Intel® Integrated RAID Module SROMBSASMR (AXXROMBSASMR) Hardware User's Guide

Intel Order Number: E58607-004

DISCLAIMER

Preface

This is the primary hardware guide for the Intel® Integrated RAID Module SROMBSASMR (also known as Intel® Integrated RAID Controller SROMBSASMR), which can be used to manage SAS and SATA disk drives. It contains installation instructions and specifications.

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

Audience

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

- Engineers who are designing an Intel® Integrated RAID Module SROMBSASMR for their RAID system.
- Anyone installing an Intel® Integrated RAID Module SROMBSASMR 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 SROMBSASMR.
- Chapter 2 describes the procedures for installing and configuring the RAID module.
- Chapter 3 provides the characteristics and technical specifications for the Intel® Integrated RAID Module SROMBSASMR.
- 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 included on the Resource CD that shipped with the RAID module.

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1 Overview

The Intel® Integrated RAID Module SROMBSASMR (also known as Intel® Integrated RAID Controller SROMBSASMR) is a high-performance intelligent custom board-to-board PCI Express* SAS/SATA RAID module that offers reliability, high performance, and fault-tolerant disk subsystem management. This is a RAID solution that meets the internal storage needs of workgroup, department, or enterprise systems to use cost-effective SATA or high performance SAS media.

As a third generation PCI Express* storage controller, the Intel® Integrated RAID Module SROMBSASMR addresses the demand for increased data throughput and scalability requirements across entry level, midrange, and enterprise server platforms.

The controller can be connected to up to four drives directly and allows the use of expanders to connect to additional drives. For more information about the use of expanders, see the *ANSI SAS Standard, version 1.0 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.

The optional Intel® RAID Smart Battery AXXRSBBU3 provides cached data protection for the RAID module, even during system failures.

Benefits of SAS and SATA

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

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

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

Intel® Integrated RAID Module SROMBSASMR

The Intel® Integrated RAID Module SROMBSASMR is an intelligent custom board-to-board PCI Express* interface RAID adapter with an integrated LSI* 1078 RAID-On-Chip chipset, providing both a SAS controller and RAID engine. With 128 MB RAM built onto the board and four internal ports with four individual SAS/SATA connectors, this controller supports up to 16 enterprise-class SAS or SATA devices and 64 logical drives. The proprietary PCI Express* connector fits into a 50-pin connector capable of 2.5 Gbps per lane over PCI Express* x4 with a 3.0 Gbps point-to-point transfer rate.

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

- Intel® Server Board S5520UR
- Intel® Server system SR2612UR
- Intel® Server System SR1690WB
- Intel® Server Board S3420GPLX
- Intel® Server Board S5520HC/S5500HCV
- Intel® Workstation Board S5520SC
- Intel® Server Board S5500WB

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

The SAS controller supports the *ANSI Serial Attached SCSI (SAS) Standard, Version 1.0* and the Serial ATA (SATA) protocol defined by the *Serial ATA Specification, Version 1.0a*.

Protocol Support

- Serial SCSI Protocol (SSP): Communication with other SAS devices.
- SATA II Protocol: Communication with other SATA II devices.
- Serial Management Protocol (SMP): Topology management information sharing with expanders.
- Serial Tunneling Protocol (STP): Support for SATA II through expander interfaces.

Operating System Support

- Windows Server 2008*, Windows Server 2003*, Windows Vista*, Windows XP*.
- Red Hat* Enterprise Linux 4.0, and 5.0.
- SuSE* Linux Enterprise Server 9 and 10.

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

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 SROMBSASMR.

Usability

- Small, thin cabling with serial point-to-point 3.0 Gbps data transfer rates.
- Support for non-disk devices and mixed capacity drives.
- Support for intelligent XOR RAID levels 0, 1, 5, 6, 10, 50, and 60.
- Dedicated or global hot spare with auto rebuild if an array drive fails.
- User defined stripe size per drive: 8, 16, 32, 64, 128, 256, 512, or 1024 KB.
- Advanced array configuration and management utilities provide:
  - Online Capacity Expansion (OCE) adds space to existing drive or new drive. See Appendix A: Drive Roaming and Drive Migration Install for limitations on OCE and RAID migration.
  - Online RAID level migration (upgrade of RAID mode may require OCE)
  - Drive migration
  - Drive roaming
  - No reboot necessary after expansion
- Upgradeable Flash ROM interface.
- Allows for staggered spin-up, hot-plug, and lower power consumption.
- User specified rebuild rate (percent of system resources to use from 0-100%).

  Caution: *Exceeding 50% rate may cause operating system errors due to waiting for controller access.*

- Background operating mode can be set for Rebuilds, Consistency Checks, Initialization (auto restarting Consistency Check on redundant volumes), Migration, OCE, and Patrol Read.

Redundancy and Error Handling

- In-band and out-of-band SES2.
- Enclosure management support.
- Fault indicators per drive.
- Drive coercion (auto-resizing to match existing disks).

- Auto-detection of failed drives with transparent rebuild. There must be disk activity (I/O to the drive) for a missing drive to be marked as failed.

- Auto-resume of initialization or rebuild on reboot (the Auto Rebuild feature must be enabled before virtual disk creation).

- Smart initialization automatically checks consistency of virtual disks if there are five or more disks in a RAID 5 array, which optimizes performance by enabling read-modify-write mode. RAID 5 arrays of only three or four drives use Peer Read mode.

- Smart Technology predicts failures of drives and electronic components.

- Patrol Read checks drives and maps bad sectors.

- Commands are retried at least four times.

- Firmware provides best effort to recognize an error and recover if possible.

- Failures are logged from controller and drive firmware, and SMART monitor.

- Failures are logged in NVRAM, viewable from OS Event Log, Intel® RAID Web Console 2, CIM, and LEDs.

- Multiple cache options allow configuration-specific performance optimization:

  — Write-back: Faster because it does not wait for the disk but data will be lost if power is lost.

  — Write-through: Usually slower but ensures data is on the disk.

  — Read Ahead: Predicts next read will be sequential and buffers this data into the cache.

  — Non Read Ahead: Always reads from the drive after determining exact location of each read.

  — Adaptive Read Ahead: Reads ahead and caches data only if doing sequential reads.

  — I/O setting. Determines whether read operations check the cache before reading from disks.

    ✧ Cache I/O: Checks cache first, only reads disk if data is not in the cache.

    ✧ Direct I/O: Reads data directly from disk. (not cache)

- Redundancy through:

  — Configuration stored in non-volatile RAM and on the drives (COD).

  — Hot-swap support.

  — Optional battery backup for cache memory.

SAS/SATA Features

- Provides four independent PHYs, each supporting 3.0 Gbps SAS and SATA data transfers.

- Scalable interface that supports up to 16 physical devices and 64 logical devices via expanders.

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

- Supports Serial Management Protocol (SMP) to communicate topology management information.

- Allows addressing of multiple SATA targets through an expander if using SATA 2.0-compliant hard disk drives.

- Allows multiple initiators to address a single target (in a fail-over configuration) through an expander.

Online Capacity Expansion and RAID Level Migration Rules

- Migration must occur to the same or larger capacity configuration.

- Migration cannot occur if there is more than one virtual disk in a logical array.

- Migration and OCE cannot be done on Spanned Arrays (RAID 10, 50, 60).

- Migrations supported are RAID 1 to RAID 0, RAID 5 to RAID 0, RAID 6 to RAID 0.

- With OCE, migrations supported are RAID 0 to RAID 1, RAID 0 to RAID 5, RAID 1 to RAID 5.

2 Intel® Integrated RAID Module SROMBSASMR Hardware Installation

Requirements

- Intel® Integrated RAID Module SROMBSASMR, with the provided standoffs
- A host system with an available 50-pin PCI Express* connector
- Resource CD, which contains drivers and documentation
- SAS or SATA 3.0 hard drives
- Four 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 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 snap standoffs into the matching holes in the server/workstation board. To locate the matching module card slot on your server/workstation board, see your server/workstation board documentation.

The Intel® Server Board S5520HC/S5500HCV is shown for illustrative purpose (see Figure 1).
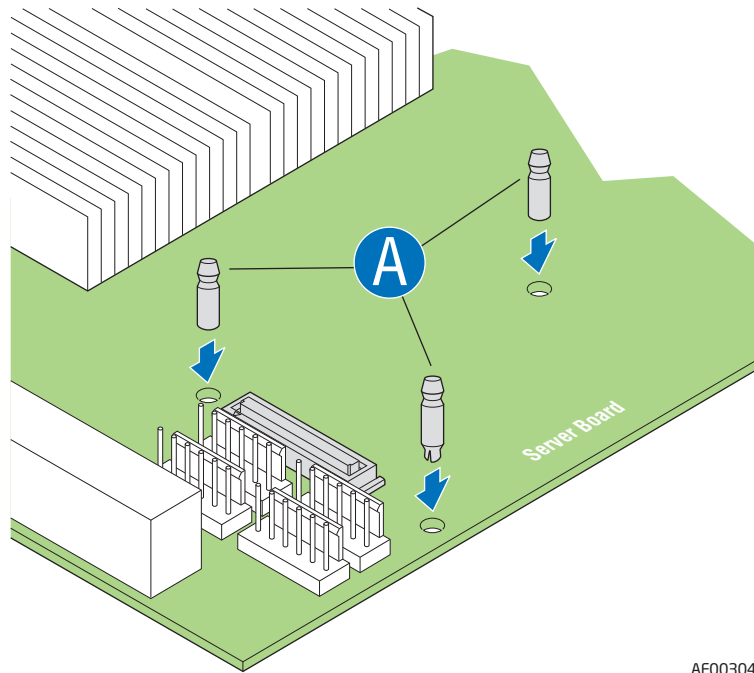
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Figure 1. Installing the Snap Standoff

4. Attach the Intel® Integrated RAID Module SROMBSASMR module card to the matching server/workstation board connector, and press the module card firmly to engage the snap standoffs installed in step 3 (see Figure 2).

5. Press down gently but firmly to ensure that the card is properly seated in the connector.
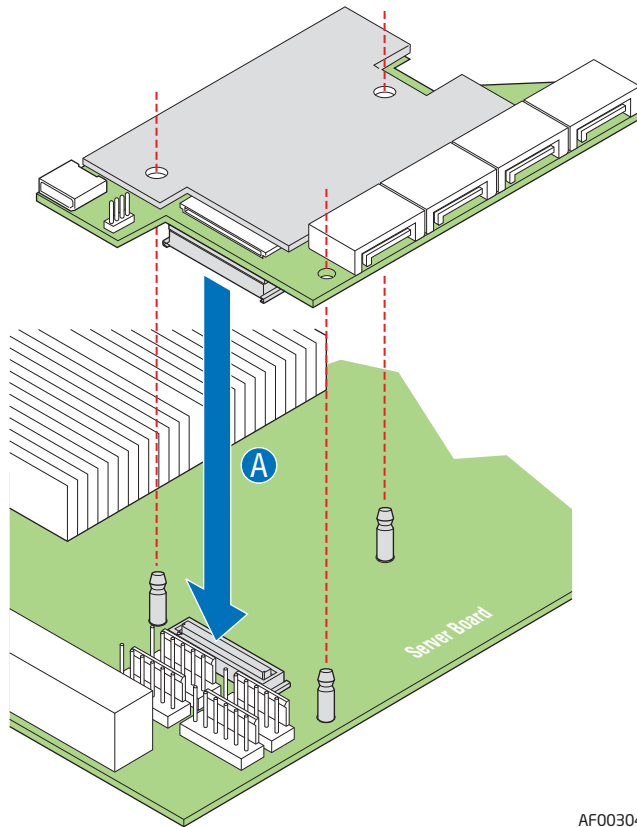
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Figure 2. Installing the Intel® Integrated RAID Module SROMBSASMR

6. Connect the SAS/SATA cables from the backplane (or hard drives) to the RAID module (see Figure 3). 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. .*
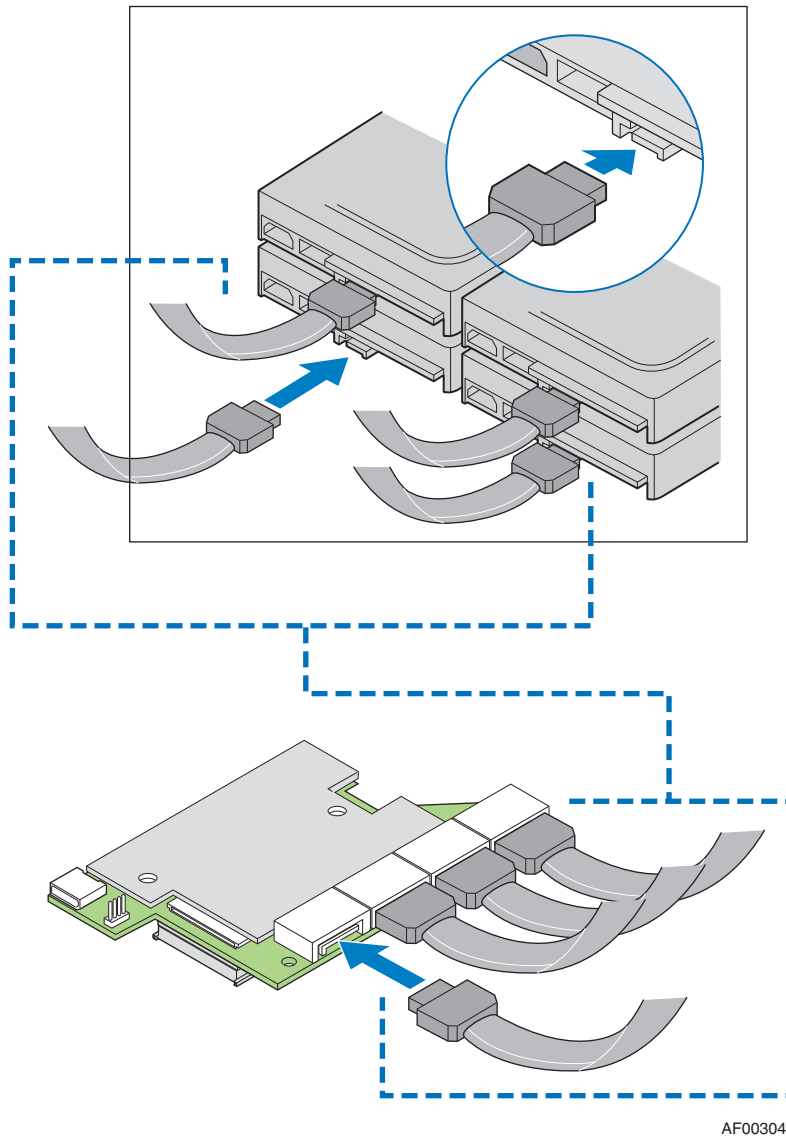
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Figure 3. Connecting Cable between the RAID Module and Drives/Backplane

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

Configuring the RAID Module

To configure the RAID Module, follow these steps:

1. Turn on the system power and check to make sure that the SAS/SATA devices power up before or at the same time as the system.

2. During the boot, the following BIOS message appears to state the keys that you need to press to enter the Intel®RAID BIOS Console 2:

   ```
   Press <CTRL><G> to run BIOS Console 2.
   ```

   This message times out after several seconds. If you miss it, you need to restart the system.

   After you press the keys to enter the Intel®RAID BIOS Console 2 software, the firmware takes several seconds to initialize and then display the Intel® Integrated RAID Module SROMBSASMR number and firmware version. The numbering of the RAID module follows the PCI slot scanning order used by the server board.

3. Follow the instructions in the *Intel®RAID Software User's Guide* (Document Number: D29305-00x) to configure the RAID module and to install the operating system drivers.

Replacing a Controller, Resolving a Config Mismatch

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

If the newly installed RAID module was previously configured, a message appears during POST, stating that there is a configuration mismatch because the configuration data in the NVRAM differs from that in the hard drives. Use these steps to resolve the mismatch:

1. Press <Ctrl> + <G> when prompted during boot up to access the BIOS Configuration Utility.

2. Select Configure > View/Add Configuration to see the NVRAM and drive configurations.

3. Since the drives contain the correct configuration, use configuration from the disks.

4. Press <Esc> and select YES to update the NVRAM.

5. Exit and reboot.

3 Intel® Integrated RAID Module SROMBSASMR Characteristics
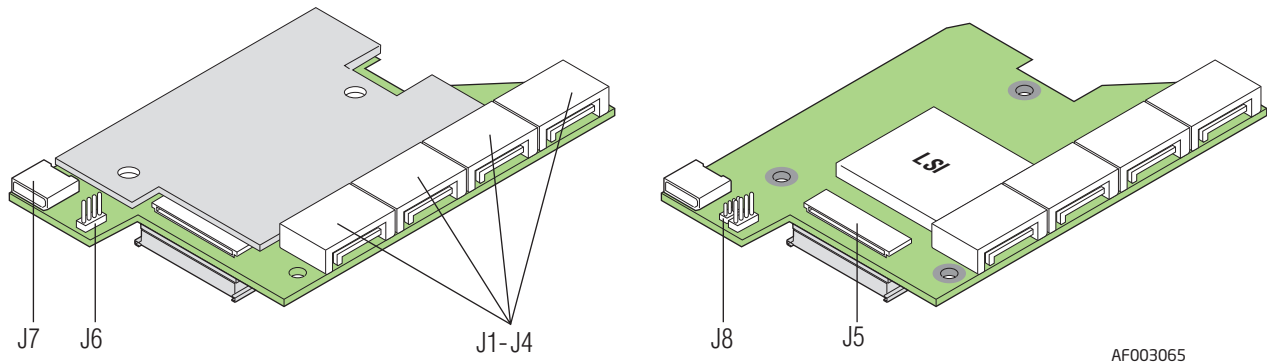
Figure 4. Card Layout

Table 1. Jumper Description

Jumper	Description	Type	Comments
J1 - J4	Internal SAS/SATA Port Connectors, Ports 0-3		Connection to SAS/SATA devices: • J1 = SAS/SATA Port 0 • J2 = SAS/SATA Port 1 • J3 = SAS/SATA Port 2 • J4 = SAS/SATA Port 3
J5	Board-to-board connector for Battery Backup Unit	20-pin connector	Provides an interface to the daughter card that contains the battery backup unit.
J6	Universal Asynchronous Receiver/Transmitter (UART)	4-pin connector	Not populated and should not be used.
J7	Keyed I^{2}C Connector	3-pin keyed connector	Out-of-band enclosure management (SES2)
J8	Debug Connector	4-pin connector	Reserved

Technical Specifications

Table 2. Technical Specifications

Specification	Intel® Integrated RAID Module SROMBSASMR
Processor	LSI* 1078 Integrated RAID-on-Chip, 533 MHz
Operating voltage	+3.3 V
Interface to host	Custom board-to-board x4 PCI Express* interface
SATA bus speed	3 Gbps per port, point-to-point
Serial port	3-pin RS232-compatible connector for debug use only
SAS controller	LSI* 1078
SAS/SATA ports	4 internal ports, 16 devices
Physical and virtual drive support	16 drives per controller and 64 logical drives
Cache	128 MB DDR2 667 MHz SDRAM, optional battery backup
Firmware	4 MB in reflashable flash ROM
Compatible devices	• 2.5-inch and 3.5-inch SAS or SATA 3.0 drives • Non-disk devices including expanders • Can support drives of mixed capacity
Cabling	Small thin cables that do not restrict airflow
Redundant configuration	32 KB NVRAM and config-on-disk (COD)
Enclosure management	In-band and out-of-band
Enclosure support	Assumes one SEP per enclosure

Array Performance Features

Table 3. Array Performance Features

Specification	Intel® Integrated RAID Module SROMBSASMR
Host data transfer rate	2.5 Gigabit/sec per PCI Express* lane
Drive data transfer rate	3 Gigabit/sec per lane
Maximum scatter / gather	26 elements
Maximum size of I/O requests	6.4 Mbytes in 64 Kbyte stripes

Specification	Intel® Integrated RAID Module SROMBSASMR
Host data transfer rate	2.5 Gigabit/sec per PCI Express* lane
Maximum queue tags per drive	As many as the drive can accept
Stripe sizes	8, 16, 32, 64, 128, 256, 512, or 1024 KB
Maximum concurrent commands	255
Support for multiple initiators	Yes
Performance	Native command queuing
Flexibility	Drive migration, RAID level migration, Drive Roaming, Online Capacity Expansion - without reboot
Background services	Rebuild, Consistency Check, Migration, OCE, and Patrol Read
Cache options	Write-back or Write-through; Read Ahead, Adaptive Read Ahead, Non Read Ahead; Cache I/O or Direct I/O; Disk Cache

Fault Tolerance

Table 4. Fault Tolerance Features

Specification	Intel® Integrated RAID Module SROMBSASMR
Self Monitoring Analysis and Reporting Technology (SMART) support	• Detects up to 70% of predictable disk drive failures • Monitors the internal performance of all motors, heads, and drive electronics.
Optional Battery Backup	• Intel® RAID Smart Battery AXXRSBBU3 cache backup • Up to 72 hours of data retention
Drive Replacement	• Auto detection of failure • Hot-plug • Hot-swap
Drive Rebuild Using Hot Spares	• Automatic at fail • Dedicated per Array • Global for any array • Auto-resume of initialization or rebuild on reboot
Error Checking and Indication	• Parity generation and checking, automatic consistency checking • Patrol reads • Activity and fault LEDs • Multiple retries • Logs in NVRAM, event log, CIM, Smart, Intel® RAID Web Console 2

Electrical Characteristics

All power is supplied to the Intel® Integrated RAID Module SROMBSASMR through the board-to-board connector via PCI Express* 3.3 V rails.

The supply voltages are 3.3 V ± 9 percent from PCI edge connector only. The maximum power for the +3.3 V rail is 18 W. The +12 V rail is not provided by the base card. The +3.3 V rail is used by the 3.3 V logic circuitry and also used to generate the other required voltage rails of +1.5 V and +1.8 V. The +3.3 V auxiliary voltage is used to generate the +12 V standby for the Intel® RAID Smart Battery AXXRSBBU3.

The voltage level used in the charging circuitry for the battery pack on the optional Intel® RAID Smart Battery AXXRSBBU3 is +12 V. During fast charging of the battery pack, expected power consumption is 230 mA rise in +12V current.

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

Safety Characteristics

The Intel® Integrated RAID Module SROMBSASMR 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: Drive Roaming and Drive Migration Install

Drive Roaming

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

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

To use drive roaming, follow these steps:

1. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).

2. Remove the server cover. For instructions, see your server system documentation.

3. Move the drives to different positions on the backplane to change the targets. See your server documentation for instructions to install and remove drives.

4. Determine the target requirements.

5. Make sure the drives are inserted properly.

6. Install the server cover. For instructions, see your server system documentation.

7. Plug in and power on the system.

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

Drive Migration

Drive migration moves a configured set of hard drives from one controller to another. The drives must remain on the same port and be reinstalled in the same order as in the original configuration. The controller to which you migrate the drives cannot have an existing configuration.

Note: *Only complete configurations can be migrated; individual virtual disks cannot be migrated. Drive roaming and drive migration cannot be supported at the same time.*

To migrate drives, follow these steps:

1. Clear the configuration on the system to which you migrate the drives.

   This prevents a configuration data mismatch between the hard drives and the NVRAM.

2. Turn off the power to the system, all drives, enclosures, and system components. Remove the power cord(s).

3. Remove the server cover. For instructions, see your server system documentation.

4. Disconnect the cables from the drives to be migrated.

5. Remove the hard drives from the first system and install them into the second system. For instructions to install and remove drives, see your server documentation.

6. Connect the data cables to the hard drives in the second system in the same order as they were connected in the first system. Make sure all the cables meet specifications.

7. Determine the drive target requirements.

8. Make sure all cables are properly attached and the RAID module is properly installed.

9. Install the server cover. For instructions, see your server system documentation.

10. Plug in and power on the system.

When you start the system, the controller detects the RAID configuration from the configuration data on the drives.

Appendix B: Installation / Assembly Safety Instructions

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

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

- To help avoid damaging your computer, be sure the voltage selection switch on the power supply is set to match the alternating current (AC) power available at your location.

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

- To help prevent electric shock, plug the computer and peripheral power cables into properly grounded power sources. These cables are equipped with 3-prong plugs to ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a 3-wire cable with properly grounded plugs.

- To help protect your computer system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply.

- Be sure nothing rests on your computer system's cables and that the cables are not located where they can be stepped on or tripped over.

- Do not spill food or liquids on your computer. If the computer gets wet, consult the documentation that came with it.

- Do not push any objects into the openings of your computer. Doing so can cause fire or electric shock by shorting out interior components.

- Keep your computer away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath your computer; do not place your computer in a closed-in wall unit or on a rug.

When working inside your computer:

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

- Turn off your computer and any peripherals.

- Disconnect your computer and peripherals from their power sources. Also disconnect any telephone or telecommunications lines from the computer.

Doing so reduces the potential for personal injury or shock.
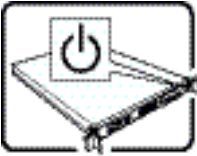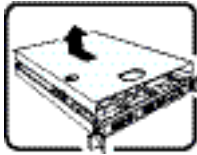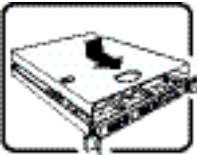
Additional safety guidelines:

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnect the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure both connectors are correctly oriented and aligned.

- Handle components and cards with care. Do not touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.

Protecting against electrostatic discharge

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

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

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component in your computer. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.

- When transporting a sensitive component, first place it in an antistatic container or packaging.

- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

English

Read all caution and safety statements in this document before performing any of the instructions. See also *Intel® Server Boards and Server Chassis Safety Information* on the Resource CD and/or at http://support.intel.com/support/motherboards/server/sb/cs-010770.htm.

	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.
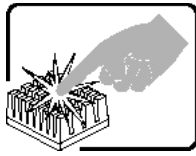
	A microprocessor and heat sink may be hot if the system has been running. Also, there may be sharp pins and edges on some board and chassis parts. Contact should be made with care. Consider wearing protective gloves.

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 -Servergeh*äusen auf der Ressourcen-CD oder unter http://support.intel.com/support/motherboards/server/sb/cs-010770.htm.
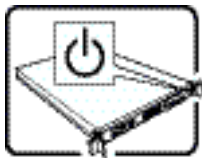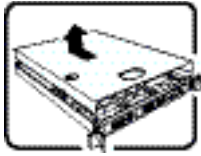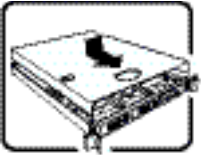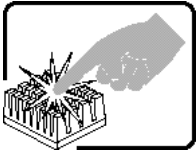
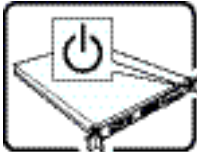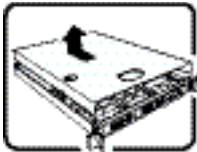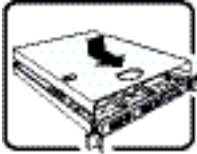|	Der Wechselstrom des Systems wird durch den Ein-/Aus-Schalter für Gleichstrom nicht ausgeschaltet. Ziehen Sie jedes Wechselstrom-Netzkabel aus der Steckdose bzw. dem Netzgerät, um den Stromanschluß des Systems zu unterbrechen.
	Die Stromkabel sind das "Unterbrechungsgerät" zur Hauptstromquelle. Die Steckdose, in die das System gesteckt wird, sollte sich in der Nähe des Gerätes befinden und leicht zugänglich sein.
	SICHERHEITSMASSNAHMEN: Immer wenn Sie die Gehäuseabdeckung abnehmen um an das Systeminnere zu gelangen, sollten Sie folgende Schritte beachten:
	1. Schalten Sie alle an Ihr System angeschlossenen Peripheriegeräte aus.
	2. Schalten Sie das System mit dem Hauptschalter aus.
	3. Ziehen Sie den Stromanschlußstecker Ihres Systems aus der Steckdose.
	4. Auf der Rückseite des Systems 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.

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	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://support.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.
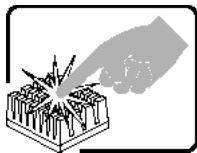
	Le microprocesseur et le dissipateur de chaleur peuvent être chauds si le système a été sous tension. Faites également attention aux broches aiguës des cartes et aux bords tranchants du capot. Nous vous recommandons l'usage de gants de protection.

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://support.intel.com/support/motherboards/server/sb/cs-010770.htm
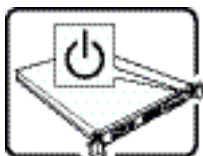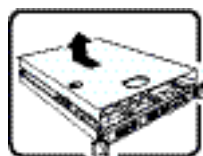
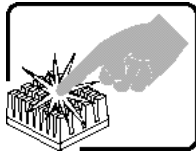|	
	Nótese que el interruptor activado / desactivado en el panel frontal no desconecta la corriente alterna del sistema. Para desconectarla, deberá desenchufar todos los cables de corriente alterna de la pared o desconectar la fuente de alimentación. Estos cables actúan como dispositivo de desconexión. La toma de corriente deberá estar situada cerca del equipo y ser de fácil acceso.
	INSTRUCCIONES DE SEGURIDAD: Cuando extraiga la tapa del chasis para acceder al interior del sistema, siga las siguientes instrucciones: 1. Apague todos los dispositivos periféricos conectados al sistema. 2. Apague el sistema presionando el interruptor encendido / apagado. 3. Desconecte todos los cables de alimentación CA del sistema o de las tomas de corriente alterna. 4. Identifique y desconecte todos los cables enchufados a los conectores E/S o a los puertos situados en la parte posterior del sistema. 5. Cuando manipule los componentes, es importante protegerse contra la descarga electrostática (ESD). Puede hacerlo si utiliza una muñequera antiestática 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.
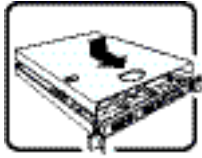
	Para obtener un enfriamiento y un flujo de aire adecuados, reinstale siempre las tapas del chasis antes de poner en marcha el sistema. Si pone en funcionamiento el sistema sin las tapas bien colocadas puede dañar los componentes del sistema. Para instalar las tapas: 1. Asegúrese primero de no haber dejado 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
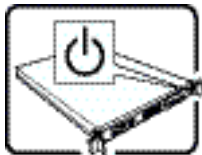
	L'interruttore attivato / disattivato nel pannello anteriore non interrompe l'alimentazione in c.a. del sistema. Per interromperla, è necessario scollegare tutti i cavi di alimentazione in c.a. dalle prese a muro o dall'alimentazione di corrente. Il cavo è considerato il dispositivo d'interruzione dell'alimentazione 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 C: Regulatory and Certification Information

Product Safety and EMC Compliance

This Intel® RAID Module 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.