

Intel[®] RAID Controller RS25FB044 Hardware User's Guide

Intel Order Number: G22858-002

DISCLAIMER

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL®'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL® ASSUMES NO LIABILITY WHATSOEVER, AND INTEL® DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL® PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. Intel® products are not intended for use in medical, life saving, life sustaining applications. Intel® may make changes to specifications and product descriptions at any time, without notice.

Intel® is a trademark or registered trademark of Intel Corporation or its subsidiaries in the United States and other countries.

*Other names and brands may be claimed as the property of others.

Copyright © 2012 by Intel Corporation. Portions Copyright 2012 by LSI* Corporation. All rights reserved.

Preface

This is the primary hardware guide for the Intel® RAID Controller RS25FB044 which can be used to manage SAS and SATA disk drives. It contains installation instructions and specifications.

For details on configuring the storage adapters, and for an overview of the software drivers, see the *Intel® RAID Software User's Guide* on the Resource CD.

Audience

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

- Engineers who are designing an Intel® RAID Controller RS25FB044 for their RAID system.
- Anyone installing an Intel® RAID Controller RS25FB044 in their RAID system.

Organization

This document includes the following chapters and appendices:

- Chapter 1 provides a general overview of the Intel® RAID Controller RS25FB044.
- Chapter 2 describes the procedures for installing and configuring the RAID controller.
- Chapter 3 provides the characteristics and technical specifications for the Intel® RAID Controller RS25FB044.
- Appendix A explains drive roaming.
- Appendix B provides safety instructions to be observed during installation and assembly.
- Appendix C provides regulatory and certification information.

Related Publication

The *Intel® RAID Software User's Guide* is included on the Resource CD that shipped with the RAID module.

Table of Contents

Preface	iii
Audience	iii
Organization	iii
Related Publication	iii
Overview	1
Benefits of SAS and SATA	1
Intel® RAID Controller RS25FB044	2
Protocol Support	2
Operating System Support	3
Usability	3
Redundancy and Error Handling	3
SAS/SATA Features of the LSI* LSI SAS2308 Processor Chip	4
Intel® RAID Controller RS25FB044 Hardware Installation	5
Requirements	5
Installing the RAID Controller	5
Configuring the RAID Controller	8
Replacing a Controller	8
Intel® RAID Controller RS25FB044 Characteristics	9
Major Components	11
LSI* LSI SAS2308 Processor Chip	11
Flash ROM	11
Boot Strap ROM (SEEPROM)	11
Diagnostic Components	11
SAS/SATA Connectors	11
Technical Specifications	14
Array Performance Features	15
Fault Tolerance	15
Electrical Characteristics	16
Thermal and Atmospheric Characteristics	16
Safety Characteristics	16
Operating Certifications	16
Supported Device Technology	17
Support for Hard Disk Drive Devices	17
SAS Expander Support	17
Support for Non-Hard Disk Drive Devices	17
Enclosure Management Support	17
RAID Functionality and Features	17

Hierarchy	17
SAS Bus and ID Mapping	18
A. Drive Roaming Install	19
Drive Roaming	19
B. Installation/Assembly Safety Instructions	21
Deutsch	24
Français	25
Español	27
Italiano	28
C. Regulatory and Certification Information	31
Product Safety and EMC Compliance	31

List of Figures

Figure 1. Changing the Bracket.....	6
Figure 2. Installing the Intel® RAID Controller RS25FB044	6
Figure 3. Connecting Cables between the RAID Controller and Drives/Backplane	7
Figure 4. Card Layout.....	9
Figure 5. RS25FB044 Hardware Block Diagram.....	10
Figure 6. Intel® RAID Controller RS25FB044 SAS/SATA Connectors	12

List of Tables

Table 1. Jumper and Connector Description	10
Table 2. SFF8088 External Connector Pin-out	12
Table 3. SFF8087 Internal Connector with one SGPIO Connector Pin-out	13
Table 4. Technical Specifications	14
Table 5. Array Performance Features	15
Table 6. Fault Tolerance Features	15
Table 7. RAID Virtual Drive Status	18

1 Overview

The Intel® RAID Controller RS25FB044 reliable and fault-tolerant disk subsystem management based on the Intel® Entry Hardware RAID (IR) Stack. This is an ideal RAID solution for the internal or external large capacity storage needs of mid to low-end servers and workstations for use by workgroups and departmental-sized organizations or individuals. The Intel® RAID Controller RS25FB044 offers a cost-effective way to implement RAID in a server for internal or external storage.

The Intel® RAID Controller RS25FB044 addresses the growing demand for increased data throughput and scalability requirements across mid to low-end servers and workstations. This adapter supports third generation PCI Express* at launch.

The controller can be connected to up to eight drives directly and allows the use of expanders to connect to additional drives. For more information about the use of expanders, see the ANSI SAS Standard, version 2.0 specification.

SATA and SAS are serial, point-to-point, device interfaces that use simplified cabling, smaller connectors, lower pin counts, and lower power requirements than parallel SCSI.

Benefits of SAS and SATA

SAS is a serial, point-to-point, enterprise-level device interface that leverages the proven SCSI protocol set. SAS is a convergence of the advantages of SATA, SCSI, and FC, and is the future mainstay of the enterprise and high-end workstation storage markets. SAS offers a higher bandwidth per pin than parallel SCSI and improves signal and data integrity.

The SAS interface uses the proven SCSI command set to ensure reliable data transfers, while providing the connectivity and flexibility of point-to-point serial data transfers. The serial transmission of SCSI commands eliminates clock skew challenges. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements than parallel SCSI.

SAS controllers leverage a common electrical and physical connection interface that is compatible with Serial ATA technology. The SAS and SATA protocols use a thin, 7-wire connector instead of the 68-wire SCSI cable or 40-wire ATA cable. The SAS/SATA connector and cable are easier to manipulate, connect to smaller devices, and do not inhibit airflow. The point-to-point SATA architecture eliminates difficulties created by the legacy ATA master-slave architecture, while maintaining compatibility with existing ATA firmware.

Intel® RAID Controller RS25FB044

The Intel® RAID Controller RS25FB044 is an intelligent PCI Express* 3.0 compliant interface RAID adapters with an integrated LSI* LSISAS2308 Dual-Core Processor Chip, providing both a SAS controller and RAID engine. With eight independent ports supporting 6-Gbps and 3 Gbps SAS data transfers using one SFF8087 and one SFF8088 mini multi-lane connectors, this controller supports up to 256 enterprise-class SAS or SATA devices.

The RAID Controller is designed to fit the following Intel® Server Boards and Systems:

- Intel® Server Board S5520UR
- Intel® Server System SR2600UR
- Intel® Server System SR2625UR
- Intel® Server System SR1625UR
- Intel® Server Board S2600CP
- Intel® Server System P4000CP
- Intel® Server System R2000GZ/GL
- Intel® Server Board S5520HC/S5520HCT/S5500HCV with Intel® Server Chassis SC5600
- Intel® Workstation Board S5520SC
- Intel® Workstation System SC5650SCWS
- Intel® Server Board S5500BC with Intel® Server Chassis SC5650
- Intel® Server Board S3420GP with Intel® Server Chassis SC5650
- Intel® Server Board S1200BT-LC or S1200BT-SE, with Intel® Server Chassis SC5650

Note: Additional Intel® Server Boards and Systems may be supported. For the most up-to-date list, see the Compatibility section under the link for this Intel® RAID Module at <http://www.intel.com/support/go/motherboards/server/index.htm>.

The SAS RAID controllers support the SAS protocol as described in the *Serial Attached SCSI Standard, Version 2.0*. The controllers also support the Serial ATA III (SATA III) protocol defined by the *Serial ATA Specification, Version 1.0a* and the *Serial ATA III: Extension to the Serial ATA Specification, Version 1.1*. SATA II is an extension to SATA 1.0a.

Protocol Support

Each port on the SAS controllers supports SAS devices, SATA III devices, or both using SSP, SMP, STP, and SATA III as follows:

- Serial SCSI Protocol (SSP) to enable communication with other SAS devices.
- SATA III Protocol to enable communication with other SATA III devices.

- Serial Management Protocol (SMP) to share topology management information with expanders.
- Serial Tunneling Protocol (STP) support for SATA III through expander interfaces.

Operating System Support

- Windows 2003*, Windows Vista*, Windows Server 2008*, Windows Server 2008* R2, and Windows 7*
- SuSE* Linux Enterprise Server 11 and 10
- Red Hat* Enterprise Linux Server 6.0 and 5.0
- VMWare* ESXi Server 4.x and 5.x

The operating systems supported may not be supported by your server board. See the *Tested operating system list* for your server board at <http://www.intel.com/support/go/motherboards/server/index.htm>.

To make sure the RAID module supports your operating system, see also the *Tested Hardware and Operating System List* for the Intel® RAID Controller RS25FB044.

Usability

- Small, thin cabling with up to 6.0 Gb/s serial, point-to-point data transfer rates.
- Support for non-disk devices and mixed capacity drives.
- Support for RAID levels 0, 1, and 1E.
- Dedicated or global hot spare with auto rebuild if an array drive fails.
- Fixed RAID strip size of 64 KB.
- Advanced array configuration and management utilities that provide drive roaming.
- Upgradable Flash ROM interface.
- Allows for staggered spin-up, hot-plug, and lower power consumption.

Redundancy and Error Handling

- Activity and fault indicators per drive, port selector (dual-port drives).
- Auto-detection of failed drives with transparent rebuild.
- Commands are retried up to four times.
- SMART technology predicts failures of drives and electronic components for drives in IR mode.
- Firmware provides best effort to recognize an error and recover from it if possible.
- Failures are logged from controller and drive firmware.
- Failures are logged in Intel® RAID Web Console 2, CIM, and LEDs.

SAS/SATA Features of the LSI* LSI SAS2308 Processor Chip

See “[LSI* LSI SAS2308 Processor Chip in Page 12](#)” for SAS/SATA features of the LSI* LSI SAS2308 Processor Chip.

2 Intel® RAID Controller RS25FB044 Hardware Installation

Requirements

- An Intel® RAID Controller RS25FB044 (SAS/SATA cables need to be prepared separately)
- A host system with an available x8 or x16 PCI-Express* slot
- The Resource CD, which contains drivers and documentation
- SAS or SATA 6Gb/s hard drives
- SAS/SATA cable accessory kit (product code - AXXCBL740MS7P), which has two individual cables and can be ordered from Intel® separately.

In addition, Intel Corporation strongly recommends using an uninterruptible power supply (UPS).

Installing the RAID Controller

To install the RAID Controller, follow these steps:

1. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).
2. Remove the server system cover. For instructions, see the server system documentation.
3. If necessary, change the bracket on the RAID controller to fit the height of the server system (see [Figure 1](#)).

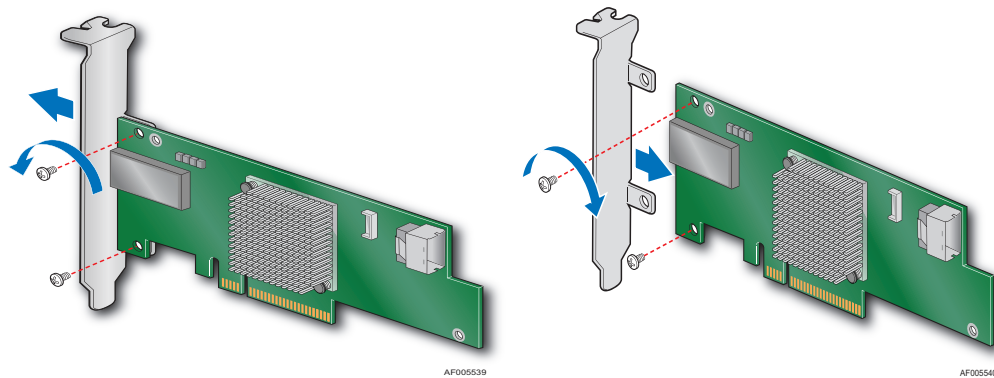


Figure 1. Changing the Bracket

4. Install the RAID controller into an available server system x8 or x16 PCI-Express* slot (see [Figure 2](#)). To locate an appropriate slot and for instructions on installing an add-in card, see your server system documentation.

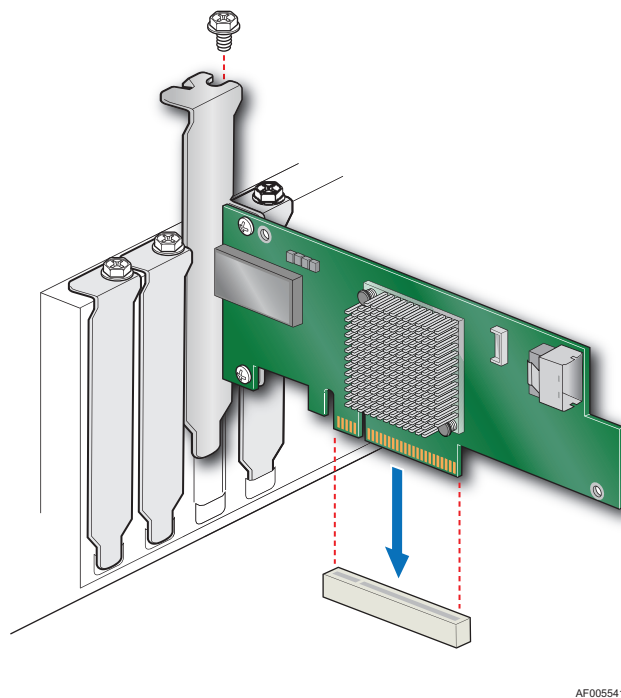
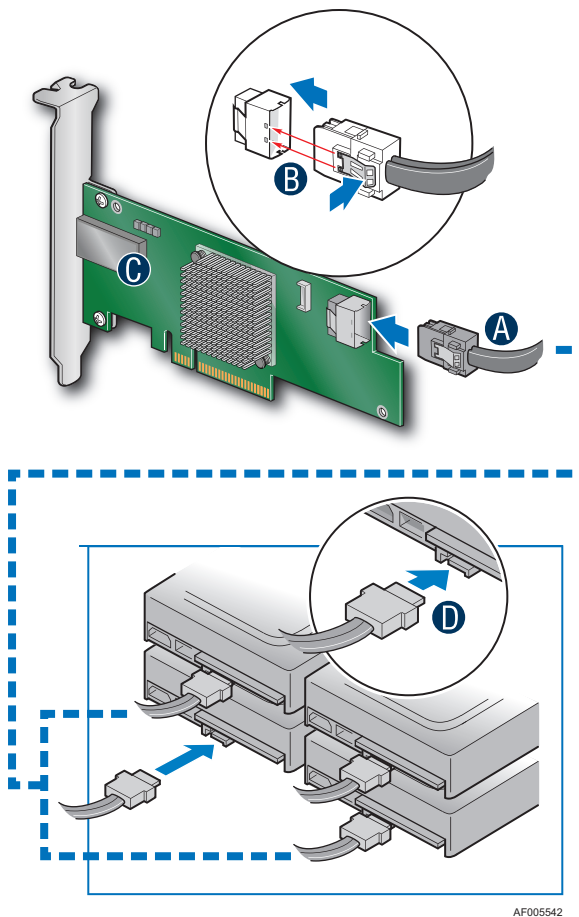


Figure 2. Installing the Intel® RAID Controller RS25FB044

5. For internal drives, connect one 4-port combined end of an internal cable to the internal mini-SAS (SFF8087) connector (see letter “A” in [Figure 3](#)). If you are using external cables, connect the external cable to the external mini-SAS (SFF8088) connector (see letter “C” in [Figure 3](#)). Connect the other end of the cables to SATA drives or to the ports on a SATA or SAS backplane (see letter “D” in [Figure 3](#)).

To prevent throughput problems:

- Use the cables provided or use the shortest possible cable.
- Do not use cables longer than one meter.
- Decrease the maximum length by one foot if you are using a backplane.
- Do not use cross-over cables.
- Only connect to a SATA drive, SAS or SATA backplane, or an expander device.
- Route the cables carefully.
- Check that the controller and cables are all properly attached.



AF005542

Figure 3. Connecting Cables between the RAID Controller and Drives/Backplane

6. Install the server system cover and connect the power cords. For instructions, see your server system documentation.
7. Reinstall the chassis cover and reconnect the power cord(s). For instructions, see your server chassis documentation.
8. Reconnect any peripheral items you needed to disconnect.

9. Turn the power on to the server and hard drives. As the server powers up, listen to be sure that the SAS and SATA devices are powered up before or at the same time as the computer boots.
10. Watch the boot process until you see a BIOS message informing you of the key combination that you need to press to enter the LSI* Corporation MPT SAS BIOS Configuration Utility*. A message similar to the following appears:
 - Press <CTRL> + <C> to start the LSI* SAS Configuration Utility
 - This message times-out after several seconds. If you miss it, you will pass the option to get into the LSI* Corporation MPT SAS BIOS Configuration Utility*.

The firmware takes several seconds to initialize and then displays the Intel® RAID Controller RS25FB044 number and firmware version. The numbering of the controllers follows the PCI slot scanning order used by the server board.

Configuring the RAID Controller

After performing the Intel® RAID Controller RS25FB044 installation, you must configure the storage adapter and install the operating system driver. *The Intel® RAID Software User's Guide* (Document Number: D29305-0xx) provides IT/IR RAID configuration options and instructions for the Intel® RAID Controller RS25FB044, as well as detailed installation instructions for operating system drivers.

Replacing a Controller

To replace the RAID controller, see your server system documentation for instructions to remove and then install an add-in adapter.

3 Intel® RAID Controller RS25FB044 Characteristics

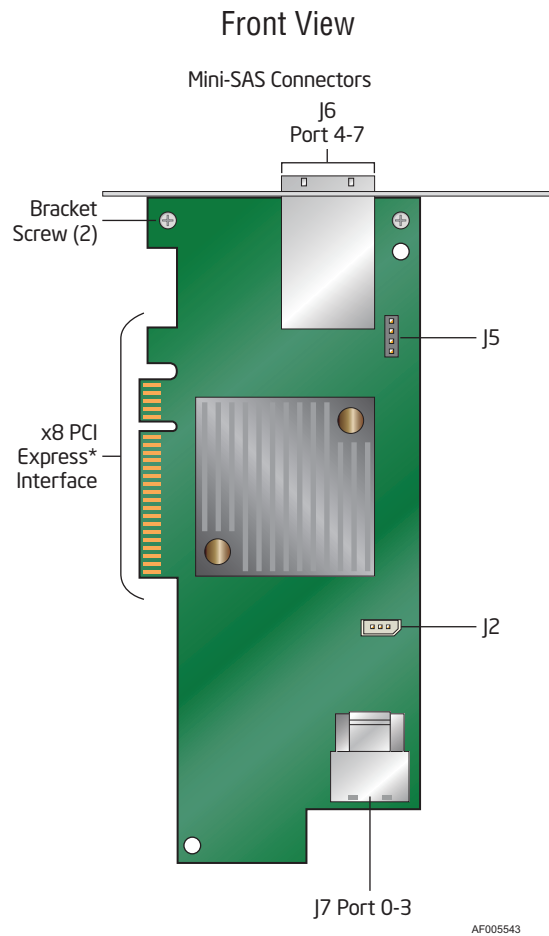


Figure 4. Card Layout

Table 1. Jumper and Connector Description

Jumper	Description	Type	Comments
J2	SES	3-pin header	For enclosure management
J5	UART	4-pin header	For debug purpose
J6	External mini SAS Port Connector: ports 4-7		Connection to external SAS/SATA devices
J7	Internal mini SAS Port Connector: ports 0-3		Connection to internal SAS/SATA devices

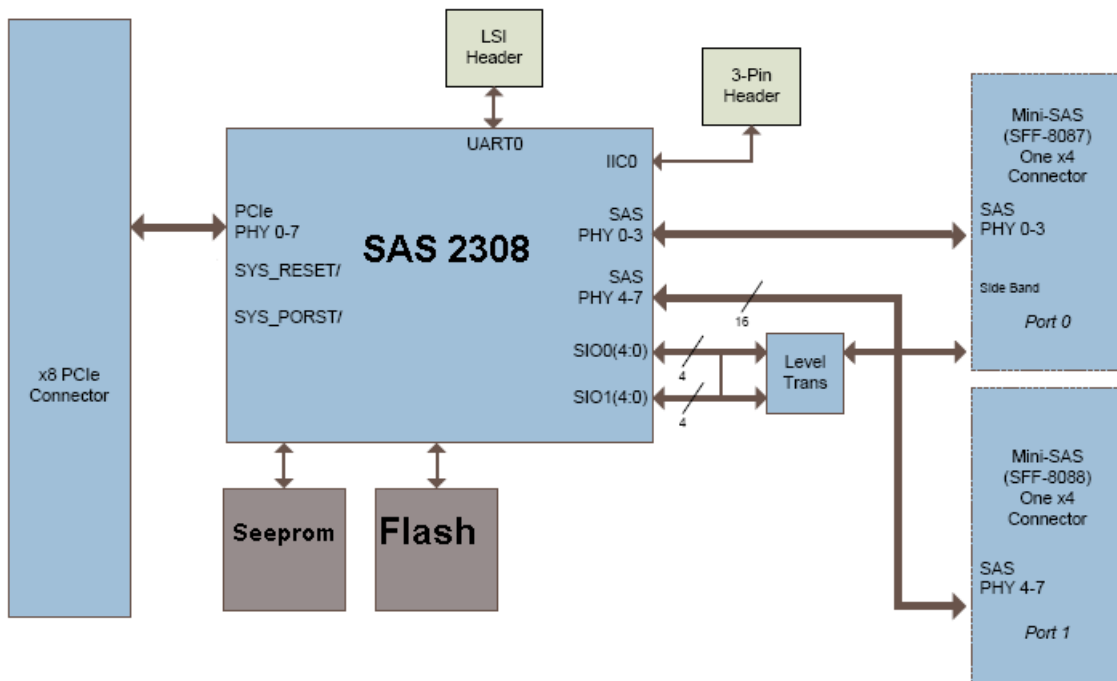


Figure 5. RS25FB044 Hardware Block Diagram

Major Components

LSI* LSI SAS2308 Processor Chip

The LSI* LSI SAS2308 Processor Chip provides the following functionality:

- The Chip provides eight independent PHYs, each supporting 6Gb/s and 3Gb/s SAS data transfers per PHY.
- Supports SSP to enable communication with other SAS devices.
- Supports SMP to communicate topology management information.
- Supports single PHY or wide ports consisting of 2, 3, or 4 PHYs within a single quad port.
- Allows addressing of multiple SATA targets through an expander if using SATA 3.0-compliant hard disk drives.
- Allows multiple initiators to address a single target (in a fail-over configuration) through an expander.

For more information, see <http://www.lsi.com/>.

Flash ROM

A CFI-compliant flash ROM is used to accommodate RAID firmware and IR RAID configuration utility OpROM.

Boot Strap ROM (SEEPROM)

The serial bootstrap ROM is used to configure the LSI* LSI SAS2308 Processor Chip before the server board configures the PCI Express* registers. The bootstrap ROM sets the Phase Lock Loop (PLL) dividers, bootstrap configuration, and so on.

Diagnostic Components

LED Placement and Function

The Intel® RAID Controller RS25FB044 contains a green system heartbeat LED that indicates the card is capable of general activity.

SAS/SATA Connectors

The Intel® RAID Controller RS25FB044 provides one internal SFF8087 and one external SFF8088/SATA signal connectors. Each connector provides support for four SAS/SATA ports. The sideband signals are configured to adhere to the SFF-8485 Specifications for SGPIO support.

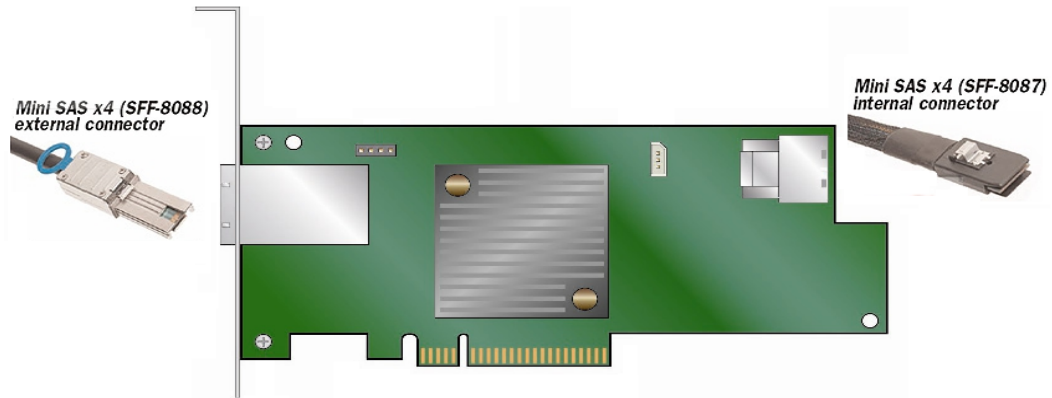


Figure 6. Intel® RAID Controller RS25FB044 SAS/SATA Connectors

SAS/SATA Connector Pin-out

Signal names are with respect to the host. The device connected to the host reverses the signal names. Transmit pins connect to receive pins on the other device. The SAS/SATA connector is keyed at pin 1. These pin-outs for the serial ATA connector are not compatible with the legacy PATA connector.

Table 2. SFF8088 External Connector Pin-out

Signal	Pin	Signal	Pin
GND	A1	GND	B1
RX 0+	A2	TX 0+	B2
RX 0-	A3	TX 0-	B3
GND	A4	GND	B4
RX 1+	A5	TX 1+	B5
RX 1-	A6	TX 1-	B6
GND	A7	GND	B7
RX 2+	A8	TX 2+	B8
RX 2-	A9	TX 2-	B9
GND	A10	GND	B10
RX 3+	A11	TX 3+	B11

Signal	Pin	Signal	Pin
RX 3-	A12	TX 3-	B12
GND	A13	GND	B13

Table 3. SFF8087 Internal Connector with one SGPIO Connector Pin-out

Controller Connector Pin-out		Backplane Connector Pin-out		Port
SFF-8087 Pin #	Pin Definition	Pin #	Pin Definition	
A1	GND	7	GND	Port 0
A2	RX0+	6	TX+	
A3	RX0-	5	TX-	
B1	GND	4	GND	
B2	TX0+	2	RX+	
B3	TX0-	3	RX-	
B4	GND	1	GND	
A4	GND	7	GND	
A5	RX1+	6	TX+	
A6	RX1-	5	TX-	
A7	GND	4	GND	
B5	TX1+	2	RX+	
B6	TX1-	3	RX-	
B7	GND	1	GND	
B8	SB0/SCLK/SCL	1	SCLK	SGPIO
B9	SB1/SLOAD/SDA	2	SLOAD	
B10	SB2/GND	4	GND	
A9	SB3/GND			
A10	SB4/SDATA_OUT/RST	3	SDATAOUT0	
A11	SB5/SDATA_IN/ADDR			
A8	SB7/BP_TYPE			
B11	SB6/CTLR_TYPE			

Controller Connector Pin-out		Backplane Connector Pin-out		Port
SFF-8087 Pin #	Pin Definition	Pin #	Pin Definition	
A12	GND	7	GND	Port 2
A13	RX2+	6	TX+	
A14	RX2-	5	TX-	
B12	GND	4	GND	
B13	TX2+	2	RX+	
B14	TX2-	3	RX-	
B15	GND	1	GND	
A15	GND	7	GND	Port 3
A16	RX3+	6	TX+	
A17	RX3-	5	TX-	
A18	GND	4	GND	
B16	TX3+	2	RX+	
B17	TX3-	3	RX-	
B18	GND	1	GND	

Technical Specifications

Table 4. Technical Specifications

Specification	Intel® RAID Controller RS25FB044
Processor	LSI* LSI SAS2308 PCI* Express-SAS/SATA I/O Processor chip, 150MHz
Operating voltage	+3.3 V
Interface to host	PCI Express* Revision 3.0, x8 lane width 8.0 Gb/s
SATA bus speed	Upto 6 Gbps per port, point-to-point
SAS/SATA ports	One x4 internal port and one x4 external port, 32 devices per port with expanders.

Specification	Intel® RAID Controller RS25FB044
Physical and virtual drive support	Supports 256 physical drives. A max of two IR volumes (arrays) may be created. Each volume (array) supports not more than 10 physical drives. Other unconfigured drives are in Pass-Through mode, or JBOD mode.
Firmware	Reflashable flash ROM
Compatible devices	<ul style="list-style-type: none"> • 2.5-inch and 3.5-inch SAS or SATA III drives including SSD drives • Non disk devices including expanders • Can support drives of mixed capacity
Cabling	Small thin cables that do not restrict airflow and Shared connectors for multiple drives
Enclosure management	In-band and out-of-band SES2; out-of-band SGPIO
Enclosure support	Assumes one SEP per enclosure

Array Performance Features

Table 5. Array Performance Features

Specification	Intel® RAID Controller RS25FB044
Host data transfer rate	Upto 8.0 Gigabit/sec per PCI Express* lane
Drive data transfer rate	Upto 6 Gigabit/sec per lane
Maximum queue tags per drive	As many as the drive can accept
Strip size	64 KB
Cache Options	Disk cache enabled/disabled

Fault Tolerance

Table 6. Fault Tolerance Features

Specification	Intel® RAID Controller RS25FB044
Power Conservation	<ul style="list-style-type: none"> • Staggered spin-up • Lower power requirements
Drive Replacement	<ul style="list-style-type: none"> • Auto detection of failure • Hot-plug • Hot-swap

Specification	Intel® RAID Controller RS25FB044
Power Conservation	<ul style="list-style-type: none"> • Staggered spin-up • Lower power requirements
Drive Rebuild Using Hot Spares	<ul style="list-style-type: none"> • Automatic at fail • Auto-resume of initialization or rebuild on reboot
Error Checking and Indication	Activity and fault LEDs

Electrical Characteristics

All power is supplied to the Intel® RAID Controller RS25FB044 through the PCI Express* 12 V rails and optionally from the +3.3 V and + 3.3Vaux rails.

The supply voltages are 3.3 V ± 9 percent from PCI edge connector only. The maximum power for the +3.3 V rail is 15 W. The +3.3 V rail is used by the 3.3 V logic circuitry and also used to generate the other required voltage rails of +1.0 V and +1.8 V.

Thermal and Atmospheric Characteristics

The thermal and atmospheric characteristics are:

- Relative humidity range: 5% to 90% non-condensing
- Maximum dew point temperature: 32°C
- Airflow must be at least 200 linear feet per minute (SFPM) to avoid operating above the maximum ambient temperature.

The storage and transit environment conditions are:

- Temperature range from -45°C to 105°C (dry bulb)
- Relative humidity range: 5% to 90% non-condensing
- MTBF (electrical components) number: 2,00,000 hours at 40°C

Safety Characteristics

The Intel® RAID Controller RS25FB044 meets or exceeds the requirements of UL flammability rating V0. Each bare board is marked with the supplier name or trademark, type, and UL flammability rating.

Operating Certifications

The RAID controller in this document is qualified to get Microsoft Windows Winqual* certification (WHQL) at product launch.

Supported Device Technology

The various device technologies supported by the Intel[®] RAID Controller RS25FB044 are described in the subsections that follow.

Support for Hard Disk Drive Devices

The Intel[®] RAID Controller RS25FB044 integrates four internal and four external high-performance SAS/SATA II ports that support SAS and enterprise-class SATA hard drives. Each port supports both SAS and SATA devices using the SAS Serial SCSI Protocol (SSP), Serial Management Protocol (SMP), and Serial Tunneling Protocol (STP). The SSP protocol enables communication with other SAS devices. STP allows the SAS RAID controller to communicate with SATA devices using the SATA commands.

SAS Expander Support

The Intel[®] RAID Controller RS25FB044 supports LSI* expanders, that are used either as independent devices, or as a component in Intel enclosures. Other expanders may be supported post launch, based on market conditions and customer requirements.

Support for Non-Hard Disk Drive Devices

As SAS-based non-hard drive devices were not available when this controller was in development, support for these devices will be determined as they become available. For information on support for non-hard drive devices, see the Intel[®] RAID Controller RS25FB044 Tested Hardware and Operating System List.

Enclosure Management Support

The Intel[®] RAID Controller RS25FB044 support SES2 enclosure management in-band to expander-based backplanes and out-of-band to direct-connect backplanes. These RAID Controllers also support SGPIO enclosure management interface.

RAID Functionality and Features

Hierarchy

The fundamental purpose of a RAID system is to present a usable data storage medium (virtual drive) with some level of redundancy to a host operating system. The Intel[®] RAID firmware is based on the concept of associating physical drives in arrays and then creating

a virtual drive from that array that includes a functional RAID level. To create a virtual drive and present it to the host operating system, the RAID firmware typically follows these steps:

1. One or more physical drives are selected and associated as an array.
2. One or more arrays are associated and given a RAID level. This process creates a virtual drive and provides an option to initialize the virtual drive.
3. The RAID firmware presents the virtual drive to the operating system.

RAID Virtual Drive Status

Table 7. RAID Virtual Drive Status

Drive State	Code	Description
Optimal	Optimal	The drive operating system is good. All configured drives are online.
Degraded	Degraded	The drive operating condition is not optimal because one of the configured drives has failed or is offline.
Offline	Offline	The drive is not available to the operating system and is unusable.

RAID Controller Drive Limitations

Only drives that comply with the SAS and SATA specification extensions are supported.

SAS Bus and ID Mapping

Devices on the SAS bus are persistently mapped based on a SAS address.

Appendix A: Drive Roaming Install

Drive Roaming

Drive roaming occurs when the hard drives are changed to different ports on the same controller. When the drives are placed on different ports, the controller detects the RAID configuration from the configuration data on the drives.

Note: *If you move a drive that is currently being rebuilt, the rebuild operation will restart, not resume.*

To use drive roaming, follow these steps:

1. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).
2. Remove the server cover. For instructions, see your server system documentation.
3. Move the drives to different positions on the backplane to change the targets. See your server documentation for instructions to install and remove drives.
4. Determine the target requirements.
5. Make sure the drives are inserted properly.
6. Install the server cover. For instructions, see your server system documentation.
7. Plug in and power on the system.

The controller detects the RAID configuration from the configuration data on the drives (COD).

Appendix B: Installation/Assembly Safety Instructions

As you use your computer system, observe these safety guidelines:

- 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.
- To help avoid possible damage to the server board, wait five seconds after turning off the system before removing a component from the server 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:

- 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.
- Turn off your computer and any peripherals.
- 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.

Additional safety guidelines:

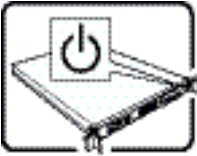

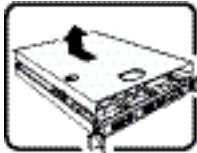
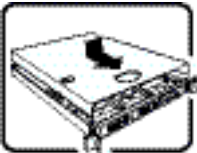
- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnect the cable. As you pull connectors apart, keep them evenly 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. Do not 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.

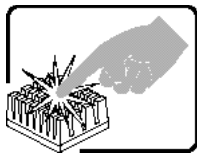
Protecting against electrostatic discharge

- 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.

English

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/sb/cs-010770.htm>.

	<p>The power button on the system does not turn off system AC power. To remove AC power from the system, you must unplug each AC power cord from the wall outlet or power supply.</p> <p>The power cord(s) is considered the disconnect device to the main (AC) power. The socket outlet that the system plugs into shall be installed near the equipment and shall be easily accessible.</p>
	<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>After you have completed the six SAFETY steps above, you can remove the system covers. To do this:</p> <ol style="list-style-type: none">1. Unlock and remove the padlock from the back of the system if a padlock has been installed.2. Remove and save all screws from the covers.3. Remove the cover(s).
	<p>For proper cooling and airflow, always reinstall the chassis covers before turning on the system. Operating the system without the covers in place can damage system parts. To install the covers:</p> <ol style="list-style-type: none">1. Check first to make sure you have not left loose tools or parts inside the system.2. Check that cables, add-in cards, and other components are properly installed.3. Attach the covers to the chassis with the screws removed earlier, and tighten them firmly.4. Insert and lock the padlock to the system to prevent unauthorized access inside the system.5. Connect all external cables and the AC power cord(s) to the system.



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.

Deutsch

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/sb/cs-010770.htm>.



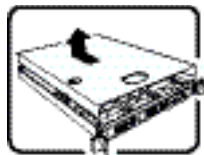
Der Wechselstrom des Systems wird durch den Ein-/Aus-Schalter für Gleichstrom nicht ausgeschaltet. Ziehen Sie jedes Wechselstrom-Netzkabel aus der Steckdose bzw. dem Netzgerät, um den Stromanschluß des Systems zu unterbrechen.

Die Stromkabel sind das "Unterbrechungsgerät" zur Hauptstromquelle. Die Steckdose, in die das System gesteckt wird, sollte sich in der Nähe des Gerätes befinden und leicht zugänglich sein.



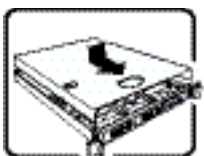
SICHERHEITSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:

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 beschrifteten 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.



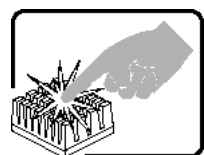
SICHERHEITSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:

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 beschrifteten 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.



Zur ordnungsgemäßen Kühlung und Lüftung muß die Gehäuseabdeckung immer wieder vor dem Einschalten installiert werden. Ein Betrieb des Systems ohne angebrachte Abdeckung kann Ihrem System oder Teile darin beschädigen. Um die Abdeckung wieder anzubringen:



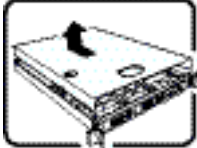
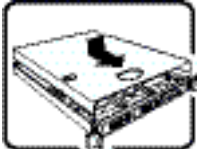
1. Vergewissern Sie sich, daß Sie keine Werkzeuge oder Teile im Innern des Systems zurückgelassen haben.
2. Überprüfen Sie alle Kabel, Zusatzkarten und andere Komponenten auf ordnungsgemäßen Sitz und Installation.
3. Bringen Sie die Abdeckungen wieder am Gehäuse an, indem Sie die zuvor gelösten Schrauben wieder anbringen. Ziehen Sie diese gut an.
4. Bringen Sie die Verschlusseinrichtung (Padlock) wieder an und schließen Sie diese, um ein unerlaubtes Öffnen des Systems zu verhindern.
5. Schließen Sie alle externen Kabel und den AC Stromanschlußstecker Ihres Systems wieder an.

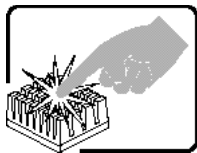


Der Mikroprozessor und der Kühler sind möglicherweise erhitzt, wenn das System in Betrieb ist. Außerdem können einige Platinen und Gehäuseteile scharfe Spitzen und Kanten aufweisen. Arbeiten an Platinen und Gehäuse sollten vorsichtig ausgeführt werden. Sie sollten Schutzhandschuhe tragen.

Français

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/sb/cs-010770.htm>

	<p>Notez que le commutateur CC de mise sous tension /hors tension du panneau avant n'éteint pas l'alimentation CA du système. Pour mettre le système hors tension, vous devez débrancher chaque câble d'alimentation de sa prise.</p> <p>C'est le câble d'alimentation qui est considéré comme le moyen de se déconnecter du CA. La prise à laquelle le système est branché doit se situer à proximité de l'équipement et être facilement accessible.</p>
	<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>Une fois TOUTES les étapes précédentes accomplies, vous pouvez retirer les panneaux du système. Procédez comme suit:</p> <ol style="list-style-type: none"> 1. Si un cadenas a été installé sur à l'arrière du système, déverrouillez-le et retirez-le. 2. Retirez toutes les vis des panneaux et mettez-les dans un endroit sûr. 3. Retirez les panneaux.
	<p>Afin de permettre le refroidissement et l'aération du système, réinstallez toujours les panneaux du boîtier avant de mettre le système sous tension. Le fonctionnement du système en l'absence des panneaux risque d'endommager ses pièces. Pour installer les panneaux, procédez comme suit:</p> <ol style="list-style-type: none"> 1. Assurez-vous de ne pas avoir oublié d'outils ou de pièces démontées dans le système. 2. Assurez-vous que les câbles, les cartes d'extension et les autres composants sont bien installés. 3. Revissez solidement les panneaux du boîtier avec les vis retirées plus tôt. 4. Remettez le cadenas en place et verrouillez-le afin de prévenir tout accès non autorisé à l'intérieur du système. 5. Rebranchez tous les cordons d'alimentation c. a. et câbles externes au système.



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.

Español

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/sb/cs-010770.htm>



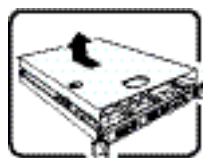
Nótese que el interruptor activado/desactivado en el panel frontal no desconecta la corriente alterna del sistema. Para desconectarla, deberá desenchufar todos los cables de corriente alterna de la pared o desconectar la fuente de alimentación.

Estos cables actúan como dispositivo de desconexión. La toma de corriente deberá estar situada cerca del equipo y ser de fácil acceso.



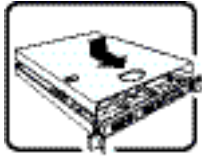
INSTRUCCIONES DE SEGURIDAD: Cuando extraiga la tapa del chasis para acceder al interior del sistema, siga las siguientes instrucciones:

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.



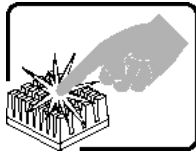
Después de completar las seis instrucciones de SEGURIDAD mencionadas, ya puede extraer las tapas del sistema. Para ello:

1. Desbloquee y extraiga el bloqueo de seguridad de la parte posterior del sistema, si se ha instalado uno.
2. Extraiga y guarde todos los tornillos de las tapas. Extraiga las tapas.



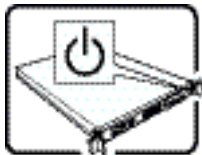
Para obtener un enfriamiento y un flujo de aire adecuados, reinstale siempre las tapas del chasis antes de poner en marcha el sistema. Si pone en funcionamiento el sistema sin las tapas bien colocadas puede dañar los componentes del sistema. Para instalar las tapas:

1. Asegúrese primero de no haber dejado herramientas o componentes sueltos dentro del sistema.
2. Compruebe que los cables, las placas adicionales y otros componentes se hayan instalado correctamente.
3. Incorpore las tapas al chasis mediante los tornillos extraídos anteriormente, tensándolos firmemente.
4. Inserte el bloqueo de seguridad en el sistema y bloquéelo para impedir que pueda accederse al mismo sin autorización.
5. Conecte todos los cables externos y los cables de alimentación CA al sistema.




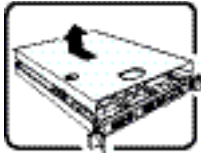
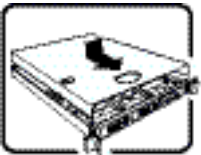
Si el sistema ha estado en funcionamiento, el microprocesador y el disipador de calor pueden estar aún calientes. También conviene tener en cuenta que en el chasis o en el tablero puede haber piezas cortantes o punzantes. Por ello, se recomienda precaución y el uso de guantes protectores.

Italiano



L'interruttore attivato/disattivato nel pannello anteriore non interrompe l'alimentazione in c.a. del sistema. Per interromperla, è necessario scollegare tutti i cavi di alimentazione in c.a. dalle prese a muro o dall'alimentazione di corrente.

Il cavo è considerato il dispositivo d'interruzione dell'alimentazione principale (in c.a.). La presa alla quale si collega il sistema deve essere installata vicino all'unità e deve essere facilmente accessibile.

	<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. Spegnerne tutti i dispositivi periferici collegati al sistema. 2. Spegnerne il sistema, usando il pulsante spento/accesso 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>Dopo aver seguito i sei passi di SICUREZZA sopracitati, togliere le coperture del telaio del sistema come segue:</p> <ol style="list-style-type: none"> 1. Aprire e rimuovere il lucchetto dal retro del sistema qualora ve ne fosse uno installato. 2. Togliere e mettere in un posto sicuro tutte le viti delle coperture. 3. Togliere le coperture.
	<p>Per il giusto flusso dell'aria e raffreddamento del sistema, rimettere sempre le coperture del telaio prima di riaccendere il sistema. Operare il sistema senza le coperture al loro proprio posto potrebbe danneggiare i componenti del sistema. Per rimettere le coperture del telaio:</p> <ol style="list-style-type: none"> 1. Controllare prima che non si siano lasciati degli attrezzi o dei componenti dentro il sistema. 2. Controllare che i cavi, dei supporti aggiuntivi ed altri componenti siano stati installati appropriatamente. 3. Attaccare le coperture al telaio con le viti tolte in precedenza e avvitarle strettamente. 4. Inserire e chiudere a chiave il lucchetto sul retro del sistema per impedire l'accesso non autorizzato al sistema. 5. Ricollegare tutti i cavi esterni e le prolunghie AC del sistema.
	<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>

Appendix C: Regulatory and Certification Information

Product Safety and EMC Compliance

This Intel® RAID Controller has been evaluated for regulatory compliance as an Intel end system, and is included as part of the end system certification. For information on end system certification, refer to the product regulatory certification for the end system level product.

