

Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 Hardware User's Guide

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Preface

This is the primary hardware guide for the Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040, 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 under the link for this Intel® Integrated RAID module at http://www.intel.com/p/en_US/support/server.

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 planning to use an Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 as a part of their RAID system.
- Anyone installing an Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 in their RAID system.

Organization

This document includes the following chapters and appendices:

- Chapter 1 provides a general overview of the Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040.
- Chapter 2 describes the procedures for installing and configuring the RAID modules.
- Chapter 3 provides the characteristics and technical specifications for the Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040.
- Appendix A explains drive roaming and drive migration.
- 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 available under the link for this Intel® Integrated RAID module at http://www.intel.com/p/en_US/support/server.

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1 Overview

The Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 provide 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 large capacity storage needs of mid to low-end servers and workstations for use by workgroups and departmental-sized organizations or individuals. The Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 offer a cost-effective way to implement RAID in a server for internal storage.

As the third generation PCI Express* storage adapters, the Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 address the growing demand for increased data throughput and scalability requirements across mid to low-end servers and workstations.

The controller can be connected to up to four drives (RMS25KB040 and RMS25JB040) or eight drives (RMS25KB080 and RMS25JB080) 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, 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® Integrated RAID Module RMS25KB0x0 and RMS25JB0x0

The Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 are intelligent RAID adapter based on the LSI* SAS2308 PCI* Express-SAS/SATA I/O Processor chip, providing both a SAS controller and RAID engine. With four independent ports (RMS25KB040 and RMS25JB040) or eight independent ports (RMS25KB080 and RMS25JB080) supporting 6Gb/s and 3Gb/s SAS data transfers using one or two SFF-8087 mini multi-lane connectors, the controllers support enterprise-class SAS or SATA devices. Drives not configured as part of a RAID array can be configured as “pass through” drives in Non-RAID mode.

Intel® Integrated RAID Module RMS25KB080 and RMS25KB040 are custom low-profile RAID adapters and the PCI Express* connector fits into an x8 or x16 PCI Express* slot capable of performance up to 8 Gb/s per lane.

Intel® Integrated RAID Module RMS25JB080 and RMS25JB040 are custom board-to-board PCI Express* 3.0 compliant interface RAID adapters and the PCI Express* connector fits into a 80 pin connector capable of performance up to 8 GT/s per lane.

The RAID modules are designed to fit various Intel® Server Boards and systems. For the most up-to-date support list, see the Compatibility section under the link for these Intel® Integrated RAID Modules at http://www.intel.com/p/en_US/support/server.

Protocol Support

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

- Serial SCSI Protocol (SSP) to enable communication with other SAS devices.
- SATA II Protocol to enable communication with other SATA II 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 II through expander interfaces.

Operating System Support

- Windows Server 2008 R2*, Windows 7*, Windows Server 2003*, Windows Vista*
- Red Hat* Enterprise Linux 5.0, and 6.0
- SuSE* Linux Enterprise Server 10 and 11
- VMWare* ESX 4.0

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>.

To make sure the RAID module supports your operating system, see also the *Tested Hardware and Operating System List* for the Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040.

Usability

- The the Intel® Integrated RAID Module RMS25KB080 and RMS25KB040 ship with both a standard and a low-profile bracket.
- 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, 1E, and 10.
- 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.
- Allows for staggered spin-up, hot-plug, and lower power consumption.

Redundancy and Error Handling

- Sideband SGPIO Enclosure management support.
- Activity and fault indicators per drive.
- 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

- Provides eight independent phys, each supporting 6Gb/s and 3Gb/s SAS data transfers per PHY.
- Scalable interface that supports up to 244 physical devices through expanders.
- 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 2.0-compliant hard disk drives.

2 Intel® Integrated RAID Module RMS25KB0x0 and RMS25JB0x0 Hardware Installation

Requirements

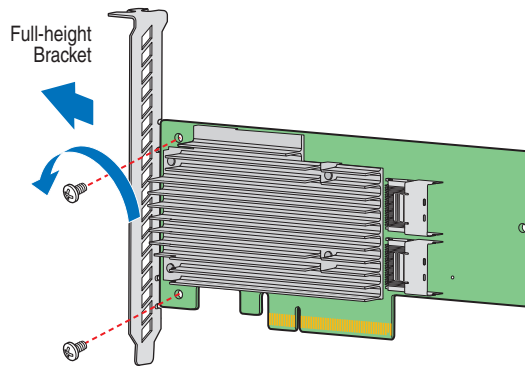
- Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 or RMS25JB040 (SAS/SATA cables need to be prepared separately).
- A supported host system with an available x8 or x16 PCI-Express* slot for RMS25KB080 and RMS25KB040, or an available SAS Module Connector for RMS25JB080 and RMS25JB040.
- Resource CD, which contains drivers and documentation.
- SAS or SATA hard drives up to 6Gb/s speed.
- SAS/SATA cable accessory kit, which can be ordered from Intel separately. Please see the Tested Operating System List for available cable accessory kits at http://www.intel.com/p/en_US/support/server.

***Note:** Intel Corporation strongly recommends using an uninterruptible power supply (UPS). The Resource CD is shipped with systems or boards that support Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 or RMS25JB040.*

Installing the Intel® Integrated RAID Module RMS25KB0x0

To install the RAID module, follow these steps:

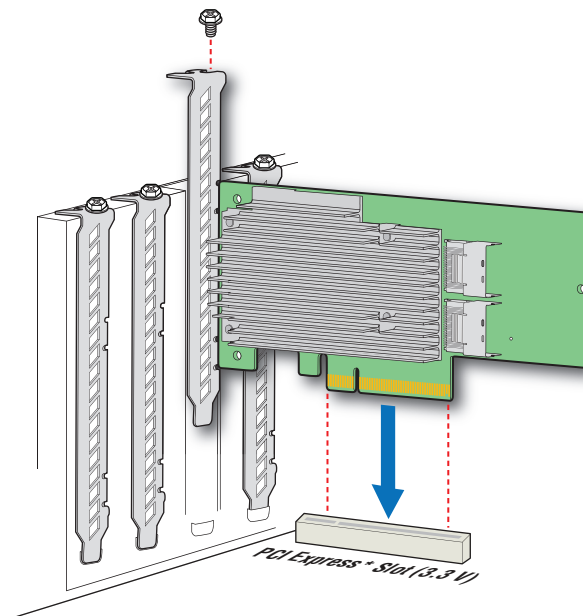
1. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).
2. Remove the server cover. For instructions, see your server system documentation.
3. If necessary, change the bracket on the RAID module to fit the height of the server system (see [Figure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



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Figure 1. Changing the Bracket

4. Install the RAID module 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.



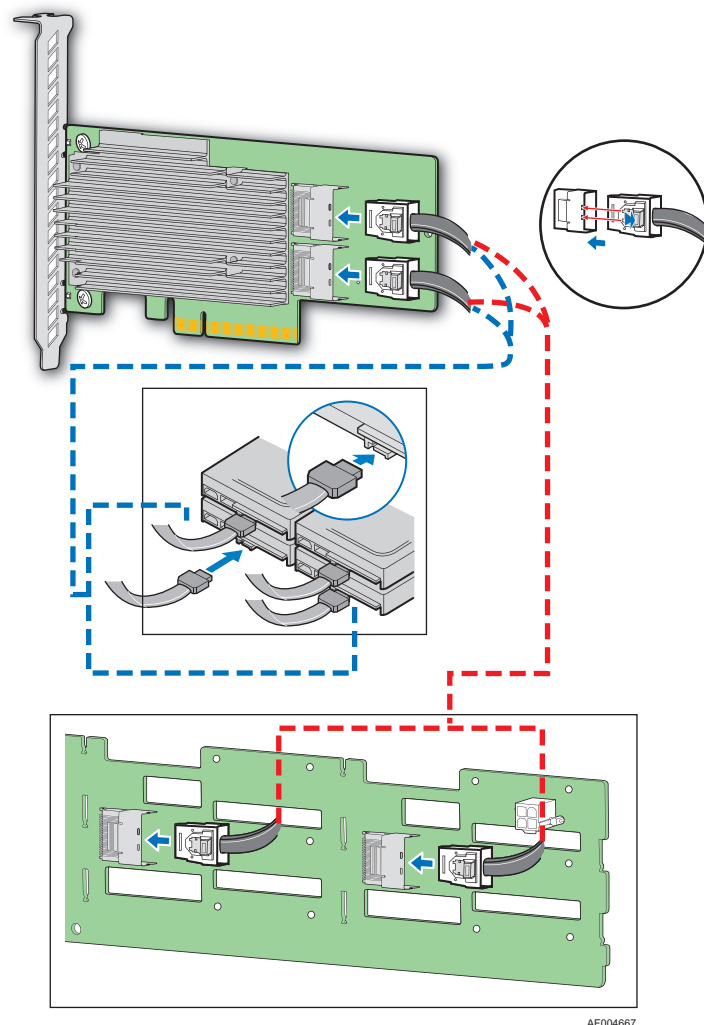
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Figure 2. Installing the Intel® Integrated RAID Module RMS25KB0x0

5. Connect the proper cables into the adapter using the 4-port combined end. Make sure the module and cables are properly attached and plug the cable into connector at the inside edge of the adapter.

Note: 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 module and cables are all properly attached.



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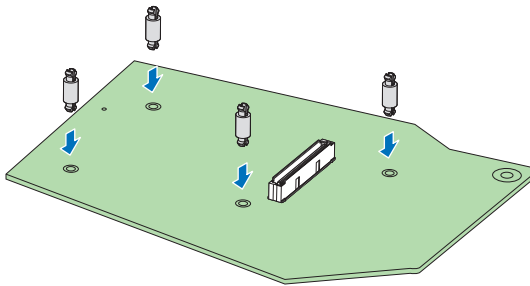
Figure 3. Connecting Cable between the RAID Module and Drives/Backplane

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

Installing the Intel® Integrated RAID Module RMS25JB0x0

To install the RAID module, 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. Insert the three barrel standoffs into the matching holes in the server board. To locate the matching module card slot on your server board, see your server board documentation. The Intel® Server Board S2600IP is shown for illustrative purpose. Actual standoff hole locations could be different (see [Figure 1](#)).



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Figure 4. Installing the Barrel Standoff

4. Attach the RAID to the matching server board connector, and press the module card firmly to engage the barrel standoffs installed in step 3 (see [Figure 3](#)). Press down gently but firmly to ensure that the card is properly seated in the connectors, and then insert the four pin standoffs into the barrel standoffs respectively. The Intel® RAID Module RMS25KB080 is shown for illustrative purpose (see [Figure 5](#)).

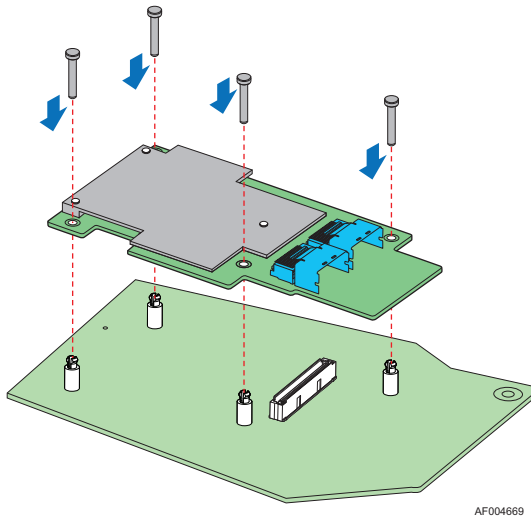


Figure 5. Installing the Intel® Integrated RAID Module RMS25JB0x0

5. Connect the proper cables into the adapter using the 4-port combined end. Make sure the module and cables are properly attached and plug the cable into connector at the inside edge of the adapter.

Note: 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 module and cables are all properly attached.

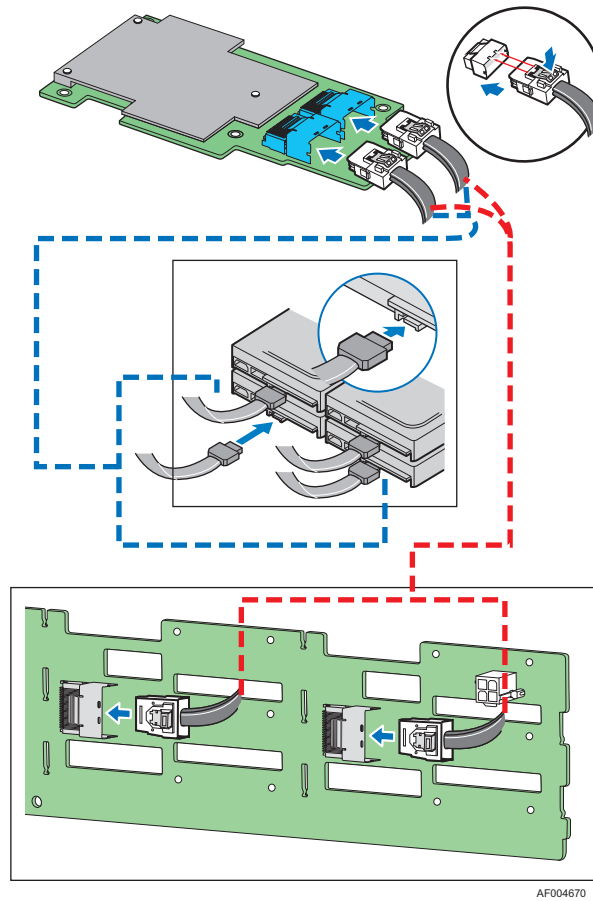


Figure 6. Connecting Cable between the RAID Module and Drives/Backplane

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

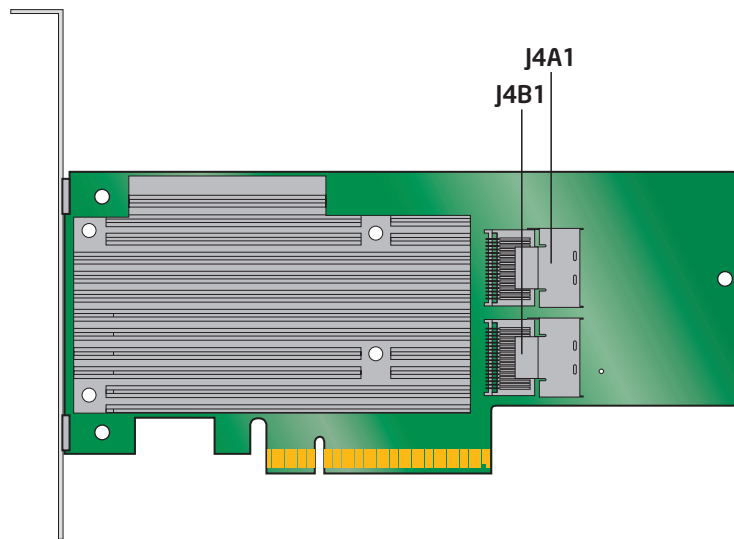
Configuring the RAID Module

After performing the Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 or RMS25JB040 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 configuration options and instructions for the Intel® RAID Module RMS25KB080, RMS25KB040, RMS25JB080 or RMS25JB040, as well as detailed installation instructions for operating system drivers.

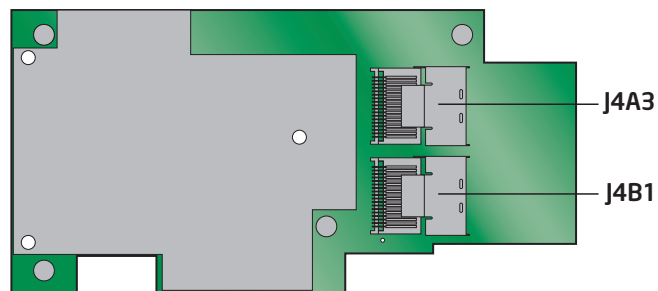
Replacing a Module

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

3 Intel® Integrated RAID Module RMS25KB0x0 and RMS25JB0x0 Characteristics



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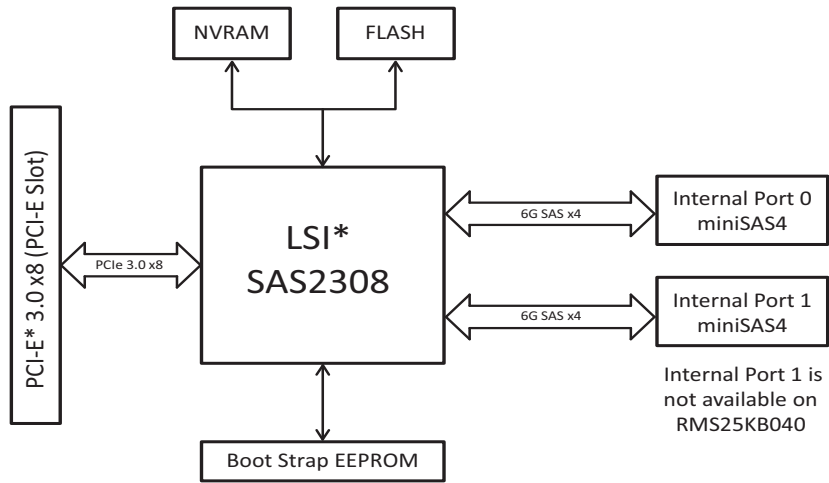


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Figure 7. Card Layout

Table 1. Jumper Description

Jumper/ Connector	Type	Description
J4B1	x4 SAS Ports 4-7 internal connector	SFF-8087 mini SAS 4i internal connector. Connects the controller by cable to SAS/SATA devices J4B1 (Ports 4-7) is only available on Intel® Integrated Module RMS25KB080 and RMS25JB080.
J4A1 and J4A3	x4 SAS Ports 0-3 internal connector	SFF-8087 mini SAS 4i internal connector. Connects the controller by cable to SAS/SATA devices.



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Figure 8. Intel® Integrated RAID Module RMS25KB0x0

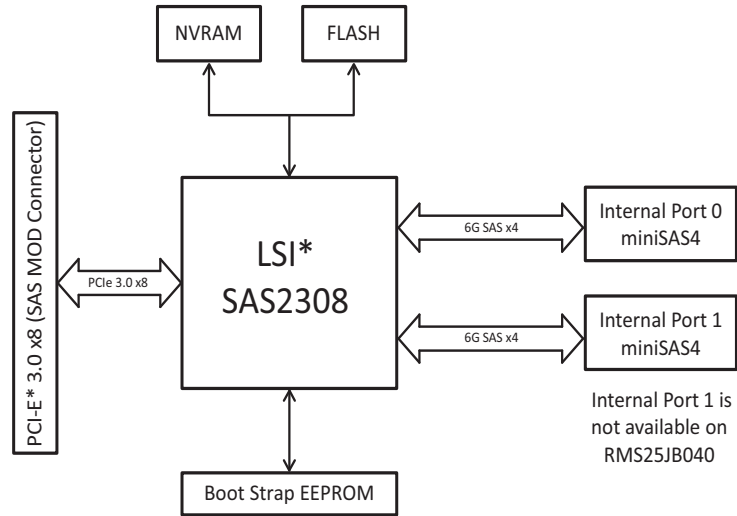


Figure 9. Intel® Integrated RAID Module RMS25JB0x0

Major Components

LSI* LSISAS2308 Processor Chip

The LSI* LSISAS2308 Processor Chip provides the following functionality:

- x8 PCI Express* bus operating at 5.0 Gb/s serial transfer rate
- SAS/SMP/STP/SATA support
- Supports SAS and SATA devices
- Initiator and Target mode (SSP)
- Supports narrow ports and wide ports
- PCI Express* interface supports x8, x4, and x1 lane configurations

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

Note: Some of these chip features may not be supported by Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 or RMS25JB040.

Flash ROM

An 16-MB CFI-compliant flash ROM is used to accommodate RAID firmware and RAID BIOS Console 2 OpROM.

Boot Strap ROM (SEEPROM)

The serial bootstrap ROM is used to configure the LSI* LSISAS2308 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.

NVSRAM

A 32-KB NVSRAM is used to store disk and drive setup information.

Diagnostic Components

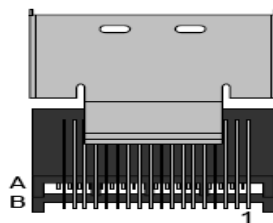
LED Placement and Function

The Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 contain the following LEDs:

- One surface-mounted heartbeat LED (Green Color) to indicate SAS2208 activity.
- Another two surface-mounted system error LEDs (Amber Color) to indicate a board error.

SAS/SATA Connectors

The Intel® Integrated RAID Module RMS25KB080 and RMS25JB080 provide two internal SFF8087 SAS/SATA signal connectors. The Intel® Integrated RAID Module RMS25KB040 and RMS25JB040 provide one internal SFF8087 SAS/SATA signal connector. 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.



Internal connector

Figure 10. Internal SFF8087 SAS/SATA signal 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. 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	Port 1
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	

Note: The RAID controller in this document doesn't ship with SAS/SATA cables. Users can separately order the SAS/SATA cable accessory kit as needed. Please see the Tested Operating System List for available cable accessory kits at http://www.intel.com/p/en_US/support/server/.

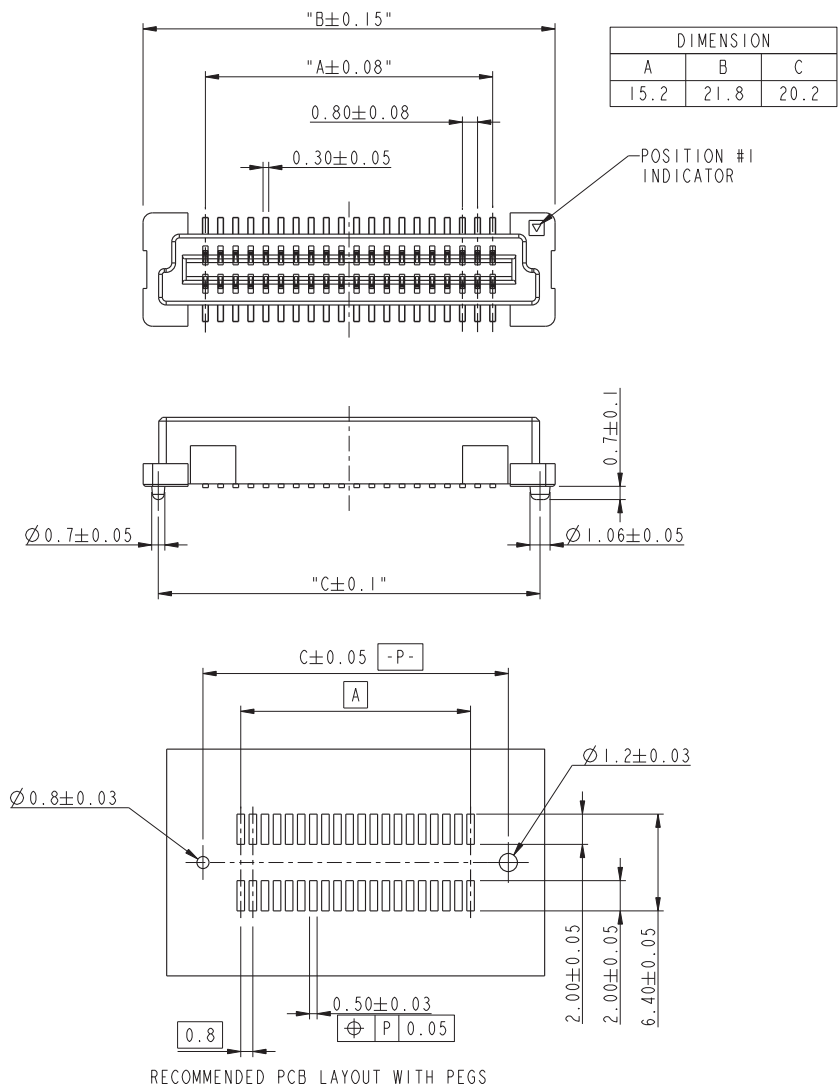
PCI Interface

Intel® Integrated RAID Module RMS25KB080 and RMS25KB040 must be installed into a standard x8 or larger PCI Express* slot that complies with the PCI Express Specification, Revision 3.0. The controller is PCI Express* 1.0 and 2.0 compatible and is backward-compatible with x8 or larger slots that are wired with x1, x2, and x4 PCI Express* lanes.

Note: The modules will support PCI Express* Revision 3.0 at post launch.

Host Board Interface

Intel® Integrated RAID Module RMS25JB080 and RMS25JB040 board interface with the host system through one custom board-to-board interface that implements one x8 PCI Express* lanes signaling as defined in the *PCI Express Specification 3.0*. These interfaces also provide +3.3 V power to the board.



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Figure 11. PCI Interface

Table 3. Host Board Interface Connector Pin-Out

Pin #	Description	Pin #	Description
1	RSVD_SE	2	GND
3	GND	4	PCIe Gen3 Rp [0]
5	PCIe Gen3 Tp [0]	6	PCIe Gen3 Rn [0]
7	PCIe Gen3 Tn [0]	8	GND
9	GND	10	PCIe Gen3 Rp [1]
11	PCIe Gen3 Tp [1]	12	PCIe Gen3 Rn [1]
13	PCIe Gen3 Tn [1]	14	GND
15	GND	16	PCIe Gen3 Rp [2]
17	PCIe Gen3 Tp [2]	18	PCIe Gen3 Rn [2]
19	PCIe Gen3 Tn [2]	20	GND
21	GND	22	PCIe Gen3 Rp [3]
23	PCIe Gen3 Tp [3]	24	PCIe Gen3 Rn [3]
25	PCIe Gen3 Tn [3]	26	GND
27	GND	28	PCIe Gen3 Rp [4]
29	PCIe Gen3 Tp [4]	30	PCIe Gen3 Rn [4]
31	PCIe Gen3 Tn [4]	32	GND
33	GND	34	PCIe Gen3 Rp [5]
35	PCIe Gen3 Tp [5]	36	PCIe Gen3 Rn [5]
37	PCIe Gen3 Tn [5]	38	GND
39	GND	40	PCIe Gen3 Rp [6]
41	PCIe Gen3 Tp [6]	42	PCIe Gen3 Rn [6]
43	PCIe Gen3 Tn [6]	44	GND
45	GND	46	PCIe Gen3 Rp [7]
47	PCIe Gen3 Tp [7]	48	PCIe Gen3 Rn [7]
49	PCIe Gen3 Tn [7]]	50	GND
51	GND	52	rSASm REFCLK- [0]
53	SMB DAT	54	rSASm REFCLK+ [0]
55	SMB CLK	56	GND

Pin #	Description	Pin #	Description
57	GND	58	PERST#
59	RSVD_DN	60	WAKE#
61	RSVD_DP	62	FM_rINTm_PRESENT_N
63	GND	64	LED_HDD_N
65	RSVD_DN	66	3.3VSTBY
67	RSVD_DP	68	FM_rINTm_MODULE_EN
69	GND	70	5VSB
71	RSVD_SE	72	FRU/TEMP ADDR [A0]
73	3.3V	74	12V
75	3.3V	76	12V
77	3.3V	78	12V
79	3.3V	80	12V

Mechanical Overview

The following figures display the Intel® Integrated RAID Module RMS25JB040 and RMS25JB080 dimensions.

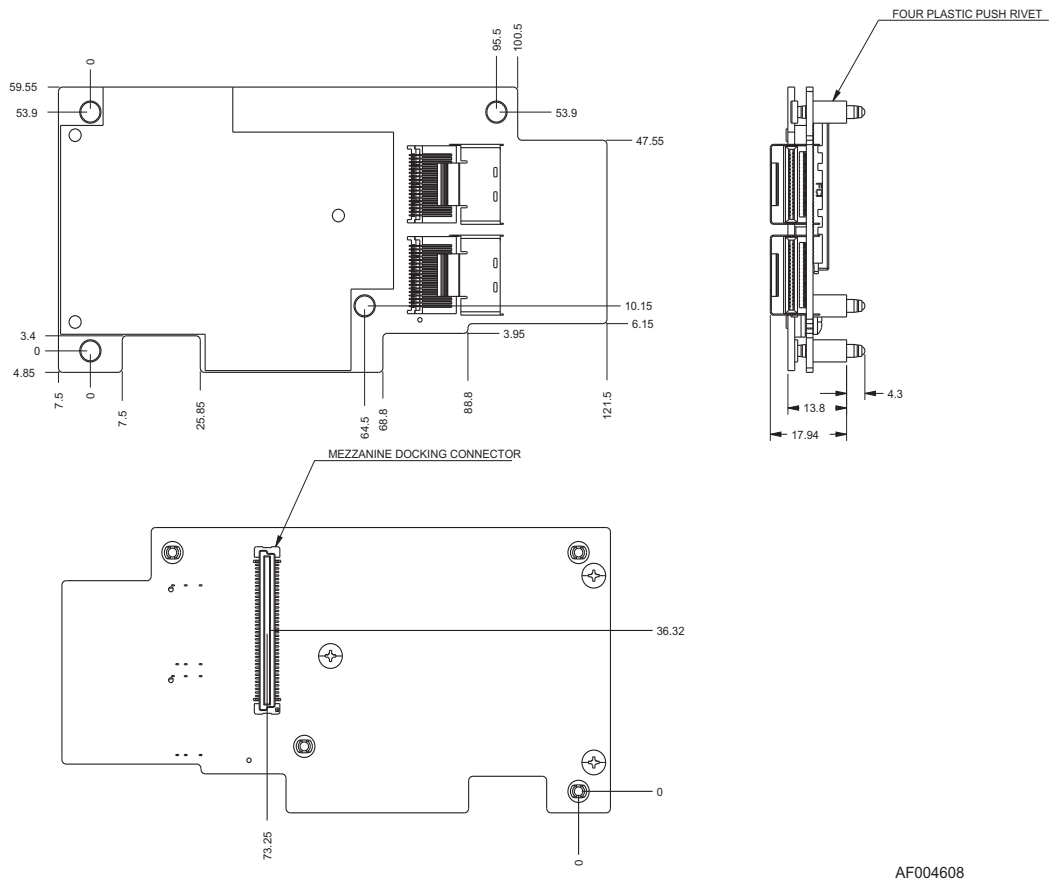


Figure 12. Mechanical Drawing for Intel® Integrated RAID Module RMS25JB0x0

Technical Specifications

Table 4. Technical Specifications

Specification	Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040
Processor	LSI* LSISAS2308 PCI* Express-SAS/SATA I/O Processor chip, 800MHz
Operating voltage	+3.3 V, +12 V

Specification	Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040
Card size	RMS25KB040 and RMS25KB080: 2.713 inch x 6.600 inch (Low-profile) RMS25JB040 and RMS25JB080: See Intel® Integrated RAID Module RMS25JB0x0 Mechanical overview
Array interface to host	PCI Express* Revision 3.0, x8 lane width 8.0 Gbps Note: <i>PCI Express* Revision 3.0 will be supported at post launch.</i>
SAS/SATA bus speed	Up to 6 Gbps per port, point-to-point.
SAS/SATA ports	<ul style="list-style-type: none"> • 2x4 internal port (RMS25KB080 and RMS25JB080) • 1x4 internal port (RMS25KB040 and RMS25JB040)
Physical and virtual drive support	Up to 256 physical drives including up to 10 physical drives per RAID array. Up to 2 RAID arrays per controller. Drives not configured as part of a RAID array can be configured as “pass through” drives in Non-RAID mode.
Firmware	16 MB in reflashable flash ROM
Compatible devices	<ul style="list-style-type: none"> • 2.5-inch and 3.5-inch SAS 2.0 or SATA III • Non disk devices including expanders • Can support drives of mixed capacity
Cabling	<ul style="list-style-type: none"> • Small, thin cables that do not restrict airflow • Shared connectors for multiple drives
Redundant configuration	32 KB NVRAM and config-on-disk (COD)
Enclosure management	SGPIO
Enclosure support	Assumes one SEP per enclosure.

Array Performance Features

Table 5. Array Performance Features

Specification	Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040
Host data transfer rate	Upto 8.0 Gigatransfer/sec per PCI Express* lane
Drive data transfer rate	Upto 6.0 Gigabit/sec per PHY
Maximum scatter/gather	80 elements
Maximum queue tags per drive	As many as the drive can accept
Stripe sizes	64 KB
Background services	Rebuild
Cache options	Disk Cache

Fault Tolerance

Table 6. Fault Tolerance Features

Specification	Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040
Drive Replacement	<ul style="list-style-type: none">• Auto detection of failure• Hot-plug• Hot-swap
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	<ul style="list-style-type: none">• Parity generation and checking• Activity and fault LEDs

Electrical Characteristics

All power is supplied to the adapter via the PCI Express 3.3V and 12V rail. Necessary Voltages are provided by onboard switching regulator circuitry operating off of 12V and 3.3V rails.

Thermal and Atmospheric Characteristics

The maximum board temperature is limited by the LSI SAS2308 IO Processor since it uses the most power and will be the hottest component on the board.

- SAS2308 maximum junction temperature: 115°C
- Ambient temperature: maximum 60°C
- Airflow over SAS2308: 200 ft/min
- Environmental humidity: 20% to 80% non-condensing
- MTBF: greater than 300,000 hours

Safety Characteristics

The bare PC board shall meet or exceed the requirements of UL flammability rating V0. The bare PC board shall also be marked with the supplier's name or trademark, type, and UL flammability rating. The maximum electrical potential on the board will be 12.96V potential difference, referenced from ground to +12V.

Operating Certifications

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

Supported Device Technology

The various device technologies supported by the Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 is described in the subsections that follow.

Support for Hard Disk Drive Devices

Intel[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 integrates four or eight internal high-performance SAS/SATA III 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[®] Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 supports LSI* expanders, Vitesse SAS expanders, and PMC expanders that are used as a component in Intel and 3rd party enclosures. Other expanders may be supported post launch, based on market conditions and customer requirements.

Support for Non-Hard Disk Drive Devices

Selected non-hard drive devices are supported for use with this module. For information on support for non-hard drive devices, see this RAID module's Tested Hardware and Operating System List.

Enclosure Management Support

The Intel® Integrated RAID Module RMS25KB080, RMS25KB040, RMS25JB080 and RMS25JB040 support the internal SAS sideband signal SFF-8485 (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.

Appendix A: Drive Roaming

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:

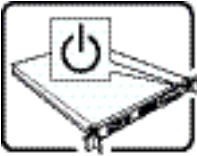

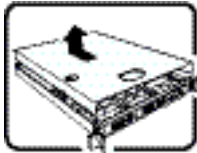
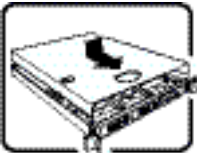
- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnect the cable. As you pull connectors apart, keep them evenly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

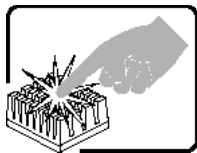
Protecting against electrostatic discharge

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

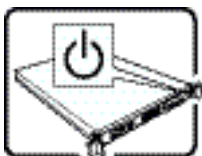
	<p>The power button on the system does not turn off system AC power. To remove AC power from the system, you must unplug each AC power cord from the wall outlet or power supply.</p> <p>The power cord(s) is considered the disconnect device to the main (AC) power. The socket outlet that the system plugs 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://www.intel.com/support/motherboards/server/sb/cs-010770.htm>.



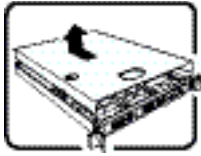
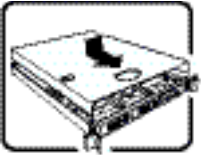
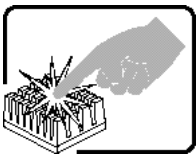
Der Wechselstrom des Systems wird durch den Ein-/Aus-Schalter für Gleichstrom nicht ausgeschaltet. Ziehen Sie jedes Wechselstrom-Netzkabel aus der Steckdose bzw. dem Netzgerät, um den Stromanschluß des Systems zu unterbrechen.

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.





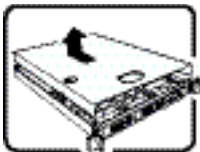
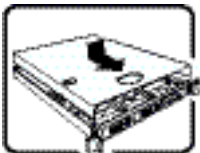
SICHERHEITSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:

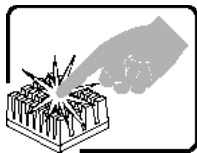
1. Schalten Sie alle an Ihr System angeschlossenen Peripheriegeräte aus.
2. Schalten Sie das System mit dem Hauptschalter aus.
3. Ziehen Sie den Stromanschlußstecker Ihres Systems aus der Steckdose.
4. Auf der Rückseite des Systems beschrifteten und ziehen Sie alle Anschlußkabel von den I/O Anschlüssen 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.

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

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>.

	<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. Veá 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>.



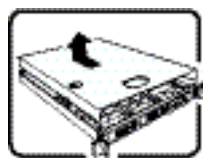
Nótese que el interruptor activado/desactivado en el panel frontal no desconecta la corriente alterna del sistema. Para desconectarla, deberá desenchufar todos los cables de corriente alterna de la pared o desconectar la fuente de alimentación.

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



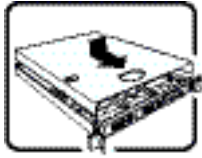
INSTRUCCIONES DE SEGURIDAD: Cuando extraiga la tapa del chasis para acceder al interior del sistema, siga las siguientes instrucciones:

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 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.



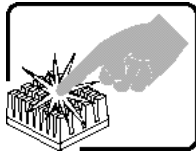
Después de completar las seis instrucciones de SEGURIDAD mencionadas, ya puede extraer las tapas del sistema. Para ello:

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.



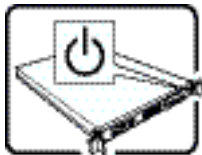
Para obtener un enfriamiento y un flujo de aire adecuados, reinstale siempre las tapas del chasis antes de poner en marcha el sistema. Si pone en funcionamiento el sistema sin las tapas bien colocadas puede dañar los componentes del sistema. Para instalar las tapas:

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.




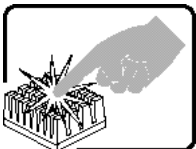
Si el sistema ha estado en funcionamiento, el microprocesador y el disipador de calor pueden estar aún calientes. También conviene tener en cuenta que en el chasis o en el tablero puede haber piezas cortantes o punzantes. Por ello, se recomienda precaución y el uso de guantes protectores.

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 prolunghe 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

These Intel® RAID Modules have 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.

