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Sun StorageTek SAS RAID HBA

Installation Guide For The Eight-Port, Internal HBA
Model SG-XPCIESAS-R-INT-Z



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Preface

This installation guide explains how to install Oracle's eight-port, internal Sun StorageTek SAS RAID HBA (referred to as Sun StorageTek SAS RAID Internal HBA in this document), which uses Adaptec technology. It also provides a basic overview of Serial Attached SCSI (SAS) and Redundant Array of Independent Disk (RAID) technology.

This preface contains the following topics:

- "Before You Read This Document" on page xi
- "Related Documentation" on page xii
- "Documentation, Drivers, Support, and Training" on page xiii
- "Documentation Comments" on page xiii

Before You Read This Document

Familiarize yourself with computer hardware, data storage, RAID technology, and the input/output (I/O) technology—SAS, or Serial ATA (SATA)—used by the HBA.

Also, familiarize yourself with Direct-Attached Storage (DAS) or Network-Attached Storage (NAS)—whichever is appropriate for your storage space—and Storage Area Network (SAN) concepts and technology.

If you are using a SPARC system with the HBA and you need to install the Solaris OS, read the *Solaris 10 10/08 Installation Guide: Basic Installations* (part number: 820-5236-*nn*) prior to installing the HBA. You can find this document by performing a search at:

`http://docs.sun.com`

Related Documentation

The following table lists the documentation for this product. The online documentation is available at:

http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

Application	Title	Part Number	Format	Location
Command-line utility	*Uniform Command-Line Interface User's Guide*	820-2145-*nn*	PDF HTML	Documentation CD, Online
RAID Management	*Sun StorageTek RAID Manager Software User's Guide*	820-1177-*nn*	PDF HTML	Documentation CD, Online
RAID Management	*Sun StorageTek RAID Manager Software Release Notes*	820-2755-*nn*	PDF HTML	Documentation CD, Online

The following table lists the documentation that is related to this product.

Application	Title	Part Number	Format	Location
Server-Specific Installation	*Installing the StorageTek SAS RAID HBA Into the SPARC Enterprise T5120 and T5220 Servers*	820-4753-*nn*	Printed PDF HTML	Shipping kit Online at: http://docs.sun.com/app/docs/prod/sparc.t5220~t5220?l=en#hic
Server-Specific Installation	*Installing the StorageTek SAS RAID HBA Into the SPARC Enterprise T5140 and T5240 Servers*	820-4754-*nn*	Printed PDF HTML	Shipping kit Online at http://docs.sun.com/app/docs/prod/sparc.t5240~t5240?l=en#hic

Documentation, Drivers, Support, and Training

Sun Function	URL
Documentation	http://docs.sun.com
Drivers (not including Solaris)	http://support.intel.com/support/go/sunraid.htm
Support	http://www.sun.com/support/
Training	http://www.sun.com/training/

Documentation Comments

We are interested in improving our documentation and welcome your comments and suggestions. Submit comments about this document by clicking the Feedback[+] link at:

http://docs.sun.com

Please include the title and part number of your document with your feedback:

Sun StorageTek SAS RAID HBA Installation Guide , part number 820-1847-20

CHAPTER 1

HBA Overview

This chapter provides a basic overview of Oracle's eight-port, internal Sun StorageTek SAS RAID HBA (referred to as Sun StorageTek SAS RAID Internal HBA in this document), which uses Adaptec technology. This chapter describes the various operating systems, host platforms, storage, and infrastructure configurations that support the HBA.

The chapter contains the following sections:

- "Kit Contents" on page 1
- "HBA Features" on page 2
- "Operating System and Technology Requirements" on page 5
- "System Interoperability" on page 6

Kit Contents

- Sun StorageTek SAS RAID Internal HBA
- Full-height bracket
- Battery backup (BBU) module and installation hardware
- Sun StorageTek RAID Driver CD
- Sun StorageTek RAID Manager CD (which contains the HBA documentation)
- Live CD

Note – If a CD listed in this section is not included in the ship kit, you can obtain the contents of the CD at:
`http://support.intel.com/support/go/sunraid.htm`

HBA Features

The Sun StorageTek SAS RAID Internal HBA (SG-XPCIESAS-R-INT-Z) has the following features:

Note – These features are supported by some operating systems but not others. For more information, refer to the *Sun StorageTek RAID Manager Software User's Guide* or online Help.

- Flash ROM to update the HBA firmware and BIOS using the BIOS Configuration utility or the Sun StorageTek RAID Manager graphical user interface (For more information, see the *Sun StorageTek RAID Manager Software User's Guide.)*
- Disk drive hot-plugging (See the HDD hot-plug guidelines in "Understanding Hot-Plug Limitations and Conditions Within the BIOS RAID Configuration Utility" on page 66.)
- Event logging and broadcasting, including email and SNMP messages
- The Sun StorageTek RAID Manager GUI, a BIOS-based utility, and a command-line interface for creating and managing RAID arrays
- Support for disk drive enclosures with SES2 enclosure management hardware
- A battery backup module

Array-Level Features

Note – These features are supported by some operating systems but not others. For more information, refer to the *Sun StorageTek RAID Manager Software User's Guide* or online Help.

- Support for RAID levels 0, 1, 1E, 10, 5, 5EE, 50, 6, 60, simple volume, spanned volume, and RAID volume
- Support for hot-spares (global and dedicated)
- Support for automatic failover, so arrays are automatically rebuilt when a failed disk drive is replaced (applies to redundant arrays in SES2- or SAF-TE-enabled disk drive enclosures *only*)
- Optimized disk utilization, which ensures that the full capacity of all disk drives can be used, even if the disk drives vary in size
- Online capacity expansion, so you can increase the capacity of an array without recreating it

- Support for array migration from one RAID level to another

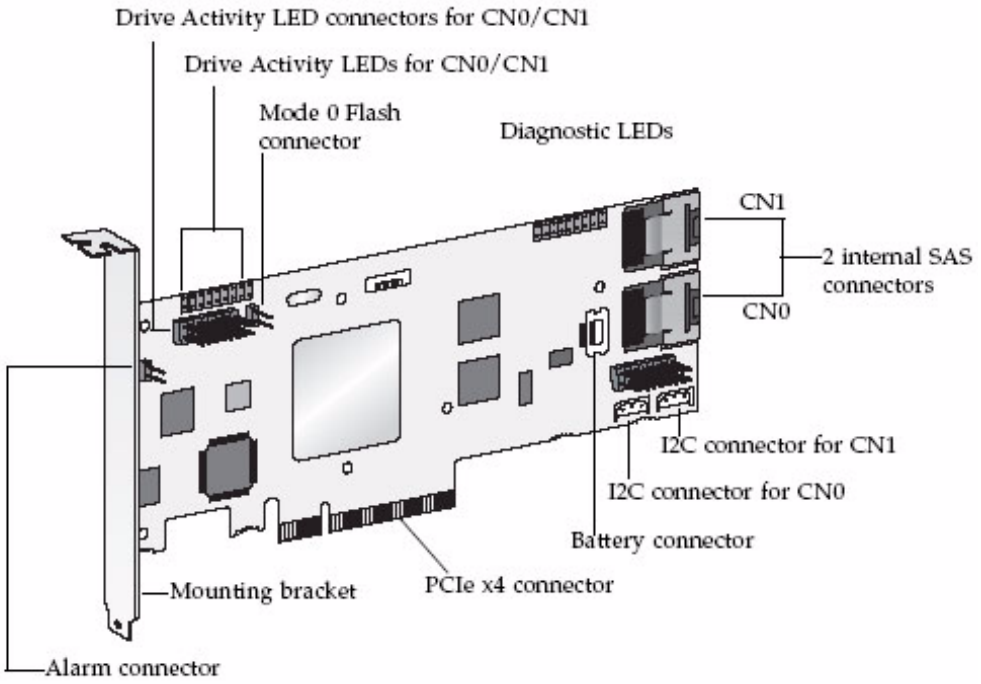
Advanced Data Protection Suite

- **Copyback Hot-Spare**—You can use this feature to move data from a hot-spare back to its original location after a failed disk drive is replaced.
- **Striped Mirror (RAID 1E)**—A RAID 1 Enhanced array is similar to a RAID 1 array except that data is both mirrored *and* striped, and more disk drives can be included.
- **Hot-Spare (RAID 5EE)**—A RAID 5EE array is similar to a RAID 5 array except that it includes a distributed spare and must be built from a minimum of four disk drives.
- **Dual Drive Failure Protection (RAID 6)**—A RAID 6 array is similar to a RAID 5 array except that it includes *two* independent sets of parity data instead of one.
- **Dual Drive Failure Protection (RAID 60)**—A RAID 60 array is similar to a RAID 50 array except that it includes *four* independent sets of parity data instead of two.

Component Layout

The Sun StorageTek SAS RAID Internal HBA is a SAS RAID HBA with these features.

FIGURE 1-1 Sun StorageTek SAS RAID Internal HBA Component Layout



The following table lists the features of the HBA.

TABLE 1-1 HBA Features

Feature	Specification
Form factor	Low-profile MD2
Bus compatibility	PCIe
PCIe bus width	x8
PCIe bus speed	2.5 Gb/s
PHYs	8
Standard cache	256 MB DDR2
Connectors, internal	Two mini SAS x4 (SFF-8087)
RAID levels	0, 1, 1E, 10, 5, 5EE, 50,6, 60, JBOD
Simple volume	

TABLE 1-1 HBA Features

Feature *(Continued)*	Specification *(Continued)*
Disk drives	SATA, SATA II, SAS
Maximum number of disk drives	8 (or up to 100 with expanders)
Hot-spares	
Enclosure support	I2C and SGPIO
Automatic failover	
Audible alarm	
Battery backup module	ABM-800

Operating System and Technology Requirements

This HBA supports the following operating system and technology versions.

TABLE 1-2 Supported Operating System and Technology Versions

Operating System/Technology	Supported Versions
Solaris 10 OS for the x64 and x86 (32-bit and 64-bit) platforms	• Solaris 10 10/08 (s10u6) • Solaris 10 5/08 (s10u5) • Solaris 10 8/07 (s10u4)
Solaris 10 OS for the SPARC (64-bit) platform	Solaris 10 10/08 (s10u6)
Linux OS	• RHEL 5 Server, 32-bit and 64-bit • RHEL 5 Advanced Platform, 32-bit and 64-bit • Red Hat Enterprise Linux (RHEL) 4 ES, 32-bit and 64-bit • RHEL 4 AS Update 5, 32-bit and 64-bit

TABLE 1-2 Supported Operating System and Technology Versions *(Continued)*

Operating System/Technology	Supported Versions
	• SUSE Linux Enterprise Server (SLES) 10 • SUSE Linux Enterprise Server (SLES) 9, SP4
VMware® Technology	ESX Server version 3.0.2, Update 1 (driver support only; storage management must be done through the command-line interface or the BIOS utility. For more information, see the *Uniform Command-Line Interface User's Guide* at: http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic
Microsoft Windows OS	• Windows Server 2008 Enterprise Edition, 32-bit or 64-bit • Windows Server 2008 Standard Edition, 32-bit or 64-bit • Windows Server 2003 Enterprise Edition, 32-bit or 64-bit • Windows Server 2003 Standard Edition, 32-bit or 64-bit

Note – For up-to-date operating system version support, visit http://support.intel.com/support/go/sunraid.htm.

System Interoperability

This section provides information about selected platforms and servers that are compatible with the Sun StorageTek SAS RAID Internal HBA. This section contains the following subsections:

- "Host Platform Support" on page 6
- "Server Support" on page 7
- "Software Support" on page 7

Host Platform Support

The HBA is supported by a computer that meets the following criteria:

- 1 GB of RAM, at minimum
- Available compatible PCI Express x8 slot
- 100 MB of free disk drive space

Server Support

TABLE 1-3 lists the servers that the HBA supports.

TABLE 1-3 Server Support

Server	Supported OS/Technology
SPARC Servers	
Sun SPARC Enterprise T5120 server	Solaris
Sun SPARC Enterprise T5220 server	Solaris
Sun SPARC Enterprise T5140 server	Solaris
Sun SPARC Enterprise T5240 server	Solaris
Sun SPARC Enterprise T5440 server	Solaris
Sun SPARC Enterprise M3000 server	Solaris
Sun Fire T1000 server	Solaris
Sun Ultra U45 server	Solaris
x64 Servers	
Sun Fire X2250 server	Solaris, Linux, VMware, and Windows
Sun Fire X4140 server	Solaris, Linux, VMware, and Windows
Sun Fire X4150 server	Solaris, Linux, VMware, and Windows
Sun Fire X4240 server	Solaris, Linux, VMware, and Windows
Sun Fire X4250 server	Solaris, Linux, VMware, and Windows
Sun Fire X4440 server	Solaris, Linux, VMware, and Windows
Sun Fire X4450 server	Solaris, Linux, VMware, and Windows

Software Support

TABLE 1-4 lists the software applications that the HBA supports.

TABLE 1-4 Software Support

Software	Supported OS
VERITAS Software Foundation 5.0	Solaris
Sun StorEdge Enterprise Backup Software 6.0B/7.0/7.1	Solaris, Linux, and Windows
VERITAS NetBackup 6.0	Solaris, Linux, and Windows

CHAPTER 2

Hardware Installation and Removal

This chapter explains how to install and remove the HBA, and how to install and connect internal disk drives.

This chapter contains the following sections:

- "Observing ESD and Handling Precautions" on page 9
- "To Prepare for Hardware Installation" on page 10
- "To Install the Battery Backup Module" on page 15
- "To Install the HBA" on page 17
- "Connecting Disk Drives" on page 19
- "Testing the HBA Installation" on page 20
- "Removing the Hardware" on page 25

Observing ESD and Handling Precautions



Caution – Damage to the HBA can occur as the result of careless handling or electrostatic discharge (ESD). Always handle the HBA with care to avoid damage to electrostatic sensitive components.

To minimize the possibility of ESD-related damage, use both a workstation antistatic mat and an ESD wrist strap. You can get an ESD wrist strap from any reputable electronics store or from Sun as part number #250-1007. Observe the following precautions to avoid ESD-related problems:

- Leave the HBA in its antistatic bag until you are ready to install it in the system.

- Always use a properly fitted and grounded wrist strap or other suitable ESD protection when handling the HBA and observe proper ESD grounding techniques.
- Hold the HBA by the edge of the PCB, not the connectors.
- Place the HBA on a properly grounded antistatic work surface pad when it is out of its protective antistatic bag.

Preparing for Hardware Installation

▼ To Prepare for Hardware Installation

1. **Read** "Safety Agency Compliance Statements" on page 117.
2. **Familiarize yourself with the physical features of the Sun StorageTek SAS RAID Internal HBA and the RAID levels that it supports.**

   See "Component Layout" on page 3.
3. **Ensure you have the right quantity of initialized disk drives for the RAID level you want to use for the arrays.**

   See "Selecting the Best RAID Level" on page 101.

   All the disk drives must have the same performance level. You can use different-sized disk drives in the array, but the array will be limited to the capacity of the smallest and slowest disk drive.

   For more information, refer to the *Sun StorageTek RAID Manager Software User's Guide* or online Help.

   The Sun StorageTek SAS RAID Internal HBA supports both SAS and SATA disk drives.
4. **Ensure that you have the proper cables for the HBA and disk drives.**

   You will need one SAS cable for each disk drive you are connecting to the HBA. Use only Sun-provided SAS cables (provided to you with your Sun system at the time of purchase). For more information or to purchase cables for your Sun system, visit the Sun web site at `http://www.sun.com`. Cable connectors are keyed so that you cannot insert them incorrectly.

Note – If you are installing the HBA in a Sun SPARC Enterprise T5120, T5220, T5140, or T5240 server, see the server-specific installation documents listed in "Related Documentation" on page xii. These documents provide detailed cabling information for the servers.

The following figures depict the SAS cables.

FIGURE 2-1 Internal Mini-SAS with Power, Which Connects to Four SAS or SATA Disk Drives



FIGURE 2-2 Internal Mini-SAS to SATA Fan-Out, Which Connects to Four SATA Disk Drives



FIGURE 2-3 Internal Mini-SAS, Which Connects to SAS or SATA Disk Drives on a Backplane



5. **If you are installing the HBA into a full-height computer chassis, replace the original low-profile bracket with the full-height bracket included in the HBA ship kit.**



Caution – Handle the HBA by its bracket or edges only.

6. **Choose your installation option.**

   You can choose to create a bootable array and then install an operating system and the HBA driver on that array, or you can complete a standard installation, where the HBA driver is installed on an existing operating system.

Installation Task Map

You can choose either of these installation options:

- "To Install the OS Onto a Bootable Array" on page 12
- "To Install on an Existing Operating System" on page 14

▼ To Install the OS Onto a Bootable Array

1. **Install the battery backup module (BBU).**

   See "Installing the Battery Backup Module" on page 14.

2. **Install and connect the HBA and disk drives.**

   See "Installing the HBA" on page 17.

3. **Create a bootable array.**

   See "Creating a Bootable Array on an x64 System" on page 27 or "Creating a Bootable Array on a SPARC System" on page 33.

4. **Set the boot controller.**

   See "Creating a Bootable Array on an x64 System" on page 27 or "Creating a Bootable Array on a SPARC System" on page 33.

5. **Install the operating system and the HBA driver.**

   See "Installing an OS Onto a Bootable Array on an x64 System" on page 39 or "Installing the Solaris OS on a SPARC System" on page 45.

6. **Install the Sun StorageTek RAID Manager software and begin to manage data storage.**

   Use the Sun StorageTek RAID Manager CD provided in the HBA ship kit to install the Sun StorageTek RAID Manager software. For information about installing and using the software, see the *Sun StorageTek RAID Manager Software User's Guide*. For the latest version of the software, go to: `http://support.intel.com/support/go/sunraid.htm`.

▼ To Install on an Existing Operating System

1. **Install the battery backup module (BBU).**

   See "Installing the Battery Backup Module" on page 14.

2. **If you are installing on an x64 system, skip to the next step. If you are installing on a SPARC system, use the Open Boot Prompt (OBP) to make note of the current devices on the system.**

   See "Verifying the Current Devices on a SPARC System" on page 16.

3. **Install and connect the HBA and disk drives.**

   See "Installing the HBA" on page 17.

4. **Install the HBA driver.**

   See "Installing the Driver on an Existing OS" on page 50.

5. **Install the Sun StorageTek RAID Manager software and begin to manage data storage.**

   Use the Sun StorageTek RAID Manager CD provided in the HBA ship kit to install the Sun StorageTek RAID Manager software. For information about installing and using the software, see the *Sun StorageTek RAID Manager Software User's Guide.* For the latest version of the software, go to: `http://support.intel.com/support/go/sunraid.htm`.

Installing the Battery Backup Module

Tools required:

- Small Phillips head screw driver to tighten the screws
- (Suggested) Small needle nose pliers or tweezers
- ESD wrist strap

▼ To Install the Battery Backup Module

1. **Attach an ESD wrist strap.**

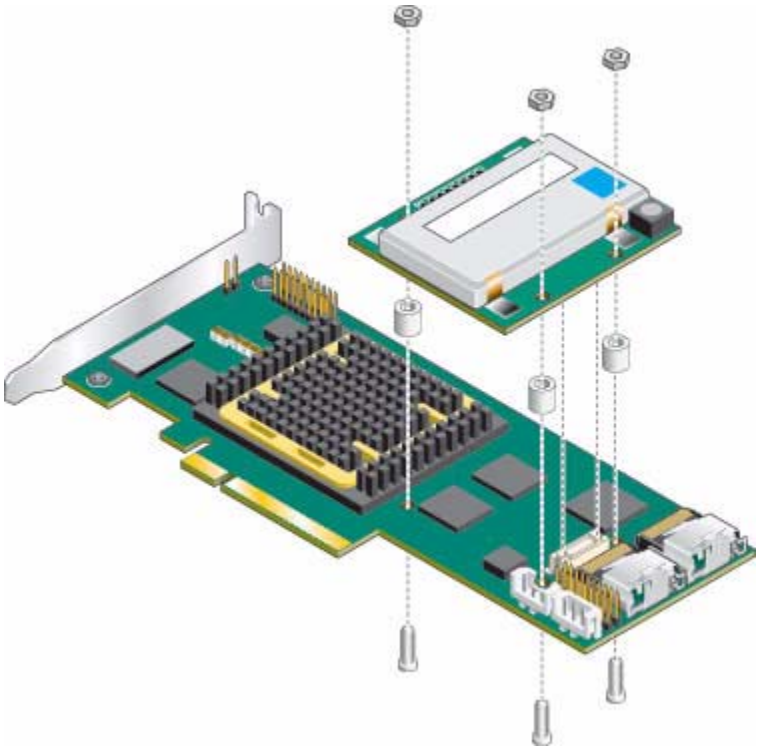
   See "Observing ESD and Handling Precautions" on page 9.

2. **Lay the top square piece of packing foam from the ship kit on your work surface, smooth side up.**

3. **Take the HBA out of the antistatic bag and set it on the packing foam with the heat sink facing up.**

4. **Slightly lift the HBA, and from underneath it, insert three plastic screws from the BBU kit through the following three mounting holes in the HBA:**
   - The bottom left hole. This is about 3 inches from the right edge of the HBA.
   - The bottom right hole. This is about 1 inch from the right edge of the HBA.
   - The top right hole. This is about 1 inch from the right edge of the HBA.

FIGURE 2-4 Installing the Battery Backup Module



5. **Place a spacer over each screw.**

   The BBU connector on the HBA is just below the screw closest to the right edge of the HBA.

6. **Line up the BBU connector on the BBU module with the connector on the HBA.**

   The screws you inserted will line up with matching holes in the BBU.

7. **Gently press down on the right edge of the BBU module until the connectors click into place.**



Caution – DO NOT force the connection. If a gentle push does not mate the connectors, realign the components and try again.

8. **Obtain the three nuts from the BBU kit, and for each nut, do the following:**

   a. **Place the nut onto the screw and hold the nut in place.**

   b. **With the Phillips head screw driver, reach underneath the HBA and, while holding the nut in place with your other hand (or with needle nose pliers or tweezers), screw the plastic screw into the nut.**

   c. **Repeat** Step a **-** Step b **for the remaining nuts.**

Note – If you are unable to place a nut onto the screw that is close to the heat sink, use a small pair of needle nose pliers or tweezers.



Caution – Do not over-tighten the screws.

Verifying the Current Devices on a SPARC System

If you are installing on a non-SPARC system, skip to "Installing the HBA" on page 17.

▼ To Verify the Current Devices

1. **Enter the Open Boot Prompt (OBP) and use the `show-disks` command to list the current devices.**

```
{0} ok show-disks
a) /pci@0/pci@0/pci@2/scsi@0/disk
b) /pci@0/pci@0/pci@1/pci@0/pci@1/pci@0/usb@0,2/storage@2/disk
q) NO SELECTION
Enter Selection, q to quit: q
{0} ok
```

Note – Device paths might vary from this example, depending on the SPARC system you are using and into which PCI-E slot the card is plugged.

---

2. **Take note of the devices.**

   This will help you determine which device is the HBA after you install the HBA.

Installing the HBA

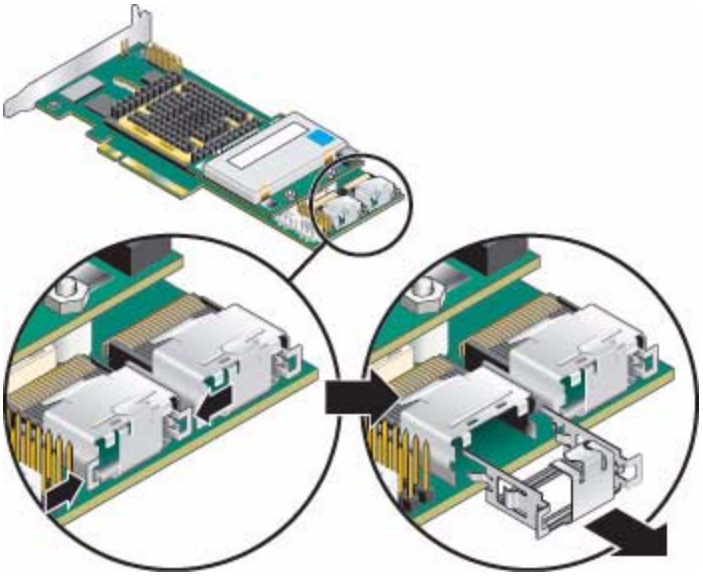
Note – For the Sun SPARC Enterprise T5120, T5220, T5140, and T5240 servers, contact Sun support to install the HBA.

▼ To Install the HBA

1. **Remove the safety clip from each internal SAS connector by using your thumb and forefinger to gently press the tabs of the safety clip and pull the clip out.**

   See FIGURE 2-5.

FIGURE 2-5 Removing the Safety Clips From the SAS Connectors



2. **Turn off the computer and disconnect the power cord.**
3. **Open the cabinet, following the manufacturer instructions.**
4. **Select an available x8 PCI Express expansion slot that is compatible with the HBA and remove the slot cover.**



Caution – Touch a grounded metal object before handling the HBA.

5. **Insert the HBA into the PCI Express expansion slot and press down gently but firmly until it clicks into place.**

   When installed properly, the HBA will appear level with the expansion slot.

6. **Secure the bracket in the x8 PCI Express slot, using the retention device (for instance, a screw or lever) supplied with the computer.**
7. **Continue with the following section.**

Connecting Disk Drives

You can connect SAS disk drives, SATA disk drives, or a combination of both to the HBA. There are no jumpers or switches to set before installation. In a direct-attach connection, the SAS or SATA disk drives are connected directly to the HBA with SAS cables. The number of direct-attached disk drives is limited to four per internal SAS connector.

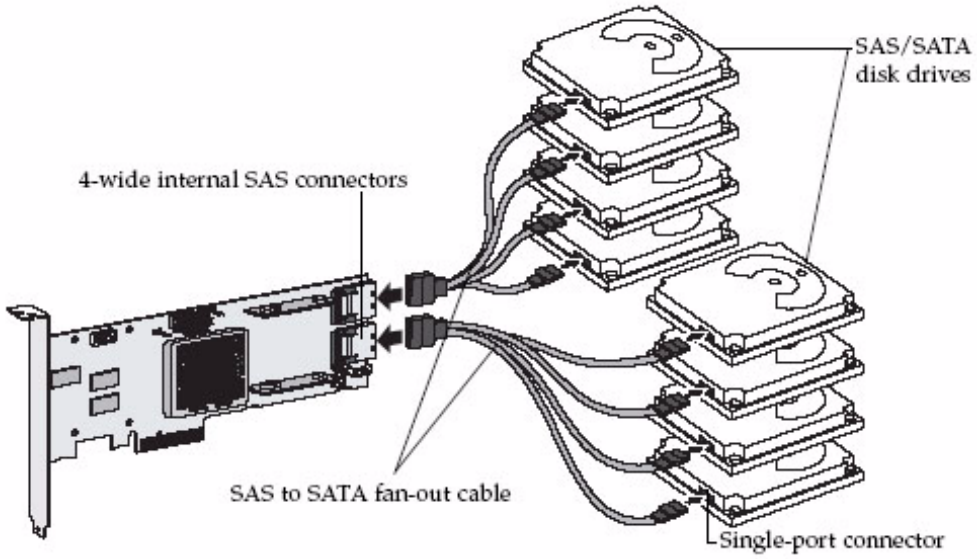
Use high-quality cables to connect the HBA to the internal device(s), such as disk drives or backplanes. Use only Sun-supplied cables. For more information or to purchase cables, visit the Sun web site at http://www.sun.com.

▼ To Connect Directly to the HBA

In a direct-attach connection, SAS or SATA disk drives are connected directly to a SAS card with SAS cables. The number of direct-attached disk drives is limited to four per internal SAS connector.

1. **Install the internal SAS or SATA disk drives, following the instructions in your system documentation.**
2. **Use internal SAS or mini-SAS cables to attach the disk drives to the HBA.**

FIGURE 2-6 Attach Cables Between RAID HBA and Internal SAS or SATA Drives



3. **Close the computer cabinet, and reattach the power cord.**

▼ To Connect to a System Backplane

In a backplane connection, disk drives and SAS cards are attached to and communicate with each other through a system backplane.

The number of disk drives is limited to the number of slots available on the backplane. Some backplanes have embedded SAS expanders and can support up to 128 end devices. (For more information about backplane and expander connections, see "Backplane Connections" on page 108.)

1. **Connect one or more internal SAS or SATA disk drives to the backplane.**

   Refer to your system's documentation for more information.

2. **Use an internal SAS cable, or cables, to connect the HBA to the backplane.**
3. **When all internal disk drives have been installed and connected, close the computer cabinet and reattach the power cord.**

Testing the HBA Installation

Note – Check all SAS cables to ensure that they are securely attached and are not damaged or pinched anywhere along the length of cable.

This section contains the following subsections:

- "To Test the HBA Installation on a SPARC System" on page 20
- "To Test the HBA Installation on an x64 System" on page 23

▼ To Test the HBA Installation on a SPARC System

1. **Power-up the computer and storage systems.**
   a. **Ensure that all hard disk drives are securely installed.**
   b. **Connect all power cords securely and plug them into the proper power sources.**

c. **Power-on the disk drive enclosure, and verify that all available HDD status indicators are normal for the storage enclosure(s) that they are in.**

d. **Power-on the computer system.**

2. **Enter the Open Boot Prompt (OBP) and use the `show-disks` command to list the current devices.**

   In the following example, the HBA is the first device that is listed.

```
{0} ok show-disks
a) /pci@0/pci@0/pci@8/pci@0/pci@8/scsi@0/disk
b) /pci@0/pci@0/pci@2/scsi@0/disk
c) /pci@0/pci@0/pci@1/pci@0/pci@1/pci@0/usb@0,2/storage@2/disk
q) NO SELECTION
Enter Selection, q to quit: Chassis | critical: V_VCORE at /SYS/MB has
exceeded high warning threshold.
valid choice: a...c, q to quit q
```

Note – Device paths might vary from this example, depending on which SPARC system you are using and into which PCI-E slot the card is plugged.

3. **Use the `select` command to select the device node for the HBA, and follow the on-screen instructions by pressing Enter when prompted.**

Note – When you run this command, omit `/disk` from the HBA device path, as shown in the following example.

```
{0} ok select /pci@0/pci@0/pci@8/pci@0/pci@8/scsi@0
Waiting for AAC Controller to start: . . . . . Started

Config Changes:

1 ->One or more device either moved or removed
or not responding or added
Press <ENTER> to accept current config changes - with in 30 seconds
(Default - Ignore changes and check the setup)

<ENTER> Pressed. Current Config is accepted
```

4. **To display the firmware version on the HBA, use the** `show-version` **command.**

```
 {0} ok show-version

AAC Kernel Version: 15815

{0} ok
```

5. **To display additional configuration information, list the device properties by using the** `.properties` **command.**

```
{0} ok .properties
firmware-version 15815
assigned-addresses 820f0010 00000000 00e00000 00000000 00200000
820f0030 00000000 00d00000 00000000 00080000
compatible pciex9005,285.108e.286.9
pciex9005,285.108e.286
pciex9005,285.9
pciex9005,285
pciexclass,010400
pciexclass,0104
model AAC,285
reg 000f0000 00000000 00000000 00000000 00000000
030f0010 00000000 00000000 00000000 00200000
version 0.00.01
wide 00000010
device_type scsi-2
name scsi
fcode-rom-offset 0000fe00
port-type PCIE-Endpoint
interrupts 00000001
cache-line-size 00000010
class-code 00010400
subsystem-id 00000286
subsystem-vendor-id 0000108e
revision-id 00000009
device-id 00000285
vendor-id 00009005
{0} ok
```

6. **Return to the** `root` **node by using the** `unselect-dev` **command.**

```
 {0} ok unselect-dev
```

Note – At this point, there are no volumes created and the output from a `probe-scsi-all` command will not display any drives.

If no errors or issues are discovered, continue to "Next Steps" on page 25 to complete the installation process. If any issues are discovered, correct them and retest the HBA before continuing.

▼ To Test the HBA Installation on an x64 System

1. **Power-up the computer and storage systems:**
   a. **Ensure that all hard disk drives are securely installed.**
   b. **Connect all power cords securely and plug them into the proper power source(s).**
   c. **If applicable, power on the disk drive enclosure.**
      If the enclosure provides HDD status indicators, make sure they are normal.
   d. **Power-on the computer system.**
      If the system provides HDD status indicators, make sure they are normal.
2. **Enter the BIOS RAID Configuration Utility:**
   a. **During POST, press Ctrl + A when prompted.**
   b. **As the computer continues its startup sequence, review the boot messages to determine the firmware version on the HBA.**
      Boot messages, similar to those shown in the following example, are displayed that indicate the firmware version (in this example, the FW build is 15815).

```
Adaptec RAID BIOS V5.3-0 [Build 15815]
(c) 1998-2008 Adaptec, Inc. All Rights Reserved
<<<Press <Ctrl><A> for Adaptec RAID
Adaptec RAID Configuration Utility will be invoked after initialization.
Booting the Controller Kernel....Controller started

Controller #00: Sun STK RAID INT at PCI Slot:02, Bus:04, Dev:00, Func:00
Waiting for Controller to Start....Controller started
Controller monitor V5.3-0[15815], Controller kernel V5.3-0[15815]
Battery Backup Unit Present
Controller POST operation successful
Controller Memory Size: 256 MB
```

```
Controller Serial Number: 00721EC0006
Controller WWN: 5000E0CE21907000
No Logical Drives Found
```

c. **When the utility starts, review the list of HBAs installed on the computer.**

d. **If more than one HBA is listed, select the one you wish to test and press Enter.**

3. **Enter the Array Configuration Utility (ACU) by highlighting Array Configuration Utility and then pressing Enter.**

   You might see a screen next indicating Configuration Change. This is normal for a newly installed HBA and targets.

4. **Press Enter as prompted.**

5. **Verify that all attached HDDs are detected by the HBA:**

   a. **At the Main Menu highlight Initialize Drives and press Enter.**

   b. **In the Select drives for initialization column, verify that all attached HDDs are displayed.**

   c. **Select drives to initialize them for verification.**

      You can initialize all of the drives now or wait until you are ready to create your arrays.

6. **Verify that all HDDs are available for array creation:**

   a. **Return to the Main Menu page, highlight Create Array and press Enter.**

   b. **In Select drives to create Array, verify that all the attached HDDs are available for array creation.**

   c. **Highlight a couple of drives and press the space bar.**

      Verify that the drives are moved into the right column in preparation for array creation.

7. **Press Esc and exit.**

   You will create the arrays later.

8. **Test the alarm for the HBA:**

   a. **Press Esc until you reach the controller Options menu.**

   b. **Highlight Serial Select and press Enter.**

   c. **Highlight Controller Configuration and press Enter.**

   d. **Highlight Alarm Control… and press Enter.**

e. **Highlight Test and press Enter. Verify a 3-second audible alarm.**

9. **Verify that all target devices are present:**

   a. **Press Esc until you reach the controller Options menu.**

   b. **Highlight Disk Utilities and press Enter.**

      You will see an indication that the HBA is scanning SAS devices.

   c. **After the scanning completes, verify that all attached target devices are displayed.**

   d. **Press Esc to exit.**

If no errors or issues are discovered, continue to the next section to complete the installation process. If any issues are discovered, correct them and retest the HBA before continuing.

Next Steps

If you are installing an operating system onto a bootable array, continue with one of these sections, depending on whether you use an x64 or SPARC system:

- "Creating a Bootable Array on an x64 System" on page 27
- "Creating a Bootable Array on a SPARC System" on page 33.

If you are completing a standard installation onto an existing operating system, continue with "Installing the Driver on an Existing Operating System" on page 49.

Removing the Hardware

The following instructions describe the tasks required to remove the HBA. If you need to replace a failed HBA, remove the hardware, as described in this section, and see "Best Practices For Replacing an HBA" on page 88.



Caution – Never remove the HBA when an attached array is in the process of rebuilding a logical drive from a "Degraded" state.

▼ To Prepare the HBA for Removal

1. **If the computer is running the OS, halt all I/O activity to the HBA.**
2. **Complete all transactions being done by the HBA such as migrations, rebuilds, verifications, and so on.**
3. **Properly log out of the OS and shut down the computer.**
4. **Unplug the computer.**
5. **Open the computer chassis and disconnect the SAS/SATA cable(s) from the HBA.**

▼ To Remove the HBA

1. **Remove the retention mechanism (screw, clip, and so on) that is securing the HBA bracket to the chassis.**
2. **Hold the upper portion of the bracket with one hand and the rear of the HBA with the other hand.**
3. **Pull straight up until the HBA clears the PCI Express* expansion slot.**
4. **Lift the HBA from the computer chassis.**

CHAPTER 3

Creating a Bootable Array on an x64 System

As an installation option, you can choose to create a bootable array and then install an operating system and the HBA driver onto that array. This chapter describes how to set the Sun StorageTek SAS RAID Internal HBA to be the boot controller, and how to create a bootable array on an x64 system.

Note – If you are a SPARC system user, and you want to create a bootable array and then install the Solaris operating system and the HBA driver onto that array, DO NOT complete any task in this chapter. Instead, go to "Creating a Bootable Array on a SPARC System" on page 33.

Note – If you want to complete a standard installation onto an existing operating system, DO NOT complete any task in this chapter. Instead, skip to "Installing the Driver on an Existing Operating System" on page 49.

This chapter contains the following sections:

- "Creating an Array" on page 28
- "Making the Array Bootable" on page 31
- "Setting the Boot HBA" on page 31

Creating an Array

A RAID 5 array is created in the examples shown in this section because RAID 5 provides the most security and best performance with a minimum of three disk drives. However, you can choose to create an array with a different RAID level; you can also change array level later, after the operating system is installed.

You can create an array using either of these tools:

- **Array Configuration Utility (ACU)**—BIOS-based menus and keyboard navigation. See "To Create a RAID 5 Array With the ACU" on page 29.
- **Command Line Interface (UCLI)**—Refer to the *Uniform Command-Line Interface User's Guide* at the following website:

  `http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

You can use either tool, but the ACU utility is the quicker and easier tool for this task. The ACU is menu-based and provides instructions for completing tasks on-screen. Menus can be navigated using the arrows, Enter, Esc, and other keys on your keyboard.

Note – Do *not* combine SAS and SATA disk drives within the same array. The Sun StorageTek RAID Manager software generates a warning if you try to create a logical drive using a combination of SAS and SATA disk drives. See "Introduction to Serial Attached SCSI" on page 103 for more information.

▼ To Create a RAID 5 Array With the ACU

Note – Hot-plugging of enclosures is not supported in the BIOS RAID Configuration utility. Hot-plugging of SAS/SATA hard disk drives (HDDs) is supported only within hard disk enclosures and only under the conditions specified in "Understanding Hot-Plug Limitations and Conditions Within the BIOS RAID Configuration Utility" on page 66.

1. **Power on the computer.**
2. **When prompted, press Ctrl+A to enter the BIOS RAID Configuration utility.**

   During boot up, if the system has insufficient memory the following message will be displayed.

```
Adaptec RAID Configuration Utility will load after system
initialization. Please wait... Or press <Enter> Key to attempt
loading the utility forcibly [Generally, not recommended]
```

3. **If you have more than one HBA of the same model or family in the computer, select the HBA that you want, and press Enter.**
4. **Select Array Configuration Utility, then press Enter.**
5. **Select Initialize Drives, then press Enter.**
6. **Select at least three disk drives for the array, press Insert for each selected disk drive, then press Enter.**



Caution – During initialization, all data is deleted from the disk. Before continuing, back up any data you want to keep.

7. **Press Y, then press Enter.**

   The selected disk drives are initialized, then the ACU screen is displayed.
8. **Select Create Array, then press Enter.**
9. **Select the disk drives that were just initialized, press Insert for each selected disk drive, and press Enter.**

10. **When the Array Properties screen is displayed, follow the instructions in the following table.**

TABLE 3-1 Filling in Array Properties Screen

Property Line	Entry or Selection
Array Type	Select RAID 5, then press Enter.
Array Label	Type a name, then press Enter.
Array Size	Press Enter, then press Enter again to use the default granularity of GB.
Stripe Size	Press Enter to use the default (256 KB).
Read Caching	Press Enter to use the default (Yes).
Write Caching	Press Enter to use the default (Disable). **Caution -** When write cache is enabled, there is a slight possibility of data loss or corruption during a power failure.
Create RAID via	Press Enter to use the default (Build/Verify).
[Done]	Press Enter.



11. **If a cache warning message is displayed, type** `Y`**.**

12. **After the array is created, a message is displayed telling you that the array can now be used.**

13. **Press any key to return to the ACU Menu.**

    You can start using the array immediately. However, performance is reduced until the build process is complete.

14. **Press Esc until the Exit utility window is displayed.**

15. **Select Yes, then press Enter.**

    The computer restarts.

16. **Continue with** "Installing an OS Onto a Bootable Array on an x64 System" on page 39**.**

Making the Array Bootable

Note – You may need to change the system BIOS to modify the boot order. For more information, refer to your computer documentation or see "Best Practices For Controlling the Boot Order of Logical Drives" on page 87.

The Sun StorageTek SAS RAID Internal HBA always uses the lowest numbered array as its bootable array.

▼ To Make the Array Bootable

1. **Select Manage Arrays from the main ACU menu.**
2. **Select the array that you want to make bootable, then press Ctrl+B.**

Note – You cannot make an array bootable while it is building, verifying, or rebuilding.

The number of the array changes to Array 00, which makes this array the boot array for the Sun StorageTek SAS RAID Internal HBA.

3. **Restart the computer.**

Setting the Boot HBA

The Sun StorageTek SAS RAID Internal HBA supports bootable disk drives and bootable arrays. You can configure the computer system to boot from either a disk drive or an array connected to the HBA.

▼ To Set the Boot HBA

Note – For more information about completing these steps, refer to your computer documentation.

1. **Enter the system setup.**
2. **Navigate to the drive boot sequence.**
3. **Move the boot HBA to the top of the list.**

Next Steps

Install an operating system (OS) onto the bootable array and then install the HBA driver on the array, as described in "Installing an OS Onto a Bootable Array on an x64 System" on page 39.

CHAPTER 4

Creating a Bootable Array on a SPARC System

As an installation option, you can choose to create a bootable array (bootable logical drive) and then install the Solaris 10 10/08 operating system, which contains the required HBA driver, onto that array (logical drive). This chapter describes how to set the Sun StorageTek SAS RAID Internal HBA to be the boot controller, and how to create a bootable array on a SPARC system.

Note – If you are an x64 system user, and you want to create a bootable array and then install an operating system and the HBA driver onto that array, DO NOT complete any task in this chapter. Instead, go to "Creating a Bootable Array on an x64 System" on page 27.

Note – If you want to complete a standard installation onto an existing operating system, DO NOT complete any task in this chapter. Instead, skip to "Installing the Driver on an Existing Operating System" on page 49.

Note – The procedures in this chapter do not require the use of a network install server. If you prefer to create RAID volumes from a network install server, do not follow the procedures in this chapter. Instead, add the command-line interface (CLI), shown in the examples in this chapter, to the miniroot image on the network install server. To obtain the CLI, install the Sun StorageTek RAID Manager software package for SPARC, located on the Sun StorageTek RAID Manager CD in the HBA ship kit or go to:
`http://support.intel.com/support/go/sunraid.htm`
For more information about modifying the miniroot image, see "Patching the Miniroot Image" in the *Solaris 10 10/08 Installation Guide: Network-Based Installations* document, located at `http://docs.sun.com`..

The chapter contains the following sections:

- "Preparing to Create a Bootable Logical Drive" on page 34
- "Building a Logical Drive On Which to Install the Solaris OS" on page 34
- "Next Steps" on page 38

Preparing to Create a Bootable Logical Drive

▼ To Prepare to Create a Bootable Logical Drive on a SPARC System

1. **Install and connect the HBA and disk drives, ensuring that the physical drives are cabled to the HBA.**

   See "Hardware Installation and Removal" on page 9.

2. **Obtain the Live CD for SPARC from the HBA ship kit or go to:** `http://support.intel.com/support/go/sunraid.htm`.

Building a Logical Drive On Which to Install the Solaris OS

In order to install the Solaris 10/08 OS, you need to build the logical drive (array) on which to install it. This section contains the following subsections:

- "To Create a Logical Drive" on page 35
- "To Delete a Logical Drive on RAID Card 1" on page 37
- "To Label the Newly Created Logical Drive" on page 37

Note – The following procedures provide basic examples of the command-line interface (CLI). For detailed information about using the CLI, see the *Uniform Command-Line Interface User's Guide*, located at: `http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

▼ To Create a Logical Drive

1. **Prepare to create the logical drive, as described in** "To Prepare to Create a Bootable Logical Drive on a SPARC System" on page 34**.**

2. **From the system console, boot from the Live CD.**

```
ok boot cdrom
```

3. **At the system prompt, access the command-line interface (CLI), and use the** `./arcconf GETCONFIG` **command to print a list of the complete configuration of card 1 on the system.**

   In the following example, note that the CLI is located in the `/opt/StorMan` directory, and the name of the CLI is `arcconf`. All commands must start with `./` unless you have altered the path to include `/opt/StorMan` in it.

```
# cd /opt/StorMan
# ./arcconf GETCONFIG 1
```

Note – Ignore any "failing to write to log files" messages that might be displayed after running the command. The command will run successfully and will provide a list of physical disks, card status, and logical disks. The list might be long if you have many physical disks. If you have multiple RAID cards, you can specify them with different numbers, starting from 1.

---

4. **Do one of the following:**

   - **To create a logical drive on the RAID card 2, using RAID level 1 (a mirror) and using all the space on physical drives 0,0 and 0,1**, run the `CREATE` command as shown in the following example.

     Note that in this example, the RAID card number follows the `CREATE` command, and the RAID level follows the keyword, `MAX`. Drives are listed in a space-separated fashion, with the channel number followed by the ID number.

```
# ./arcconf CREATE 2 LOGICALDRIVE MAX 1 0 0 0 1
```

   - **To create a logical drive on the RAID card 1, using RAID 5 and all space on disks 0,2 0,3 and 0,4**, run the `CREATE` command as shown in the following example.

```
# ./arcconf CREATE 1 LOGICALDRIVE MAX 5 0 2 0 3 0 4
```

Note – After using the `CREATE` command, you will see error messages like the one shown in the next example. This is because you are working on a read-only file system and certain links cannot be created. However, if the last message says "Command completed successfully", the logical drive is created.

```
Creating logical device: Device 2
  devfsadm: mkdir failed for /dev 0x1ed: Read-only file system
  WARNING: /pci@7c0/pci@0/pci@8/scsi@0/sd@2,0 (sd2):
           Corrupt label; wrong magic number

  devfsadm: inst_sync failed for /etc/path_to_inst.117: Read-only file system
  devfsadm: WARNING: failed to update /etc/path_to_inst

  Command completed successfully.
```

▼ To Delete a Logical Drive on RAID Card 1

You might need to free up some space in order to create the logical drive on which the Solaris OS will be installed. You can do so by deleting existing logical drives.

Caution – Using the command in this procedure will destroy all data on the specified logical drive. Be very careful when using this command to prevent unintentional data loss.

- **To delete a logical drive on RAID card 1, use the** `DELETE` *card-number* `LOGICALDRIVE` *drive-number* **command.**

  In this example, *x* is the number of the logical drive that you want to delete.

```
# ./arcconf DELETE 1 LOGICALDRIVE x
```

▼ To Label the Newly Created Logical Drive

Before the Solaris OS can install software onto the newly created logical drive, you must label the drive.

1. **Use the** `./arcconf GETCONFIG` *card-number* `LD` **command to display the logical drives on RAID card 1.**

```
# ./arcconf GETCONFIG 1 LD
```

2. **Use the** `devfsadm` **command to find the newly created drive and load its drivers.**

```
# devfsadm
```

3. **To label the newly created drive, use the** `format` **command and select the logical drive.**

   You can distinguish the logical RAID card drives in the output by looking at the vendor/product ID string. The Sun StorageTek SAS RAID HBA card is displayed as “Sun-STKRAID.” The last part of the string will display “EXT” (for external) or “INT” (for internal), depending on the type of card you have.

```
# format
Searching for disks...done


AVAILABLE DISK SELECTIONS:
       0. c0t0d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>
          /pci@780/pci@0/pci@9/scsi@0/sd@0,0
       1. c0t1d0 <SUN72G cyl 14087 alt 2 hd 24 sec 424>
          /pci@780/pci@0/pci@9/scsi@0/sd@1,0
       2. c2t0d0 <Sun-STKRAIDINT-V1.0 cyl 17818 alt 2 hd 255 sec 63>
          /pci@7c0/pci@0/pci@8/scsi@0/sd@0,0
       3. c2t1d0 <Sun-STKRAIDINT-V1.0 cyl 8907 alt 2 hd 255 sec 63>
          /pci@7c0/pci@0/pci@8/scsi@0/sd@1,0
Specify disk (enter its number): 2
```

4. **When the** `format` **process displays the** `Disk not labeled. Label it now?` **prompt, type** `y` **and press Enter.**
5. **Exit the** `format` **process by typing** `quit` **and pressing Enter.**

   You now have a labeled logical drive.
6. **Use the** `init 0` **command, switch to the** `ok` **prompt, and use the** `boot net` **command to reboot the system for normal network-based installation.**

```
# init 0
  # syncing file systems... done
  Program terminated
  r)eboot, o)k prompt, h)alt?o
  ok boot net
```

Next Steps

Install the Solaris OS and the HBA driver onto the bootable array, as described in "Installing the Solaris OS on a SPARC System" on page 45.

CHAPTER 5

Installing an OS Onto a Bootable Array on an x64 System

If you chose to create a bootable array on an x64 system as part of your installation (see "Creating a Bootable Array on an x64 System" on page 27), you can install an operating system and the HBA driver on that bootable array.

This chapter explains how to install an operating system (OS) onto a bootable array and then install the HBA driver on the array.

Note – If you are using a SPARC system and you chose to create a bootable array as part of your installation ("Creating a Bootable Array on a SPARC System" on page 33), DO NOT perform any steps in this chapter. Instead, skip to "Installing the Solaris OS on a SPARC System" on page 45.

Note – If you want to perform a standard installation on an existing operating system, DO NOT perform the procedures in this chapter. Instead, go to "Installing the Driver on an Existing Operating System" on page 49.

Note – Each computer system is different. The instructions in this chapter might need to be modified, depending on your actual system configuration. See your system documentation for more information.

This chapter contains the following sections:

- "Preparing to Install an OS" on page 40
- "Installing the HBA Driver With an OS" on page 40

Preparing to Install an OS

▼ To Prepare to Install an OS

1. **Install and connect the HBA and disk drives.**

   See "Hardware Installation and Removal" on page 9.

2. **Obtain the driver CD from the HBA ship kit or obtain the latest version of the driver at** `http://support.intel.com/support/go/sunraid.htm`**.**

3. **Create a bootable array.**

   See "Creating a Bootable Array on an x64 System" on page 27.

Note – For up-to-date operating system version support, go to `http://support.intel.com/support/go/sunraid.htm`.

Installing the HBA Driver With an OS

The HBA driver can be installed with various operating systems and technology on an x64 system. This section contains the following subsections:

- "To Install the Driver With the Windows OS" on page 41
- "To Install the Driver With the Red Hat Linux OS" on page 41
- "To Install the Driver With the SUSE Linux OS" on page 42
- "To Install the Driver With the Solaris OS" on page 42
- "To Install the Driver With VMware Technology" on page 43

▼ To Install the Driver With the Windows OS

Note – You will need the Windows Installation media to complete this task.

1. **Insert the Windows installation medium, then restart the computer.**
2. **Follow the on-screen instructions to begin the Windows installation.**
3. **When prompted to install a third-party driver, press F6.**

Note – When F6 is active, a prompt is displayed at the bottom of the screen for only 5 seconds. If you miss your chance to press F6, restart the computer.

4. **Insert the driver CD, and then wait until you are prompted to install a driver.**
5. **Press S to specify that the driver is on the installed medium, then press Enter.**
   The computer reads the medium.
6. **When the driver is found, press Enter.**
7. **Follow the on-screen instructions to complete the installation.**
8. **To configure and manage the hard disks, see the** *Sun StorageTek RAID Manager Software User's Guide* **at:**
   http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver With the Red Hat Linux OS

Note – You will need your Red Hat Installation media to complete this task.

1. **Insert the Red Hat Installation medium.**
2. **Restart the computer.**
3. **When the Red Hat Welcome screen is displayed, type `linux dd` at the Boot: prompt.**
4. **When prompted, insert the driver CD, then select OK.**
5. **Follow the prompts to set up the environment you want.**
6. **If you are installing other third-party devices, install them now.**
   Otherwise, select Done.

7. **Complete the Linux installation, following the instructions included with the operating system.**
8. **To configure and manage the hard disks, see the** *Sun StorageTek RAID Manager Software User's Guide* **at:**
   http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver With the SUSE Linux OS

Note – You will need the SUSE installation media to perform this task.

1. **Insert the SUSE Installation medium.**
2. **Restart the computer.**
3. **When the SUSE installation selection screen is displayed, choose the type of installation you want, then press the F6 key to indicate the use of a driver medium, such as a USB thumb key or a CD-ROM / DVD-ROM drive.**

   If F6 is not shown on the screen, you may have an older version of SUSE; press the Alt key instead.
4. **When prompted, insert the driver CD, and then press any key to continue.**
5. **Follow the prompts to set up the environment you want.**
6. **If you are installing other third-party devices, install them now.**

   Otherwise, select Back.
7. **Complete the Linux installation, following the instructions included with the operating system.**
8. **To configure and manage the hard disks, see the** *Sun StorageTek RAID Manager Software User's Guide* **at:**
   http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver With the Solaris OS

This HBA supports, at a minimum, the Solaris 10 8/07 (s10u4) OS on an x64-based system. The Solaris 10 8/07 OS requires nothing from the user. However, install the latest patches from the http://www.sunsolve.sun.com website after installing the Solaris OS.

▼ To Install the Driver With VMware Technology

Note – You will need the VMware Installation media to complete this task.

1. **Insert the VMware Installation medium.**
2. **Restart the computer.**
3. **Follow the on-screen instructions to begin the VMware installation.**

Note – The VMware ESX Server embedded driver will see the device and install.

4. **Complete the VMware installation, following the instructions included with your operating system.**

Note – The Sun StorageTek RAID Manager GUI is not supported with VMware technology. To create and manage arrays, use the command-line interface and the BIOS utility. See the *Uniform Command-Line Interface User's Guide* for more information at:
`http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

Next Steps

Do either of the following:

- Install and use the Sun StorageTek RAID Manager GUI to create arrays on the disk enclosure. See the *Sun StorageTek RAID Manager User's Guide* at:
  `http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`
- Use the BIOS utility to create arrays on the disk enclosure. See "Using the BIOS RAID Configuration Utility" on page 65.

CHAPTER 6

Installing the Solaris OS on a SPARC System

If you chose to create a bootable array on a SPARC system as part of your installation (see "Creating a Bootable Array on a SPARC System" on page 33), you can install the Solaris 10/08 (s10u6) operating system (OS), at minimum, on that bootable array. Starting with the Solaris 10/08 OS, the driver required by the HBA is provided with the Solaris OS.

Note – If you are using an x64 system and you chose to create a bootable array as part of your installation ("Creating a Bootable Array on an x64 System" on page 27), DO NOT perform any steps in this chapter. Instead, skip to "Installing an OS Onto a Bootable Array on an x64 System" on page 39.

This chapter contains the following sections:

- "Preparing to Install the Solaris OS" on page 46
- "Installing the Solaris OS" on page 46
- "Next Steps" on page 47

Preparing to Install the Solaris OS

Before you begin, prepare to install the Solaris 10/08 OS.

▼ To Prepare to Install the Solaris OS

- **Complete the procedures in** "Creating a Bootable Array on a SPARC System" on page 33**.**

Note – For up-to-date Sun StorageTek SAS RAID HBA support, go to `http://support.intel.com/support/go/sunraid.htm`.

Installing the Solaris OS

■ "To Install the Solaris OS" on page 46

▼ To Install the Solaris OS

1. **Obtain the Solaris 10 10/08 OS, at minimum, from the Sun download site:**

   `http://www.sun.com/software/solaris`

2. **Perform a normal installation, as described in the** *Solaris 10 10/08 Installation Guide: Basic Installations* **(part number: 820-5236-***nn***).**

   You can obtain this document by performing a search at:

   `http://docs.sun.com`

3. **Apply any patches that are specifically required for the system.**

4. **Reboot the system.**

```
# reboot
```

The system will now be able to see, and boot from, the logical drive on which you installed the Solaris OS.

Next Steps

You can optionally install and use the Sun StorageTek RAID Manager GUI to create arrays on the disk enclosure. See the *Sun StorageTek RAID Manager User's Guide* at: http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

CHAPTER 7

Installing the Driver on an Existing Operating System

As an installation option, you can choose to perform a standard installation by installing the HBA driver on an existing operating system. This chapter describes how to perform this operation.

Note – If you want to create a bootable array and install an operating system and the HBA driver on that array, DO NOT perform the procedures in this chapter. Instead, see "Creating a Bootable Array on an x64 System" on page 27 or "Creating a Bootable Array on a SPARC System" on page 33.

This chapter contains the following sections:

- "Preparing to Install the HBA Driver" on page 49
- "Installing the Driver on an Existing OS" on page 50

Preparing to Install the HBA Driver

Before you begin, prepare to install the HBA driver by doing the following:

1. **Install and connect the HBA and disk drives.**

   See "Hardware Installation and Removal" on page 9.

Note – For up-to-date operating system version support, visit `http://support.intel.com/support/go/sunraid.htm`.

2. **Obtain the driver CD from the HBA ship kit or obtain the latest version of the driver at** `http://support.intel.com/support/go/sunraid.htm`.

Installing the Driver on an Existing OS

The driver can be installed on various operating systems. This section contains the following subsections:

- "To Install the Driver on the Windows OS" on page 50
- "To Install the Driver on the Red Hat or SUSE Linux OS" on page 50
- "To Install the Driver on the Solaris OS on an x64 System" on page 51
- "To Install the Driver on the Solaris OS on a SPARC System" on page 51
- "To Install the Driver On the VMware Technology" on page 52

▼ To Install the Driver on the Windows OS

1. **Start or restart Windows.**

   The Found New Hardware Wizard opens and searches for the driver.

2. **Insert the driver CD.**
3. **Select the source, and click Next.**
4. **Click Next, and click Next again.**
5. **Follow the on-screen instructions to complete the driver installation.**
6. **Remove the driver CD and restart the computer.**
7. **To configure and manage the hard disks, see the** *Sun StorageTek RAID Manager Software User's Guide* **at:**
   `http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

▼ To Install the Driver on the Red Hat or SUSE Linux OS

Note – The driver required by this HBA is provided with the RHEL 5 and SUSE 10 operating systems. The RHEL 5 and SUSE 10 operating systems require nothing from the user. You do not need to perform the procedure in this section.

---

1. **Insert the driver CD.**

2. **Mount the CD.**

   For example:

   Red Hat: **`mount /dev/cdrom /mnt/cdrom`**
   SUSE: **`mount /dev/cdrom /media/cdrom`**

3. **Install the module RPM.**

   `rpm -Uvh` *mount-point*`/`*xxx*`/`*yyy*`.rpm`

   Where *mount-point* is the specific mount point on the Linux system, *xxx* is the driver path, and *yyy*`.rpm` is the rpm file.

4. **Reboot the computer to ensure the driver loaded correctly.**

5. **Run** `fdisk`, `mkfs`, **and create mount points for any new disk drives.**

6. **To configure and manage the hard disks, see the** *Sun StorageTek RAID Manager Software User's Guide* **at:**
   http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver on the Solaris OS on an x64 System

This HBA supports, at a minimum, the Solaris 10 8/07 (s10u4) OS on an x64-based system. The Solaris 10 8/07 OS requires nothing from the user. However, install the latest patches from the http://www.sunsolve.sun.com website after installing the Solaris OS.

To configure and manage the hard disks, see the *Sun StorageTek RAID Manager Software User's Guide* at:
http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver on the Solaris OS on a SPARC System

This HBA supports, at a minimum, the Solaris 10/08 (s10u6) OS on a SPARC system. The Solaris 10 8/07 OS requires nothing from the user. However, install the latest patches from the http://www.sunsolve.sun.com website after installing the Solaris OS.

To configure and manage the hard disks, see the *Sun StorageTek RAID Manager Software User's Guide* at:
http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic

▼ To Install the Driver On the VMware Technology

Note – The embedded driver provided by VMware ESX Server is suitable for most applications. If an updated driver is needed, use the following procedure.

1. **Start the computer, then insert the driver CD.**
2. **At the console screen of the VMware ESX Server, mount the CD.**

   For example:

   `mount -r /dev/cdrom /mnt/cdrom`.
3. **Install the module RPM:**

   `rpm -ivh /mnt/cdrom/`*`xxx`*`/`*`yyy.rpm`*

   where *xxx* is the driver path, and *yyy.rpm* is the rpm file.
4. **Reboot the computer and remove the driver medium.**

Note – The Sun StorageTek RAID Manager GUI is not supported with VMware technology. To create and manage arrays, use the command-line interface and the BIOS utility. See the *Uniform Command-Line Interface User's Guide* at:
`http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

Next Steps

Do either of the following:

- Install and use the Sun StorageTek RAID Manager GUI to create arrays on the disk enclosure. See the *Sun StorageTek RAID Manager User's Guide*.
- If you are using an x64 system, you can also use the BIOS utility to create arrays on the disk enclosure. See "Using the BIOS RAID Configuration Utility" on page 65.

CHAPTER 8

Known Issues

This chapter contains the latest supplementary information for the preceding chapters in this guide.Specific Change Request (CR) identification numbers are provided for service personnel, when necessary. The chapter contains the following sections:

- "Ship Kit Issues" on page 53
- "BIOS Utility Issues" on page 54
- "Performance Issues" on page 54

Ship Kit Issues

This section describes the known ship kit issue.

Some or All CDs Are Not Included in the HBA Ship Kit

Workaround: You can obtain the latest drivers and software at:
http://support.intel.com/support/go/sunraid.htm

BIOS Utility Issues

This section contains the known issues related to the BIOS RAID Configuration Utility:

- "Creating an Array With the BIOS Utility Changes the BIOS Boot Order" on page 54
- "Hot-Plug Functionality Does Not Work in the BIOS Utility" on page 54
- "Performance Issues" on page 54

Creating an Array With the BIOS Utility Changes the BIOS Boot Order

Workaround: After creating the array, check the BIOS settings to verify the correct boot order and make changes as necessary. For more information, see "Best Practices For Controlling the Boot Order of Logical Drives" on page 87.

Hot-Plug Functionality Does Not Work in the BIOS Utility

Workaround: Hot-plugging of enclosures is not supported in the BIOS RAID Configuration utility. Hot-plugging of SAS/SATA hard disk drives (HDDs) is supported only within hard disk enclosures and only under the conditions specified in "Understanding Hot-Plug Limitations and Conditions Within the BIOS RAID Configuration Utility" on page 66.

Performance Issues

This section contains the known performance issues:

- "The System Freezes When a Sun Storage 32GB SLC SATA Solid State Drive (SSD) is Configured In the HBA" on page 55
- "Cannot Access the HBA From the GUI Nor Access a LUN From the Host" on page 55
- "Data Miscompare With 3.5" SAS Disks" on page 55

The System Freezes When a Sun Storage 32GB SLC SATA Solid State Drive (SSD) is Configured In the HBA

CR 6806467

Issue: This occurs because the HBA has firmware prior to version 16732 installed on it and the Sun Storage 32GB SLC SATA SSD has firmware version 8626 or earlier installed on it.

Workaround: Do the following:

1. **Upgrade the HBA to firmware version 16732, at minimum.**

   You can obtain the latest HBA firmware at: `http://support.intel.com/support/go/sunraid.htm`

2. **Power cycle the HBA host system.**

3. **Upgrade the SSD to firmware version 8850, at minimum.**

   You can obtain the latest SSD firmware at: `http://www.sunsolve.sun.com`

4. **Power cycle the SSD.**

Cannot Access the HBA From the GUI Nor Access a LUN From the Host

CR 6820225

Workaround: Reboot the host system on which the HBA resides.

Data Miscompare With 3.5" SAS Disks

CR 6822080

Issue: After repeatedly scanning a Seagate SAS Cheetah 15K disk, inconsistent data is reported, even though nothing has changed on the disk. This is due to an old firmware version (prior to 0A1C) on the Seagate SAS Cheetah 15K disk, model ST3450856SS (Sun part number: 390-0424-03).

Workaround: Upgrade the firmware on the Seagate SAS Cheetah 15K disk to version 0A1C, at minimum.

APPENDIX **A**

Configuration Rules

This appendix lists the configuration rules for the Sun StorageTek SAS RAID Internal HBA.

Note – Use only Sun-approved devices and cabling with the HBA.

The appendix contains the following sections:

- "Target Devices" on page 57
- "Cabling" on page 58

Target Devices

The following rules apply for supported target devices:

- Internal Enclosures:
  - SAS/SATA backplane
  - SASA/SATA backplane with SES-2 enclosure management support

Note – Enclosure cascading is not supported.

- SAS/SATA HDDs:
  - Eight direct-attached per HBA (128 HDDs maximum via backplane SAS expander)

Note – Mixing SATA and SAS HDDs in the same logical RAID array is not supported. Although it is not an unsupported configuration, SAS and SATA HDDs must not be mixed in the same enclosure.

Cabling

Note – If you are installing the HBA on a Sun SPARC Enterprise T5120, T5220, T5140, or T5240 server, you will need different cables than the ones listed in this section. For more information about cabling for these servers, see the server-specific installation documentation listed in "Related Documentation" on page xii.

- SAS internal 4-lane cable with SFF-8087 host-side connector
  - Maximum recommended length of 6 meters
- SATA internal x4 cable with mini-SAS
  - Maximum length of 1 meter

APPENDIX **B**

HBA Specifications

This appendix provides information about the HBA specifications. The appendix contains the following sections:

- "Physical Dimensions" on page 59
- "Environmental Specifications" on page 60
- "DC Power Requirements" on page 60
- "Current Requirements" on page 60
- "Performance Specifications" on page 60
- "Connector Pin Definitions" on page 61

Physical Dimensions

Meets PCI low-profile MD2 specification.

- Height: 67 mm
- Length: 167 mm

Environmental Specifications

Note – With a Battery Backup Unit (BBU), the ambient temperature must not exceed 40 ˚C.

TABLE B-1 Environmental Specifications

Ambient temperature without forced airflow	0 ˚C to 40 ˚C
Ambient temperature with forced airflow	0 ˚C to 55 ˚C
Relative humidity	10% to 90%, noncondensing
Altitude	Up to 3,000 meters

Note – Forced airflow is recommended.

DC Power Requirements

PCI Express, DC Voltage 3.3 V 9%, 12 V 8%

Current Requirements

1.0 A @ 3.3 VDC; 1.0 A @ 12.0 VDC

Performance Specifications

The Serial Attached SCSI [SAS] bus defines these layers:

- Physical layer: Consists of two sets of differential lines, one receive set and one transmit set [4-wire total]. This layer defines the cable, connector, and transceiver [Transmitter / Receiver] characteristics.
- PHY layer: Connects the differential Transmitter and Receiver circuits [ICs] to the Physical Layer.
- Link layer
- Port layer
- Application layer

The external connector accepts 4 physical links and the cable may hold between 1 and 4 physical links. Internal connectors are defined and two data rates are defined: 1.5 Gbps and 3.0 Gbps over a 100 ohm [+ 15 ohm] differential impedance cable.

SAS uses the Serial ATA physical interface, including the connector receptacle and connector plugs. SAS transmits data using 8B/10B at a maximum level of 1.2 volts [Tx voltage = 800-1600mV], [Rx voltage = 275-1600mV]. SAS uses big-endian, while SATA uses little-endian byte ordering. SAS uses a 32 bit CRC. SAS uses LVDS.

Connector Pin Definitions

SAS Pin-Out

Two types of ports are defined: A Narrow Port communicates over a narrow link and contains only one transmit/receive pair, and a Wide Port communicates over a wide link and contains more than one transmit/receive pair. The ports reside in the PHY layer, and the link resides in the physical layer.

TABLE B-2 SAS Pin-Out

Signal Name	1 Physical Link	2 Physical Links	3 Physical Links	4 Physical Links
Rx 0+	S1	S1	S1	S1
Rx 0-	S2	S2	S2	S2
Rx 1+	N/A	S3	S3	S3
Rx 1-	N/A	S4	S4	S4
Rx 2+	N/A	N/A	S5	S5
Rx 2-	N/A	N/A	S6	S6

TABLE B-2 SAS Pin-Out

Signal Name *(Continued)*	1 Physical Link *(Continued)*	2 Physical Links *(Continued)*	3 Physical Links *(Continued)*	4 Physical Links *(Continued)*
Rx 3+	N/A	N/A	N/A	S7
Rx 3-	N/A	N/A	N/A	S8
Tx 3-	N/A	N/A	N/A	S9
Tx 3+	N/A	N/A	N/A	S10
Tx 2-	N/A	N/A	S11	S11
Tx 2+	N/A	N/A	S12	S12
Tx 1-	N/A	S13	S13	S13
Tx 1+	N/A	S14	S14	S14
Tx 0-	S15	S15	S15	S15
Tx 0+	S16	S16	S16	S16
Signal Ground	G1 - G9	G1 - G9	G1 - G9	G1 - G9
Chassis Ground	Housing	Housing	Housing	Housing

SATA Pin-Out

The Serial ATA [SATA] bus is defined over two separate connectors, one connector for the data lines and one for the power lines. A SATA hard drive may also have a third connector for legacy PATA power connections. The PATA power connector may be used in instead of the SATA power to supply a connection which is more rugged and reliable then the SATA-1 power connection.

TABLE B-3 SATA Data Pin-Out

Pin #	Signal Name	Signal Description
1	GND	Ground
2	A+	Transmit +
3	A-	Transmit -
4	GND	Ground
5	B-	Receive -
6	B+	Receive +
7	GND	Ground

TABLE B-4 SATA Power Pin-Out

Pin#	Signal Name	Signal Description
1	V33	3.3v Power
2	V33	3.3v Power
3	V33	3.3v Power, Pre-charge, 2nd mate
4	Ground	1st Mate
5	Ground	2nd Mate
6	Ground	3rd Mate
7	V5	5v Power, pre-charge, 2nd mate
8	V5	5v Power
9	V5	5v Power
10	Ground	2nd Mate
11	Reserved	-
12	Ground	1st Mate
13	V12	12v Power, Pre-charge, 2nd mate
14	V12	12v Power
15	V12	12v Power

APPENDIX **C**

Using the BIOS RAID Configuration Utility

The BIOS RAID Configuration utility is a BIOS-based utility that you can use to create and manage controllers, disk drives and other devices, and arrays.

Note – If you are using a SPARC system, you cannot use the BIOS RAID Configuration utility. Instead, use the Sun StorageTek RAID Manager graphical user interface (GUI). For more information, see the *Sun StorageTek RAID Manager Software User's Guide* at:
`http://docs.sun.com/app/docs/prod/stortek.raid.hba#hic`

Note – If you are not an advanced user familiar with working in a computer BIOS, do not use the BIOS RAID Configuration utility tools. Instead, use the Sun StorageTek RAID Manager graphical user interface.

This appendix contains the following sections:

- "Introduction to the BIOS RAID Configuration Utility" on page 66
- "Understanding Hot-Plug Limitations and Conditions Within the BIOS RAID Configuration Utility" on page 66
- "Running the BIOS RAID Configuration Utility" on page 68
- "Using the ACU to Create and Manage Arrays" on page 69
- "Using the -Select Utility to Modify HBA Settings" on page 73
- "Using the Disk Utilities to Manage Disk Drives" on page 76
- "Viewing the BIOS-Based Event Log" on page 78

Introduction to the BIOS RAID Configuration Utility

The BIOS RAID Configuration utility comprises these tools:

- **The Array Configuration Utility (ACU)**—For creating and managing arrays and initializing and rescanning disk drives. See "Using the ACU to Create and Manage Arrays" on page 69.
- **A -*Select* Utility**—Serial*Select*, or SATA*Select*, for modifying the HBA and disk drive settings. See "Using the -Select Utility to Modify HBA Settings" on page 73.
- **Disk Utilities**—For formatting or verifying disk drives. See "Using the Disk Utilities to Manage Disk Drives" on page 76.

Understanding Hot-Plug Limitations and Conditions Within the BIOS RAID Configuration Utility

Hot-plugging of hard disk enclosures is not supported from within the BIOS RAID Configuration utility. However, hot-plugging of SAS/SATA hard disk drives (HDDs) is supported, but only within hard disk enclosures and under the following conditions:

- "Hot-Unplug Removal Conditions" on page 66
- "Hot-Plug Addition Conditions" on page 67
- "Hot-Unplug and Plug Replacement/Reinsertion Conditions" on page 67

Note – Hot-plugging of hard disk drives is NOT supported during periods when the controller is busy performing actions on logical drives (building, rebuilding, or migrating RAID volumes).

Hot-Unplug Removal Conditions

Hot-unplug, **removal,** of HDDs is supported under the following conditions:

- The hard disk drive to be removed must not be a part of a logical device (its status must be ‘available’).
- After the hard disk drive is removed from the enclosure, you must perform a bus scan by using the `Rescan Drives` option from the main menu of the Array Configuration Utility (ACU).
- You must confirm that the Disk Utility reports the correct configuration of the attached target devices.

Hot-Plug Addition Conditions

Hot-plug, **add**, of HDDs is supported under the following conditions:

- After the hard disk drive is added to the enclosure, you must perform a bus scan by using the `Rescan Drives` option from the main menu of the ACU.
- You must confirm that the Disk Utility reports the correct configuration of the attached target devices.

Hot-Unplug and Plug Replacement/Reinsertion Conditions

Hot unplug and plug, **replace/reinsert,** of HDDs is supported under the following conditions:

- The hard disk drive to be removed must not be a part of a logical device (its status must be ‘available’).
- If a hard disk drive is to be removed and replaced either into the same slot or a different unused slot using the same disk drive or a new disk drive, you must perform a bus scan between the removal and the replacement steps, as follows:

  a. Remove the selected hard disk drive.

  b. Complete a bus scan by using the `Rescan Drives` option in the ACU.

  c. Confirm that the Disk Utility reports the correct configuration of attached target devices

  d. Replace/reinsert the hard disk (new or same) into the enclosure slot (same or another unused slot).

  e. Complete a bus scan by using the `Rescan Drives` option in the ACU.

  f. Confirm that Disk Utility reports the correct configuration of attached target devices.

Running the BIOS RAID Configuration Utility

This section describes how to start and navigate through the BIOS RAID Configuration utility. The section contains the following subsections:

- "To Start the BIOS RAID Configuration Utility" on page 68
- "To Navigate the BIOS RAID Configuration Utility" on page 69

▼ To Start the BIOS RAID Configuration Utility

1. **If the Sun StorageTek SAS RAID Internal HBA is connected to a RAID enclosure, power on the enclosure (or enclosures) before you power on the computer.**
2. **Start or restart the computer.**
3. **When prompted, press Ctrl+A.**

During boot up, if your system has insufficient memory the following message will be displayed.

```
BIOS RAID Configuration Utility will load after system
initialization. Please wait... Or press <Enter> Key to attempt
loading the utility forcibly [Generally, not recommended]
```

Note – The first time you power on the computer after you install a new HBA, the BIOS may display a configuration that doesn't match the system's configuration. This is normal behavior.

▼ To Navigate the BIOS RAID Configuration Utility

- **Use the arrows, Enter, Esc, and other keys on your keyboard to navigate through the utility menus.**

  All the tools within the BIOS RAID Configuration utility are menu-based and instructions for completing tasks are displayed on-screen.

Using the ACU to Create and Manage Arrays

You can use the ACU, a tool of the BIOS RAID Configuration utility, to create and manage arrays. This section contains the following subsections:

- "To Start the ACU" on page 70
- "To Create a New Array With the ACU" on page 70
- "To Manage Existing Arrays With the ACU" on page 71
- "To Make an Array Bootable With the ACU" on page 71
- "To Initialize Disk Drives With the ACU" on page 72
- "To Rescan Disk Drives With the ACU" on page 72
- "To Perform a Secure Erase on Disk Drives With the ACU" on page 72
- "To Stop a Secure Erase in Progress With the ACU" on page 72

▼ To Start the ACU

1. **Start the BIOS RAID Configuration utility.**

   See "To Start the BIOS RAID Configuration Utility" on page 68.

2. **If you have more than one HBA, select the HBA that you want to manage and press Enter.**

3. **Select Array Configuration Utility and press Enter.**

4. **Follow the on-screen instructions to create and manage arrays, and initialize, rescan, and erase disk drives.**

▼ To Create a New Array With the ACU

Note – You can create an array with the ACU and the Sun StorageTek RAID Manager graphical user interface (GUI). However, it is a much quicker process to create an array through the GUI than the ACU. Creating an array with the ACU might take two to three times longer than creating an array with the GUI. For more information, see the *Sun StorageTek RAID Manager Software User's Guide*.

---

1. **Select Create Arrays from the main ACU menu.**

   Only disk drives that can be used in a new array are available for selection. (Disk drives must be initialized before they can be used in an array. See "To Initialize Disk Drives With the ACU" on page 72 for more information.)

2. **Use the Array Properties menu to modify the RAID level, size, name, stripe size, and caching settings of the array.**

Note – For more information about RAID levels and using disk drives to create arrays, see "Selecting the Best RAID Level" on page 91.

Note – Creating a new array might change the BIOS boot order. Check the BIOS settings to verify the correct boot order. For more information, see "Best Practices For Controlling the Boot Order of Logical Drives" on page 87.

▼ To Manage Existing Arrays With the ACU

1. **Select Manage Arrays from the main ACU menu.**
2. **From the Manage Arrays menu, do any of the following:**

- View the properties of an array.

Note – Failed drives are displayed in a different text color.

- Make an array bootable. See "To Make an Array Bootable With the ACU" on page 71.
- Assign or remove hot-spares.
- Delete an array.



Caution – Before deleting an array, back up the data to avoid permanently losing it.

▼ To Make an Array Bootable With the ACU

Note – You may need to change the system BIOS to modify the boot order. For more information, refer to your computer documentation or see "Best Practices For Controlling the Boot Order of Logical Drives" on page 87.

The Sun StorageTek SAS RAID Internal HBA always uses the lowest numbered array as its bootable array.

1. **Select Manage Arrays from the main ACU menu.**
2. **Select the array that you want to make bootable, then press Ctrl+B.**

Note – You cannot make an array bootable while it is building, verifying, or rebuilding.

The array number changes to Array 00, which makes the array the boot array for the HBA.

3. **Restart the computer.**

▼ To Initialize Disk Drives With the ACU

If a disk drive is displayed grayed-out (unavailable for use in a new array), it may need to be initialized.

- **Select Initialize Drives from the main ACU menu.**



Caution – Do not initialize a disk drive that is part of an array. Initializing a disk drive that is part of an array may make the array unusable. Back up all data from your disk drive before you initialize it.

▼ To Rescan Disk Drives With the ACU

- **Select Rescan Drives from the main ACU menu.**

▼ To Perform a Secure Erase on Disk Drives With the ACU

When you perform a secure erase on a disk drive, all data on that disk drive is completely and irretrievably eradicated. Secure erase performs three distinct writing passes to the disk drive being erased—it does not just write zeros.

Performing a secure erase takes up to six times longer than clearing (or zeroing) a disk drive. You may want to perform a secure erase only on disk drives that contain confidential or classified information.

Note – To erase (or zero) a disk drive with non-classified information, you may choose to format it (see "Using the Disk Utilities to Manage Disk Drives" on page 76) instead, or clear it using Sun StorageTek RAID Manager graphical user interface (GUI)—both options take much less time than the secure erase option.

- **Select Secure Erase from the main ACU menu, then select Y (yes).**

  To return to the main ACU menu once the secure erase has begun, press Esc. The selected disk drive(s) cannot be used until the erase is complete.

▼ To Stop a Secure Erase in Progress With the ACU

1. **From the main ACU window, select Secure Erase.**

2. **Select the disk drive being secure erased, then press Ctrl+Q.**

   The secure erase stops and the ACU returns to its main window.

Using the -*Select* Utility to Modify HBA Settings

Included in the BIOS RAID Configuration utility is a tool for modifying the settings of the HBA and the disk drives connected to it. This utility is called Serial*Select* or SATA*Select*. This section contains the following subsections:

- "To Start Using a -Select Utility" on page 73
- "To Apply Changes and Exit a -Select Utility" on page 73
- "To Modify General HBA Settings With a -Select Utility" on page 74
- "To Modify SAS-Specific HBA Settings With a -Select Utility" on page 75

▼ To Start Using a -*Select* Utility

1. **Start the BIOS RAID Configuration utility (see** "To Start the BIOS RAID Configuration Utility" on page 68**), select the -*Select* utility, and press Enter.**
2. **Follow the on-screen instructions to modify the settings of the HBA and connected disk drives, as required.**

▼ To Apply Changes and Exit a -*Select* Utility

1. **Press Esc until you are prompted to exit.**

   If you modified any settings, you are prompted to save the changes before you exit.

2. **Select Yes to exit, then press any key to restart your computer.**

   Any changes you made take effect after the computer restarts.

▼ To Modify General HBA Settings With a -*Select* Utility

Note – Default HBA settings are suitable for most computers. Do not change the default settings.

- **Select Controller Configuration from the main -*Select* utility menu and change the settings listed in the following table.**

  Some options may not be available for the HBA.

Note – Default settings are shown in **bold** type.

TABLE C-1 General HBA Settings

Option	Description
Drive's Write Cache	When enabled, write cache is enabled on the disk drive. When **disabled**, write cache is not used on the disk drive. It is recommended that you disable write cache on the disk drive. **Caution -** When write cache is enabled, there is a slight possibility of data loss or corruption during a power failure.
Runtime BIOS	When **enabled**, the HBA BIOS allows the HBA to act as a bootable device. Disabling the BIOS allows another HBA to act as a bootable device.
Automatic Failover	When **enabled**, the HBA automatically rebuilds an array when a failed disk drive is replaced. When disabled, the array must be rebuilt manually.
Array Background Consistency Check	When enabled, the HBA constantly verifies a redundant array. Note that there may be a significant performance reduction. Default is **disabled**.
BBS Support	When **enabled** in systems that support BBS, the HBA is presented as a bootable device in the BIOS.
Array-based BBS Support	When enabled in systems that support BBS, the HBA presents attached bootable devices up to the BIOS for boot device selection. This is relevant for logical arrays. Default is **disabled**.
Physical Drives Display During POST	When enabled, connected disk drives are displayed during system Power On Self Test (POST). Displaying the disk drives adds a few seconds to the overall POST time. Default is **disabled**.
CD-ROM Boot Support	When **enabled**, the system can be booted from a bootable CD. **Note**—CDs are not supported by current software.

TABLE C-1 General HBA Settings

Option *(Continued)*	Description *(Continued)*
Removable Media Devices Boot Support	When **enabled**, removable media devices, such as CD drives, are supported.
Alarm Control	When enabled, the alarm sounds. Default is **enabled**. **Note**—When the alarm is turned off (disabled), it will automatically turn back on after a reboot.
SATA Native Command Queuing (NCQ)	When **enabled**, NCQ is enabled. Disable this feature if you want to attach more than 48 SATA II disk drives. Only available with SATA II disk drives.

▼ To Modify SAS-Specific HBA Settings With a -*Select* Utility

In addition to the general settings listed on"To Modify General HBA Settings With a -Select Utility" on page 74, the Sun StorageTek SAS RAID Internal HBA has SAS-specific settings that can be modified if required. (For more information about SAS, see "Introduction to Serial Attached SCSI" on page 103.)

- **Select PHY Configuration from the Serial*Select* main menu and change the settings listed in the following table.**

Note – Default settings are shown in **bold** type.

TABLE C-2 SAS-Specific HBA Settings

Option	Description
PHY Rate	The data transfer rate between the HBA and devices. The default setting is **Auto**, which allows the SAS card to adjust the data transfer rate as required.
CRC Checking	When enabled, determines whether the HBA verifies the accuracy of data transfer on the serial bus. Default setting is **Yes** (enabled). Set to No (disabled) only if the HBA is connected to a device that does not support CRC Checking.
SAS Address	In a situation where you want each phy on a HBA to be in a different SAS domain, this setting specifies a unique world-wide name for each phy. Default is **0**. **Note:** This setting is for SAS address conflict resolution only and must otherwise remain at its default value.

Using the Disk Utilities to Manage Disk Drives

You can use the disk utilities, another tool in the BIOS RAID Configuration utility, to low-level format or verify your disk drives. (New disk drives are low-level formatted at the factory and do not need to be low-level formatted again.)



Caution – Before you format a disk drive, back up all data. Formatting destroys all data on a disk drive.

This section contains the following subsections:

- "To Format or Verify a Disk Drive With the Disk Utilities" on page 76
- "To Locate Disk Drives With the Disk Utilities" on page 76
- "To Identify Disk Drives With the Disk Utilities" on page 77

▼ To Format or Verify a Disk Drive With the Disk Utilities

1. **Start the BIOS RAID Configuration utility.**
   See "To Start the BIOS RAID Configuration Utility" on page 68.
2. **Select the HBA you want, then press Enter.**
3. **Select Disk Utilities.**
4. **Select the disk drive you want, then press Enter.**
5. **Select Format Disk or Verify Disk Media.**

▼ To Locate Disk Drives With the Disk Utilities

Note – This feature is only available with disk drives that have an activity LED.

You can use the Identify Drive feature to physically locate a disk drive by blinking the LED.

1. **Start the BIOS RAID Configuration utility.**

   See "To Start the BIOS RAID Configuration Utility" on page 68.

2. **Select the HBA you want, then press Enter.**

3. **Select Disk Utilities.**

4. **Select the disk drive you want, then press Enter.**

5. **Select Identify Drive, then press Enter.**

6. **When you have finished locating your disk drive, press any key to stop the blinking.**

▼ To Identify Disk Drives With the Disk Utilities

You can identify disk drives by viewing the list of disk drives on your system. Only physical drives that display during POST are shown.

1. **Start the BIOS RAID Configuration utility.**

   See "To Start the BIOS RAID Configuration Utility" on page 68.

2. **Select the HBA you want, then press Enter.**

3. **Select Disk Utilities.**

   The Disk Utilities view will provide you with the following information:

TABLE C-3 Information Provided by Disk Utilities

Location	Model	Rev#	Speed	Size
CN1=DEV1 Box0=Slot0 Exp0=phy0	The manufacturer information.	The revision number of the disk drive.	The speed of the disk drive.	The size of the disk drive.

The location information of a disk drive is determined by three types of connections:

- **Direct attached drives**—The connection is determined by the cable connected to a device, for example CN1 (connector 1) is connected to DEV1 (device 1). For more information, see "Direct-Attach Connections" on page 108.
- **Storage Enclosure Processor (SEP) managed devices**—The connection is determined by an active backplane. Box0 (enclosure 0) is connected to slot0 (disk drive slot 0 in the enclosure). For more information, see "Backplane Connections" on page 108.

- **Expanders**—The connections is determined by an expander. Exp0 (expander 0) is connected to phy0 (phy 0 within a connector). For more information, see "SAS Expander Connections" on page 109.

Note – Devices other than disk drives (CDROM, tape drives, and so on) are listed in order after your system disk drives.

Viewing the BIOS-Based Event Log

The BIOS-based event log records all firmware events, such as configuration changes, array creation, and boot activity.

Some events are not stored indefinitely—the event log is cleared of any non-persistent events each time you restart your computer; additionally, once the log is full, new events overwrite old events.

▼ To View the Event Log

1. **Start the BIOS RAID Configuration utility.**

   See "To Start the BIOS RAID Configuration Utility" on page 68.

2. **Select the HBA you want, then press Enter.**
3. **When the BIOS RAID Configuration utility menu is displayed, then press Ctrl+P.**
4. **Select Controller Log Information, then press Enter.**

   The current event log opens.

APPENDIX **D**

Troubleshooting

This appendix provides basic troubleshooting information and solutions for solving HBA problems. The appendix contains the following sections:

- "Troubleshooting Checklist" on page 79
- "Silencing the Alarm" on page 80
- "Recovering From a Disk Drive Failure" on page 80

Troubleshooting Checklist

If you encounter difficulties installing or using the Sun StorageTek SAS RAID Internal HBA, check these items first:

- With the computer powered off, check the connections to each disk drive, power supply, LED connector, and so on.

Try disconnecting and reconnecting disk drives from the HBA.

- Check that the HBA is installed in a compatible expansion slot (x8 PCI Express).
- Ensure that the HBA is firmly seated and secured in the expansion slot.
- If the HBA is not detected during system boot, try installing it in a different compatible expansion slot.
- Did the driver install correctly?
- If you have external disk drives (or other devices), are they powered on?

If you are still unable to resolve a problem, you can find additional troubleshooting information and direction at `http://www.sun.com`.

Silencing the Alarm

An alarm will sound when an error occurs. To silence the alarm, use BIOS RAID Configuration utility. See "Using the BIOS RAID Configuration Utility" on page 65.

Recovering From a Disk Drive Failure

This section explains how to recover when a disk drive fails:

- If the array was protected by a hot-spare (see "Failed Disk Drive Protected by a Hot-Spare" on page 80).
- If the array was *not* protected by a hot-spare (see "Failed Disk Drive Not Protected by a Hot-Spare" on page 81).
- If there is a disk drive failure in more than one array simultaneously (see "Failure in Multiple Arrays Simultaneously" on page 81).
- If it is a RAID 0 array (see "Disk Drive Failure in a RAID 0 Array" on page 81).
- If multiple disk drives fail within the same array (see "Multiple Failures in the Same Array" on page 82).

Failed Disk Drive Protected by a Hot-Spare

When an array is protected by a hot-spare, if a disk drive in that array fails the hot-spare is automatically incorporated into the array and takes over for the failed drive.

▼ To Recover From a Disk Drive Failure

1. **Remove and replace the failed disk drive (following manufacturer's instructions).**
2. **Choose the correct step:**

- **If copyback is not enabled**—In the Sun StorageTek RAID Manager graphical user interface (GUI), remove the 'hot-spare' designation from the original hot-spare (the disk drive that was built into the array). Then, designate a new hot-spare to protect the arrays on that HBA.

- **If copyback is enabled**—Data is automatically moved back to its original location once the HBA detects that the failed drive has been replaced. No action is required.

Failed Disk Drive Not Protected by a Hot-Spare

When an array is not protected by a hot-spare, if a disk drive in that array fails, remove and replace the failed disk drive. The HBA detects the new disk drive and begins to rebuild the array.

If the HBA fails to rebuild the array, check that the cables, disk drives, and HBAs are properly installed and connected. Then, if necessary, use Sun StorageTek RAID Manager GUI to rebuild the array. For instructions, refer to the *Sun StorageTek RAID Manager Software User's Guide* or online Help.

Failure in Multiple Arrays Simultaneously

If there is a disk drive failure in more than one array at the same time (one failure per array), and the arrays have hot-spares protecting them, the HBA rebuilds the arrays with these limitations:

- A hot-spare must be of equal or greater size than the failed disk drive it's replacing.
- Failed disk drives are replaced with hot-spares in the order in which they failed. (The array that includes the disk drive that failed first is rebuilt first, assuming an appropriate hot-spare is available—see bullet above.)

If there are more disk drive failures than hot-spares, see "Failed Disk Drive Not Protected by a Hot-Spare" on page 81.

If copyback is enabled, data is moved back to its original location once the HBA detects that the failed drive has been replaced.

Disk Drive Failure in a RAID 0 Array

Because RAID 0 volumes do not include redundancy, if a disk drive fails in a RAID 0 array, the data can't be recovered.

Correct the cause of the failure or replace the failed disk drives. Then, restore your data (if available).

Multiple Failures in the Same Array

Except in RAID 6 and RAID 60 arrays (see "Selecting the Best RAID Level" on page 91), if more than one disk drive fails at the same time in the same array, the data cannot be recovered.

Correct the cause of the failure or replace the failed disk drives. Then, restore your data (if available).

Note – In some instances, RAID 10 and RAID 50 arrays may survive multiple disk drive failures, depending on which disk drives fail. For more information, refer to the *Sun StorageTek RAID Manager Software User's Guide* or online Help.

APPENDIX **E**

Best Practices

This appendix provides information about how to best use the Sun StorageTek SAS RAID HBA to improve your overall user experience. The appendix contains the following sections:

- "Best Practices For Placing a New HBA in a System Running the Solaris OS" on page 83
- "Best Practices For Switching Cables and Making New Connections" on page 84
- "Best Practices For Cabling to Disk Enclosures" on page 85
- "Best Practices For Testing Hard Drive Failure Conditions" on page 85
- "Best Practices For Deleting Logical Volumes Without Deleting Partitions" on page 86
- "Best Practices For Testing Physical Drive Failures" on page 86
- "Best Practices For Rescanning or Discovering Drives" on page 87
- "Best Practices For Controlling the Boot Order of Logical Drives" on page 87
- "Best Practices For Selecting Members of RAID Logical Devices" on page 88
- "Best Practices For Replacing an HBA" on page 88

Best Practices For Placing a New HBA in a System Running the Solaris OS

If you install a new HBA into a system that is running the Solaris OS, the system might not detect the newly installed HBA.

To confirm whether the system has detected the HBA, do the following:

1. **Run the `arcconf getversion` command at a terminal window.**

   Assuming the newly installed HBA is the sole HBA installed in the system, the output of the `arcconf getversion` command will display 1 adapter.

2. **Review the output of the `arcconf getversion` command and do one of the following:**
   - If the output displays 1 adapter, the system has detected the HBA and you do not need to perform any further action.
   - If the output displays 0 adapters, run the `/usr/sbin/devfsadm` command to force the system to detect the HBA, and then continue to the next step.

3. **Repeat Step 1 to confirm that the system has detected the HBA.**

Best Practices For Switching Cables and Making New Connections

This section contains the following topics:

- "Switching a Cable From One Port To the Other" on page 84
- "Pulling a Cable and Reconnecting It To the Same Port" on page 85
- "Connecting a JBOD With SATA Disks" on page 85

Switching a Cable From One Port To the Other

If you need to switch a cable from one port to the other port on the same HBA or on the same JBOD, wait long enough after the initial cable pull for all the physical hard drives to be removed from the displays of the graphical user interface (GUI) and command-line interface (CLI). Waiting after the initial pull prevents the controller from trying to remove drives at the same time as it is re-adding those same drives on the other port. If no display is available, wait at least two minutes between pulling the cable and reconnecting it to the other port.

Pulling a Cable and Reconnecting It To the Same Port

Wait at least two minutes between pulling a cable and reconnecting it to the same port on an HBA or JBOD. To avoid confusing the controller, wait until the physical drives are removed from the display of the GUI and CLI.

Connecting a JBOD With SATA Disks

When connecting a JBOD with SATA disks to an HBA, connection problems might occur if the JBOD was previously connected to a different HBA. This is due to a SAS feature called, *affiliation*. An affiliation is used by the SAS protocol to prevent multiple SAS initiators (HBAs) from walking on each other when communicating with SATA drives. To avoid these connection problems, remove the affiliation by power cycling the JBOD prior to connecting the JBOD to the new HBA.

Best Practices For Cabling to Disk Enclosures

The HBA supports using a single connection, or path, between a RAID card and a JBOD. Therefore, when connecting a RAID card to a disk enclosure, be sure to use only one cable. Using more than one cable does NOT provide redundancy.

Best Practices For Testing Hard Drive Failure Conditions

When hot-plugging hard drives to test failure conditions, wait at least one minute between removing the drive and re-inserting it. Waiting one minute gives the controller time to recognize the removal of the hard drive. In a true failure situation, a removed drive is replaced with a different hard drive. In testing situations where the same drive is re-inserted, a one-minute waiting period before re-insertion is required.

Best Practices For Deleting Logical Volumes Without Deleting Partitions

When attempting to delete a logical volume, the Sun StorageTek RAID Manager graphical user interface (GUI) might require you to remove any partitions on the logical drive before it allows drive deletion. This is a safety feature designed to prevent accidental deletion of drives that contain valid data.

If you need to remove a logical volume without first deleting partitions from the OS, you can do so by using the `arcconf` command-line interface (CLI) instead of the GUI. The CLI allows the deletion of logical volumes without requiring the removal of partitions first.

To delete a logical volume through the CLI without deleting partitions, type the following at the command prompt:

`arcconf DELETE` *controller-number* **`LOGICALDRIVE`** *logical-drive-number*

You will receive a warning message, as shown in the following example.

```
WARNING: Logical device z may contain a partition.
All data in logical device z will be lost.
Delete the logical device?
Press y, then ENTER to continue or press ENTER to abort:
```

Best Practices For Testing Physical Drive Failures

If, for testing purposes, you use the Sun StorageTek RAID Manager GUI to fail a physical drive, the drive will not return to a ready state without you replacing the drive. In a test scenario, you may not need to physically replace the drive as you are only performing a test.

In this scenario, you can use the `arcconf` CLI to return the drive to its ready state without actually having to replace the drive.

To do so, type the following at the command prompt:

`arcconf SETSTATE` *controller-number* **`DEVICE`** *drive-channel-number drive-ID-number* **`RDY`**

Typing this command causes the failed drive to return to a ready state in the GUI.

Best Practices For Rescanning or Discovering Drives

If you add a new enclosure to an existing card, or if you initiate a card rescan and the rescan finds a new physical disk drive on the card, the newly discovered drive might be displayed as failed in the Sun StorageTek RAID Manager GUI (with a red X over the drive). When a drive is displayed as failed in the GUI, it causes multiple messages to be generated in the system messages file. These messages may indicate there is a failed drive, that the drive must be removed, or that the drive is not responding.

If this occurs, keep in mind that this is normal behavior for the GUI and you do not need to perform any further action. Treating the drive as failed is the safest way in which the GUI can handle newly discovered drives that are in an unkown state. After some time passes, and the GUI determines nothing is wrong with the drive, the failed marker will be removed and the drive can operate normally.

In the event that the newly added enclosure is a complete enclosure, it may take several minutes for the GUI to remove the failed marker from each drive. This is because the time for discovery is proportional to the number of drives added by the enclosure.

Best Practices For Controlling the Boot Order of Logical Drives

After installing a RAID HBA and creating at least one logical drive, the BIOS on the host system might insert that drive into the hard disk drive boot order in front of existing system disks. If the newly created logical drive does not have a boot sector, you will be unable to boot the host system upon subsequent reboots. This is not an issue if you are installing an internal RAID HBA, assuming you plan to boot off logical drives. However, if you are installing an external RAID HBA, the drive boot order might adversely affect other system boot drives.

To control the boot order of the logical drives on the host system, do the following:

1. Enter the host system BIOS, select boot, and review the Hard Disk Drives entry.

2. **Verify whether the logical drive of the RAID card is the first drive in the list.**
3. **If the first drive listed is the original system boot drive, you do not need to perform any further action. If the first drive listed is the logical drive of the RAID card, change the list so that the original boot drive is listed first.**
4. **To save the settings, do one of the following:**
   - **If you are working on an ILOM Remote Console, go to the ILOM Keyboard menu at the top of the window and choose F10.**
   - **If you are working on any other type of system or console, press Esc.**

   The system can now boot as expected.

Best Practices For Selecting Members of RAID Logical Devices

When selecting physical drives to be members of RAID logical devices, make sure that the drives you select are from a single enclosure in a single logical device. This is because any action that removes an entire enclosure temporarily or permanently (firmware upgrades, switching off a single enclosure, dual power supply failures, and so on) could result in rebuilds, degraded states, and complete failures, depending on how many drives from a given RAID logical device are contained in one enclosure. Do not build logical devices that span enclosures unless you are an advanced RAID user who understands the risks of doing so.

Best Practices For Replacing an HBA

This section contains the following topics:

- "Replacing an HBA On a SPARC System" on page 89
- "Replacing an HBA On an x64 System" on page 89

Replacing an HBA On a SPARC System

Upon replacing an existing HBA card with a new card on a SPARC system, the new card automatically detects the existing configuration upon installation and no further action is required. However, if the new HBA is not seeing one or more volumes in the existing configuration, rescan those volumes to enable their detection.

Replacing an HBA On an x64 System

Upon replacing an existing HBA card with a new card on an x64 system, the BIOS RAID Configuration utility sends a warning message alerting you to a configuration change during the initialization process of the new card. The existing drives and volumes in the configuration will not be activated on the new card until you accept the configuration change indicated in the warning message.

To activate the existing drives and volumes on the new card, do one of the following:

- Upon receiving the configuration change warning message, press Enter to accept the configuration change.
- View the configuration change through the BIOS Configuration utility (press Ctrl+A when prompted during POST), and accept the change from the utility.

APPENDIX F

Selecting the Best RAID Level

When you create arrays (or logical drives) for the Sun StorageTek SAS RAID Internal HBA, you can assign a RAID level to protect your data.

Each RAID level offers a unique combination of performance and redundancy. RAID levels also vary by the number of disk drives they support.

This appendix describes the RAID levels supported by the Sun StorageTek SAS RAID Internal HBA, and provides a basic overview of each to help you select the best level of protection for your storage system.

The appendix contains the following sections:

- "Understanding Drive Segments" on page 92
- "Nonredundant Arrays (RAID 0)" on page 92
- "RAID 1 Arrays" on page 93
- "RAID 1 Enhanced Arrays" on page 94
- "RAID 10 Arrays" on page 95
- "RAID 5 Arrays" on page 96
- "RAID 5EE Arrays" on page 97
- "RAID 50 Arrays" on page 98
- "RAID 6 Arrays" on page 100
- "RAID 60 Arrays" on page 101
- "Selecting the Best RAID Level" on page 101
- "Migrating RAID Levels" on page 102

Understanding Drive Segments

A *drive segment* is a disk drive or portion of a disk drive that is used to create an array. A disk drive can include both *RAID segments* (segments that are part of an array) and available segments. Each segment can be part of only one logical device at a time. If a disk drive is not part of any logical device, the entire disk is an available segment.

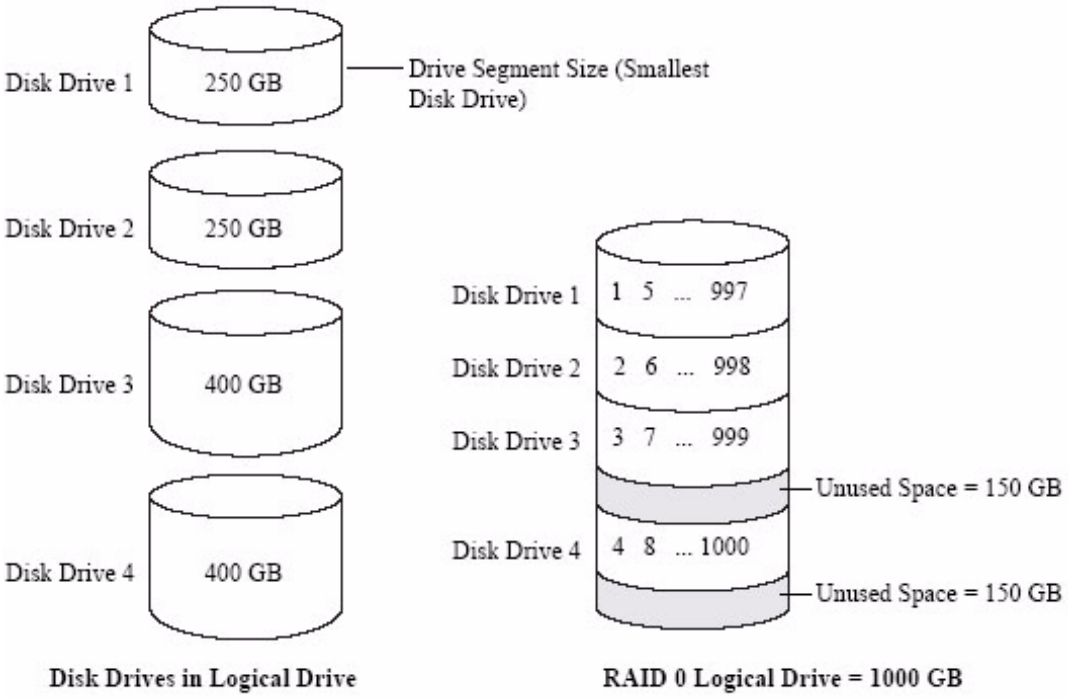
Nonredundant Arrays (RAID 0)

An array with RAID 0 includes two or more disk drives and provides data *striping*, where data is distributed evenly across the disk drives in equal-sized sections. However, RAID 0 arrays do not maintain redundant data, so they offer *no data protection*.

Compared to an equal-sized group of independent disks, a RAID 0 array provides improved I/O performance.

Drive segment size is limited to the size of the smallest disk drive in the array. For instance, a array with two 250 GB disk drives and two 400 GB disk drives can create a RAID 0 drive segment of 250 GB, for a total of 1000 GB for the volume, as shown in this figure.

FIGURE F-1 Nonredundant Arrays (RAID 0)

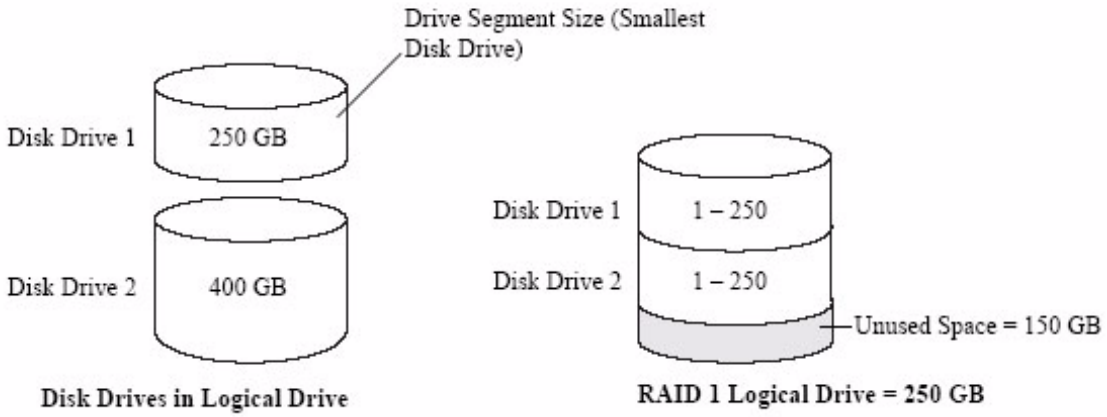


RAID 1 Arrays

A RAID 1 array is built from two disk drives, where one disk drive is a *mirror* of the other (the same data is stored on each disk drive). Compared to independent disk drives, RAID 1 arrays provide improved performance, with twice the read rate and an equal write rate of single disks. However, capacity is only 50 percent of independent disk drives.

If the RAID 1 array is built from different-sized disk drives, drive segment size is the size of the smaller disk drive, as shown in this figure.

FIGURE F-2 RAID 1 Arrays

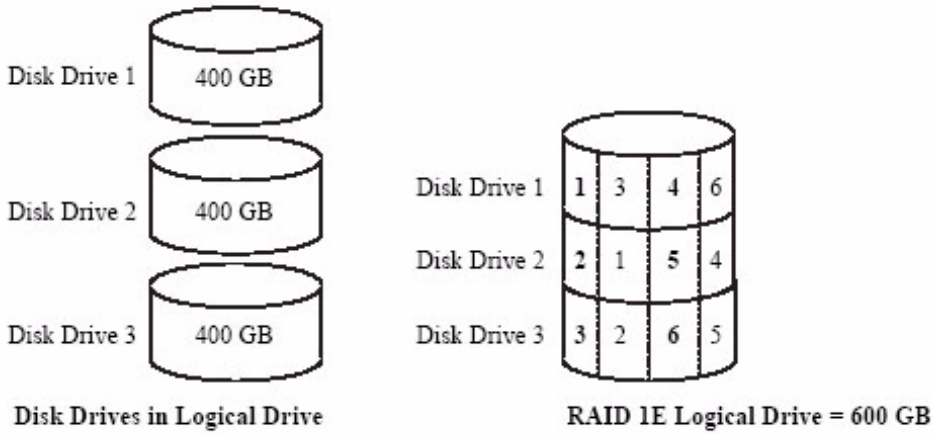


RAID 1 Enhanced Arrays

A RAID 1 Enhanced (RAID 1E) array—also referred to as a *striped mirror*—is similar to a RAID 1 array except that data is both mirrored *and* striped, and more disk drives can be included. A RAID 1E array can be built from three or more disk drives.

In this figure, the large bold numbers represent the striped data, and the smaller, non-bold numbers represent the mirrored data stripes.

FIGURE F-3 RAID 1 Enhanced Arrays

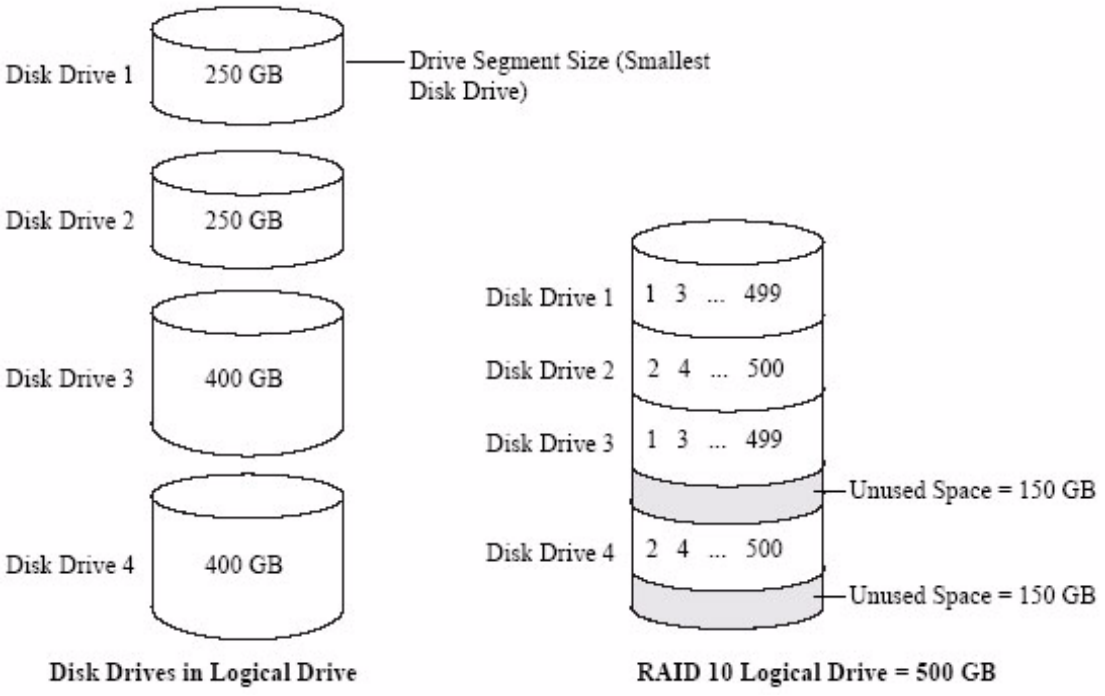


RAID 10 Arrays

A RAID 10 array is built from two or more equal-sized RAID 1 arrays. Data in a RAID 10 array is both striped and mirrored. Mirroring provides data protection, and striping improves performance.

Drive segment size is limited to the size of the smallest disk drive in the array. For instance, a array with two 250 GB disk drives and two 400 GB disk drives can create two mirrored drive segments of 250 GB, for a total of 500 GB for the array, as shown in this figure.

FIGURE F-4 RAID 10 Arrays



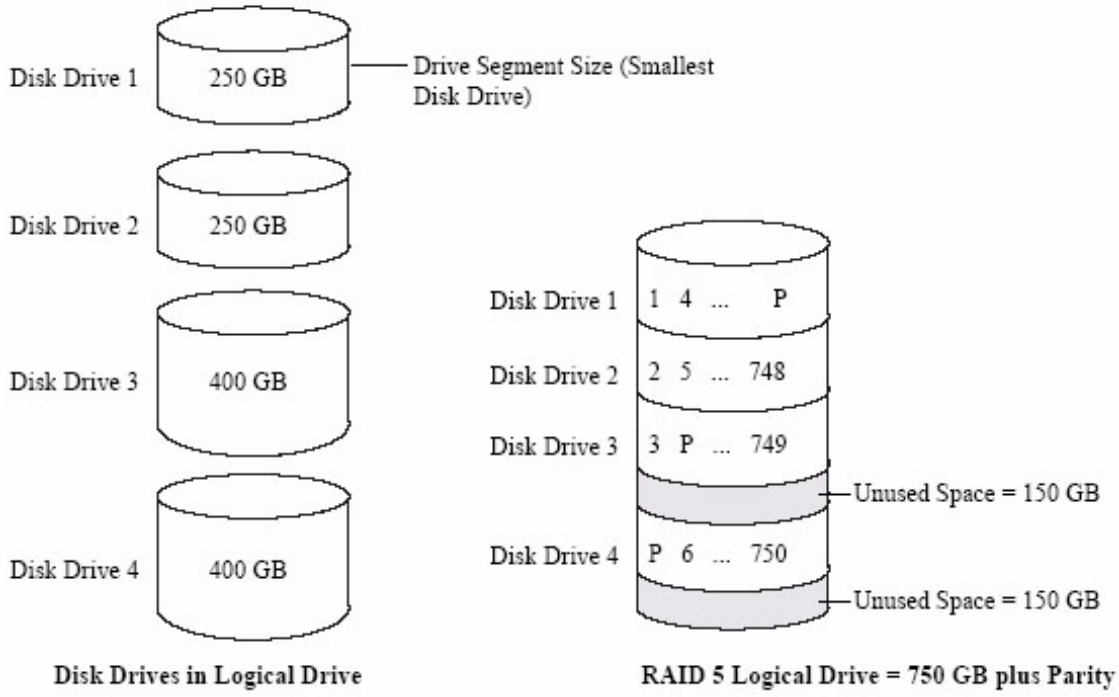
RAID 5 Arrays

A RAID 5 array is built from a minimum of three disk drives, and uses data striping and *parity* data to provide redundancy. Parity data provides data protection, and striping improves performance.

Parity data is an error-correcting redundancy that's used to re-create data if a disk drive fails. In RAID 5 arrays, parity data (represented by Ps in the next figure) is striped evenly across the disk drives with the stored data.

Drive segment size is limited to the size of the smallest disk drive in the array. For instance, an array with two 250 GB disk drives and two 400 GB disk drives can contain 750 GB of stored data and 250 GB of parity data, as shown in this figure.

FIGURE F-5 RAID 5 Arrays



RAID 5EE Arrays

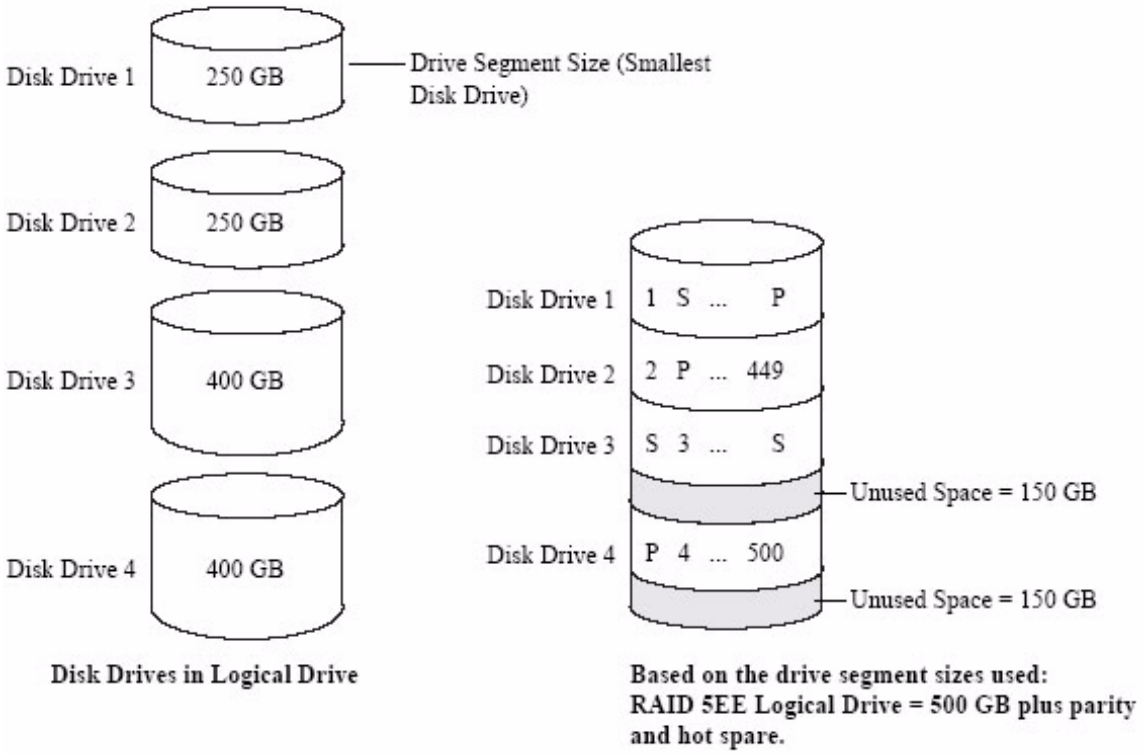
A RAID 5EE array—also referred to as a *hot-spare*—is similar to a RAID 5 array except that it includes a *distributed spare* drive and must be built from a minimum of four disk drives.

Unlike a hot-spare, a distributed spare is striped evenly across the disk drives with the stored data and parity data, and can't be shared with other logical disk drives. A distributed spare improves the speed at which the array is rebuilt following a disk drive failure.

A RAID 5EE array protects your data and increases read and write speeds. However, capacity is reduced by two disk drives' worth of space, which is for parity data and spare data.

In this example, S represents the distributed spare, P represents the distributed parity data.

FIGURE F-6 RAID 5EE Arrays



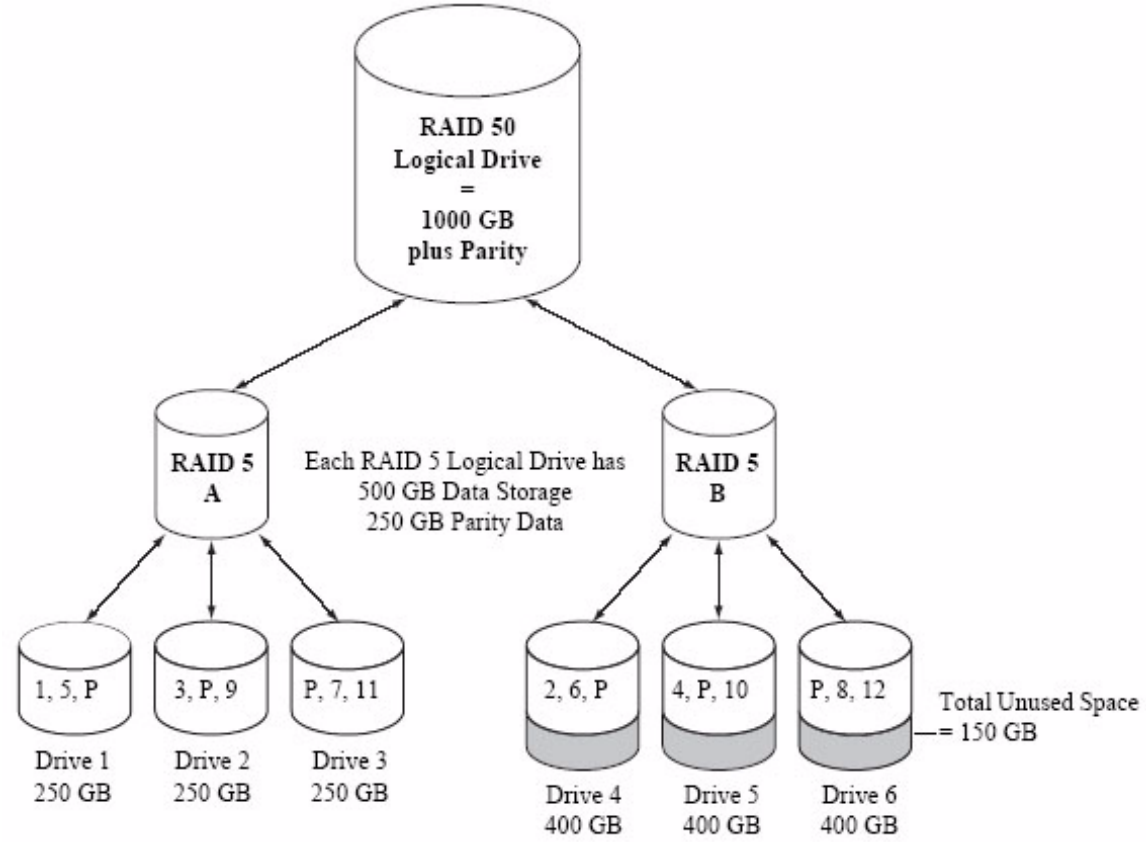
RAID 50 Arrays

A RAID 50 array is built from at least six disk drives configured as two or more RAID 5 arrays, and stripes stored data and parity data across all disk drives in both RAID 5 arrays. (For more information, see "RAID 5 Arrays" on page 96.)

The parity data provides data protection, and striping improves performance. RAID 50 arrays also provide high data transfer speeds.

Drive segment size is limited to the size of the smallest disk drive in the array. For example, three 250 GB disk drives and three 400 GB disk drives comprise two equal-sized RAID 5 arrays with 500 GB of stored data and 250 GB of parity data. The RAID 50 array can therefore contain 1000 GB (2 x 500 GB) of stored data and 500 GB of parity data.

FIGURE F-7 RAID 50 Arrays



In this example, P represents the distributed parity data.

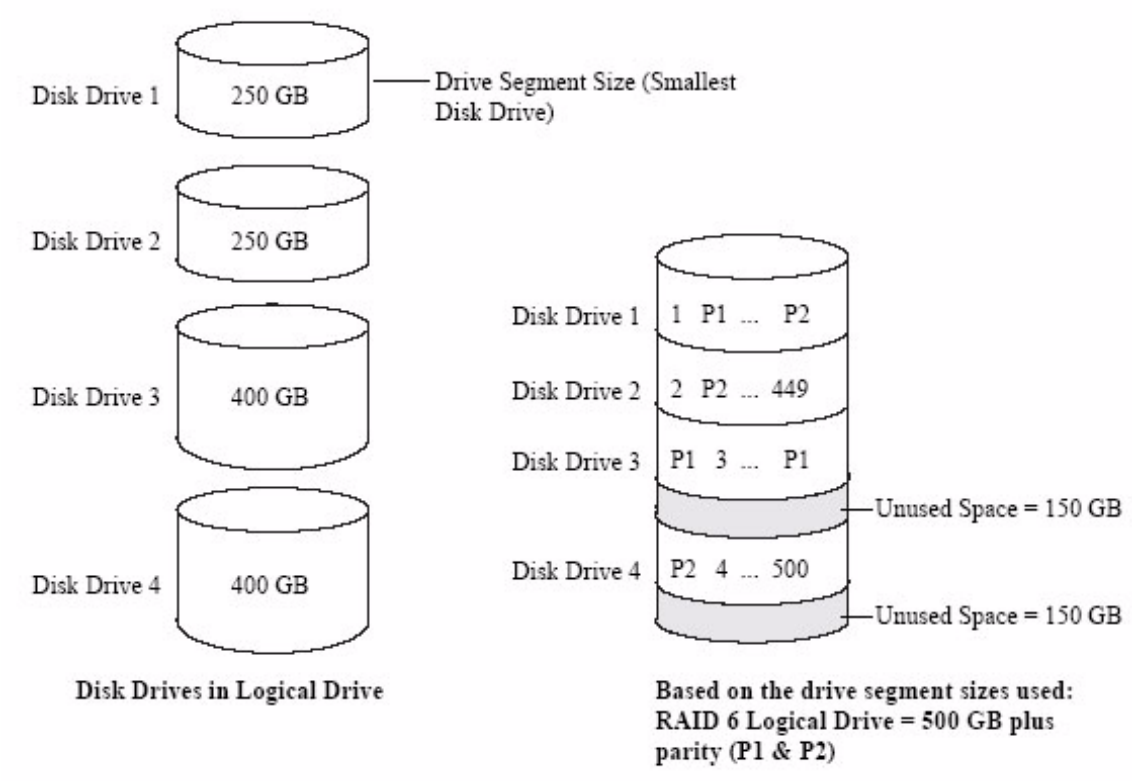
RAID 6 Arrays

A RAID 6 array—also referred to as *dual drive failure protection*—is similar to a RAID 5 array because it uses data striping and parity data to provide redundancy. However, RAID 6 arrays include *two* independent sets of parity data instead of one. Both sets of parity data are striped separately across all disk drives in the array.

RAID 6 arrays provide extra protection for your data because they can recover from two simultaneous disk drive failures. However, the extra parity calculation slows performance (compared to RAID 5 arrays).

RAID 6 arrays must be built from at least four disk drives. Maximum stripe size depends on the number of disk drives in the array.

FIGURE F-8 RAID 6 Arrays



RAID 60 Arrays

Similar to a RAID 50 array (see "RAID 50 Arrays" on page 98), a RAID 60 array—also referred to as *dual drive failure protection*— is built from at least eight disk drives configured as two or more RAID 6 arrays, and stripes stored data and two sets of parity data across all disk drives in both RAID 6 arrays.

Two sets of parity data provide enhanced data protection, and striping improves performance. RAID 60 arrays also provide high data transfer speeds.

Selecting the Best RAID Level

Use this table to select the RAID levels that are most appropriate for the arrays on your storage space, based on the number of available disk drives and your requirements for performance and reliability.

TABLE F-1 Selecting the Best RAID Level

RAID Level	Redundancy	Disk Drive Usage	Read Performance	Write Performance	Built-in Hot-Spare	Minimum Disk Drives
RAID 0	No	100%	www	www	No	2
RAID 1	Yes	50%	ww	ww	No	2
RAID 1E	Yes	50%	ww	ww	No	3
RAID 10	Yes	50%	ww	ww	No	4
RAID 5	Yes	67 – 94%	www	w	No	3
RAID 5EE	Yes	50 – 88%	www	w	Yes	4
RAID 50	Yes	67 – 94%	www	w	No	6
RAID 6	Yes	50 – 88%	ww	w	No	4
RAID 60	Yes	50 – 88%	ww	w	No	8

Disk drive usage, read performance, and write performance depend on the number of drives in the array. In general, the more drives, the better the performance.

Migrating RAID Levels

As your storage space changes, you can migrate existing RAID levels to new RAID levels that better meet your storage needs. You can perform these migrations through the Sun StorageTek RAID Manager software. For more information, see the *Sun StorageTek RAID Manager Software User's Guide*. TABLE F-2 lists the supported RAID level migrations.

TABLE F-2 Supported RAID Level Migrations

Existing RAID Level	Supported Migration RAID Level
Simple volume	RAID 1
RAID 0	• RAID 5 • RAID 10
RAID 1	• Simple volume • RAID 0 • RAID 5 • RAID 10
RAID 5	• RAID 0 • RAID 5EE • RAID 6 • RAID 10
RAID 6	RAID 5
RAID 10	• RAID 0 • RAID 5

APPENDIX **G**

Introduction to Serial Attached SCSI

This section provides a basic overview of the main features of Serial Attached SCSI (SAS), introduces some common SAS terms, and explains how SAS differs from parallel SCSI.

Note – This section is not specific to the Sun StorageTek SAS RAID Internal HBA. Instead, this appendix provides general information. Diagrams are for reference purposes only and do not represent any specific configurations supported by the Sun StorageTek SAS RAID Internal HBA.

For technical articles and tutorials about SAS, refer to the SCSI Trade Association (STA™) Web site at `www.scsita.org`.

This appendix contains the following sections:

- "Terminology Used in This Appendix" on page 104
- "About SAS" on page 104
- "About SAS Device Communication" on page 105
- "About Phys" on page 105
- "About SAS Ports" on page 106
- "About SAS Addresses" on page 106
- "About SAS Connectors" on page 107
- "About SAS Cables" on page 107
- "About Identifying Disk Drives in SAS" on page 107
- "About SAS Connection Options" on page 108
- "Differences Between SAS and Parallel SCSI" on page 110

Terminology Used in This Appendix

For convenience, SAS HBAs and SAS RAID HBAs are referred to generically in this appendix as *SAS cards*. HBAs, RAID controllers, disk drives, and external disk drive enclosures are referred to as *end devices* and expanders are referred to as *expander devices*.

For convenience, this appendix refers to end devices and expander devices collectively as *SAS devices*.

About SAS

Legacy parallel SCSI is an interface that lets devices such as computers and disk drives communicate with each other. Parallel SCSI moves multiple bits of data *in parallel* (at the same time), using the SCSI command set.

SAS is an evolution of parallel SCSI to a point-to-point serial interface. SAS also uses the SCSI command set, but moves multiple bits of data one at a time. SAS links end devices through direct-attach connections, or through expander devices.

SAS cards can typically support up to 128 end devices and can communicate with both SAS and SATA devices. (You can add 128 end devices—or even more—with the use of SAS expanders. See "SAS Expander Connections" on page 109.)

Note – Although you can use both SAS and SATA disk drives in the same *SAS domain* (see "SAS Expander Connections" on page 109), do not combine SAS and SATA disk drives within the same array or logical drive. The difference in performance between the two types of disk drives may adversely affect the performance of the array.

Data can move in both directions simultaneously across a SAS connection (called a *link*—see "About SAS Device Communication" on page 105). Link speed is 300 MB/sec in half-duplex mode. Therefore, a SAS card with eight links has a bandwidth of 2400 MB/sec.

Although they share the SCSI command set, SAS is conceptually different from parallel SCSI physically, and has its own types of connectors, cables, connection options, and terminology, as described in the rest of this chapter.

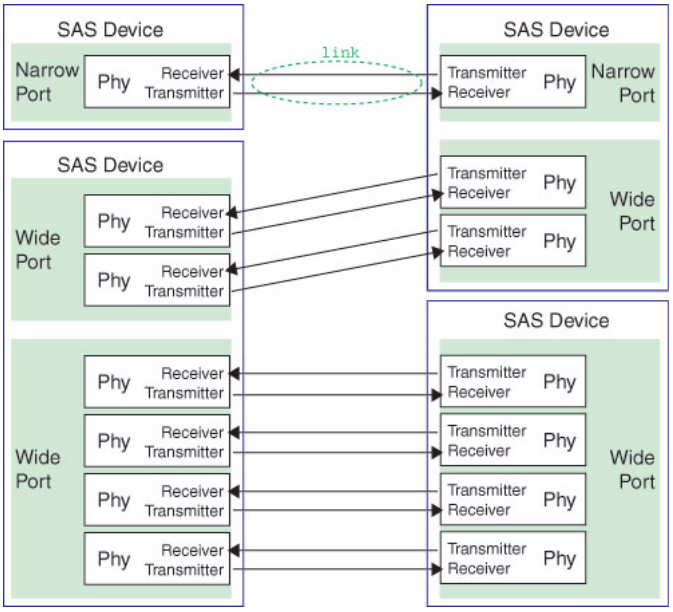
To compare SAS to parallel SCSI, see "Differences Between SAS and Parallel SCSI" on page 110.

About SAS Device Communication

SAS devices communicate with each other through links. A *link* is a physical connection between two phys.

As shown in the following figure, SAS devices contain ports (see "About SAS Ports" on page 106), ports contain *phys*, and each phy contains one transmitter and one receiver—one *transceiver*. A phy can belong to one port only.

FIGURE G-1 SAS Device Communication



About Phys

Phys are part of the physical communication connection between SAS devices. Each phy contains a transceiver that sends data back and forth between SAS devices.

When a connection is formed between two end devices, a link is established from a phy in one port to a phy in the other port. As shown in the figure above, a wide port can support multiple independent links simultaneously.

Phys are internal, within SAS connectors (see "About SAS Connectors" on page 107).

SAS cables physically connect one or more phys on one SAS device to one or more phys on another SAS device.

About SAS Ports

Note – Because the physical link between SAS devices is from phy to phy, rather than port to port, a "port" is more of a virtual concept, different from what is normally considered a port on other types of RAID HBAs and storage devices.

A *port* is one or more phys. A *narrow port* contains one phy. A *wide port* typically contains four phys.

Each port has its own unique SAS address (see "About Identifying Disk Drives in SAS" on page 107), and all the phys in a port share that same SAS address.

SAS card port options vary. A SAS card with four phys could be configured with one wide port, with two wide ports that comprise two phys, or with four narrow ports each containing one phy. (A wide port with four phys is referred to as a *4-wide* or *4x* port.)

About SAS Addresses

Each SAS port is identified with a unique SAS address, which is shared by all phys on that port.

For example, a SAS disk drive might have two narrow ports. Each port has one unique SAS address. The single phy in each port uses its port's SAS address.

In another example, a SAS device might have one 4-wide port. That port has one SAS address, which is shared by all four phys in the port.

Unlike SCSI devices and SCSI IDs, SAS devices self-configure their SAS addresses. User intervention is not required to set SAS addresses, and SAS addresses cannot be modified.

About SAS Connectors

A SAS or mini-SAS connector is the physical plug or receptacle that you see on a SAS device. It's what you plug a SAS cable into, or the end of the SAS cable that's being plugged in. (See "Preparing for Hardware Installation" on page 10.)

A connector is what forms physical links between phys. Some SAS connectors can support multiple links. The number of links a SAS connector can support is referred to as its *width*. *Narrow* connectors support a single link; *wide* connectors supports more than 1 link.

A single SAS device may have one or more connectors. A single SAS connector may help form links between more than two SAS devices. (For instance, as shown in FIGURE 2-6, the 4-wide internal SAS connector forms links with four independent disk drives.)

About SAS Cables

Internal standard SAS cables are narrower than internal parallel SCSI cables. The connectors vary in size depending on the number of links they support, from single link connectors to
4-wide (or larger) connectors. Internal fan-out cables let you attach four disk drives to a single 4-wide connector.

Mini-SAS connectors support both internal and external SAS connections. The mini-SAS connectors are smaller than the standard SAS internal and external connectors. Mini-SAS connectors support single and multilinks with the ability to scale to future speed needs.

About Identifying Disk Drives in SAS

In the BIOS and in the management utilities (see "To Identify Disk Drives With the Disk Utilities" on page 77), disk drives are identified in the following formats:

- CNX:DevY = Device Y is attached to Connector X (see "Direct-Attach Connections" on page 108 below for more information)
- BoxX:SlotX = Enclosure X is attached to a disk drive in Slot X (see "Backplane Connections" on page 108 below for more information)

- ExpX:PhyX = Expander X is attached to Phy X (see "SAS Expander Connections" on page 109 below for more information)

where X is the count number.

Note – Devices other than disk drives (CDROM, tape drives, and so on) are listed in order after your system disk drives.

In parallel SCSI, XX is the disk drive's channel number, YY is the target number, and ZZ is the logical unit number (LUN).

About SAS Connection Options

You can connect end devices to each other through direct cable connections and through backplane connections. When you use one or more expander devices (see "SAS Expander Connections" on page 109), you can create large configurations.

Direct-Attach Connections

In a direct-attach connection, SAS or SATA disk drives are connected directly to a SAS card with SAS or mini-SAS cables. One disk drive is attached to one SAS/mini-SAS connector with one SAS/mini-SAS cable (or multiple disk drives are attached to one SAS/mini-SAS connector with one fan-out cable). FIGURE 2-6 shows an example of direct-attach connections.

The number of direct-attached disk drives is limited to the number of *phys* supported by the SAS card. (Note that there may be multiple phys within a single connector. See "SAS Expander Connections" on page 109.)

Backplane Connections

In a backplane connection, disk drives and SAS cards are attached to and communicate with each other through a system backplane.

There are two types of backplane connections, *passive* and *active*. When connecting to either backplane, it's important to properly connect your disk drive LEDs in order to identify disk drive conditions. See "Component Layout" on page 3 for your RAID HBA Activity LED connections and locations.

When connecting to a backplane, the Sun StorageTek RAID Manager GUI enables you to manage your system disk drives, see the *Sun StorageTek RAID Manager Software User's Guide*.

The number of end devices is limited to the number of slots available on the backplane. For example, the Sun S50 enclosure, which contains an expander, is a backplane connection that supports up to 12 SAS or SATA disk drives.

Some backplanes support daisy-chain expansion to other backplanes. For example, you can daisy-chain (connect one to the next) up to nine Sun S50 enclosures to a single SAS card in a host system.

SAS Expander Connections

A SAS expander device literally expands the number of end devices that you can connect together. Expander devices, typically embedded into a system backplane (see "Backplane Connections" on page 108), support large configurations of SAS end devices, including SAS cards and SAS and SATA disk drives. With expander devices, you can build large and complex storage topologies.

There are two types of SAS expanders: *fanout expanders* and *edge expanders*. Each performs a different role in a storage system. (For more information about how SAS expanders work, refer to the STA Web site at www.scsita.org.)

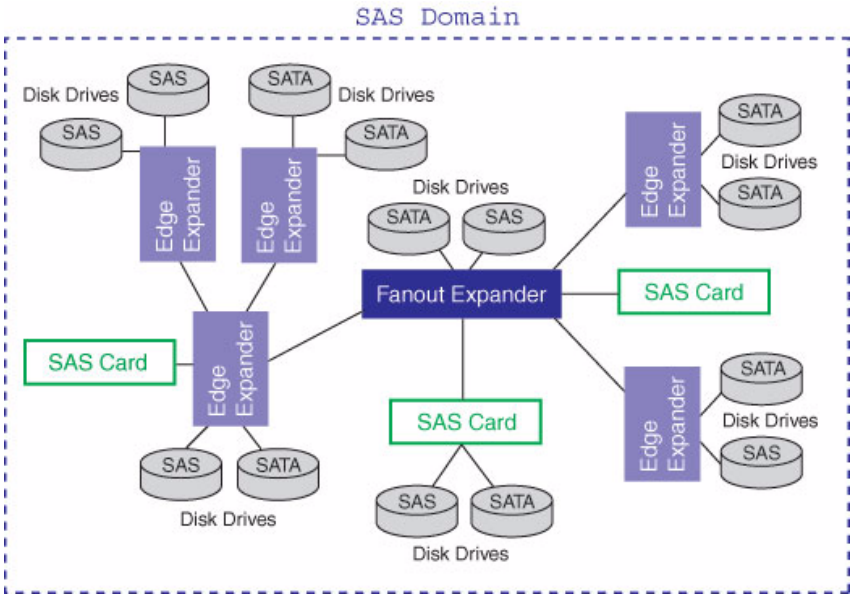
You can connect up to 128 SAS ports to an edge expander. (A single edge expander can therefore support up to 128 SAS addresses.)

You can connect up to 128 edge expanders to a fanout expander.

You can use only one fanout expander in any single SAS *domain* (a topology of SAS—and possibly SATA—end devices and expander devices). A single SAS domain can therefore comprise up to 16,384 SAS ports (and therefore up to 16,384 SAS addresses including the fanout expander).

The next figure illustrates (in very basic terms) a SAS domain and shows how SAS cards, SAS and SATA disk drives, and expander devices can fit together in a large data storage topology.

FIGURE G-2 SAS Expander Connections



Differences Between SAS and Parallel SCSI

In summary, although SAS and parallel SCSI both use the SCSI command set, how they move data from one place to another is very different. To support point-to-point *serial* data transport, SAS introduces new types of connectors, cables, connection options, and terminology.

Generally speaking, SAS is faster and more flexible than parallel SCSI, and provides more options for building your storage space. SAS lets you mix SAS and SATA disk drives together, and lets you connect many, *many* more devices.

This table describes many of the main differences between the two interfaces.

TABLE G-1 Differences Between Parallel SCSI and SAS

Parallel SCSI	Serial Attached SCSI
Parallel interface	Serial interface
Maximum speed 320 MB/sec shared by all devices on the bus	Maximum speed 300 MB/sec per phy when in half-duplex mode
Supports SCSI devices only	Supports SATA and SAS disk drives simultaneously
Up to 16 devices per SCSI channel	More than 100 disk drives per SAS card, using an expander (see "SAS Expander Connections" on page 109) or 50 SATAII disk drives.
Supports single-port devices only	Supports single- and dual-port devices
Uses SCSI IDs to differentiate between devices connected to the same adapter	Uses unique SAS addresses to differentiate between devices
User intervention required to set SCSI IDs	SAS addresses self-configured by SAS devices
Requires bus termination	Requires no bus termination
Standard SCSI connectors	SAS connectors (see "HBA Features" on page 2)

APPENDIX **H**

Declaration of Conformity, Safety, and Regulatory Statements

This appendix provides Declaration of Conformity, safety, and regulatory statements for the product. The appendix contains the following topics:

- "Declaration of Conformity" on page 115
- "Safety Agency Compliance Statements" on page 117
- "Regulatory Compliance Statements" on page 129

Declaration of Conformity

To receive a copy of the latest Declaration of Conformity (DoC) for the product, either contact your local Sun sales representative, or create an online request at:

https://www2.sun.de/dct/forms/reg_us_1607_755_0.jsp

Safety Agency Compliance Statements

Read this section before beginning any procedure. The following text provides safety precautions to follow when installing a Sun Microsystems product.

Safety Precautions

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.
- This product is intended for restricted access whereby access is controlled through the use of a means of security (for example, key, lock, tool, badge access) and personnel authorized for access have been instructed on the reasons for the restrictions and any precautions that need to be taken.

Symbols

The following symbols may appear in this book:



Caution – There is a risk of personal injury and equipment damage. Follow the instructions.



Caution – Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.



Caution – Hazardous voltages are present. To reduce the risk of electric shock and danger to personal health, follow the instructions.

Depending on the type of power switch your device has, one of the following symbols may be used:



On – Applies AC power to the system.



Off – Removes AC power from the system.



Standby – The On/Standby switch is in the standby position.

Modifications to Equipment

Do not make mechanical or electrical modifications to the equipment. Sun Microsystems is not responsible for regulatory compliance of a modified Sun product.

Placement of a Sun Product



Caution – Do not block or cover the openings of your Sun product. Never place a Sun product near a radiator or heat register. Failure to follow these guidelines can cause overheating and affect the reliability of your Sun product.

SELV Compliance

Safety status of I/O connections comply to SELV requirements.

Power Cord Connection



Caution – Sun products are designed to work with power systems having a grounded neutral (grounded return for DC-powered products). To reduce the risk of electric shock, do not plug Sun products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.



Caution – Not all power cords have the same current ratings. Do not use the power cord provided with your equipment for any other products or use. Household extension cords do not have overload protection and are not meant for use with computer systems. Do not use household extension cords with your Sun product.



注意 – 添付の電源コードを他の装置や用途に使用しない
添付の電源コードは本装置に接続し、使用することを目的として設計され、その安全性が確認されているものです。決して他の装置や用途に使用しないでください。火災や感電の原因となる恐れがあります。

The following caution applies only to devices with a Standby power switch:



Caution – The power switch of this product functions as a standby type device only. The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible. Do not connect the power cord when the power supply has been removed from the system chassis.

The following caution applies only to devices with multiple power cords:



Caution – For products with multiple power cords, all power cords must be disconnected to completely remove power from the system.

Battery Warning



Caution – There is danger of explosion if batteries are mishandled or incorrectly replaced. On systems with replaceable batteries, replace only with the same manufacturer and type or equivalent type recommended by the manufacturer per the instructions provided in the product service manual. Do not disassemble batteries or attempt to recharge them outside the system. Do not dispose of batteries in fire. Dispose of batteries properly in accordance with the manufacturer's instructions and local regulations. Note that on Sun CPU boards, there is a lithium battery molded into the real-time clock. These batteries are not customer replaceable parts.

System Unit Cover

You must remove the cover of your Sun computer system unit to add cards, memory, or internal storage devices. Be sure to replace the cover before powering on your computer system.

Caution – Do not operate Sun products without the cover in place. Failure to take this precaution may result in personal injury and system damage.

Rack System Instructions

The following or similar rack-mount instructions are included with the installation instructions:

- **Elevated Operating Ambient** – If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.
- **Reduced Air Flow** – Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- **Mechanical Loading** – Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- **Circuit Overloading** – Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- **Reliable Earthing** – Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

Laser Compliance Notice

Sun products that use laser technology comply with Class 1 laser requirements.

Class 1 Laser Product
Luokan 1 Laserlaite
Klasse 1 Laser Apparat
Laser Klasse 1

CD and DVD Devices

The following caution applies to CD, DVD, and other optical devices.

Caution – Use of controls, adjustments, or the performance of procedures other than those specified herein may result in hazardous radiation exposure.

Conformité aux normes de sécurité

Veuillez lire attentivement cette section avant de commencer. Ce texte traite des mesures de sécurité qu'il convient de prendre pour l'installation d'un produit Sun Microsystems.

Mesures de sécurité

Pour votre sécurité, nous vous recommandons de suivre scrupuleusement les mesures de sécurité ci-dessous lorsque vous installez votre matériel:

- Suivez tous les avertissements et toutes les instructions inscrites sur le matériel.
- Assurez-vous que la tension et la fréquence de votre source d'alimentation correspondent à la tension et à la fréquence indiquées sur l'étiquette de la tension électrique nominale du matériel
- N'introduisez jamais d'objets quels qu'ils soient dans les ouvertures de l'équipement. Vous pourriez vous trouver en présence de hautes tensions dangereuses. Tout objet étranger conducteur risque de produire un court-circuit pouvant présenter un risque d'incendie ou de décharge électrique, ou susceptible d'endommager le matériel.

- Ce produit est destiné à être utilisé dans des zones à accès limité, dans lesquelles les accès sont contrôlés au moyen de systèmes de sécurité (par exemple, à clé, verrou, dispositif ou badge). Le personnel autorisé à accéder à ces zones doit avoir été préalablement informé des raisons justifiant la limitation des accès et de toutes les précautions à prendre.

Symboles

Vous trouverez ci-dessous la signification des différents symboles utilisés:



Attention – Vous risquez d'endommager le matériel ou de vous blesser. Veuillez suivre les instructions.



Attention – Surfaces brûlantes. Evitez tout contact. Les surfaces sont brûlantes. Vous risquez de vous blesser si vous les touchez.



Attention – Tensions dangereuses. Pour réduire les risques de décharge électrique et de danger physique, observez les consignes indiquées.

Selon le type d'interrupteur marche/arrêt dont votre appareil est équipé, l'un des symboles suivants sera utilisé:

Marche – Met le système sous tension alternative.



Arret – Met le système hors tension alternative.



Veilleuse – L'interrupteur Marche/Veille est sur la position de veille.

Modification du matériel

N'apportez aucune modification mécanique ou électrique au matériel. Sun Microsystems décline toute responsabilité quant à la non-conformité éventuelle d'un produit Sun modifié.

Positionnement d'un produit Sun



Attention – Evitez d'obstruer ou de recouvrir les orifices de votre produit Sun. N'installez jamais un produit Sun près d'un radiateur ou d'une source de chaleur. Si vous ne respectez pas ces consignes, votre produit Sun risque de surchauffer et son fonctionnement en sera altéré.

Conformité SELV

Le niveau de sécurité des connexions E/S est conforme aux normes SELV.

Connexion du cordon d'alimentation



Attention – Les produits Sun sont conçus pour fonctionner avec des systèmes d'alimentation équipés d'un conducteur neutre relié à la terre (conducteur neutre pour produits alimentés en CC). Pour réduire les risques de décharge électrique, ne branchez jamais les produits Sun sur une source d'alimentation d'un autre type. Contactez le gérant de votre bâtiment ou un électricien agréé si vous avez le moindre doute quant au type d'alimentation fourni dans votre bâtiment.



Attention – Tous les cordons d'alimentation ne présentent pas les mêmes caractéristiques électriques. Les cordons d'alimentation à usage domestique ne sont pas protégés contre les surtensions et ne sont pas conçus pour être utilisés avec des ordinateurs. N'utilisez jamais de cordon d'alimentation à usage domestique avec les produits Sun.

L'avertissement suivant s'applique uniquement aux systèmes équipés d'un interrupteur Veille:



Attention – L'interrupteur d'alimentation de ce produit fonctionne uniquement comme un dispositif de mise en veille. Le cordon d'alimentation constitue le moyen principal de déconnexion de l'alimentation pour le

système. Assurez-vous de le brancher dans une prise d'alimentation mise à la terre près du système et facile d'accès. Ne le branchez pas lorsque l'alimentation électrique ne se trouve pas dans le châssis du système.

L'avertissement suivant s'applique uniquement aux systèmes équipés de plusieurs cordons d'alimentation:



Attention – Pour mettre un système équipé de plusieurs cordons d'alimentation hors tension, il est nécessaire de débrancher tous les cordons d'alimentation.

Mise en garde relative aux batteries



Attention – Les batteries risquent d'exploser en cas de manipulation maladroite ou de remplacement incorrect. Pour les systèmes dont les batteries sont remplaçables, effectuez les remplacements uniquement selon le modèle du fabricant ou un modèle équivalent recommandé par le fabricant, conformément aux instructions fournies dans le manuel de service du système. N'essayez en aucun cas de démonter les batteries, ni de les recharger hors du système. Ne les jetez pas au feu. Mettez-les au rebut selon les instructions du fabricant et conformément à la législation locale en vigueur. Notez que sur les cartes processeur de Sun, une batterie au lithium a été moulée dans l'horloge temps réel. Les batteries ne sont pas des pièces remplaçables par le client.

Couvercle de l'unité

Pour ajouter des cartes, de la mémoire ou des périphériques de stockage internes, vous devez retirer le couvercle de votre système Sun. Remettez le couvercle supérieur en place avant de mettre votre système sous tension.



Attention – Ne mettez jamais des produits Sun sous tension si leur couvercle supérieur n'est pas mis en place. Si vous ne prenez pas ces précautions, vous risquez de vous blesser ou d'endommager le système.

Instructions de montage en rack

Les instructions de montage en rack suivantes ou similaires à celles-ci sont fournies avec les instructions d'installation :

- **Température ambiante de fonctionnement élevée** : en cas d'installation dans un châssis fermé ou contenant plusieurs appareils, la température ambiante de fonctionnement au niveau du rack peut être supérieure à la température ambiante de la pièce. En conséquence, il convient de veiller à installer le matériel dans un environnement compatible avec la température ambiante maximale (Tma), spécifiée par le fabricant.
- **Débit d'air réduit** : l'installation du matériel dans un rack doit être effectuée de façon à ne pas compromettre le débit d'air nécessaire pour un fonctionnement sûr de ce matériel.
- **Charge mécanique** : le montage de l'équipement en rack doit être réalisé de manière à éviter toute situation dangereuse résultant d'une charge déséquilibrée.
- **Surcharge de circuit** : il convient de prendre les précautions nécessaires pour la connexion du matériel au circuit d'alimentation et de réfléchir aux conséquences d'une éventuelle surcharge des circuits sur la protection de surintensité et sur le câblage d'alimentation. En l'occurrence, les valeurs nominales de la plaque signalétique du matériel doivent être prises en compte.
- **Mise à la terre fiable** : une mise à la terre fiable du matériel monté en rack doit être assurée. Une attention toute particulière est requise pour les raccordements d'alimentation autres que ceux effectués directement sur le circuit principal (par exemple, en cas d'utilisation de blocs multiprises).

Avis de conformité des appareils laser

Les produits Sun qui font appel aux technologies lasers sont conformes aux normes de la classe 1 en la matière.

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Laser Klasse 1

Périphériques CD et DVD

L'avertissement suivant s'applique aux périphériques CD, DVD et autres périphériques optiques:

Attention – L'utilisation de contrôles et de réglages ou l'application de procédures autres que ceux spécifiés dans le présent document peuvent entraîner une exposition à des radiations dangereuses.

Einhaltung sicherheitsbehördlicher Vorschriften

Lesen Sie vor dem Ausführen von Arbeiten diesen Abschnitt. Im folgenden Text werden Sicherheitsvorkehrungen beschrieben, die Sie bei der Installation eines Sun Microsystems-Produkts beachten müssen.

Sicherheitsvorkehrungen

Treffen Sie zu Ihrem eigenen Schutz bei der Installation des Geräts die folgenden Sicherheitsvorkehrungen:

- Beachten Sie alle auf den Geräten angebrachten Warnhinweise und Anweisungen.
- Stellen Sie sicher, dass Spannung und Frequenz der Stromversorgung den Nennleistungen auf dem am Gerät angebrachten Etikett entsprechen.
- Führen Sie niemals Fremdobjekte in die Öffnungen am Gerät ein. Es können gefährliche Spannungen anliegen. Leitfähige Fremdobjekte können einen Kurzschluss verursachen, der einen Brand, Stromschlag oder Geräteschaden herbeiführen kann.
- Dieses Produkt unterliegt Zugangsbeschränkungen. Der Zugang wird mithilfe eines Sicherheitsmechanismus kontrolliert (z. B. einem Schlüssel, einer Sperre, einem Tool oder eines Werksausweises) und das autorisierte Zugangspersonal wurde über die Gründe für die Beschränkungen und die zu treffenden Sicherheitsmaßnahmen unterrichtet.

Symbole

Die Symbole in diesem Handbuch haben folgende Bedeutung:

Achtung – Gefahr von Verletzung und Geräteschaden. Befolgen Sie die Anweisungen.

Achtung – Heiße Oberfläche. Nicht berühren, da Verletzungsgefahr durch heiße Oberfläche besteht.

Achtung – Gefährliche Spannungen. Befolgen Sie die Anweisungen, um Stromschläge und Verletzungen zu vermeiden.

Je nach Netzschaltertyp an Ihrem Gerät kann eines der folgenden Symbole verwendet werden:

Ein – Versorgt das System mit Wechselstrom.

Aus– Unterbricht die Wechselstromzufuhr zum Gerät.

Wartezustand – Der Ein-/Standby-Netzschalter befindet sich in der Standby-Position.

Modifikationen des Geräts

Nehmen Sie keine elektrischen oder mechanischen Gerätemodifikationen vor. Sun Microsystems ist für die Einhaltung der Sicherheitsvorschriften von modifizierten Sun-Produkten nicht haftbar.

Aufstellung von Sun-Geräten

Achtung – Geräteöffnungen Ihres Sun-Produkts dürfen nicht blockiert oder abgedeckt werden. Sun-Geräte sollten niemals in der Nähe von Heizkörpern oder Heißluftklappen aufgestellt werden. Die Nichtbeachtung dieser Richtlinien kann Überhitzung verursachen und die Zuverlässigkeit Ihres Sun-Geräts beeinträchtigen.

SELV-Konformität

Der Sicherheitsstatus der E/A-Verbindungen entspricht den SELV-Anforderungen.

Anschluss des Netzkabels



Achtung – Sun-Geräte sind für Stromversorgungssysteme mit einem geerdeten neutralen Leiter (geerdeter Rückleiter bei gleichstrombetriebenen Geräten) ausgelegt. Um die Gefahr von Stromschlägen zu vermeiden, schließen Sie das Gerät niemals an andere Stromversorgungssysteme an. Wenden Sie sich an den zuständigen Gebäudeverwalter oder an einen qualifizierten Elektriker, wenn Sie nicht sicher wissen, an welche Art von Stromversorgungssystem Ihr Gebäude angeschlossen ist.



Achtung – Nicht alle Netzkabel verfügen über die gleichen Nennwerte. Herkömmliche, im Haushalt verwendete Verlängerungskabel besitzen keinen Überlastschutz und sind daher für Computersysteme nicht geeignet. Verwenden Sie bei Ihrem Sun-Produkt keine Haushalts-Verlängerungskabel.

Die folgende Warnung gilt nur für Geräte mit Standby-Netzschalter:



Achtung – Beim Netzschalter dieses Geräts handelt es sich nur um einen Ein/Standby-Schalter. Zum völligen Abtrennen des Systems von der Stromversorgung dient hauptsächlich das Netzkabel. Stellen Sie sicher, dass das Netzkabel an eine frei zugängliche geerdete Steckdose in der Nähe des Systems angeschlossen ist. Schließen Sie das Stromkabel nicht an, wenn die Stromversorgung vom Systemchassis entfernt wurde.

Die folgende Warnung gilt nur für Geräte mit mehreren Netzkabeln:



Achtung – Bei Produkten mit mehreren Netzkabeln müssen alle Netzkabel abgetrennt werden, um das System völlig von der Stromversorgung zu trennen.

Warnung bezüglich Batterien



Achtung – Bei unsachgemäßer Handhabung oder nicht fachgerechtem Austausch der Batterien besteht Explosionsgefahr. Verwenden Sie bei Systemen mit austauschbaren Batterien ausschließlich Ersatzbatterien desselben Typs und Herstellers bzw. einen entsprechenden, vom Hersteller gemäß den Anweisungen im Service-Handbuch des Produkts empfohlenen Batterietyp. Versuchen Sie nicht, die Batterien auszubauen oder außerhalb des Systems wiederaufzuladen. Werfen Sie die Batterien nicht ins Feuer. Entsorgen Sie die Batterien entsprechend den Anweisungen des Herstellers und den vor Ort geltenden Vorschriften. CPU-Karten von Sun verfügen über eine Echtzeituhr mit integrierter Lithiumbatterie. Diese Batterie darf nur von einem qualifizierten Servicetechniker ausgewechselt werden.

Gehäuseabdeckung

Sie müssen die Abdeckung Ihres Sun-Computersystems entfernen, um Karten, Speicher oder interne Speichergeräte hinzuzufügen. Bringen Sie vor dem Einschalten des Systems die Gehäuseabdeckung wieder an.



Achtung – Nehmen Sie Sun-Geräte nicht ohne Abdeckung in Betrieb. Die Nichtbeachtung dieses Warnhinweises kann Verletzungen oder Geräteschaden zur Folge haben.

Anweisungen zur Rack-Montage

Die folgenden oder ähnlichen Anweisungen zur Rack-Montage wurden in die Installationsanweisungen aufgenommen:

- **Erhöhte Betriebsumgebungstemperatur** - Wenn das Rack in einer geschlossenen Rack-Baugruppe oder in einer Multi-unit-Rack-Baugruppe installiert ist, kann die Betriebsumgebungstemperatur der Rack-Umgebung höher sein als die Umgebungstemperatur des Raumes. Deshalb sollte berücksichtigt werden, das Gerät in einer Umgebung zu installieren, die kompatibel zu der vom Hersteller angegebenen maximalen Umgebungstemperatur (Tma) ist.

- **Reduzierter Luftstrom** - Die Installation des Geräts in einem Rack sollte so erfolgen, dass die Luftstrommenge, die für den sicheren Betrieb des Geräts erforderlich ist, nicht beeinträchtigt wird.
- **Mechanische Belastung** - Die Montage des Geräts im Rack sollte so erfolgen, dass bei einer ungleichmäßigen mechanischen Belastung keine gefährliche Betriebsbedingung entstehen kann.
- **Stromkreisüberlastung** - Der Anschluss des Geräts an den Speisestromkreis und die Wirkung, die ein Überlasten der Stromkreise auf das Überstromschutz-Gerät und die Speisestromkreisverkabelung haben kann, sollten sorgfältig geprüft und berücksichtigt werden. Beim Behandeln dieses Aspekts sollten besonders die Lastangaben auf dem Leistungsschild des Geräts sorgfältig geprüft werden.
- **Zuverlässige Erdung** - Ausrüstung, die in Racks montiert ist, muss zuverlässig geerdet sein. Besonders müssen hierbei die Stromanschluss-leitungen und weniger die direkten Verbindungen zum Abzweigstromkreis beachtet werden (z. B. durch die Verwendung von Adapterleisten).

Hinweis zur Laser-Konformität

Sun-Produkte, die die Laser-Technologie verwenden, entsprechen den Laser-Anforderungen der Klasse 1.

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CD- und DVD-Geräte

Die folgende Warnung gilt für CD-, DVD- und andere optische Geräte:

Achtung – Die hier nicht aufgeführte Verwendung von Steuerelementen, Anpassungen oder Ausführung von Vorgängen kann eine gefährliche Strahlenbelastung verursachen.

Normativas de seguridad

Lea esta sección antes de realizar cualquier operación. En ella se explican las medidas de seguridad que debe tomar al instalar un producto de Sun Microsystems.

Medidas de seguridad

Para su protección, tome las medidas de seguridad siguientes durante la instalación del equipo:

- Siga todos los avisos e instrucciones indicados en el equipo.
- Asegúrese de que el voltaje y frecuencia de la fuente de alimentación coincidan con el voltaje y frecuencia indicados en la etiqueta de clasificación eléctrica del equipo.
- No introduzca objetos de ningún tipo por las rejillas del equipo, ya que puede quedar expuesto a voltajes peligrosos. Los objetos conductores extraños pueden producir cortocircuitos y, en consecuencia, incendios, descargas eléctricas o daños en el equipo.
- Este producto se ha concebido para un acceso restringido y, por tanto, éste se controla mediante mecanismos de seguridad (p. ej., acceso con clave, bloqueo, herramienta y tarjeta de identificación). Las personas con acceso autorizado están al corriente de los motivos de esta restricción y de las precauciones que se deben tomar.

Símbolos

En este documento aparecen los siguientes símbolos:

Precaución – Existe el riesgo de que se produzcan lesiones personales y daños en el equipo. Siga las instrucciones.

Precaución – Superficie caliente. Evite todo contacto. Las superficies están calientes y pueden causar lesiones personales si se tocan.

Precaución – Voltaje peligroso. Para reducir el riesgo de descargas eléctricas y lesiones personales, siga las instrucciones.

En función del tipo de interruptor de alimentación del que disponga el dispositivo, se utilizará uno de los símbolos siguientes:



Encendido – Suministra alimentación de CA al sistema.



Apagado – Corta la alimentación de CA del sistema.



Espera – El interruptor de encendido/espera está en la posición de espera.

Modificaciones en el equipo

No realice modificaciones de tipo mecánico ni eléctrico en el equipo. Sun Microsystems no se hace responsable del cumplimiento de normativas en caso de que un producto Sun se haya modificado.

Colocación de un producto Sun



Precaución – No obstruya ni tape las rejillas del producto Sun. Nunca coloque un producto Sun cerca de radiadores ni fuentes de calor. Si no sigue estas indicaciones, el producto Sun podría sobrecalentarse y la fiabilidad de su funcionamiento se vería afectada.

Cumplimiento de la normativa para instalaciones SELV

Las condiciones de seguridad de las conexiones de entrada y salida cumplen los requisitos para instalaciones SELV (del inglés *Safe Extra Low Voltage*, voltaje bajo y seguro).

Conexión del cable de alimentación



Precaución – Los productos Sun se han diseñado para funcionar con sistemas de alimentación que cuenten con un conductor neutro a tierra (con conexión a tierra de regreso para los productos con alimentación de CC). Para reducir el riesgo de descargas eléctricas, no conecte ningún producto Sun a otro tipo de sistema de alimentación. Póngase en contacto con el encargado de las instalaciones de su empresa o con un electricista cualificado en caso de que no esté seguro del tipo de alimentación del que se dispone en el edificio.



Precaución – No todos los cables de alimentación tienen la misma clasificación eléctrica. Los alargadores de uso doméstico no cuentan con protección frente a sobrecargas y no están diseñados para su utilización con sistemas informáticos. No utilice alargadores de uso doméstico con el producto Sun.

La siguiente medida solamente se aplica a aquellos dispositivos que dispongan de un interruptor de alimentación de espera:



Precaución – El interruptor de alimentación de este producto funciona solamente como un dispositivo de espera. El cable de alimentación hace las veces de dispositivo de desconexión principal del sistema. Asegúrese de que conecta el cable de alimentación a una toma de tierra situada cerca del sistema y de fácil acceso. No conecte el cable de alimentación si la unidad de alimentación no se encuentra en el bastidor del sistema.

La siguiente medida solamente se aplica a aquellos dispositivos que dispongan de varios cables de alimentación:



Precaución – En los productos que cuentan con varios cables de alimentación, debe desconectar todos los cables de alimentación para cortar por completo la alimentación eléctrica del sistema.

Advertencia sobre las baterías



Precaución – Si las baterías no se manipulan o reemplazan correctamente, se corre el riesgo de que estallen. En los sistemas que cuentan con baterías reemplazables, reemplácelas sólo con baterías del mismo fabricante y el mismo tipo, o un tipo equivalente recomendado por el fabricante, de acuerdo con las instrucciones

descritas en el manual de servicio del producto. No desmonte las baterías ni intente recargarlas fuera del sistema. No intente deshacerse de las baterías echándolas al fuego. Desháguese de las baterías correctamente de acuerdo con las instrucciones del fabricante y las normas locales. Tenga en cuenta que en las placas CPU de Sun, hay una batería de litio incorporada en el reloj en tiempo real. Los usuarios no deben reemplazar este tipo de baterías.

Cubierta de la unidad del sistema

Debe extraer la cubierta de la unidad del sistema informático Sun para instalar tarjetas, memoria o dispositivos de almacenamiento internos. Vuelva a colocar la cubierta antes de encender el sistema informático.



Precaución – No ponga en funcionamiento los productos Sun que no tengan colocada la cubierta. De lo contrario, puede sufrir lesiones personales y ocasionar daños en el sistema.

Instrucciones para el montaje en armario

Las siguientes instrucciones de montaje en armario u otras similares se incluyen en las instrucciones de instalación:

- **Temperatura de funcionamiento elevada** - si se instala en un armario cerrado o con más unidades, la temperatura ambiente de funcionamiento del entorno del armario puede ser superior a la de la habitación. Por tanto, el equipo debería instalarse en un entorno compatible con la temperatura ambiente máxima (Tma) especificada por el fabricante.
- **Flujo de aire reducido** - para instalar el equipo en un armario hay que asegurarse de que se mantendrá el flujo de aire necesario para el correcto funcionamiento del equipo.
- **Carga mecánica** - el montaje del equipo en el armario debería realizarse de modo que no se dé una situación de peligro debido a una carga mecánica irregular.
- **Sobrecarga del circuito** - debe prestarse atención a la conexión del equipo al circuito de alimentación y a las consecuencias que puede tener la sobrecarga de los circuitos en la protección de sobrecorriente y el cableado de alimentación. En caso de sobrecarga, es recomendable tener en cuenta la potencia del equipo que aparece en la placa de identificación.
- **Puesta a tierra fiable** - debería mantenerse una puesta a tierra fiable del equipo montado en un armario. Debería prestarse especial atención a las conexiones de suministro que no sean las directas al circuito derivado (p. ej., las regletas de distribución).

Aviso de cumplimiento de la normativa para la utilización de láser

Los productos Sun que utilizan tecnología láser cumplen los requisitos establecidos para los productos láser de clase 1.

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Dispositivos de CD y DVD

La siguiente medida se aplica a los dispositivos de CD y DVD, así como a otros dispositivos ópticos:



Precaución – La utilización de controles, ajustes o procedimientos distintos a los aquí especificados puede dar lugar a niveles de radiación peligrosos.

Nordic Lithium Battery Cautions

Norge



Advarsel – Litiumbatteri — Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

Sverige



Varning – Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

Danmark



Advarsel! – Litiumbatteri — Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

Suomi



Varoitus – Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

Nordic Power Distribution Cautions

English



Caution – This product is also designed for an IT power distribution system with phase-to-phase voltage of 230V.

Danmark



Advarsel! – Dette produkt er også beregnet til et IT-strømfordelingssystem med en fase-til-fase spænding på 230 V.

Nordic Grounded Socket Cautions

English



Caution – The appliance must be connected to a grounded socket.

Norge



Advarsel – Apparatet må tilkoples jordet stikkontakt.

Sverige



Varning – Apparaten skall anslutas till jordat uttag.

Suomi



Varoitus – Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan.

Regulatory Compliance Statements

Your Sun product is marked to indicate its compliance class:

- Federal Communications Commission (FCC) — USA
- Industry Canada Equipment Standard for Digital Equipment (ICES-003) — Canada
- Voluntary Control Council for Interference (VCCI) — Japan
- Bureau of Standards Metrology and Inspection (BSMI) — Taiwan

Please read the appropriate section that corresponds to the marking on your Sun product before attempting to install the product.

FCC Class B Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Modifications: Any modifications made to this device that are not approved by Sun Microsystems, Inc. may void the authority granted to the user by the FCC to operate this equipment.

ICES-003 Class B Notice - Avis NMB-003, Classe B

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

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GOST-R Certification Mark



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