Intel® RAID Expander Card RES2SV240 Hardware User's Guide

Intel Order Number: E93121-003

DISCLAIMER

Preface

This is the primary hardware guide for the Intel® RAID Expander Card RES2SV240, 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/expanders and related support devices. The people who benefit from this book are:

- Engineers who are designing an Intel®RAID Expander Card RES2SV240 for their RAID system.
- Anyone installing an Intel®RAID Expander Card RES2SV240 in their RAID system.

Organization

This document includes the following chapters and appendices:

- Chapter 1 provides a general overview of the Intel® RAID Expander Card RES2SV240.
- Chapter 2 describes the procedures for installing and configuring the expander card.
- Chapter 3 provides the characteristics and technical specifications for the Intel®RAID Expander Card RES2SV240.
- Appendix A provides safety instructions to be observed during installation and assembly.
- Appendix B provides regulatory and certification information.

Related Publication

The *Intel® RAID Software User's Guide* is included on the Resource CD available on Intel support website at www.intel.com.

Table of Contents

List of Figures

List of Tables

1 Overview

The Intel® RAID Expander Card RES2SV240 offers high performance, high disk drive connectivity,scalability, and flexibility in various storage environments, and is an attractive alternative to other expensive and complex topologies. The SAS expander is ideal for high availability and scalable server clustering environments and front-end storage subsystems used in clusters, Storage Area Networks (SANs), and Network-Attached Storage (NAS) environments. It is an optimal device for use in data centers and SANs, leveraging existing SCSI infrastructure for investment protection and ease of migration and implementation.

Intel® RAID Expander Card RES2SV240 is a 24-port, 6.0Gb/s Serial Attached SCSI (SAS) expander that enables the connection of up to 24 directly attached SAS or Serial ATA (SATA) devices. Each expander phy is individually configurable and performs SAS and SATA transfers based on the speed of the host or target at either 6.0Gb/s, 3.0Gb/s, or 1.5Gb/s.

The Intel® RAID Expander Card RES2SV240 addresses the growing demand for increased data throughput and scalability requirements across entry level, midrange, and enterprise server platforms.

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, 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 support the use of 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 Expander Card RES2SV240

The SAS/SATA functionality for the Intel® RAID Expander Card RES2SV240 is contained within the LSI* LSISAS2x24 24-Port Serial Attached SCSI/SATA Expander chip. This expander card has twenty-four independent ports supporting 6Gb/s, 3 Gb/s, or 1.5Gb/s SAS and SATA data transfers using six SFF-8087 mini-SAS connectors. This controller supports 4 inputs and 20 outputs configuration, or 8 inputs and 16 outputs configuration. This expander card is powered either from its standard PCI Express* x4 connector (with only power pins) to get power from motherboard PCI Express slot, or from its RA 4-pin power connector for remote cable power.

The expander card is designed to be compatible with the following Intel® RAID Controllers and Modules:

- Intel® Integrated RAID Module RMS2MH080
- Intel® RAID Module RMS2AF080 and RMS2AF040
- Intel® RAID Module RMS2LL080 and RMS2LL040
- Intel® RAID Controller RS2BL080, RS2BL040, and RS2BL080DE
- Intel® RAID Controller RS2MB044
- Intel® RAID Controller RS2WC080 and RS2WC040
- Intel® Integrated RAID Module SROMBSASMR

Note: *Additional cable might need to be purchased for some of above adapters to connect.*

Additional Intel® RAID Controllers and Modules may be supported. For the most up-to-date list, see the Compatibility section under the link for this Intel® RAID Expander Card at http://www.intel.com/support/motherboards/server/.

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

Protocol Support

Each port on the expander card supports SAS devices, SATA II devices, or both using SSP, SMP, STP, and SATA II as follows:

- Serial SCSI Protocol (SSP) to enable communication with other SAS devices.
- SATA II Protocol to enable communication with other SATA II devices.
- Serial Management Protocol (SMP) to share topology management information with expanders.
- Serial Tunneling Protocol (STP) support for SATA II through expander interfaces.
- SAS protocol, described in the Serial Attached SCSI (SAS) Standard, version 2.0

- SFF-8485 protocol, using the Serial GPIO (SGPIO) interface provided by the expander.

Operating System Support

The operating systems supported are determined by your RAID controller or module. See the *Tested operating system list* for your RAID controller or module at http://www.intel.com/support/motherboards/server/.

Features

- Supports both Serial Attached SCSI and Serial ATA devices
- 6.0 Gbit/s, 3.0 Gbit/s, and 1.5 Gbit/s data transfer rate
- Six SFF-8087 mini-SAS connectors providing twenty-four SAS/SATA ports
- Supports 4 inputs and 20 outputs configuration
- Supports 8 inputs and 16 outputs configuration
- Output mini-SAS connectors support sideband SGPIO as per SFF-8485 specification
- Onboard 4-pin SGPIO connector to be used for Intel$^{®}$ 6-drive hot-swap non-expander SATA/SAS backplane
- Two 2x12 headers to support Fault LED for each SAS/SATA port
- Power from RA 4-pin power connector or standard PCI Express* x4 connector
- Board functioning either in PCI Express slot or remotely in system
- Onboard screw holds allow the expander card to be mounted on a chassis wall inside a server system
- Low Profile and MD2 compliance
- Provides a low-latency connection to create and maintain transparent access to each connected SAS/SATA physical drive
- Staggered spin-up
- Hot Plug
- Native Command Queuing
- Allows multiple initiators to address a single target (in a fail-over configuration)

2   Intel® RAID Expander Card RES2SV240 Hardware Installation

Requirements

- Intel® RAID Expander Card RES2SV240, with full height or low profile brackets, or with screws
- Available PCI Express* x4 connector, or with available RA 4-pin power connector
- SAS and SATA hard drives up to 6Gb/s speed
- Six provided SAS/SATA cables (for cable requirements, see step 6 in "Installing the RAID Module")

Note: *Intel Corporation strongly recommends using an uninterruptible power supply (UPS).*

Installing the RAID Module

To install the RAID Expander Card, 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. If necessary, change the bracket on the expander card to fit the height of the server system (see Figure 1).

AF003490
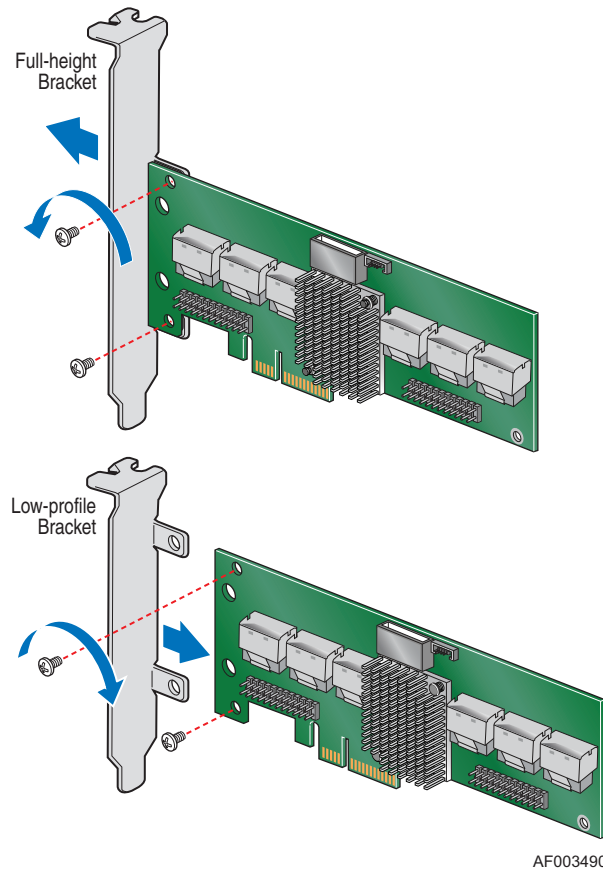
Figure 1. Changing the bracket

4. Install the expander card into an available server system x4, 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.
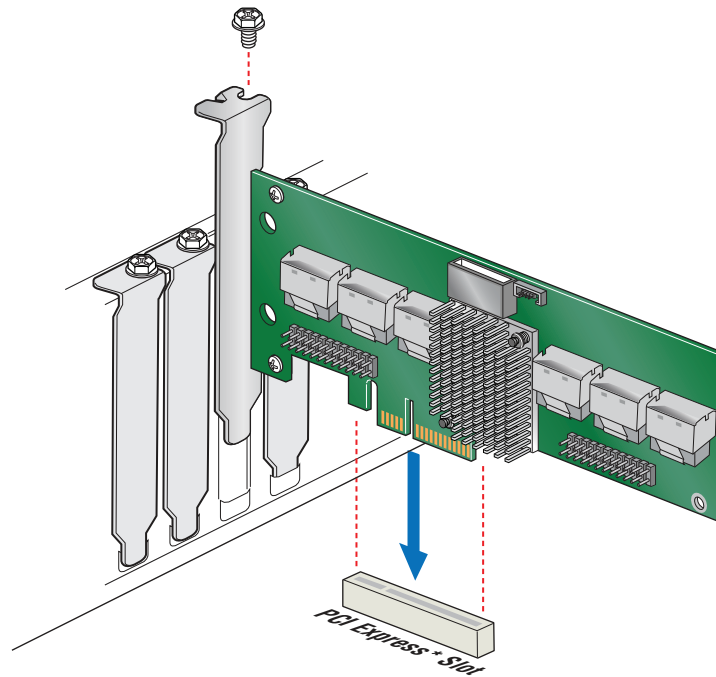
AF003491

Figure 2. Installing Intel® RAID Expander Card RES2SV240

5. (Optional) In case power can be supplied remotely from RA 4-pin 12V/5V power connector, the expander card can be located elsewhere within the server chassis instead of using a PCI Express slot, if only the cooling condition can meet the expander card's thermal and atmospheric requirement. The expander card can therefore be fastened by removing its bracket and fasten it to a customized chassis wall (see Figure 3). The expander card already has two holes for fastening the bracket and three additional holds reserved. User needs to prepare screws and standoffs to match the hole size on both the expander card and customized chassis wall.

AF003495
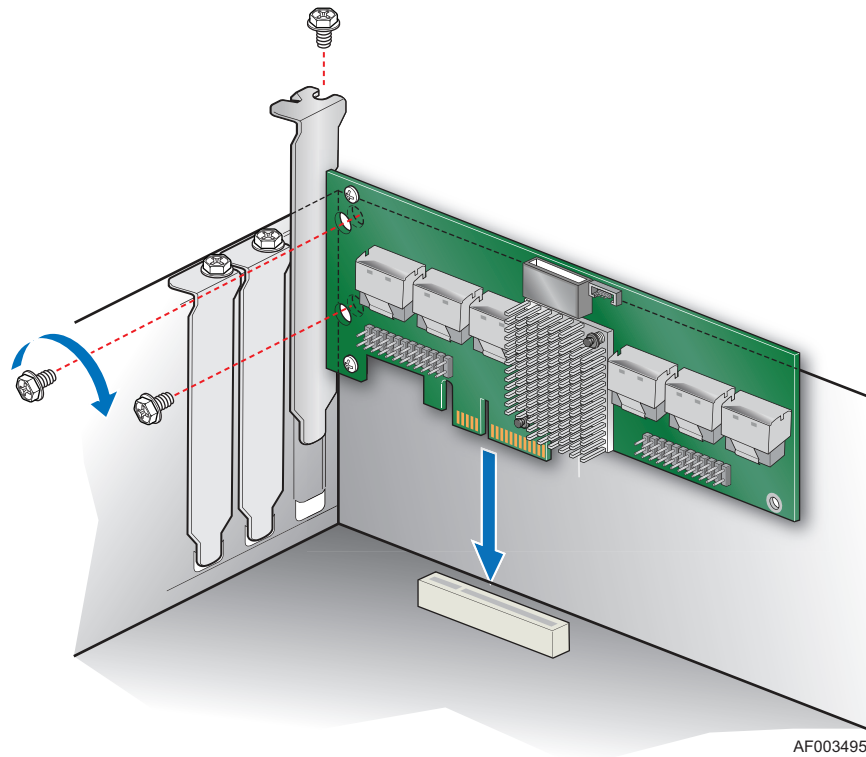
Figure 3. Installing the Expander Card onto a Customized Chassis Wall

6. Connect the SAS/SATA cables from the backplane (or hard drives) to the expander card, and from the expander card to a RAID module or RAID controller (see Figure 4, which takes 6-drive and 4-drive non-expander backplanes in Intel's pedestal chassis as an example for cabling). For information regarding connecting the recommended Right-angle end or Vertical end of the SAS/SATA cable to the SAS connectors of the controller, see your server/workstation board or chassis documentation. Make sure the cables are properly connected to the controller.

Note: *System throughput problems can occur if non-standard SAS cables are used. To minimize the potential for problems:*

✦ *Use cables no longer than ten meters for SAS and one meter for SATA. It is better to use the shortest possible cables. The cable length should be reduced by about one foot (.33 meters) if using a backplane.*

✦ *You may connect one device per SATA/SAS cable either as a device or as an expander.*

✦ *Route SAS cables carefully.*

✦ *Use only "straight" SAS cables, not "cross-over" SAS cables.*
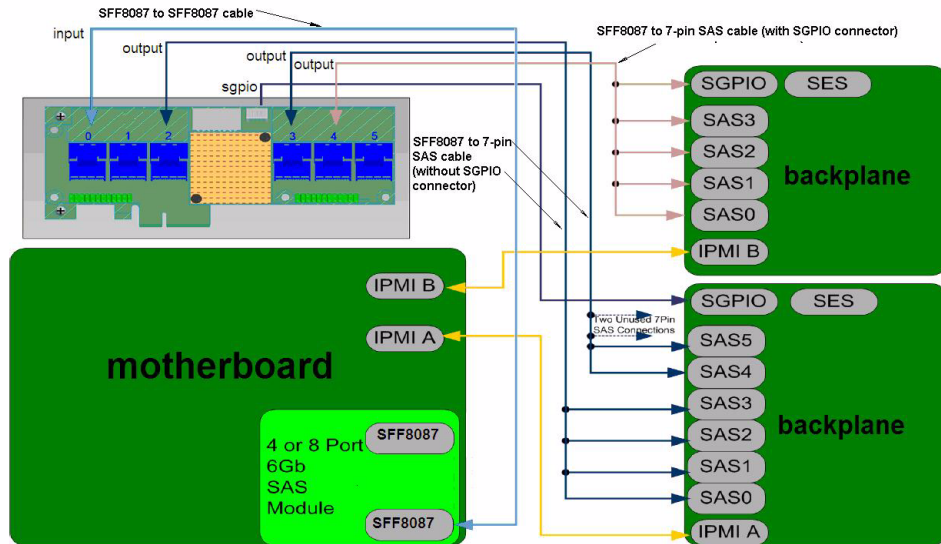
Figure 4. Cabling among the Expander Card, RAID Module/Controller and Drives/Backplane

7. Install the server system cover and connect the power cords. See your server system documentation for instructions.

Configuring the Expander Card

After physically installed into a server system, the Intel® RAID Expander Card RES2SV240 is transparent to users in RAID configurations. Refer to the technical specification or user guide of the RAID controller connected to this expander card to know how to configure a RAID system.

Replacing the Expander Card

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

3 Intel® RAID Expander Card RES2SV240 Characteristics
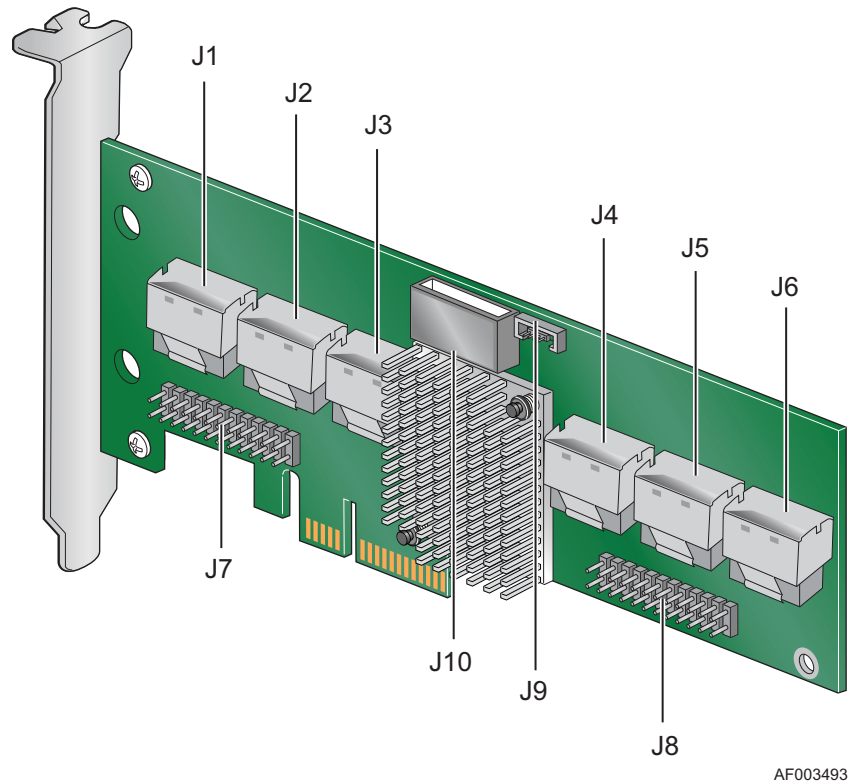
Figure 5. Card Layout

Table 1. Jumper Description

Jumper	Description	Type	Comments
J1 - J6	Internal mini SAS Port Connectors, Ports 0-3, 4-7, 8-11,12-15,16-19 and 20-23		Connection to SAS/SATA devices: • J1 = SAS port (0-3) • J2 = SAS port (4-7) • J3 = SAS port (8-11) • J4 = SAS port (12-15) • J5 = SAS port (16-20) • J6 = SAS port (20-23)
J7 - J8	Discrete Fault LED header	2x12 pin header	Connects to external, green or red LEDs that indicate drive faults, two 2x12 headers can support 24 LEDs
J9	SGPIO connector	4-pin connector	SGPIO out-of-band enclosure management, specifically to be used for Intel® 6-drive hot-swap non-expander SATA/SAS backplane
J10	Power connector	RA 4-pin connector	12V power input from remote power supply
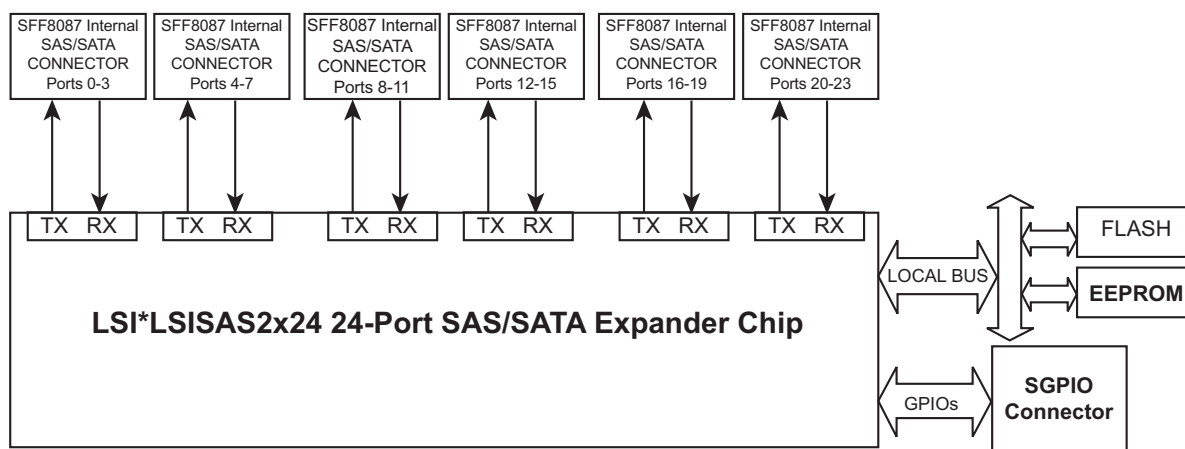
Figure 6. Hardware Block Diagram

Major Components

LSI* LSISAS2x24 24-Port SAS/SATA Expander chip

The LSI* LSISAS2x24 24-Port SAS/SATA Expander chip is a 24-port, 6.0Gb/s Serial Attached SCSI (SAS) expander that enables the connection of up to 24 directly attached SAS or Serial ATA (SATA) devices, and provides table routing to support connections for up to 1024 SAS addresses. Each expander phy is individually configurable and performs SAS and SATA transfers based on the speed of the host or target at either 6.0Gb/s, 3.0Gb/s, or 1.5Gb/s. For more information, see http://www.lsi.com/. The LSI* LSISAS2x24 24-Port SAS/SATA Expander chip provides the following functionality:

- Provides 24 phys
- Semi-Symmetric architecture
    - Any phys may be combined into wide port(s)
    - Any phy can be SAS or SATA attached
- Supports multiple data rates and auto-negotiation between the following:
    - 1.5Gb/s, 3.0Gb/s, and 6.0Gb/s SAS
    - 1.5Gb/s, 3.0Gb/s, and 6.0Gb/s SATA
- Supports SSP, STP, and SMP
- Supports the SAS protocol described in the *Serial Attached SCSI (SAS) Standard, version 2.0*
- Supports SATA as defined in the *Serial ATA: High Speed Serialized AT Attachment Specification, version 2.5*
- Supports SATA II including these features:
- 6.0Gb/s SATA
- Staggered spin-up
- Hot Plug
- Native Command Queuing
- Activity and fault indicators per phy
- Port Selector (for dual-port drives)
- Provides a low-latency connection router to efficiently create and maintain connections
- Supports T10-Based and Phy-Based Zoning for storage partitioning
- PHY[3:0] supports optical links between LSI Gen2 SAS device
- Allows any number of phys to be included in a wide port
- Provides four I2C interfaces: I2C-A, I2C-B, I2C-C, and an I2C interface to an external SEP:

— The I2C interface to the external SEP provides a backwards-compatible interface to an optional external SEP

— All four I2C interfaces can be configured for general-purpose use

— The ARM926 processor can access all four I2C interfaces

- Provides configurable drive spin-up sequencing on a per-phy basis

- Provides programmable Tx and Rx signal polarity for optimization of board routing

- Provides a scalable interface that supports up to 1024 SAS addresses through multiple expanders

- Offers an advanced LED and GPIO interface that provides serial and parallel GPIO capabilities:

— Provides a Serial General-Purpose I/O (SGPIO) interface for remote status indications

— Provides 11 independent GPIO signals

— Provides 72 independent LED signals and two internal port activity indicator signals that can be used as GPIOs

— Provides LEDs that support drive activity, fault, and status indications

- Provides debug capability via either EPP, Serial, or direct 8-bit CPU interface

- Provides external memory support for Flash, NVRAM and PSBRAM

Flash ROM

An 8-MB CFI-compliant flash ROM is used to accommodate expander card firmware.

Diagnostic Components

LED Placement and Function

The Intel® RAID Expander Card RES2SV240 contains the following LEDs:

- One surface-mounted SXP_ACTIVE ("DS3B1") LED (Green Color) to indicate activity of the internal Sxp port operating in any of the supported protocol modes.

- Another surface-mounted EXP_ACTIVE ("DS3B2") LED (Green Color) to indicate activity on the internal SMP or SSP target ports which advertise the Expander's WWN address.

SAS/SATA Connectors

The Intel® RAID Expander Card RES2SV240 provides six internal SFF8087 SAS/SATA signal connectors. Each SFF8087 connector provides support for four SAS/SATA ports. The sideband signals are configured to adhere to the SFF-8485 Specifications for SGPIO support.
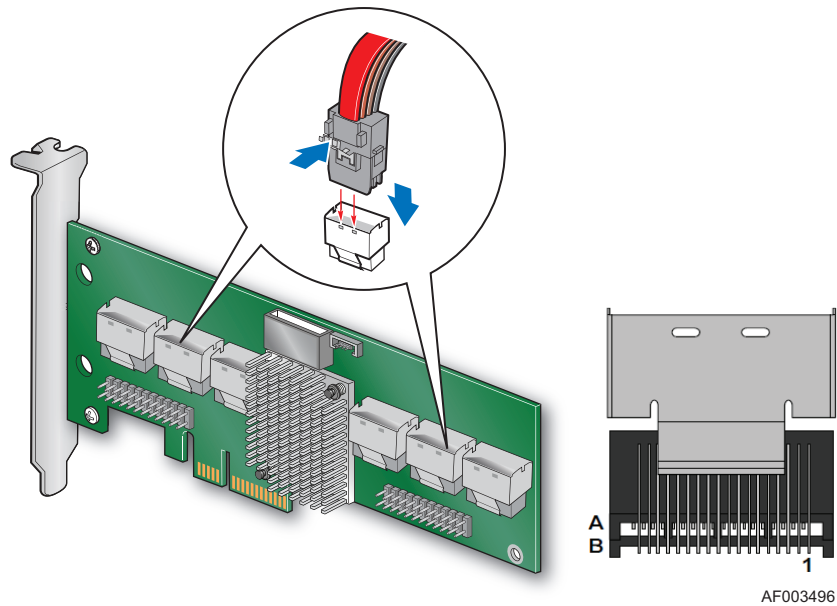
Figure 7. Intel® RAID Expander Card RES2SV240 SAS/SATA Connectors

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.

Each SFF8087 connector on this expander card can be used as input or output connector. Input means the connector is used to connect to initiator device such as RAID controller or RAID module. output means the connector is used to connect to target device such as backplane or hard drive.

Shipment of this expander card only includes long SFF8087 to SFF8087 cables for output usage and short SFF8087 to SFF8087 cables for input usage.

Table 2. SFF8087 to SFF8087 Connector Pin-out

Controller(or backplane) Connector Pin-Out		Expander Connector Pin-Out	
Pin No	Signal	Pin No	Signal
A1	GND	B1	GND
A2	SAS_RX_C_DP<0>	B2	SAS_TX_C_DP<0>
A3	SAS_RX_C_DN<0>	B3	SAS_TX_C_DN<0>
A4	GND	B4	GND
A5	SAS_RX_C_DP<1>	B5	SAS_TX_C_DP<1>
A6	SAS_RX_C_DN<1>	B6	SAS_TX_C_DN<1>
A7	GND	B7	GND
A8	SAS_A_SB_BP_TYPE	B8	SAS_A_SB0
A9	GND	B9	SAS_A_SB1
A10	SAS_A_SB4	B10	GND
A11	SAS_A_SB5	B11	SAS_A_SB_CTRL_TYPE
A12	GND	B12	GND
A13	SAS_RX_C_DP<2>	B13	SAS_TX_C_DP<2>
A14	SAS_RX_C_DN<2>	B14	SAS_TX_C_DN<2>
A15	GND	B15	GND
A16	SAS_RX_C_DP<3>	B16	SAS_TX_C_DP<3>
A17	SAS_RX_C_DN<3>	B17	SAS_TX_C_DN<3>
A18	GND	B18	GND
B1	GND	A1	GND
B2	SAS_TX_C_DP<0>	A2	SAS_RX_C_DP<0>
B3	SAS_TX_C_DN<0>	A3	SAS_RX_C_DN<0>
B4	GND	A4	GND
B5	SAS_TX_C_DP<1>	A5	SAS_RX_C_DP<1>
B6	SAS_TX_C_DN<1>	A6	SAS_RX_C_DN<1>
B7	GND	A7	GND
B8	SAS_A_SB0	A8	SAS_A_SB_BP_TYPE
B9	SAS_A_SB1	A9	GND

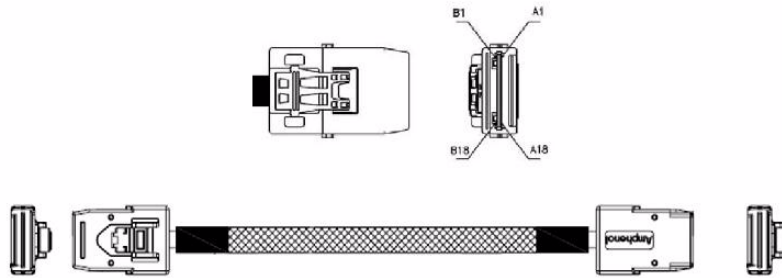| Controller(or backplane) Connector Pin-Out		Expander Connector Pin-Out	
Pin No	Signal	Pin No	Signal
B10	GND	A10	SAS_A_SB4
B11	SAS_A_SB_CTRL_TYPE	A11	SAS_A_SB5
B12	GND	A12	GND
B13	SAS_TX_C_DP<2>	A13	SAS_RX_C_DP<2>
B14	SAS_TX_C_DN<2>	A14	SAS_RX_C_DN<2>
B15	GND	A15	GND
B16	SAS_TX_C_DP<3>	A16	SAS_RX_C_DP<3>
B17	SAS_TX_C_DN<3>	A17	SAS_RX_C_DN<3>
B18	GND	A18	GND

Figure 8. SFF8087 to SFF8087 connector cable

To successfully connect the expander card to supported RAID devices and backplanes, additional cables may be needed. They are not shipped with this expander card, but below introduction provides detailed pin-out specification, so that users would be able to find such cable from market.

In server chassis non-expander backplane that has SGPIO connector on it, following cable is needed: SFF8087 to Four-port Internal Cable with one SGPIO Connector. Check the RAID controller/module and server backplane configuration details from http://www.intel.com/support/motherboards/server/ in order to get more details of whether necessary cables are included and how to configure the cabling. Additional cables may be needed depending on different types of initiator and target devices.

Table 3. SATA Connector to SFF8087 Connector Pin-out

Controller Connector Pin-Out		Expander Connector Pin-Out	
Pin No	Signal	Pin No	Signal
P0_1	GND	A1	GND
P0_2	TX+	A2	SAS_RX_C_DP<3>
P0_3	TX+	A3	SAS_RX_C_DN<3>
P0_4	GND	A4	GND
		B4	GND
P0_5	RX-	B3	SAS_TX_C_DN<3>
P0_6	RX+	B2	SAS_TX_C_DP<3>
P0_7	GND	B1	GND
P1_1	GND	A4	GND
P1_2	TX+	A5	SAS_RX_C_DP<2>
P1_3	TX+	A6	SAS_RX_C_DN<2>
P1_4	GND	A7	GND
		B7	GND
P1_5	RX-	B6	SAS_TX_C_DN<2>
P1_6	RX+	B5	SAS_TX_C_DP<2>
P1_7	GND	B4	GND
7	NC	A8	SAS_A_SB_BP_TYPE
5	NC	A9	GND
3	NC	A10	SAS_A_SB4
1	NC	A11	SAS_A_SB5
8	NC	B8	SAS_A_SB0
6	NC	B9	SAS_A_SB1
4	NC	B10	GND
2	NC	B11	SAS_A_SB_CTRL_TYPE
P2_1	GND	A12	GND
P2_2	TX+	A13	SAS_RX_C_DP<1>
P2_3	TX+	A14	SAS_RX_C_DN<1>
P2_4	GND	A15	GND

Intel® RAID Expander Card RES2SV240 Hardware User's Guide

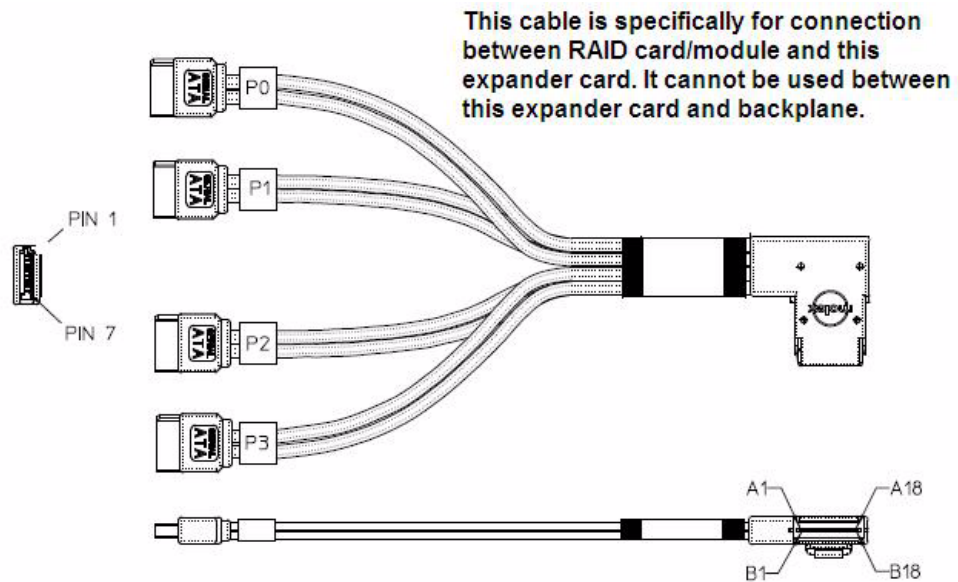| Controller Connector Pin-Out		Expander Connector Pin-Out	
Pin No	Signal	Pin No	Signal
		B15	GND
P2_6	RX+	B13	SAS_TX_C_DP<1>
P2_7	GND	B12	GND
P3_1	GND	A15	GND
P3_2	TX+	A16	SAS_RX_C_DP<0>
P3_3	TX+	A17	SAS_RX_C_DN<0>
P3_4	GND	A18	GND
		B18	GND
P3_5	RX-	B17	SAS_TX_C_DN<0>
P3_6	RX+	B16	SAS_TX_C_DP<0>
P3_7	GND	B15	GND

Figure 9. SATA Connector to SFF8087 Connector Cable

Table 4. SFF8087 (with SGPIO) Connector Pin-out

Expander Connector Pin-Out		Backplane Connector Pin-Out	
Pin No	Signal	Pin No	Signal
A1	GND	P0_7	GND
A2	SAS_RX_C_DP<3>	P0_6	SAS_TX_C_DP<0>
A3	SAS_RX_C_DN<3>	P0_5	SAS_TX_C_DN<0>
B1	GND	P0_4	GND
B2	SAS_TX_C_DP<3>	P0_2	SAS_RX_C_DP<0>
B3	SAS_TX_C_DN<3>	P0_3	SAS_RX_C_DN<0>
B4	GND	P0_1	GND
A4	GND	P1_7	GND
A5	SAS_RX_C_DP<2>	P1_6	SAS_TX_C_DP<1>
A6	SAS_RX_C_DN<2>	P1_5	SAS_TX_C_DN<1>
A7	GND	P1_4	GND
B5	SAS_TX_C_DP<2>	P1_2	SAS_RX_C_DP<1>
B6	SAS_TX_C_DN<2>	P1_3	SAS_RX_C_DN<1>
B7	GND	P1_1	GND
B8	SAS_A_SB0	1	SGPIO_SCLK
B9	SAS_A_SB1	2	SGPIO_SLOAD
B10	GND	4	SGPIO_GND
A9	GND		
A10	SAS_A_SB4	3	SGPIO_SDATAOUT0
A11	SAS_A_SB5		
A8	SAS_A_SB_BP_TYPE		
B11	SAS_A_SB_CTRL_TYPE		
A12	GND	P2_7	GND
A13	SAS_RX_C_DP<1>	P2_6	SAS_TX_C_DP<2>
A14	SAS_RX_C_DN<1>	P2_5	SAS_TX_C_DN<2>
B12	GND	P2_4	GND
B13	SAS_TX_C_DP<1>	P2_2	SAS_RX_C_DP<2>
B14	SAS_TX_C_DN<1>	P2_3	SAS_RX_C_DN<2>
B15	GND	P2_1	GND

Expander Connector Pin-Out		Backplane Connector Pin-Out	
Pin No	Signal	Pin No	Signal
A15	GND	P3_7	GND
A16	SAS_RX_C_DP<0>	P3_6	SAS_TX_C_DP<3>
A17	SAS_RX_C_DN<0>	P3_5	SAS_TX_C_DN<3>
A18	GND	P3_4	GND
B16	SAS_TX_C_DP<0>	P3_2	SAS_RX_C_DP<3>
B17	SAS_TX_C_DN<0>	P3_3	SAS_RX_C_DN<3>
B18	GND	P3_1	GND

This cable is specifically for connection between this expander card and backplane. It cannot be used between RAID card/module and this expander card.
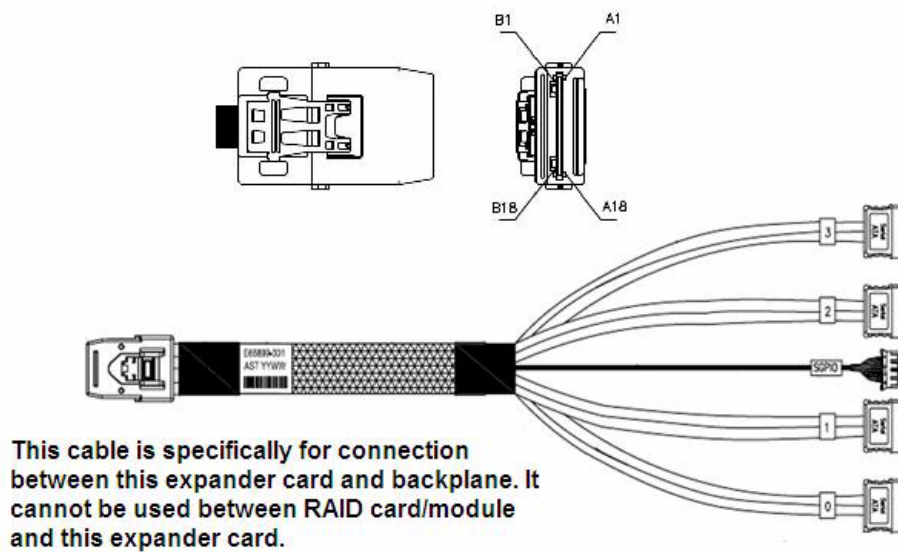
Figure 10. SFF8087 (with SGPIO) Connector Cable

Technical Specifications

Table 5. Technical Specifications

Specification	Intel® RAID Expander Card RES2SV240
Processor	LSI* LSISAS2x24 24-Port Serial Attached SCSI/SATA Expander chip

Specification	Intel® RAID Expander Card RES2SV240
Operating voltage	+12 V
Interface to host	PCI Express* x4 compliant connector only to provide power for the expander card. No other PCI Express* signals are used
SATA bus speed	Upto 6 Gbps per port, point-to-point
SAS/SATA ports	6 x4 internal ports, for both initiator and target devices
Firmware	8 MB in reflashable flash ROM
Compatible devices	• 2.5-inch and 3.5-inch SAS 2.0 or SATA drives • Non disk devices including expanders • Can support drives of mixed capacity • SAS 2.0 host controllers (RAID or Non-RAID)
Enclosure management	SGPIO

Performance Features

Table 6. Performance Features

Specification	Intel® RAID Expander Card RES2SV240
Drive data transfer rate	Upto 6 Gigabit/sec per lane
Maximum queue tags per drive	As many as the drive can accept
Support for multiple initiators	Yes
Performance	Native command queuing

Electrical Characteristics

All power is supplied to the Intel® RAID Expander Card RES2SV240 through the standard PCI Express* x4 connector 12 V rails, or a remote RA 4-pin 12V power connector.

The +12 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. The max operation power is 14.6 W.

Thermal and Atmospheric Characteristics

The thermal and atmospheric characteristics are:

• Relative humidity range: 20% to 80% 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 -30°C to 80°C (dry bulb)
- Relative humidity range: 5% to 90% non-condensing
- MTBF (electrical components) number: 300,000 hours at 40°C

Safety Characteristics

The Intel® RAID Expander Card RES2SV240 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.

Appendix A: 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.
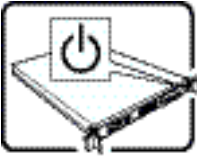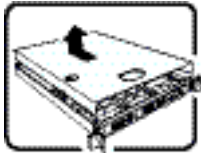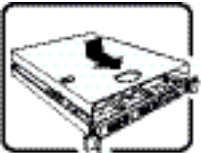
Additional safety guidelines:

- 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://www.intel.com/support/motherboards/server/sb/cs-010770.htm.

	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. 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.
	SAFETY STEPS: Whenever you remove the chassis covers to access the inside of the system, follow these steps: 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.
	After you have completed the six SAFETY steps above, you can remove the system covers. To do this: 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).
	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: 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.
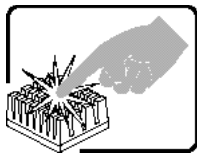
	A microprocessor and heat sink may be hot if the system has been running. Also, there may be sharp pins and edges on some board and chassis parts. Contact should be made with care. Consider wearing protective gloves.

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://www.intel.com/support/motherboards/server/sb/cs-010770.htm.
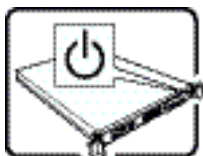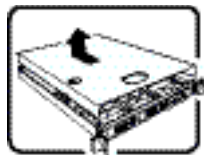
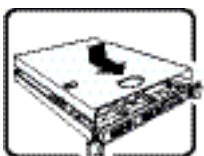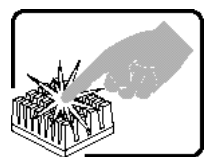|	Der Wechselstrom des Systems wird durch den Ein-/Aus-Schalter für Gleichstrom nicht ausgeschaltet. Ziehen Sie jedes Wechselstrom-Netzkabel aus der Steckdose bzw. dem Netzgerät, um den Stromanschluß des Systems zu unterbrechen.
	Die Stromkabel sind das "Unterbrechungsgerät" zur Hauptstromquelle. Die 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 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.

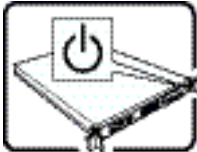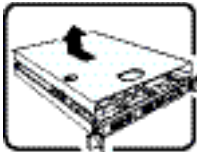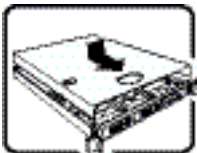|	
	SICHERHEITSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten: 1. Schalten Sie alle an Ihr System angeschlossenen Peripheriegeräte aus. 2. Schalten Sie das System mit dem Hauptschalter aus. 3. Ziehen Sie den Stromanschlußstecker Ihres Systems aus der Steckdose. 4. Auf der Rückseite des Systems 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.
	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://www.intel.com/support/motherboards/server/sb/cs-010770.htm

	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. 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.
	CONSIGNES DE SÉCURITÉ -Lorsque vous ouvrez le boîtier pour accéder à l'intérieur du système, suivez les consignes suivantes: 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.
	Une fois TOUTES les étapes précédentes accomplies, vous pouvez retirer les panneaux du système. Procédez comme suit: 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.
	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: 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.
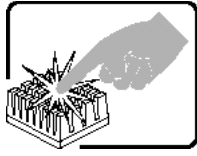
	Le microprocesseur et le dissipateur de chaleur peuvent être chauds si le système a été sous tension. Faites également attention aux broches aiguës des cartes et aux bords tranchants du capot. Nous vous recommandons l'usage de gants de protection.

Español

Lea todas las declaraciones de seguridad y precaucion 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://www.intel.com/support/motherboards/server/sb/cs-010770.htm
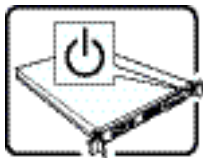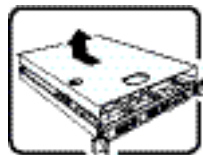
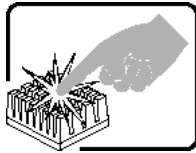|	
	Nótese que el interruptor activado/desactivado en el panel frontal no desconecta la corriente alterna del sistema. Para desconectarla, deberá desenchufar todos los cables de corriente alterna de la pared o desconectar la fuente de alimentación. Estos cables actúan como dispositivo de desconexión. 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 sujetada 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.
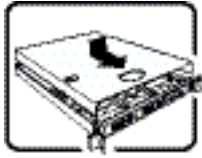
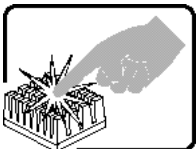|	Para obtener un enfriamiento y un flujo de aire adecuados, reinstale siempre las tapas del chasis antes de poner en marcha el sistema. Si pone en funcionamiento el sistema sin las tapas bien colocadas puede dañar los componentes del sistema. Para instalar las tapas:
	1. Asegúrese primero de no haber 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
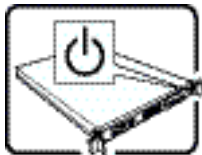
	L'interruttore attivato/disattivato nel pannello anteriore non interrompe l'alimentazione in c.a. del sistema. Per interromperla, è necessario scollegare tutti i cavi di alimentazione in c.a. dalle prese a muro o dall'alimentazione di corrente.
	Il cavo è considerato il dispositivo d'interruzione dell'alimentazione principale (in c.a.). La presa alla quale si collega il sistema deve essere installata vicino all'unità e deve essere facilmente accessibile.

	PASSI DI SICUREZZA: Qualora si rimuovano le coperture del telaio per accedere all'interno del sistema, seguire i seguenti passi: 1. Spegnere tutti i dispositivi periferici collegati al sistema. 2. Spegnere 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.
	Dopo aver seguito i sei passi di SICUREZZA sopracitati, togliere le coperture del telaio del sistema come seque: 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.
	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: 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 prolunghe AC del sistema.
	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.

Appendix B: Regulatory and Certification Information

Product Safety and EMC Compliance

This Intel® Expander Card 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.