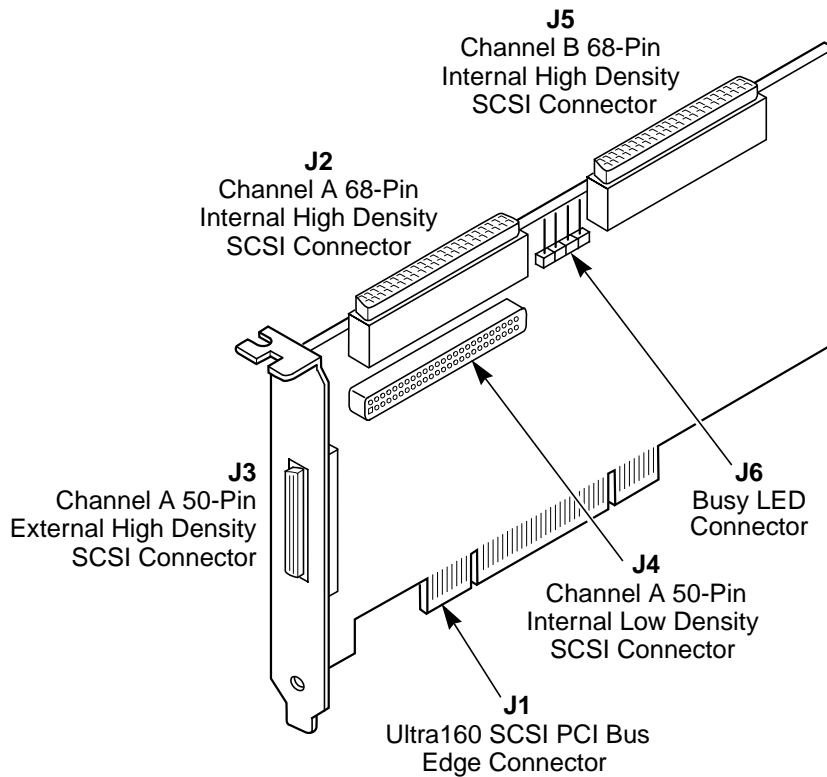
Note: Notice that the components on a Ultra160 SCSI to PCI host adapter face the opposite way from non-PCI adapter boards you may have in your system. This is correct. The board is keyed to go in only one way.

Step 4.   Secure the bracket with the bracket screw before making the internal and external SCSI bus connections. Figure 2.2 shows an example of how to insert your host adapter. All LSI Logic Ultra160 SCSI to PCI host adapters require a PCI slot that allows bus master operation.

Figure 2.2   Inserting the Host Adapter

Secure the bracket with the bracket screw.

Bracket around connector J3 fits where blank bracket panel was removed.

32-Bit slots

If you plug a 64-bit card into a 32-bit slot, be careful not to damage the main board.

64-Bit slots
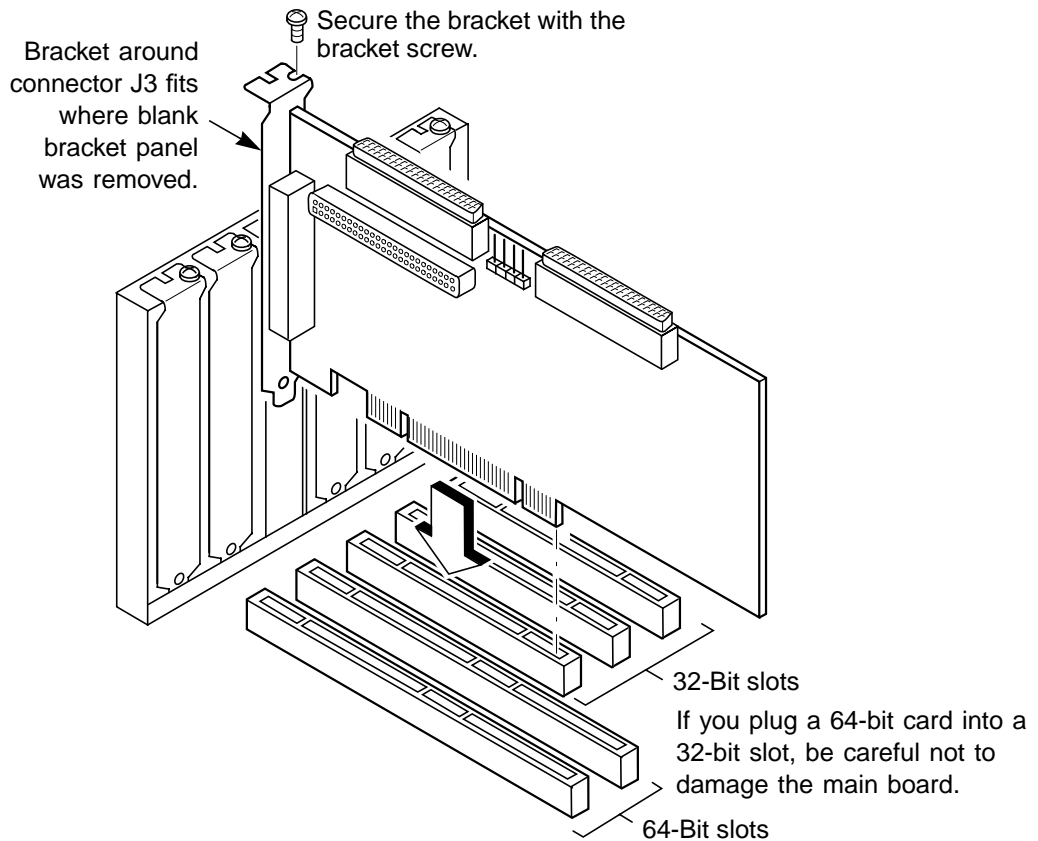
2.2   Connecting SCSI Peripherals

This section provides information about making internal and external SCSI connections.

2.2.1   Making Internal Wide SCSI Bus Connections

This section provides step-by-step instructions for making internal SCSI bus connections. These steps refer to connectors that are specific to the LSI21003. Internal and external connectors can be 50-pin or 68-pin. Refer to Section 3.3.1, "Internal SCSI Cables," page 3-10 for examples of internal cables.

If you have only external connections, skip to Section 2.2.2, "Making External SCSI Bus Connections," otherwise follow these steps:

Step 1. Plug the 68-pin connector on the SCSI ribbon cable into the internal connector on the host adapter board. Figure 2.3 illustrates how to make this connection.

Figure 2.3   Internal SCSI Ribbon Cable to Host Adapter

68-Pin High Density Ribbon Cable
(See Figure 3.8 and Figure 3.9 for
examples of internal ribbon cables.)

68-Pin
Connector

Internal
Connectors
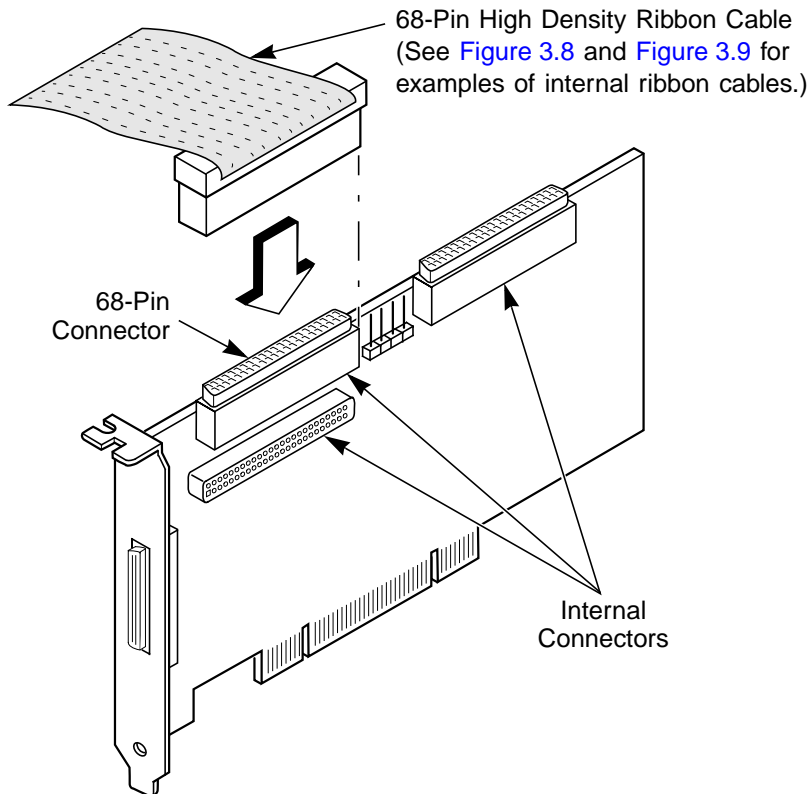
Step 2. Plug the 68-pin connector on the other end of the internal SCSI ribbon cable into the SCSI connector on the internal SCSI device. Figure 2.4 illustrates the chaining of internal SCSI devices.

If you have more than one internal SCSI device, you must have a cable with at least as many connectors as you have devices.

Note: Daisy chaining devices represent an arrangement of devices connected in a series. Any signal transmitted to the devices goes to the first device, from the first to the second, and so on. Termination occurs on the last internal SCSI device.

See Section 2.3, "Terminating the SCSI Bus," for more information on SCSI bus termination.

Step 3. Plug in any additional internal SCSI devices, as required.

Figure 2.4   Multiple Internal SCSI Devices Chained Together
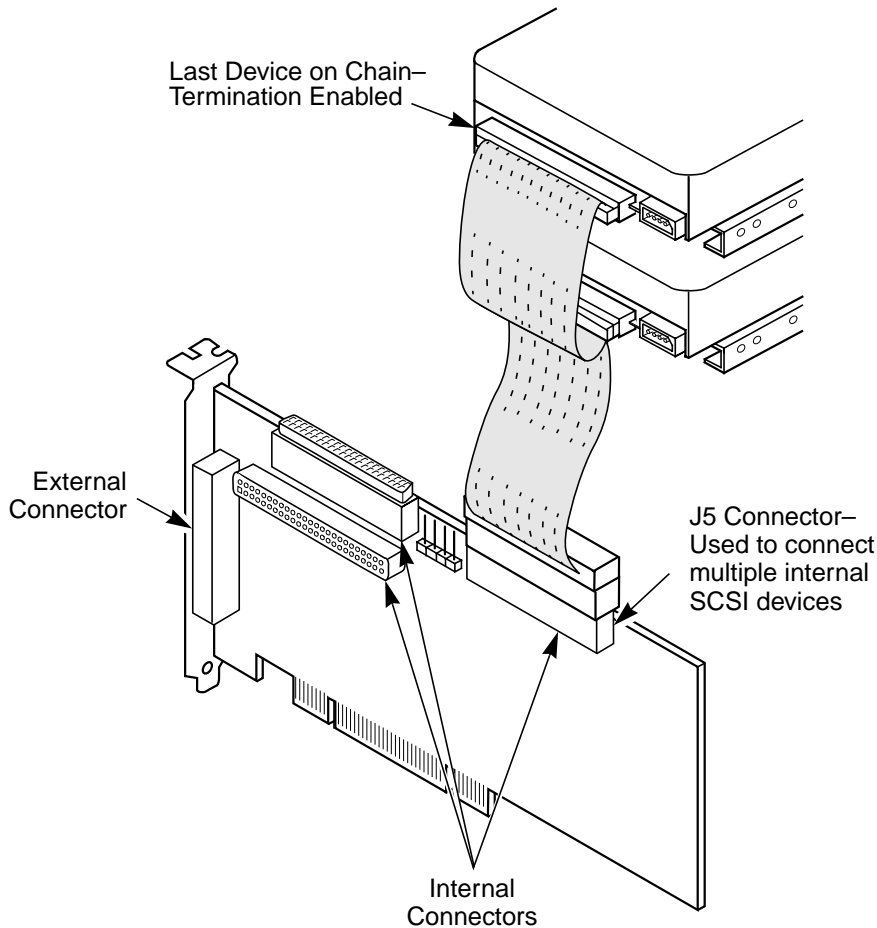
Last Device on Chain–
Termination Enabled

External
Connector

J5 Connector–
Used to connect
multiple internal
SCSI devices

Internal
Connectors

2.2.2   Making External SCSI Bus Connections

This section provides step-by-step instructions for making external SCSI bus connections. Refer to Section 3.3.2, "External SCSI Cables and Connectors," page 3-11 for examples of external cables.

Step 1.   Plug the 50-pin connector on one end of a shielded external high density cable into the appropriate connector.

This connector is exposed on the back panel of your computer.

Step 2.   Plug the 50-pin connector on the other end of the shielded external SCSI cable into the SCSI connector on your external SCSI device.

Figure 2.5 shows an example of an external SCSI connection to a single external SCSI device. If you have the correct cable, it matches the external connector. Termination occurs on the last SCSI device. See Section 2.3, "Terminating the SCSI Bus," for more information about SCSI bus termination.

Figure 2.5   External SCSI Connection to an External SCSI Device
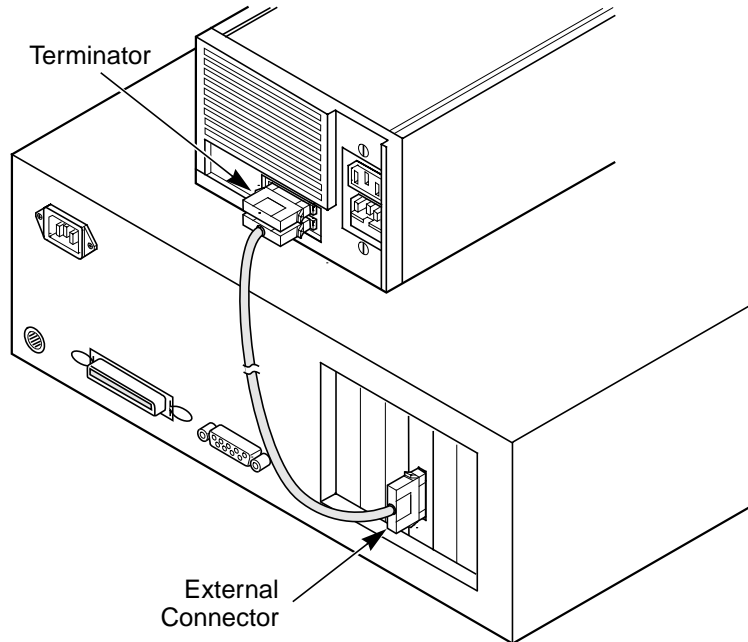
Step 3.   Chain any additional SCSI devices together with shielded external SCSI cables.

Figure 2.6 shows an example of multiple external SCSI devices that are chained together.

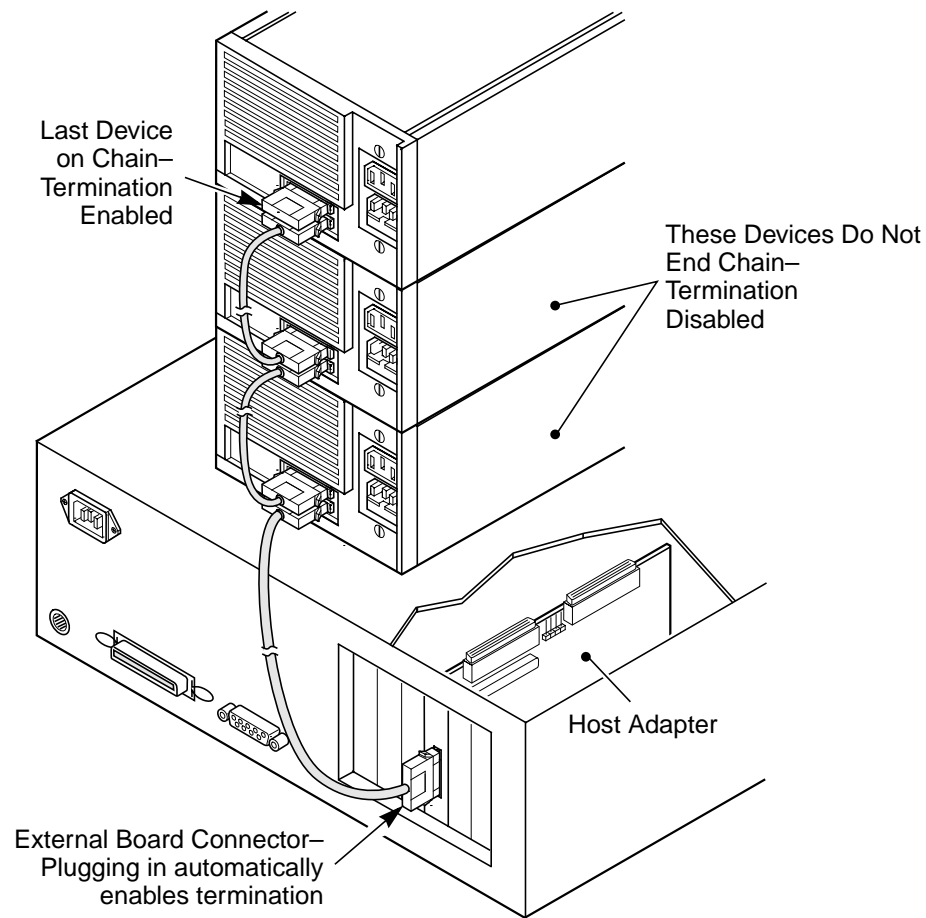**Figure 2.6   Multiple External SCSI Devices Chained Together**

2.3   Terminating the SCSI Bus

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. Refer to the peripheral manufacturer's instructions and to the user's manual for your computer for information on how to identify the terminator setting of each device and how to change it.

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 speed, limiting bus performance to Ultra SCSI. LVD peripheral devices are normally terminated with external terminators, but are sometimes set with jumpers or with a switch on the peripheral.

The Ultra160 SCSI host adapters automatically control SCSI bus termination for various bus configurations.

In one case, you may disable termination by using BIOS software control to change the BIOS termination from Automatic to Off.

In another case where jumpers are provided on the board, you would locate the shunts on the board for autotermination override. Termination can be disabled by placing a manual shunt over the post. When the shunt is off, the terminator is active. When the shunt is on the post, the terminator is disabled. Figure 2.7 illustrates how the shunt controls autotermination.

Figure 2.7   Autotermination Shunt

☐ ☐   Autotermination enabled (no jumper installed)

[☐ ☐]   Termination disabled (jumper installed)
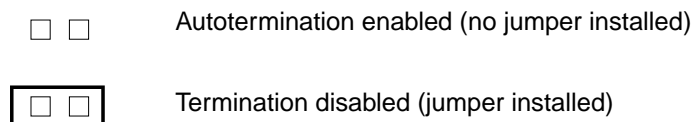
2.3.1   Internal and External SCSI Terminations

If you are making internal SCSI device connections to your host adapter, you must terminate the last internal device on the SCSI bus. If you are making external SCSI device connections to your host adapter, you must terminate the last external device on the SCSI bus. You must disable the termination on all other devices. Termination on your host adapter is automatically enabled in this case.

2.3.2   Setting SCSI IDs

You must set each SCSI device and the host adapter to a separate SCSI ID. The IDs are 0 through 7 for an 8-bit bus and 0 through 15 for a 16-bit bus. SCSI ID 7 is the preset host adapter setting, giving it the highest priority on the SCSI bus.

If you plan to boot your computer from a hard disk drive on the SCSI bus, that drive should have SCSI ID 0, or the lowest SCSI ID on the bus. Normally, you do not change the host adapter SCSI ID setting. If you wish to do so, refer to the *PCI Storage Device Management System SDMS 4.0 User's Guide,* which explains how to set your host adapter ID using the SCSI BIOS Configuration Utility.

The peripheral device SCSI IDs are usually set with jumpers or with a switch on the peripheral. Refer to the peripheral manufacturer's instructions and to the user's manual for your computer to determine the ID of each device and how to change it. No duplication of SCSI IDs is allowed on a SCSI bus. To set your SCSI IDs, follow these steps:

Step 1.   Determine the SCSI ID of each device on the SCSI bus.

Step 2.   Make any necessary changes to the SCSI IDs and record the IDs for future reference. Correct any duplications at this time. Table 2.1 provides a place to keep this record.

Table 2.1   SCSI ID Record

SCSI ID	SCSI Device Channel A	SCSI Device Channel B
15		
14		
13		
12		
11		
10		
9		
8		
7	Ultra160 SCSI to PCI Host Adapter	Ultra160 SCSI to PCI Host Adapter
6		
5		
4		
3		
2		
1		
0		

2.4 Completing the Installation

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

Verify Installation Procedures	Done
Host adapter connection in PCI bus slot secure (level)	
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, turn on the peripherals, and then turn on your computer.

Step 3.   Wait for your computer to boot up.

Step 4.   Refer to the LSI Logic *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 and to change the configuration of your host adapter, if needed.

Detailed Host Adapter Installation

Chapter 3
Ultra160 SCSI to PCI Host Adapter Characteristics

This chapter describes the LSI Logic Ultra160 SCSI to PCI Host Adapter boards for use in your computer systems. This chapter includes these topics:

3.1 Ultra160 SCSI to PCI Boards

The Ultra160 SCSI boards are used in PCI computer systems with either a Standard or Low Profile PCI (LPPCI) bracket type. Table 3.1 lists the LSI Logic Ultra160 SCSI to PCI Host Adapter Boards.

Table 3.1   Ultra160 SCSI to PCI Host Adapter Boards

Adapter	Description	Bracket	Board Dimensions
LSI20160	Single Channel Ultra160 SCSI, 32-bit, 33 MHz	Standard	4.721 x 2.536 inches 119.913 x 64.414 mm
LSI20160L	Single Channel Ultra160 SCSI, 32-bit, 33 MHz	Low Profile	4.721 x 2.536 inches 119.913 x 64.414 mm
LSI22903	Dual Channel Ultra160 SCSI, 64-bit, 33 MHz	Low Profile	6.60 x 2.53 inches 167.64 x 64.262 mm
LSI22915A	Dual Channel Ultra160 SCSI, 64-bit, 66 MHz	Standard	8.5 x 3.80 inches 215.9 x 96.52 mm

Table 3.1   Ultra160 SCSI to PCI Host Adapter Boards (Cont.)

Adapter	Description	Bracket	Board Dimensions
ITI6200U3LP	Dual Channel Ultra160 SCSI Low Profile PCI	Low Profile	6.6 x 2.5 inches 167.64 x 63.5 mm
LSI21003	Legacy Dual Channel Ultra160 SCSI, 32-bit, 33 MHz	Standard	7.5 x 2.5 inches 190.5 x 63.5 mm
LSI21040	Legacy Dual Channel Ultra160 SCSI, 64-bit/33 MHz or 32-bit/33 MHz	Standard	8.5 x 3.80 inches 215.9 x 96.52 mm

3.2   Host Adapter Characteristics

Table 3.2 shows the general characteristics for all Ultra160 SCSI to PCI Host Adapters.

Table 3.2   Host Adapter Characteristics

Flash ROM[1]	Serial EEPROM[2]	LVD/SE Signaling	Ultra160 SCSI Data Transfers	SCSI Features	SCSI Termination
Yes	Yes	16-bit SE or LVD interfaces	Up to 160 Mbytes/s as well as Fast, Ultra, and Ultra2 speeds; Synchronous offsets up to 62.	Plug n Play Scatter/Gather Activity LED	TERMPWR with auto resetting circuit breaker

1. For BIOS (boot ROM)
2. For BIOS configuration storage

The following sections provide the pertinent details and features of each LSI Logic Ultra160 SCSI to PCI host adapters. Along with these features, an example of each board's mechanical drawing is provided to illustrate the main connectors, the LSI Logic controller, and the termination speed supported by these connections. Footnotes below the drawing specify the function of each connector.

The Subsystem ID and Subsystem Vendor ID for the Ultra160 SCSI host adapters are provided in the notes below each mechanical drawing. During system initialization, the system loads the ID numbers into the Subsystem Vendor ID and Subsystem ID registers of the embedded LSI Logic Ultra160 SCSI controllers.
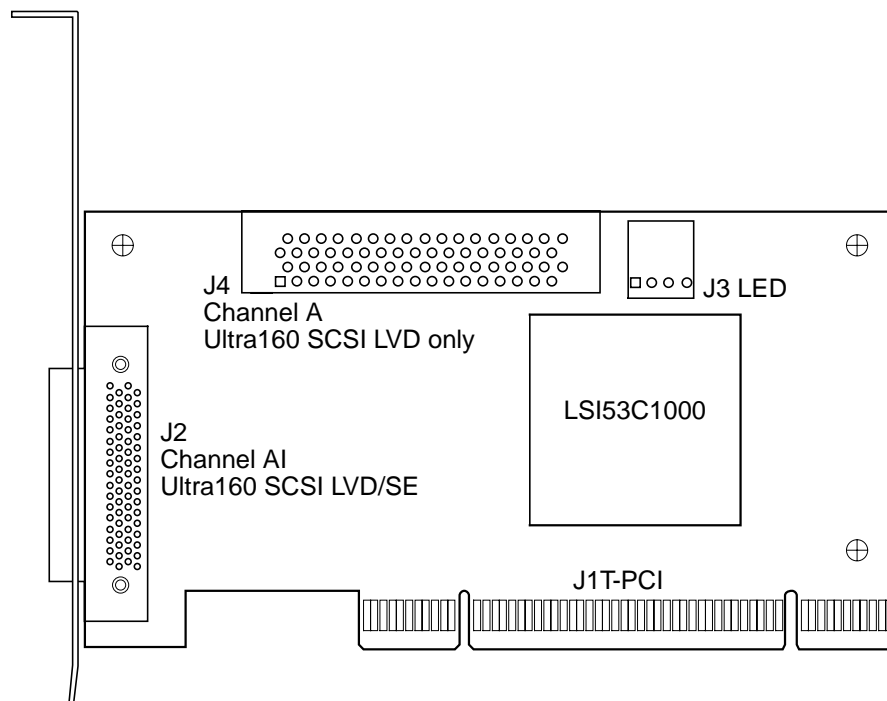
3.2.1 LSI20160 Host Adapter

The LSI20160 PCI to Single Channel Ultra160 SCSI Host Adapter (Figure 3.1) provides one Ultra160 SCSI channel. The LSI20160 board supports Low Voltage Differential (LVD) and Single-Ended (SE) SCSI. The SCSI interface is made through connectors J2 and J4.

The LSI20160 has these features:

- One Ultra160 SCSI channel

- Two connectors

    - One external 68-pin VHDCI connection

    - One internal 68-pin high density connection

- LVD/SE SCSI termination for the external connection; LVD SCSI only for internal connection

Figure 3.1   LSI20160 Mechanical Drawing

Note:
- J1: PCI 32-bit universal type board edge connector.
- J2: 68-pin VHDCI connector for external SCSI connection.
- J4: 68-pin high density internal SCSI connection.
- J3: 4-pin low density unshrouded right-angle LED connector.
- Subsystem Vendor ID is 1000.
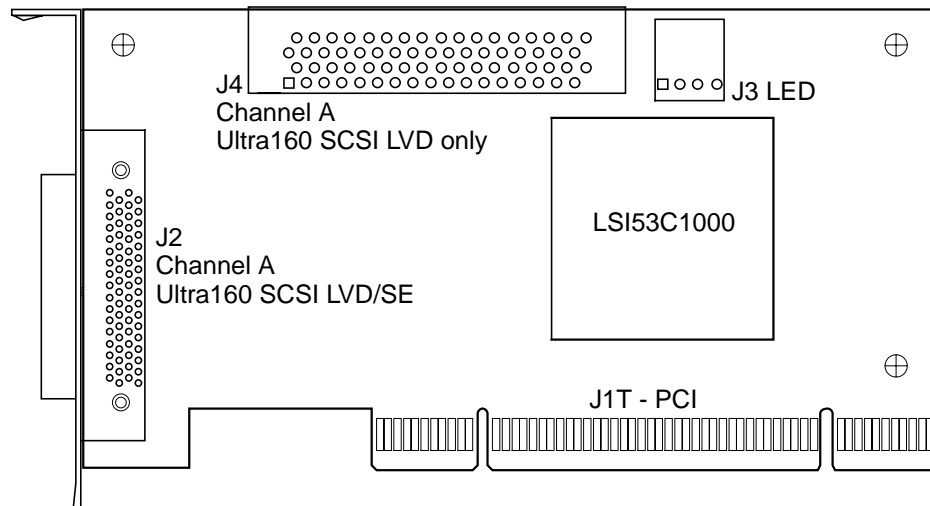- Subsystem ID is 1060.

3.2.2　LSI20160L Host Adapter

The LSI20160L PCI to Single Channel Ultra160 SCSI Low Profile PCI Host Adapter (Figure 3.2) provides one Ultra160 SCSI channel. The LSI20160L board supports Low Voltage Differential (LVD) and Single-Ended (SE) SCSI. The LSI20160L board is the LPPCI board with a low profile bracket. The SCSI interface is made through connectors J2 and J4.

The LSI20160L has these features:

- One Ultra160 SCSI channel
- Two connectors
  - One external 68-pin VHDCI connection
  - One internal 68-pin high density connection
- LVD/SE termination

Figure 3.2　LSI20160L Mechanical Drawing

Note:
- J1: PCI 32-bit, universal type board edge connector.
- J2: 68-pin VHDCI connector for external SCSI connection.
- J4: 68-pin high density internal SCSI connection.
- J3: 4-pin low density unshrouded right-angle LED connector.
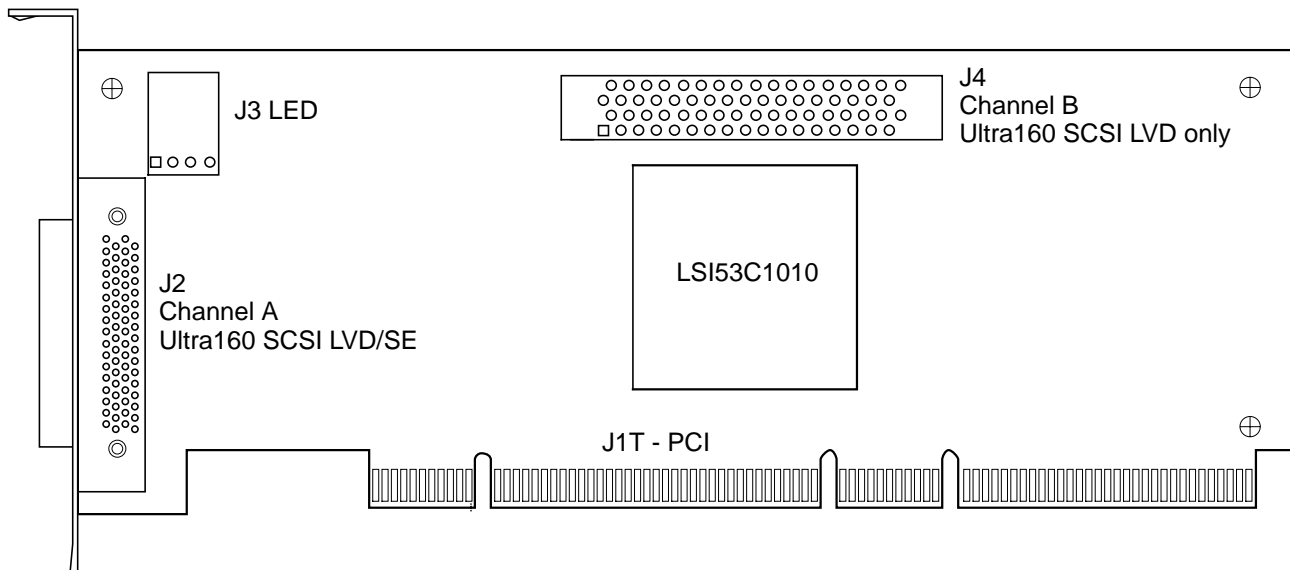- Subsystem Vendor ID is 1000.
- Subsystem ID is 1060.

3.2.3   LSI22903 Host Adapter

The LSI Logic LSI22903 PCI to Dual Channel Ultra160 SCSI Low Profile PCI Host Adapter (Figure 3.3) provides two independent Ultra160 SCSI channels. The LSI22903 board is a LPPCI board with a low profile bracket. The SCSI interface is made through connector J2 for channel A and J4 for channel B.

The LSI22903 has these features:

- Two independent Ultra160 SCSI channels
- Two connectors
  - One external 68-pin VHDCI connection
  - One internal 68-pin high density connection
- LVD/SE termination for external Channel A
- LVD termination for internal Channel B

Figure 3.3   LSI22903 Mechanical Drawing

Note:
- J1: PCI 64-bit, universal type board edge connector.
- J2: 68-pin very high density external connector for channel A.
- J4: 68-pin high density internal connector for channel B.
- J3: 4-pin low density unshrouded right-angle LED connector.
- Subsystem Vendor ID is 1000.
- Subsystem ID is 1020.

3.2.4   LSI22915A Host Adapter

The LSI22915A PCI to Dual Channel Ultra160 SCSI Host Adapter (Figure 3.4) provides two separate Ultra160 SCSI channels. Both channel A and channel B of the LSI22915A support LVD and SE as a SCSI solution for your computer. The SCSI interface is made through connector J1 or J3 for channel A and J4 or J7 for channel B.

The LSI22915A has these features:

- Two separate Ultra160 SCSI channels
- Four connectors
  - Two external 68-pin VHDCI connections
  - Two internal 68-pin high density connections
- LVD/SE termination for both channels

Figure 3.4   LSI22915A Mechanical Drawing
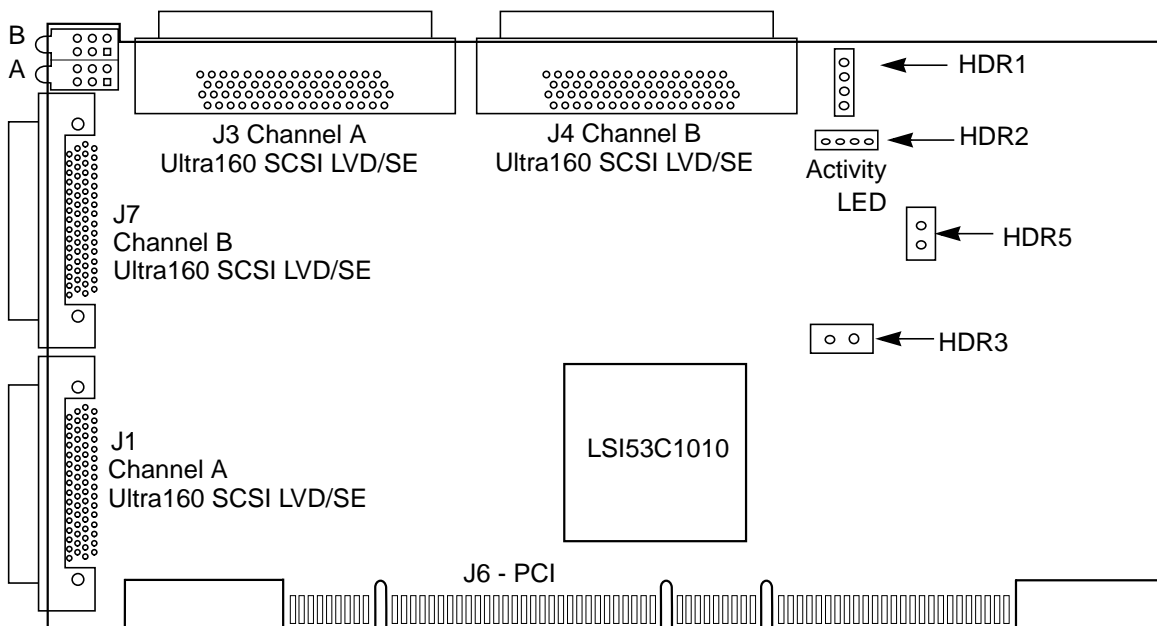
Note:

- J6: PCI 64-bit, universal type board edge connector.
- J3 and J4: 68-pin high density shielded right-angle internal connectors.
- J1 and J7: 68-pin VHDCI shielded right-angle external connector.
- HDR1 and HDR2: Remote Activity Indicator Connection for channel A and channel B.
- HDR3 and HDR5: Disable Termination for channel A and channel B
- Subsystem Vendor ID is 1000; Subsystem ID is 1010.
- Refer to Figure 3.5 (ITI6200U3LP) for LVD Status Indicator information.

3.2.5 ITI6200U3LP Host Adapter

The ITI6200U3LP (Figure 3.5) is an Ultra160 SCSI Low Profile PCI Host Adapter that provides high performance (160 Mbytes/s per channel).

The ITI6200U3LP has these features:

- Three connectors
    - Two external 68-pin VHDCI connections
    - One internal 68-pin high density connection
- LVD/SE termination for both channels

Figure 3.5   ITI6200U3LP Mechanical Drawing
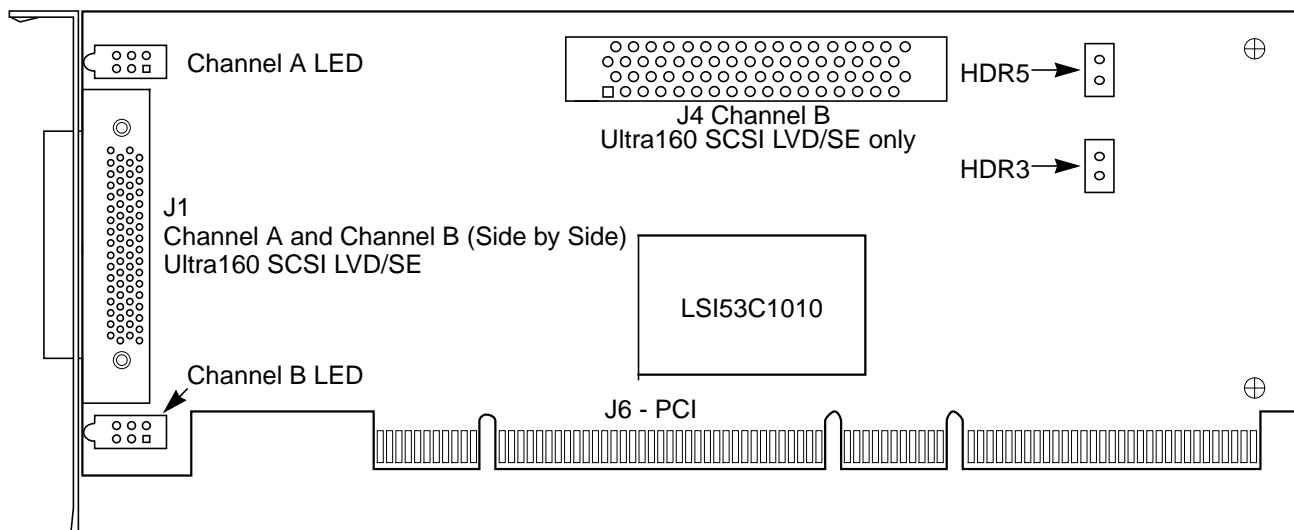
Note:
- J6: PCI 64-bit, universal type board edge connector.
- J1: 68-pin VHDCI shielded right-angle external channel A and channel B
- J4: 68-pin high density internal connector for channel B.
- HDR3: Disable termination when installed for channel A.
- HDR5: Disable termination when installed for channel B.
- Subsystem Vendor ID is 13E9.
- Subsystem ID is 1300.

The LVD status indicators for the LSI22915A and ITI6200U3LP are:

LVD Status Indicator

|		
o	Act. (Activity)	On = Bus Busy
o	Term. (Termination)	On = Terminating
o	LVD (Mode)	On = LVD; Off = SE; Blink = (error)

3.2.6   LSI21003 Host Adapter

The LSI21003 PCI to Dual Channel Ultra160 SCSI host adapter (Figure 3.6) provides 16-bit LVD and SE SCSI solutions for your computer. Channel A supports only the SE mode, while channel B supports LVD and SE modes of operation.

The LSI21003 host adapter has these features:

- Ultra SCSI Wide SE for channel A to 40 Mbytes/s per data transfer; Ultra160 SCSI for channel B to 160 Mbytes/s per data transfer

- Four connectors

    – One external 50-pin high density connection

    – Two internal 68-pin high density connections

    – One internal 50-pin low density legacy connection for channel A

- Channel A is SE only with autosense termination

- Channel B is SE or LVD with termination permanently enabled

Figure 3.6   LSI21003 Mechanical Drawing
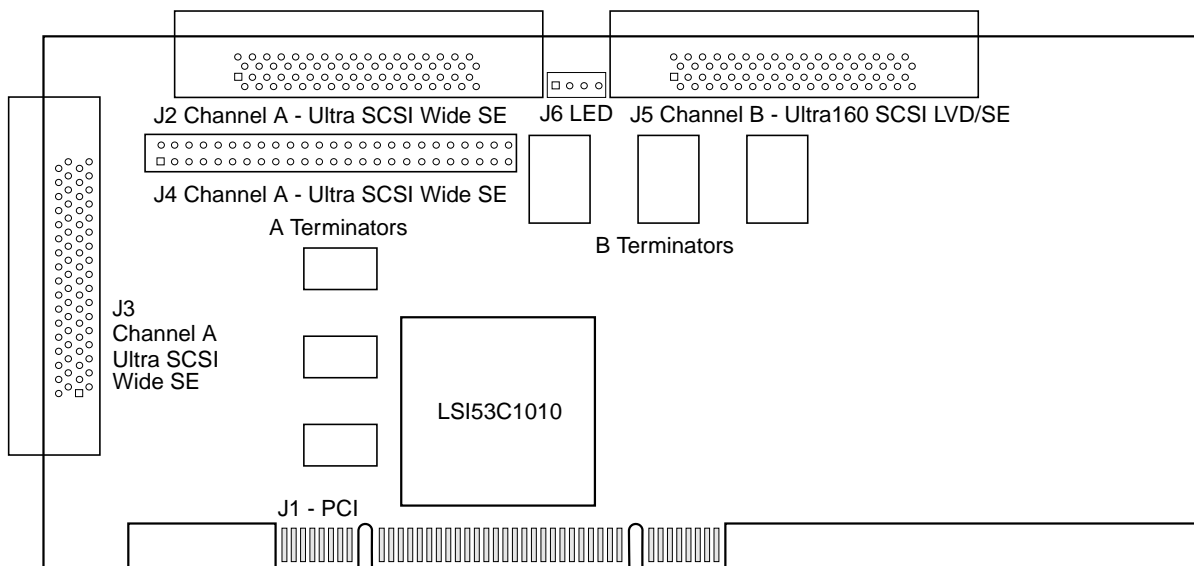
Note:

- J1: PCI 32-bit, universal type board edge connector.
- J2 and J5: 68-pin high density shielded latching right-angle internal connectors.
- J3: 50-pin high density shielded right-angle external connector.
- J4: 50-pin low density shrouded vertical internal connector.
- J6: 4-pin low density unshrouded right-angle LED connector.
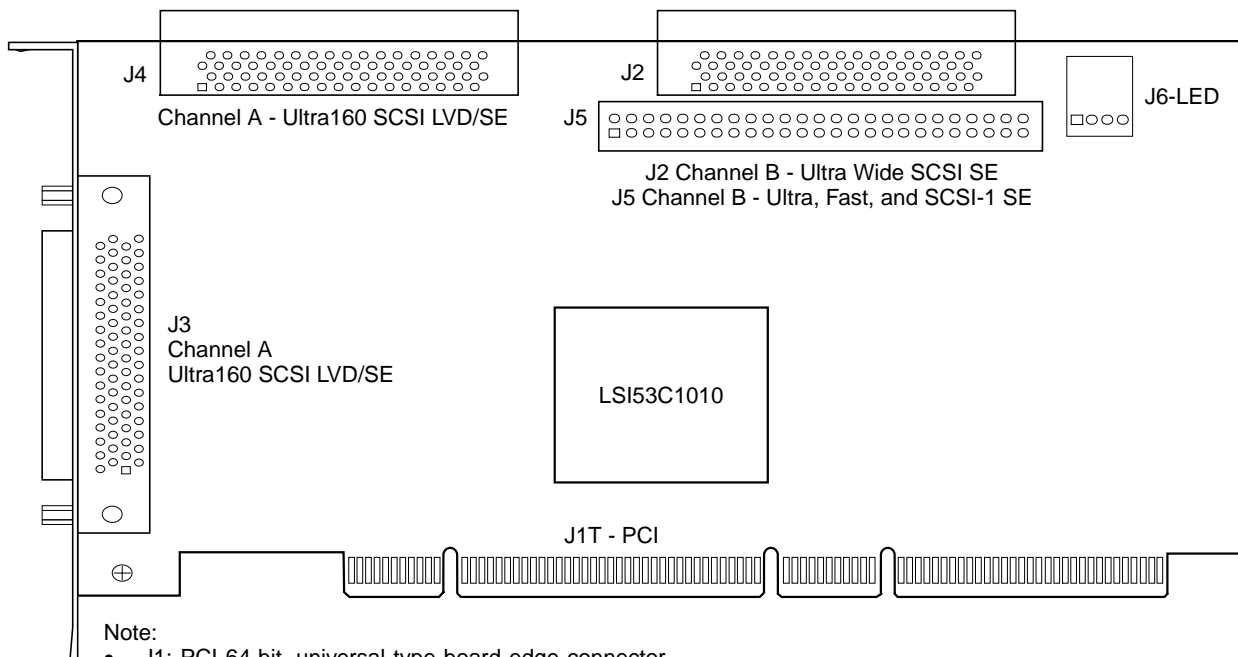- Subsystem Vendor ID is 1000.
- Subsystem ID is 1050.

3.2.7   LSI21040 Host Adapter

The LSI21040 PCI to Dual Channel Ultra160 SCSI host adapter (Figure 3.7) provides 16-bit LVD and SE solutions for your computer. Channel A supports LVD/SE modes of operation, while channel B supports only the SE mode.

The LSI21040 board has these features:

- Ultra160 SCSI for channel A to 160 Mbytes/s per data transfer; Ultra SCSI SE for channel B to 40 Mbytes/s per data transfer
- Four connectors
  - One external 68-pin high density connection
  - Two internal 68-pin high density connections
  - One internal 50-pin low density legacy connections for channel B
- LVD/SE termination on channel A automatically; SE termination on channel B automatically

Figure 3.7   LSI21040 Mechanical Drawing

Note:
- J1: PCI 64-bit, universal type board edge connector.
- J2 and J4: 68-pin high density shielded latching right-angle internal connectors.
- J3: 68-pin high density shielded right-angle external connector.
- J5: 50-pin low density shrouded vertical internal connector.
- J6: 4-pin low density unshrouded right-angle LED connector.
- Subsystem Vendor ID is 1000.
- Subsystem ID is 1040.

3.3 Cabling SCSI Devices

The cable provided in your host adapter kit is matched to the host adapter board and its operation. The Ultra160 SCSI cable also has built-in multimode (LVD/SE) termination because most Ultra160 hard disk drives are not made with on-board LVD termination.

Table 3.3 lists standard cable specifications.

Table 3.3   Cable Specifications

STA Term	Maximum Bus Length, Meters[1]		Maximum Devices
	SE	LVD	
Ultra SCSI	1.5	see note[2]	8/4
Wide Ultra SCSI	1.5/3	see note[2]	8/4
Ultra2 SCSI	see note[3]	12	8
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.
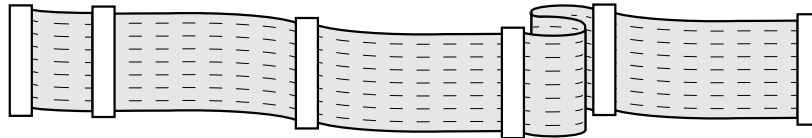
3.3.1   Internal SCSI Cables

You can make internal SCSI bus connections to your Ultra160 SCSI host adapter with an unshielded, 68- or 50-conductor ribbon cable. Some internal cables come with an LVD/SE terminator on one end. This end must be farthest from the host adapter. Figures 3.8 through 3.10 provide examples of internal cables.

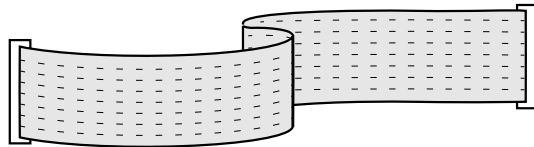**Figure 3.8   SCSI Cable – 68-Pin High Density with Termination**
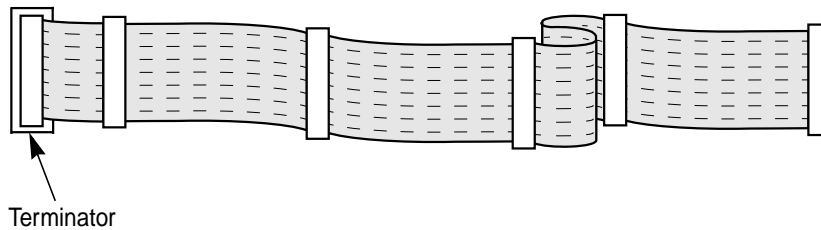
Terminator

**Figure 3.9   SCSI Cable – 68-Pin High Density without Termination**
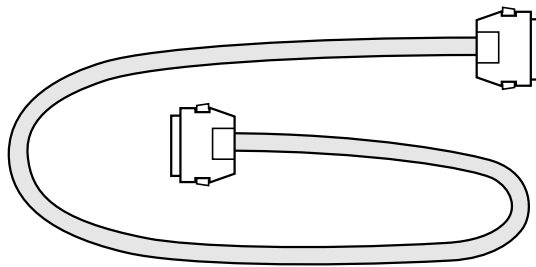
Figure 3.10   SCSI Cable – 50-Pin Low Density

3.3.2   External SCSI Cables and Connectors

All external SCSI bus connections to your Ultra160 SCSI host adapter are made with shielded cables. Figures 3.11 through 3.13 provide examples of external cables. The connectors on this cable are keyed to ensure proper pin-1 connection. Refer to Figure 3.14 for examples of connectors found on external SCSI cables.
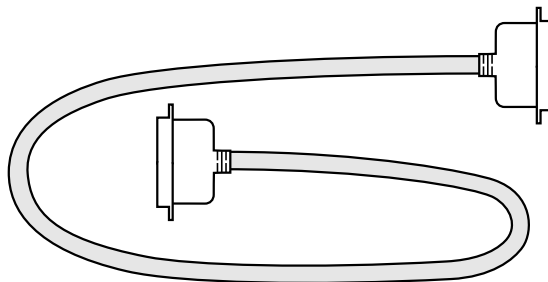
Figure 3.11   SCSI Cable – 68-Pin VHDCI
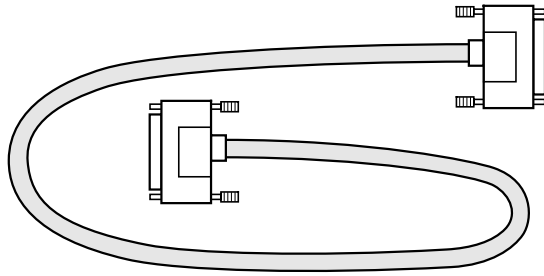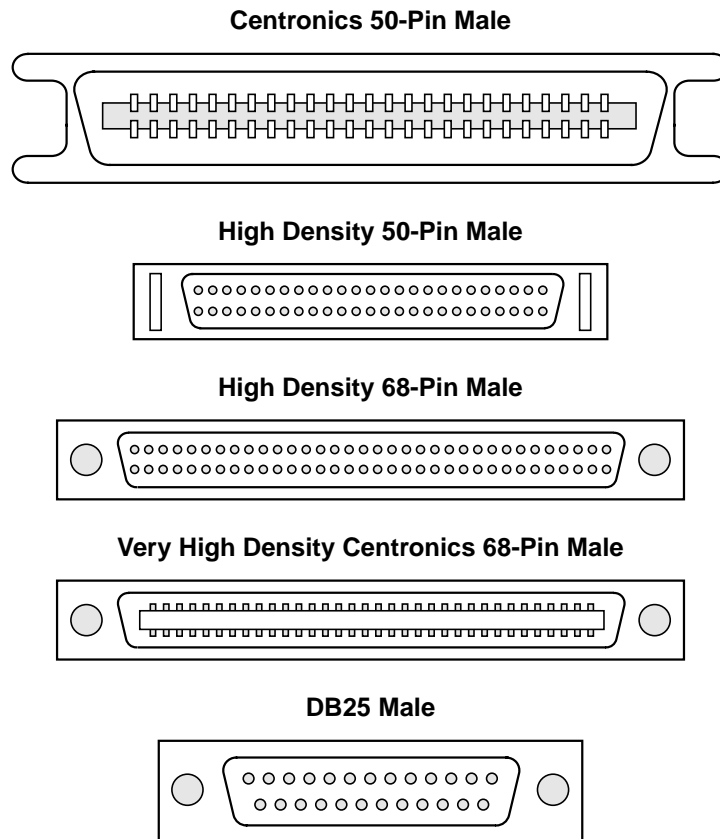
Figure 3.12   SCSI Cable – 50-Pin High Density

Figure 3.13   SCSI Cable – 50-Pin Low Density

Figure 3.14 External Connectors

Centronics 50-Pin Male

High Density 50-Pin Male

High Density 68-Pin Male

Very High Density Centronics 68-Pin Male

DB25 Male

Note: The DB25 Connector is not a SCSI Standard.

3.4   Technical Specifications

The design and implementation of the LSI Logic Ultra160 SCSI to PCI
host adapter boards minimize electromagnetic emissions, susceptibility
to radio frequency energy, and the effects of electrostatic discharge. The
board carries the CE mark, C-Tick mark, FCC Self-Certification log,
Canadian Compliance Statement, and meets the requirements of FCC
and CISPR Class B.

Ultra160 SCSI boards have specific electrical, thermal, atmospheric, and
safety characteristics in common.

3.4.1 Electrical Characteristics

This section provides the power requirements for standard PCI boards and Low Profile PCI Ultra160 SCSI boards.

3.0.0.1 Standard and Low Profile PCI Boards

Table 3.4 lists the maximum power requirements, which include SCSI TERMPWR, under normal operation.

Table 3.4   Maximum Power Requirements

Host Adapter	PCI +5.0 V DC	PCI +3.3 V DC	PCI PRSNT1#/ PRSNT2# Power	Over the Operating Range
LSI20160[1]	1.3 A, ±5 %	1.00 A, ±5 %	7.5 W	0 ˚C to 55 ˚C
LSI22915A[1]	3.0 A, ±5 %	N/A	15 W	0 ˚C to 55 ˚C
ITI6200U3LP[1]	3.0 A, ±5 %	N/A	15 W	0 ˚C to 55 ˚C
LSI21040[1]	3.0 A, ±5 %	N/A	7.5 W	0 ˚C to 55 ˚C
LSI21003	1.5 A, ±5 %	N/A	15 W	0 ˚C to 55 ˚C
LSI20160L[2]	1.3 A, ±5 % or 0.40 A, ±5 %	1.00 A, ±5 %	7.5 W	0 ˚C to 55 ˚C
LSI22903[2]	1.3 A, ±5 % or 0.40 A, ±5 %	0.80 A, ±5 %	7.5 W	0 ˚C to 55 ˚C

1. Under abnormal conditions, such as a short on SCSI TERMPWR, +5 V current may be higher. At temperatures of at least 25 ˚C, a current of 4 A is sustained no longer than 30 seconds before the self-resetting TERMPWR short circuit protection device opens.
2. 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 8 A is sustained no longer than 0.5 seconds before the self-resetting TERMPWR short circuit protection device opens.

3.4.2 Thermal, Atmospheric Characteristics

For all Ultra160 SCSI host adapter boards, the thermal, atmospheric characteristics 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 LSI20160L:

- Temperature range: – 45 ˚C to + 105 ˚C (dry bulb)

- Relative humidity range: 5% to 90% noncondensing

3.4.3 Safety Characteristics

All LSI Logic Ultra160 SCSI to PCI host adapter boards meet or exceed the requirements of UL flammability rating 94 V0. Each bare board is also marked with the supplier's name or trademark, type, and UL flammability rating. Because these boards are installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

Ultra160 SCSI to PCI Host Adapter Characteristics

Appendix A
Glossary of Terms and Abbreviations

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.
AIP	Asynchronous Information Protection (AIP) provides error checking for asynchronous, nondata phases of the SCSI bus.
BIOS	Basic Input/Output System. Software that provides basic read/write capability. Usually kept as firmware (ROM based). The system BIOS on the mainboard of a computer is used to boot and control the system. The SCSI BIOS on your host adapter acts as an extension of the system BIOS.
Configuration	Refers to the way a computer is setup; 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 (CRC) 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.
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 Single-Ended 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.
Double Transition 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.
EEPROM	Electronically Erasable Programmable Read Only Memory. A memory chip typically used to store configuration information. See NVRAM.
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.
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.
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.
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).
NVRAM	NonVolatile Random Access Memory. Actually an EEPROM (Electronically Erasable Read Only Memory chip) used to store configuration information. See EEPROM.
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.
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.
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 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.
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).

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.

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.

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.

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.

VHDCI   Very High Density Cable Interconnect.

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