

Hardware User's Guide

**Intel[®] RAID Controller
SRCU42X**

April 2004

C49616-003

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Safety Warnings

WARNING: English

Important Safety Instructions

Read all caution and safety statements in this document before performing any of the instructions. See also Intel Server Boards and Server Chassis Safety Information on the Resource CD and/or at <http://support.intel.com/support/motherboards/server/safecert.htm>.

	<p>SAFETY STEPS: Whenever you remove the chassis covers to access the inside of the system, follow these steps:</p> <ol style="list-style-type: none"> 1. Turn off all peripheral devices connected to the system. 2. Turn off the system by pressing the power button. 3. Unplug all AC power cords from the system or from wall outlets. 4. Label and disconnect all cables connected to I/O connectors or ports on the back of the system. 5. Provide some electrostatic discharge (ESD) protection by wearing an antistatic wrist strap attached to chassis ground of the system-any unpainted metal surface-when handling components. 6. Do not operate the system with the chassis covers removed.
	<p>A microprocessor and heat sink may be hot if the system has been running. Also, there may be sharp pins and edges on some board and chassis parts. Contact should be made with care. Consider wearing protective gloves.</p>

ADVERTENCIAS: Español


Instrucciones de seguridad importantes

Lea todas las declaraciones de seguridad y precaución de este documento antes de realizar cualquiera de las instrucciones. Vea Intel Server Boards and Server Chassis Safety Information en el CD Resource y/o en <http://support.intel.com/support/motherboards/server/safecert.htm>.

	<p>INSTRUCCIONES DE SEGURIDAD: Cuando extraiga la tapa del chasis para acceder al interior del sistema, siga las siguientes instrucciones:</p> <ol style="list-style-type: none"> 1. Apague todos los dispositivos periféricos conectados al sistema. 2. Apague el sistema presionando el interruptor encendido/apagado. 3. Desconecte todos los cables de alimentación CA del sistema o de las tomas de corriente alterna. 4. Identifique y desconecte todos los cables enchufados a los conectores E/S o a los puertos situados en la parte posterior del sistema. 5. Cuando manipule los componentes, es importante protegerse contra la descarga electrostática (ESD). Puede hacerlo si utiliza una muñequera antiestática sujeta a la toma de tierra del chasis - o a cualquier tipo de superficie de metal sin pintar. 6. No ponga en marcha el sistema si se han extraído las tapas del chasis.
	<p>Si el sistema ha estado en funcionamiento, el microprocesador y el disipador de calor pueden estar aún calientes. También conviene tener en cuenta que en el chasis o en el tablero puede haber piezas cortantes o punzantes. Por ello, se recomienda precaución y el uso de guantes protectores.</p>

WARNUNG: Deutsch
Wichtige Sicherheitshinweise

Lesen Sie zunächst sämtliche Warn- und Sicherheitshinweise in diesem Dokument, bevor Sie eine der Anweisungen ausführen. Beachten Sie hierzu auch die Sicherheitshinweise zu Intel-Serverplatinen und -Servergehäusen auf der Ressourcen-CD oder unter <http://support.intel.com/support/motherboards/server/safecert.htm>.

	<p>SICHERHEISSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:</p> <ol style="list-style-type: none"> 1. Schalten Sie alle an Ihr System angeschlossenen Peripheriegeräte aus. 2. Schalten Sie das System mit dem Hauptschalter aus. 3. Ziehen Sie den Stromanschlußstecker Ihres Systems aus der Steckdose. 4. Auf der Rückseite des Systems beschriften und ziehen Sie alle Anschlußkabel von den I/O Anschlüssen oder Ports ab. 5. Tragen Sie ein geerdetes Antistatik Gelenkband, um elektrostatische Ladungen (ESD) über blanke Metallstellen bei der Handhabung der Komponenten zu vermeiden. 6. Schalten Sie das System niemals ohne ordnungsgemäß montiertes Gehäuse ein.
	<p>Der Mikroprozessor und der Kühler sind möglicherweise erhitzt, wenn das System in Betrieb ist. Außerdem können einige Platinen und Gehäuseteile scharfe Spitzen und Kanten aufweisen. Arbeiten an Platinen und Gehäuse sollten vorsichtig ausgeführt werden. Sie sollten Schutzhandschuhe tragen.</p>


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AVERTISSEMENT: Français
Consignes de sécurité

Lisez attention toutes les consignes de sécurité et les mises en garde indiquées dans ce document avant de suivre toute instruction. Consultez Intel Server Boards and Server Chassis Safety Information sur le CD Resource CD ou bien rendez-vous sur le site <http://support.intel.com/support/motherboards/server/safecert.htm>.

	<p>CONSIGNES DE SÉCURITÉ: Lorsque vous ouvrez le boîtier pour accéder à l'intérieur du système, suivez les consignes suivantes:</p> <ol style="list-style-type: none"> 1. Mettez hors tension tous les périphériques connectés au système. 2. Mettez le système hors tension en mettant l'interrupteur général en position OFF (bouton-poussoir). 3. Débranchez tous les cordons d'alimentation c.a. du système et des prises murales. 4. Identifiez et débranchez tous les câbles reliés aux connecteurs d'E-S ou aux accès derrière le système. 5. Pour prévenir les décharges électrostatiques lorsque vous touchez aux composants, portez une bande antistatique pour poignet et reliez-la à la masse du système (toute surface métallique non peinte du boîtier). 6. Ne faites pas fonctionner le système tandis que le boîtier est ouvert.
	<p>Le microprocesseur et le dissipateur de chaleur peuvent être chauds si le système a été sous tension. Faites également attention aux broches aiguës des cartes et aux bords tranchants du capot. Nous vous recommandons l'usage de gants de protection.</p>

AVVERTENZA: Italiano

	<p>PASSI DI SICUREZZA: Qualora si rimuovano le coperture del telaio per accedere all'interno del sistema, seguire i seguenti passi:</p> <ol style="list-style-type: none">1. Spegner tutti i dispositivi periferici collegati al sistema.2. Spegner il sistema, usando il pulsante spento/acceso dell'interruttore del sistema.3. Togliere tutte le spine dei cavi del sistema dalle prese elettriche.4. Identificare e sconnettere tutti i cavi attaccati ai collegamenti I/O od alle prese installate sul retro del sistema.5. Qualora si tocchino i componenti, proteggersi dallo scarico elettrostatico (SES), portando un cinghia anti-statica da polso che è attaccata alla presa a terra del telaio del sistema - qualsiasi superficie non dipinta - .6. Non far operare il sistema quando il telaio è senza le coperture.
	<p>Se il sistema è stato a lungo in funzione, il microprocessore e il dissipatore di calore potrebbero essere surriscaldati. Fare attenzione alla presenza di piedini appuntiti e parti taglienti sulle schede e sul telaio. È consigliabile l'uso di guanti di protezione.</p>

Regulatory and Certification Information

Product Regulatory Compliance

This RAID Controller Card complies with the following safety and electromagnetic compatibility (EMC) regulations.

Product Safety Compliance

- UL 1950 - CSA 950 (US/Canada)
- EN 60 950 (European Union)
- IEC60 950 (International)
- CE - Low Voltage Directive (73/23/EEC) (European Union)









Product EMC Compliance - Class B

- FCC /ICES-003 (USA/Canada)
- CISPR 22 (International)
- EN55022 (Europe)
- EN55024 (Europe)
- CE - EMC Directive 89/336/EEC (Europe)
- VCCI (Japan)
- AS/NZS 3548 (Australia / New Zealand)
- BSMI CNS13438 (Taiwan)
- RRL, MIC Notice No. 1997-41 (EMC) & 1997-42 (EMI) (Korea)

Product Regulatory Compliance Markings

The RAID Controller Card is marked with the following compliance markings. Some marking information may be provided on the packaging and/or in the product documentation due to limited marking space on the product.

- ETL NRTL Mark (US/Canada)
- FCC Mark (US)
- ICES-003 (Canada)
- CE Mark (Europe)
- VCCI Mark (Japan)
- MIC Mark (Korea)
- BSMI DOC Mark (Taiwan)
- ACS C-Tick Mark (Australia)

Regulatory Compliance	Country	Marking
cULus Listing Marks	USA/Canada	
ETL (NRTL) Mark	USA/Canada	
CE Mark	Europe	
FCC Marking (Class A)	USA	This device complies with Part 15 of the FCC Rules. Operation of this device 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.
FCC Marking (Class B)	USA	 Tested to Comply With FCC standards FOR HOME OR OFFICE USE
EMC Marking (Class A)	Canada	CANADA ICES-003 CLASS A CANADA NMB-003 CLASSE A
EMC Marking (Class B)	Canada	CANADA ICES-003 CLASS B CANADA NMB-003 CLASSE B
VCCI Marking (Class A)	Japan	<div style="border: 1px solid black; padding: 5px;">この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。</div>
VCCI Marking (Class B)	Japan	<div style="border: 1px solid black; padding: 5px;">この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。 取扱説明書に従って正しい取り扱いをして下さい。</div> 
BSMI Marking (Class A or B) and Class A EMC Warning	Taiwan	 <div style="border: 1px solid black; padding: 5px;">警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策</div>
RRL MIC Mark	Korea	
C-Tick Mark	Australia	

Electromagnetic Compatibility Notices

FCC Verification Statement (USA)

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.

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124-6497
Phone: 1-800-628-8686

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.

Intel is not responsible for any radio or television interference caused by unauthorized modification of this equipment for substitution or attachment of connecting cables and equipment other than those specified by Intel. The correction of interferences caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

This RAID Controller Card has been tested to comply with FCC Standards for home or office use.

ICES-003 (Canada)

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Canadian Department of Communications.

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe Aprescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadien des Communications.

Europe (CE Declaration of Conformity)

This product has been tested in accordance too, and complies with the Low Voltage Directive (73/23/EEC) and EMC Directive (89/336/EEC). The product has been marked with the CE Mark to illustrate its compliance.

RRL (Korea)

English translation of the notice above:

1. Type of Equipment (Model Name): Model name on product
2. Certification No.: On RRL certificate. Obtain certificate from local Intel representative
3. Name of Certification Recipient: LSI Logic Corporation
4. Date of Manufacturer: Refer to date code on product
5. Manufacturer/Nation: LSI Logic Corporation / Refer to country of origin marked on product

Preface

This guide is the hardware reference and user's guide for the Intel® RAID Controller SRCU42X. It contains complete installation instructions and specifications .

For information about how to configure the SRCU42X controller, and for an overview of the software drivers, see the *Intel RAID Software User's Guide*.

Audience

This document assumes that you have some familiarity with RAID controllers and related support devices. The people who benefit from this book are:

- Engineers who are designing an SRCU42X controller into a system
- Anyone installing an SRCU42X controller in their RAID system

Organization

This document has the following chapters and appendixes:

- Chapter 1, "Overview," provides a general overview of the SRCU42X controller.
- Chapter 2, "Hardware Installation," describes the procedures for installing the SRCU42X controller.
- Chapter 3, "Intel RAID Controller SRCU42X Technical Reference," describes the technical specifications for the SRCU42X controller.
- Chapter A, "Glossary of Terms and Abbreviations," lists and explains the terms and abbreviations used in this manual.

Related Publications

Intel® RAID Software User's Guide, Intel Document No. C49617-003 (on the Resource CD included with the RAID controller)

Safety Instructions

Use the following safety guidelines to help protect your computer system from potential damage and to ensure your own personal safety.

When Using Your Computer System

As you use your computer system, observe the following safety guidelines:

CAUTION: Do not operate your computer system with any cover(s) (such as computer covers, bezels, filler brackets, and front-panel inserts) removed:

- To help avoid damaging your computer, be sure the voltage selection switch on the power supply is set to match the alternating current (AC) power available at your location:
 - 115 volts (V)/60 hertz (Hz) in most of North and South America and some Far Eastern countries such as Japan, South Korea, and Taiwan
 - 230 V/50 Hz in most of Europe, the Middle East, and the Far East. Also be sure your monitor and attached peripherals are electrically rated to operate with the AC power available in your location.
- To help avoid possible damage to the system board, wait five seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.
- To help prevent electric shock, plug the computer and peripheral power cables into properly grounded power sources. These cables are equipped with 3-prong plugs to ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a 3-wire cable with properly grounded plugs.
- To help protect your computer system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply.
- Be sure nothing rests on your computer system's cables and that the cables are not located where they can be stepped on or tripped over.
- Do not spill food or liquids on your computer. If the computer gets wet, consult the documentation that came with it.
- Do not push any objects into the openings of your computer. Doing so can cause fire or electric shock by shorting out interior components.
- Keep your computer away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath your computer; do not place your computer in a closed-in wall unit or on a rug.

When Working Inside Your Computer

Notice: Do not attempt to service the computer system yourself, except as explained in this guide and elsewhere in Intel documentation. Always follow installation and service instructions closely.

1. Turn off your computer and any peripherals.
2. Disconnect your computer and peripherals from their power sources. Also disconnect any telephone or telecommunications lines from the computer.

Doing so reduces the potential for personal injury or shock.

Also note these safety guidelines:

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure both connectors are correctly oriented and aligned.
- Handle components and cards with care. Don't touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside your computer. To prevent static damage, discharge static electricity from your body before you touch any of your computer's electronic components, such as the microprocessor. You can do so by touching an unpainted metal surface, such as the metal around the card-slot openings at the back of the computer.

As you continue to work inside the computer, periodically touch an unpainted metal surface to remove any static charge your body may have accumulated. In addition to the preceding precautions, you can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component in your computer. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

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Chapter 1

Overview

This section provides a general overview of the Intel[®] RAID Controller SRCU42X . It consists of the following sections.

- Section 1.1, “Overview,” page 15
 - Section 1.2, “Features,” page 16
 - Section 1.3, “Hardware,” page 17
-

1.1 Overview

The Intel RAID Controller SRCU42X is a high-performance intelligent Peripheral Component Interconnect to Small Computer System Interface (PCI-to-SCSI) host adapter with Redundant Array of Independent Disks (RAID) control capabilities. The SRCU42X controller provides reliability, high performance, and fault-tolerant disk subsystem management. It is an ideal RAID solution for the internal storage of workgroup, departmental, and enterprise systems. The SRCU42X controller offers a cost-effective way to implement RAID in a server.

The SRCU42X controller (dual-channel) has one LSI* 53C1030 controller chip that controls two SCSI channels. The SRCU42X controller has two VHDCI 68-pin external SCSI connectors and two HDCI 68-pin internal SCSI connectors. The SRCU42X controller is a PCI-X controller.

The SRCU42X controller supports a low voltage differential (LVD) or a single-ended (SE) SCSI bus. With LVD, you can use cables up to 12 meters long. Throughput on each SCSI channel can be as high as 320 Mbytes/s.

You can install the Intel RAID Controller SRCU42X in PCI-X computer systems with a standard bracket type. With this adapter in your PCI or PCI-X system, you can connect SCSI devices over a SCSI bus.

For Ultra320 SCSI performance, you must connect only LVD devices to the bus. Do not mix SE with LVD devices, or the bus speed will be limited to the slower SE (Ultra SCSI) SCSI data transfer rates. Do not connect a high voltage differential (HVD) device to the SCSI bus because the chip on the SRCU42X controller must be reset to return to LVD or SE mode once the HVD device is removed.

The Intel RAID Controller SRCU42X supports the following operating systems:

- Microsoft* Windows* XP
- Microsoft* Windows* 2000
- Microsoft* Windows Server* 2003
- Microsoft* WIndows* 2003, 64-bit
- Novell* NetWare* 6.x
- Red Hat* Linux* 8.0
- Red Hat* Linux* 9.0
- Red Hat* Enterprise Server* 2.1
- Red Hat* Advanced Server 3.0
- Red Hat* Linux 2.1, 64-bit
- Red Hat* Linux 3.0, 64-bit
- SCO* OpenServer* 5.0.7
- SCO* UnixWare* 7.1.3
- SuSE* Linux* 8.2
- SuSE* SLE 8
- SuSE* Linux Enterprise Server 8.0, 64-bit

Note: The operating systems supported by this controller may not be supported by your server board. Please refer to the tested OS list for your server board.

1.2 Features

Features of the Intel RAID Controller SRCU42X includes:

- Support for hard disk drives with capacities greater than 8 Gbytes
- Online RAID level migration
- RAID remapping
- No reboot necessary after expansion (for NT 4.0: if virtual sizing is enabled)
- More than 200 Qtags per array
- Hardware clustering support on the board
- User-specified rebuild rate
- Wide Ultra320 LVD SCSI performance up to 320 Mbytes/s
- Support for up to 1 Gbyte of double data rate (DDR) SDRAM; a 32-, 64-, 128-, 256, or 512-Mbyte, or 1-Gbyte DIMM can be installed.
- Support for a 64-bit PCI host interface (note that the SRCU42X is a PCI-X controller)
- The SRCU42X controller has two internal and two external SCSI connectors
- Support for RAID levels 0 (striping), 1 (mirroring), 5 (striping and parity data across all drives), 10 (mirroring and striping), and 50 (RAID 5 and striping)
- Advanced array configuration and management utilities
- Battery backup for up to 72 hours (depending on the type and amount of memory installed)
- Support for up to 14 SCSI drives per channel on storage system with SAF-TE enclosures (SCSI accessed fault-tolerant enclosures): 15 SCSI drives per channel for other configurations
- 32 Kbyte x 8 NVRAM for storing RAID system configuration information; the firmware is stored in flash ROM for easy upgrade

1.3 Hardware

You can install the SRCU42X controller in a computer with a motherboard that has 3.3 V, 64-bit PCI-X slots.

The following subsections describe the hardware configuration and configuration-on-disk.

1.3.1 Storage Adapter Configurations

Table 1-1 describes the features for the Intel RAID Controller SRCU42X.

Table 1-1 Intel Raid SRCU42X Adapter Features

Feature	Description
RAID Levels	0, 1, 5, 10, 50
SCSI Device Types	Synchronous or Asynchronous
Devices per SCSI Channel	Up to 15 Wide SCSI devices
SCSI Channels	2
SCSI Data Transfer Rate	Up to 320 Mbytes/s per channel
SCSI Bus	LVD or SE
Cache Function	Write-back (requires Battery Backup Unit), Write-through, Adaptive Read Ahead, Non Read Ahead, Read Ahead, Cache I/O, Direct I/O
Multiple Logical Drives/Arrays per Controller	Up to 40 logical drives per controller
Maximum # of Intel Raid SRCU42X Adapters per System	12
Online Capacity Expansion	Yes
Dedicated and Pool Hot Spare	Yes
Hot Swap Devices Supported	Yes
Non-Disk Devices Supported	Yes
Mixed Capacity Hard Disk Drives	Yes
Number of 16-bit Internal Connectors	2
Number of 16-bit External Connectors	2
Cluster Support	Yes
Hardware Exclusive OR (XOR) Assistance	Yes
Direct I/O	Yes
Architecture	Fusion-MPT™

1.3.2 Configuration on Disk

Configuration on Disk saves configuration information both in NVRAM on the Intel RAID Controller SRCU42X and on the disk drives attached to the SRCU42X controller. If the SRCU42X controller is replaced, the new SRCU42X controller detects the actual RAID configuration from the configuration information on the drives. This maintains the integrity of the data on each drive, even if the drives have changed their target ID.

Note: Configuration on Disk does not work if you change both the SRCU42X controller and the SCSI connectors to different connectors on the new SRCU42X controller. It works only if you make one change at a time.

1.3.3 Drive Roaming

The Intel RAID Controller SRCU42Xs support drive roaming across channels on the same SRCU42X controller. Drive roaming lets an Intel Raid SRCU42X controller detect the actual RAID configuration, maintaining the integrity of the data on each disk drive, even if the disk drives have changed channels and/or target ID.

Note: Intel RAID Controller SRCU42Xs do not support drive roaming across channels when cluster mode is enabled.

Chapter 2

Hardware Installation

This chapter describes the procedures for installing the Intel RAID Controller SRCU42X. It contains the following sections:

- Section 2.1, “Requirements,” page 19
 - Section 2.2, “Quick Installation,” page 19
 - Section 2.3, “Detailed Installation,” page 20
 - Section 2.4, “After You Have Installed the Storage Adapter,” page 24
-

2.1 Requirements

The following items are required to install the RAID controller:

- An Intel RAID SRCU42X controller
- A host computer with an available 32- or 64-bit, 3.3V PCI or PCI-X expansion slot
- The Resource CD
- The necessary internal and/or external SCSI cables. Ensure that the SCSI cables conform to all SCSI specifications.
- Ultra, Ultra2, Ultra160, or Ultra320 SCSI hard disk drives (although backward compatible, SCSI uses the speed of the slowest device on the bus)

Intel strongly recommends using an uninterruptible power supply (UPS).

2.2 Quick Installation

The following steps are for for experienced computer users/installers. Section 2.3, “Detailed Installation”, contains detailed steps.

- 1) (Optional, required to enable Write Back Cache) Attach the Battery Backup Unit to the RAID adapter.
- 2) Turn power off to the server and all hard disk drives, enclosures, and system components and remove the PC power cord.
- 3) Follow the instructions in the host system documentation to open the cabinet of the host system.
- 4) Determine the SCSI ID and SCSI termination requirements.
- 5) Install the SRCU42X controller in the server, connect SCSI devices to it, and set termination correctly on the SCSI channel(s).
- 6) Perform a safety check:
 - Ensure that all cables are properly attached.
 - Ensure that the Intel RAID Controller SRCU42X is properly installed.
 - Close the cabinet of the host system.
- 7) Turn power on after completing the safety check.

2.3 Detailed Installation

This section provides detailed instructions for installing a Intel RAID Controller SRCU42X.

1) Unpack

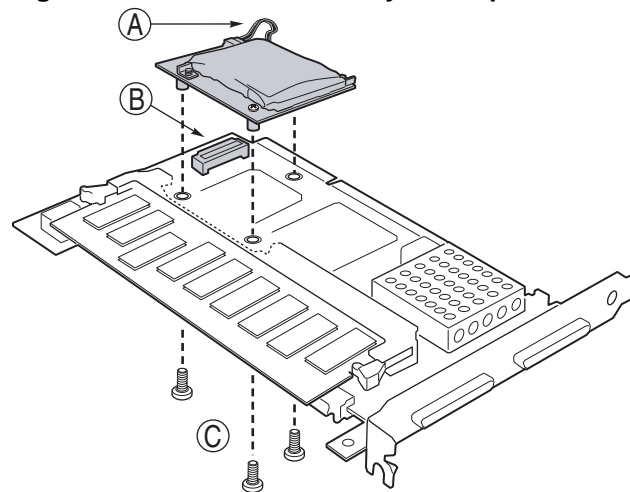
Unpack and remove the SRCU42X controller. Inspect it for damage. If it appears damaged, or if any items listed below are missing, contact your Intel support representative. The Intel RAID Controller SRCU42X is shipped with:

- ◇ The Resource CD, which contains Intel RAID drivers for supported operating systems, an electronic version of this guide, and other related documentation.
- ◇ A license agreement

2) (Optional, required to enable Write Back Cache) Attach the Battery Backup Unit (BBU) to the adapter.

- a. Remove the Battery Backup Unit from its packaging.
- b. Connect the wire from the battery to the circuit board (A).
- c. Position the BBU over the RAID adapter so the connectors line up (B). Press the BBU onto the adapter.
- d. Turn the adapter over.
- e. Using three screws (C), secure the BBU to the RAID adapter.

Figure 2.1 Install the Battery Backup Unit



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3) Power Down the System

Turn off the computer and remove the AC power cord. Remove the system's cover. See the system documentation for instructions.

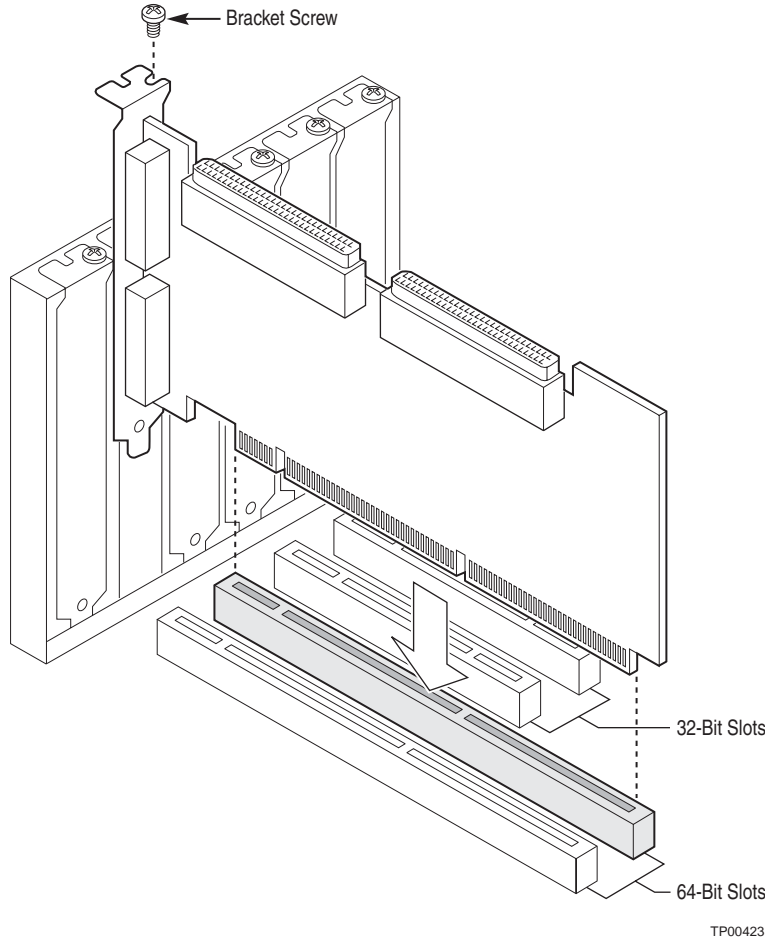
4) Check the Jumpers

Ensure that the jumper settings on the your SRCU42X controller are correct. See Chapter 3, "Intel RAID Controller SRCU42X Technical Reference," for diagrams of the SRCU42X controllers with their jumpers and connectors.

5) Install the Intel RAID SRCU42X Adapter

Select a 3.3 V PCI or PCI-X slot, and align the SRCU42X controller PCI bus connector to the slot. Press down gently but firmly to ensure that the card is properly seated in the slot, as shown in Figure 2.2. Then screw the bracket into the computer chassis.

Figure 2.2 Inserting the SRCU42X Adapter Card in a PCI Slot



6) Set the Target IDs.

Set target identifiers (TIDs) on the SCSI devices. Each device in a channel must have a unique TID. Provide unique TIDs for non-disk devices (CD-ROM or tapes), regardless of the channel where they are connected. The Intel RAID Controller SRCU42X automatically occupies TID 7, which is the highest priority. The arbitration priority for a SCSI device depends on its TID.

Table 2-1 Target ID's

Priority	Highest							Lowest				
TID	7	6	5	...	2	1	0	15	14	...	9	8

7) Connect SCSI Devices to the Storage Adapter

Use SCSI cables to connect SCSI devices to the SRCU42X controller.

To connect the SCSI devices:

- a. Disable termination on any SCSI device that does not sit at the end of the SCSI bus.
- b. Configure all SCSI devices to supply TERMPWR.
- c. Connect cables to the SCSI devices. The maximum cable length for Fast SCSI (10 Mbytes/s) devices or SE is 3 meters; it is 1.5 meters for Ultra SCSI devices; it is 12 meters for LVD devices. You can connect up to 15 Ultra SCSI devices to each SCSI channel.

System throughput problems can occur if SCSI cables are not the correct type. To minimize the potential for problems:

- Use cables no longer than 12 meters for Ultra160 and Ultra320 devices.
- For SE SCSI devices, use the shortest SCSI cables (no longer than 3 meters for Fast SCSI, no longer than 1.5 meters for an 8-drive Ultra SCSI system, and no longer than 3 meters for a 6-drive Ultra SCSI system).
- Use active termination.
- Avoid clustering the cable nodes.
- The cable stub length must be no greater than 0.1 meter (4 inches.)
- Use high impedance cables.
- Route SCSI cables carefully.

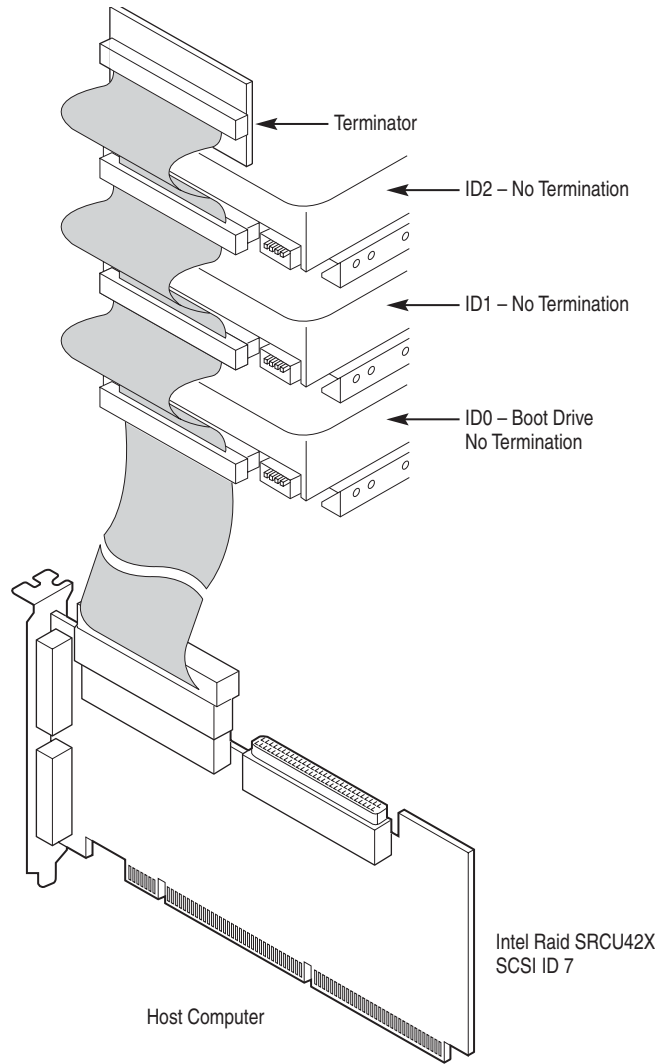
8) Set SCSI Termination

The SCSI bus is an electrical transmission line and must be terminated properly to minimize reflections and losses. Set termination at each end of the SCSI cable(s).

For a disk array, set SCSI bus termination so that removing or adding a SCSI device does not disturb termination. An easy way to do this is to connect the SRCU42X controller to one end of the SCSI cable and to connect an external terminator module at the other end of the cable. You can then connect SCSI disk drives to the connectors between the two ends of the cable. If necessary, disable termination on the SCSI devices. (This is not necessary for Ultra320 and Ultra160 SCSI drives.)

Set the termination so that SCSI termination and TermPWR are intact when any disk drive is removed from a SCSI channel, as shown in Figure 2.3.

Figure 2.3 Terminating an Internal SCSI Disk Array



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9) Power On Host System

Replace the computer cover, and reconnect the AC power cords. Turn power on to the host computer. Ensure that the SCSI devices are powered up at the same time as, or before, the host computer. If the computer is powered up before a SCSI device, the device might not be recognized.

During boot, a BIOS message appears.

The firmware takes several seconds to initialize. During this time, the SRCU42X controller scans the SCSI channel(s).

The BIOS Configuration utility prompt times out after several seconds. The second portion of the BIOS message displays the Intel RAID Controller SRCU42X number, firmware version, and cache SDRAM size. The numbering of the controllers follows the PCI slot scanning order used by the host motherboard.

Press <CTRL><G> to run BIOS Console

2.4 After You Have Installed the Storage Adapter

After installation, you must configure the SRCU42X controller and install the operating system driver. The *Intel RAID Software User's Guide* instructs you about the configuration options and how to set them on your SRCU42X controller.

Chapter 3

Intel RAID Controller SRCU42X Technical Reference

This chapter describes the characteristics of the Intel RAID Controller SRCU42X. This chapter contains the following sections:

- Section 3.1, “Overview,” page 25
- Section 3.2, “Intel RAID Controller SRCU42X Characteristics,” page 27
- Section 3.3, “Technical Specifications,” page 27

3.1 Overview

PCI is a high-speed standard local bus for interfacing I/O components to the processor and memory subsystems in a server. The component height on the top and bottom of the SRCU42X controller follow the *PCI Local Bus Specification, Revision 2.2*, and *PCI-X Addendum to the PCI Local Bus Specification, Revision 1.0a*. The Intel RAID Controller SRCU42X is used in PCI-X and PCI computer systems with PCI standard bracket types.

Figure 3.1 Intel RAID Controller SRCU42X Layout

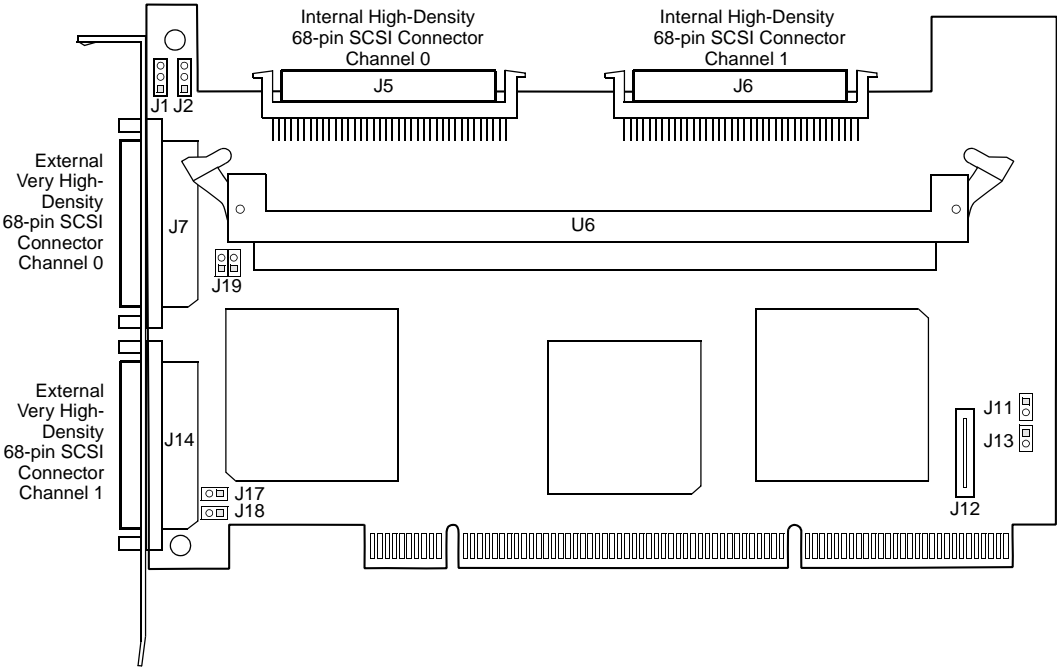


Table 3-1 Intel RAID Controller SRCU42X Headers and Connectors

Connector	Description	Type	Comments
J1	Termination Enable Channel 0	3-pin header	Jumper on pins 1-2: Software uses drive detection to control SCSI termination (default: do not change). Jumper on pins 2-3: Onboard SCSI termination disabled. No jumper: Onboard SCSI termination enabled.
J2	Termination Enable Channel 1	3-pin header	
J5	Internal SCSI Channel 0 Connector	68-pin connector	Internal high-density SCSI bus connector.
J6	Internal SCSI Channel 1 Connector	68-pin connector	
J7	External SCSI Channel 0 Connector	68-pin connector	External very high-density SCSI bus connector.
J11	Onboard Cache LED	2-pin header	LED glows when the onboard cache contains data and a write from the cache to the hard drives is pending.
J12	BBU Daughter Card	40-pin header	Connector for an optional back-up battery pack.
J13	SCSI Activity LED	2-pin header	Connector for enclosure LED to indicate data transfers. Connection is optional.
J14	External SCSI Channel 1 Connector	68-pin connector	External very high-density SCSI bus connector.
J17	Termination Power Enable Channel 0	2-pin header	Jumpered: Intel Raid SRCU42X supplies termination power. No jumper: SCSI bus provides termination power.
J18	Termination Power Enable Channel 1	2-pin header	
J19	Onboard BIOS Enable	4-pin header (two rows of two pins each)	No jumper: BIOS enabled (default) Jumper on pins 2/4: BIOS disabled
U6	DIMM Socket	DIMM socket	The Intel Raid SRCU42X supports the following sizes of SDRAM: 32, 64, 128, 256, and 512 Mbytes, and 1 Gbyte.

3.2 Intel RAID Controller SRCU42X Characteristics

Table 3-2 shows the general characteristics for the SRCU42X controller.

Table 3-2 Storage Adapter Characteristics

Flash ROM ¹	Serial EEPROM ²	LVD/SE Signaling	Ultra320 SCSI Data Transfers	SCSI Features	SCSI Termination
Yes	Yes	16-bit SE or LVD interfaces	Up to 320 Mbytes/s as well as Fast, Ultra, Ultra2, and Ultra160 speeds; Synchronous offsets up to 62.	Plug n Play Scatter/Gather Activity LED	Active, Single Ended, or LVD

1. For boot code and firmware
2. For BIOS configuration storage

3.3 Technical Specifications

The design and implementation of the SRCU42X controller minimizes electromagnetic emissions, susceptibility to radio frequency energy, and the effects of electrostatic discharge. The SRCU42X controller carries the CE mark, C-Tick mark, FCC Self-Certification logo, Canadian Compliance Statement, Korean MIC, Taiwan BSMI, and Japan VCCI, and they meet the requirements of CISPR Class B.

3.3.1 Storage Adapter Specifications

Table 3-3 lists the specifications for the SRCU42X controller.

Table 3-3 Storage Adapter Specifications

Specification	Description
Processor (PCI Controller)	Intel GC80321 64-bit RISC processor @ 400 MHz
Operating Voltage	3.3 V, 5 V, +12 V, -12 V
Card Size	Half-length PCI Adapter card size (6.875" X 4.2")
Array Interface to Host	PCI Rev 2.2, PCI-X Rev 1.0a
PCI Bus Data Transfer Rate	Up to 1064 Mbytes/s at 64-bit/133 MHz
Serial Port	3-pin RS232C-compatible connector (for manufacturing use only)
SCSI Controller(s)	One LSI* 53C1030 Dual SCSI controller
SCSI Connectors	Two 68-pin internal high-density connectors for SCSI devices. Two very high-density 68-pin external connectors for Ultra320 and Wide SCSI.
SCSI Bus Termination	Active, single-ended or LVD

Table 3-3 Storage Adapter Specifications (Cont.)

Specification	Description
Termination Disable	Automatic through cable and device detection
Cache Configuration	Up to 1 Gbyte 100 MHz DDR ECC SDRAM
Double-Sided Dual Inline Memory Modules (DIMMs)	Yes (32-, 64-, 128-, 256-, or 512-Mbyte)
Size of Flash ROM for Firmware	1 Mbyte × 8 flash ROM
Nonvolatile Random Access Memory (RAM)	32 Kbyte × 8 for storing RAID configuration

3.3.2 Array Performance Features

Table 3-4 shows the SRCU42X controller array performance features:

Table 3-4 Array Performance Features

Specification	Intel RAID Controller SRCU42X
PCI Host Data Transfer Rate	1064 Mbytes/s
Drive Data Transfer Rate	320 Mbytes/s
Maximum Scatter/Gathers	26 elements
Maximum Size of I/O Requests	6.4 Mbytes in 64 Kbyte stripes
Maximum Queue Tags per Drive	As many as the drive can accept
Stripe Sizes	2, 4, 8, 16, 32, 64, or 128 Kbyte
Maximum Number of Concurrent Commands	255
Support for Multiple Initiators	Yes

3.3.3 Fault Tolerance

Table 3-5 shows the SRCU42X controller fault tolerance features:

Table 3-5 Fault Tolerance Features

Specification	Intel Raid Controller SRCU42X
Support for SMART ¹	Yes
Optional Battery Backup for Cache Memory	Yes. Up to 48 hours data retention.
Drive Failure Detection	Automatic
Drive Rebuild Using Hot Spares	Automatic
Parity Generation and Checking	Yes

1. The Self Monitoring Analysis and Reporting Technology (SMART) detects up to 70 percent of all predictable disk drive failures. SMART also monitors the internal performance of all motors, heads, and drive electronics.

3.3.4 Electrical Characteristics

This section provides the power requirements for the Intel RAID Controller SRCU42Xs. Table 3-6 lists the maximum power requirements, which include SCSI TERMPWR, under normal operation.

Table 3-6 Maximum Power Requirements

Storage Adapter	PCI/PCI-X +5.0 V	PCI/PCI-X +3.3 V	PCI PRSNT1#/ PRSNT2# Power	Over the Operating Range
Intel Raid SRCU42X	5 A	0.0 A	25 W	0 °C to 55 °C

3.3.5 Thermal and Atmospheric Characteristics

The Intel RAID Controller SRCU42X has the following thermal, atmospheric, and safety characteristics.

- Temperature range: 0 °C to 55 °C (dry bulb)
- Relative humidity range: 5% to 90% noncondensing
- Maximum dew point temperature: 32 °C
- Airflow must be sufficient to keep the heat sink temperature below 80 °C

The following parameters define the storage and transit environment for the Intel RAID Controller SRCU42X:

- Temperature range: – 40 °C to + 105 °C (dry bulb)
- Relative humidity range: 5% to 90% noncondensing

3.3.6 Safety Characteristics

The Intel RAID Controller SRCU42X meets or exceeds 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. Since these boards are installed in a PCI bus slot, all voltages are below the SELV 42.4 V limit.

Chapter 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 SCSI, Ultra2 SCSI, Ultra160 SCSI, and Ultra320 SCSI require active termination.
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.
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 Ultra320 data rate.
EEPROM	Electrically 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 together using specific types of shielded cables.
Fusion-MPT Architecture	Fusion-MPT (Message Passing Technology) architecture consists of several main elements: Fusion-MPT firmware, the Fibre Channel and SCSI hardware, and the operating system level drivers that support these architectures. Fusion-MPT architecture offers a single binary, operating system driver that supports both Fibre Channel and SCSI devices now.
Host	The computer system in which a storage adapter is installed. It uses the storage adapter to transfer information to and from devices attached to the SCSI bus.
Host Adapter Board (HAB)	A circuit board or integrated circuit that provides a device connection to the computer system.
Internal SCSI Device	A SCSI device installed inside the computer cabinet. These devices are connected together using an unshielded ribbon cable.
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 (Electrically Erasable Read Only Memory chip) used to store configuration information. See EEPROM.
PCI and PCI-X	Peripheral Component Interconnect. A high performance local bus specification that allows connection of devices directly to computer memory. The PCI Local Bus allows transparent upgrades from 32-bit data path at 33 MHz to 64-bit data path at 33 MHz, and from 32-bit data path at 66 MHz to 64-bit data path at 66 MHz.
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 SRCU42X controller (host adapter).
SCSI Bus	A storage adapter (host adapter) and one or more SCSI peripherals connected by cables in a linear configuration. The adapter may exist anywhere on the bus, allowing connection of both internal and external SCSI devices. A system may have more than one SCSI bus by using a multi-channel adapter or by using multiple 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 storage adapters (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 storage adapter (host adapter) usually gets the highest ID (7 or 15) giving it priority to control the bus.
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).
TolerANT	A technology developed and used by Intel to improve data integrity, data transfer rates, and noise immunity through the use of active negation and input signal filtering.
Ultra SCSI	A standard for SCSI data transfers. It allows a transfer rate of up to 20 Mbytes/s over an 8-bit SCSI bus and up to 40 Mbytes/s over a 16-bit SCSI bus.
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.
Ultra320 SCSI	A standard for SCSI data transfers. It allows a transfer rate of up to 320 Mbytes/s over a 16-bit SCSI bus.
VHDCI	Very High-Density Cable Interconnect. This cable is used to connect external connectors to your storage adapter.