tSun StorEdge™ A3500 Array

Just the Facts

Copyrights

Positioning

Introduction

While offering excellent performance and superior availability features, the Sun StorEdge™ A3500 array represents a level of density and scalable capacity for Sun's mission-critical enterprise customers. Expanding on the highly successful Sun StorEdge A3000 array, the Sun StorEdge A3500 storage array incudes the following features:

- A space-saving, 19-inch rackmount cabinet which facilitates the highest density configurations
- Controller-based (hardware) RAID with excellent performance, reliability, availability, and serviceability (RAS)
- Flexible, scalable, high-capacity configurations, reaching 91 GB to 1.6 TB of storage using 9.1-GB drives, and 182 GB to 3.2 TB of storage with 18-GB drives and 364 GB to 4.3 TB of storage using 36-GB drives
- Dual hot-plug RAID controller boards in each controller module, enabling automatic controller failover
- Hot-pluggable disks, power supplies, and cooling systems for additional high availability
- Outstanding RAID 3 and 5 performance with flexible configurations for single or multiple hosts
    - Single-host connection with automatic controller failover
    - Daisy-chain support for the highest capacity configurations
    - Box sharing across two independent Solaris™ Operating Environment hosts
    - Multi-initiator support for Sun Enterprise™ clusters
- Simple setup and administration using Sun StorEdge RAID Manager command line or graphical user interfaces
- Simultaneous support of RAID levels 0, 1, 1+0, 3, and 5, and global hot spares
- Open UltraSCSI differential host interfaces for use on non-Sun/Solaris Operating Environment systems
- The Sun StorEdge A3500-Light array offers a low-cost, 72-GB, minimum entry point with dual, auto-failover controllers and mirrored cache

Product Family Placement

Customers' storage capacity requirements are growing at an unprecedented rate. In today's data centers, it is not uncommon to have requirements for multiple terabyte storage solutions. The Sun StorEdge A3500 array, with its 73.5-inch cabinet, provides a high-density storage solution. The maximum capacity exceeds 39 TB, using 18-GB drives and 36 controller modules. The Sun StorEdge A3500 array offers scalable configurations, with excellent performance and sophisticated availability features.

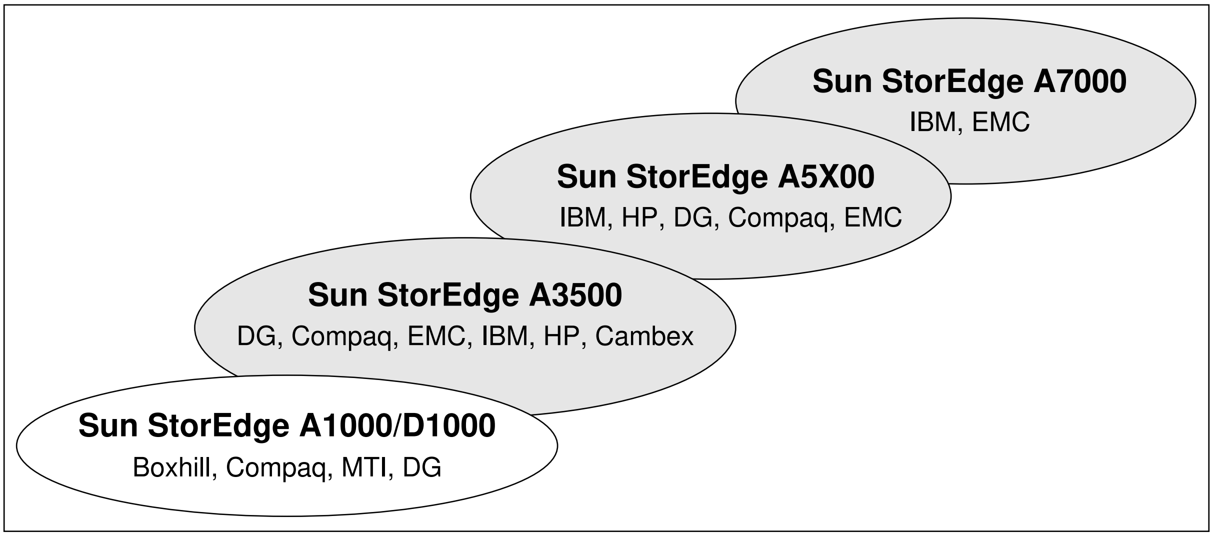
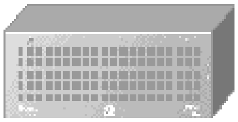
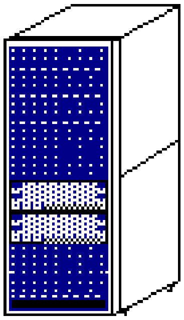
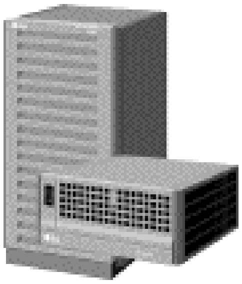
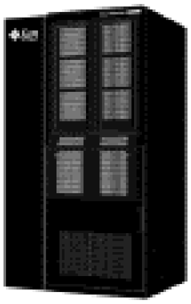


Figure 1. Sun storage product offerings

The Sun StorEdge A3500 array replaces the Sun StorEdge A3000 array. Like the Sun StorEdge A3000 array, the Sun StorEdge A3500 array is a controller-based (hardware) RAID solution. As such, it provides superior RAID-5 performance and minimal cost for data protection. RAID levels 0, 1, 1+0, and 3 are also supported.

The Sun StorEdge A3500 array offers sophisticated availability features. Sun StorEdge A3500 array data availability is 99.999 percent through the use of hot-plug controllers, disks, power, and cooling systems. Hot-plug components allow the system to be serviced while it is still in use. Also, since the Sun StorEdge A3500 array uses the same controller module as in the Sun StorEdge A3000 data center, the Sun StorEdge A3500 array provides automatic controller failover. If a controller fails, I/O operations are automatically failed over to the second controller, and users continue to access their applications and data without any interruption.

The Sun StorEdge A3500 array can be configured to meet departmental storage requirements and will scale to the highest capacity data center requirements. Mission-critical applications—application and file service, database, OLTP, data warehousing, and decision support applications—will benefit from the robust availability features and high performance of the Sun StorEdge A3500 array.

Sun StorEdge A1000 and D1000 Arrays	**Sun StorEdge A3500 Array**	**Sun StorEdge A5000 Array**	**Sun StorEdge A7000 Array**
			
Workgroup	Department to data center	Department to data center	Data center
Controller-based RAID (A1000) Host-based RAID (D1000)	Controller-based RAID	Host-based RAID	Intelligent Storage Server™ (dual-SMP UNIX® servers used as controllers)
Solaris Operating Environment, Microsoft Windows NT	Solaris Operating Environment, Microsoft Windows NT	Solaris Operating Environment, Microsoft Windows NT	Simultaneous OS/390, MVS/ESA, MVS/XA, VM/ESA, VSE/ESA, Solaris Operating Environment, HP-UX, AIX, Microsoft Windows NT
When to sell • Price/performance • Bridges gap between Sun StorEdge MultiPack systems and higher end products • For apps requiring less than 291 GB in a single array • Performance and flexibility for price-sensitive customers	When to sell • RAS + price/performance • Dual-controller, cached architecture • High availability • Best performance for write-intensive apps • High-performance OLTP • SCSI or Fibre Channel (future) host interface • Proven stability for mission-critical data	When to sell • RAS + price/performance • Fibre Channel storage networking • Replaces SPARCstorage Array • High sequential performance • High-performance data warehousing and DSS • Campus-area remote mirroring • Flexible configurations (up to 500 m)	When to sell • Mainframe-class RAS • Mainframe-class performance • Only true information sharing in the industry, allowing mainframe, UNIX, Microsoft Windows NT simultaneous, multi-platform access to the same data • Mainframe backup of open systems • Storage consolidation • Mission-critical data • MF data migration
When NOT to sell • Applications requiring more than 291 GB in a single array • Customer requires Fibre Channel today	When NOT to sell • Solaris Operating Environment user who wants FC-AL headroom today • Non-Solaris Operating Environment or Microsoft Windows NT operating environment	When NOT to sell • Hardware RAID 5 required • Non-Solaris Operating Environment or Microsoft Windows NT host attach required	When NOT to sell • Price is a primary selection criteria

Sun StorEdge A3500 Array Key Messages

Sun StorEdge A3500 array is a scalable, high-performance, high-availability solution that uses a 73.5-inch tall expansion cabinet for high-density storage solutions. It leverages existing technologies (Sun StorEdge A3000 array controller modules, Sun StorEdge D1000 array-style disk trays, and 9-GB, 18-GB, or 36-GB, 10000-rpm drives) to provide flexible, scalable, and high capacity configurations. Designed for high availability, all components are redundant, support automatic failover, and are hot pluggable.

Each Sun StorEdge A3500 array includes the following:

- One or two 73.5-inch tall Sun StorEdge expansion cabinets, with two power sequencers per cabinet
- One to three Sun StorEdge A3500 array controller module(s), each with two controller boards for automatic failover
- Sun StorEdge RAID Manager software (version 6.1.1 for the Solaris Operating Environment and 6.20.21 for Microsoft Windows NT), including the RDAC driver which enables controller failover
- Five to fifteen Sun StorEdge D1000 disk trays, each with environmental service module (ESM) boards
- Up to twelve 1-inch 9.1 GB or 18-GB, 10000-rpm disks, or eight 1.6-inch, 36-GB, 10000-rpm disk drives per tray

Customers can order these basic system configurations:

- 1 x 5 (1 controller module, 5 disk trays) in a single cabinet
- 2 x 7 (2 controller modules, 7 disk trays) in a single cabinet
- 3 x 15 (3 controller modules, 15 disk trays) in dual cabinets
- Sun StorEdge A3500-Light array (1 controller module, 2 disk trays)
- Choice of fixed configurations or configure-to-order models

By offering more trays and a taller cabinet than the previous generation Sun StorEdge A3000 array, the Sun StorEdge A3500 array provides a higher density, higher capacity solution. With the larger number of drive trays and controller modules supported, higher capacity is achieved while still offering high performance and reliability. The minimum configuration is now the Sun StorEdge A3500-Light array model. Minimum and maximum capacities for each configuration are as follows:

Configuration	**Minimum Capacity**	**Maximum Capacity**
Sun StorEdge A3500-Light—9-GB drives	72 GB	218 GB
1 x 5—9-GB drives	91 GB	546 GB
1 x 5—18-GB drives	182 GB	1092 GB
1 x 5—36-GB drives	364 GB	1456 GB
2 x 7—9-GB drives	182 GB	764 GB
2 x 7—18-GB drives	364 GB	1528 GB
2 x 7—36-GB drives	728 GB	2038 GB
3 x 15—9-GB drives	273 GB	1638 GB
3 x 15—18-GB drives	546 GB	3276 GB
3 x 15—36-GB drives	1092 GB	4368 GB

Daisy-chaining controller modules enables even higher capacity storage solutions. In summary, the Sun StorEdge A3500 array configurations provide the highest density storage, offering scalability, high capacity, excellent availability, and high performance in a remarkably small footprint.

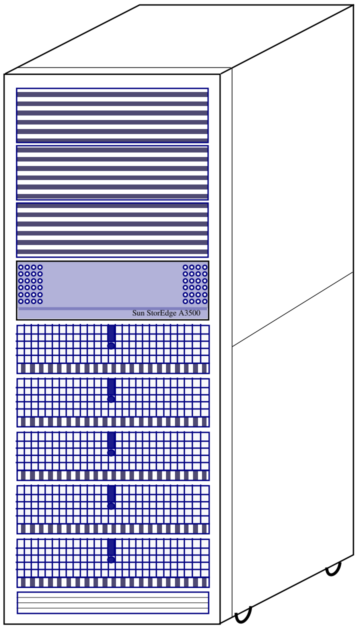
Sun StorEdge A3500 Array Key Features and Benefits

Features	Benefits
• Higher density 73.5-inch tall expansion cabinet	• Provides scalable high-capacity configurations in a narrow footprint
• These basic configurations: – 1 x 5 (1 controller module, 5 disk trays) in a single cabinet – 2 x 7 (2 controller modules, 7 disk trays) in a single cabinet – 3 x 15 (3 controller modules, 15 disk trays) in dual cabinets – Sun StorEdge A3500-Light array (1 controller module, 2 disk trays)	• Enables scalable capacity, high-performance configurations in a space-saving footprint • Allows customer to design a storage solution with plenty of room for future growth
• Controller-based RAID	• Delivers high performance by decreasing CPU drain for I/O processing • Dual active controllers provide high bandwidth and automatic failover to the second controller
• Sun StorEdge RAID Manager software	• Easy configuration, management and recovery of RAID implementation • Simple-to-use graphical user interface (GUI) as well as command line interface (CLI) for scripting
• Microsoft Windows NT host support	• Investment protection • High-performance, high-reliability storage for Microsoft Windows NT servers
• RAID 0, 1, 1+0, 3, and 5	• High data availability for mission-critical array applications • RAID-5 performance multiplies the power of the industry's most popular line of scalable UNIX servers: Sun Enterprise servers, SPARCserver™ and SPARCcenter™ systems
• 10000-rpm disk drives	• Approximately 25 to 30 percent faster data access in OLTP applications than 7200-rpm disks
• Dual hot-plug controllers, power supplies/cooling, power sequencers, and hot-plug disks	• Full redundancy provides the highest availability for a mission critical data center. If one controller fails, I/O traffic automatically fails over to the other controller. Applications continue to run without interruption. • Each controller module power supply can support the power requirements for both controller boards • Hot-plug components permit immediate servicing without system down time

Features	Benefits
128-MB to 256-MB mirrored data cache memory per controller module	Enables fast writes to the data cache Mirrored cache ensures data integrity
Battery backup for cache memory	Protects data written to cache for up to three days after a power failure
Two UltraSCSI differential interfaces to the host	Provides high bandwidth (up to 80 MB/sec.) data transfer across two host connections
UltraSCSI communication between controller boards in controller module	Improved cache mirroring performance
UltraSCSI between controller boards and disk trays	Increased RAID performance
Environmental service module (ESM) in each disk tray	Environmental monitoring and reporting for temperature, voltage, fan failure, power supply status, and a complete health check of each disk tray
Multi-initiator support for Sun Enterprise clusters	High availability and automatic failover of the host and disk array. Redundancy reduces the frequency and duration of outages.
Box sharing across independent controllers	Allows two Solaris Operating Environment hosts to share the same Sun StorEdge A3500 array data center. Specific controller and LUNs assigned to each host (no controller failover).
Daisy chaining of controller modules	Increases storage capacity with fewer host connections
Open SCSI host interface	Protects customers' storage subsystem investment by providing interoperability with other host environments

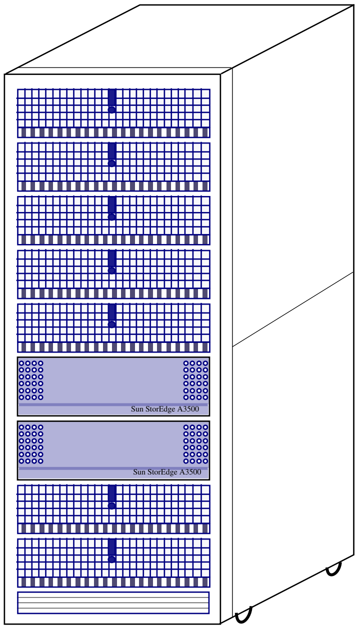
System Architecture Overview

To provide scalable storage solutions, there are three basic Sun StorEdge™ A3500 array configurations with varying numbers of controllers and drive trays. Capacities are shown for 36-GB, 1.6-inch high, 10000-rpm disk configurations.



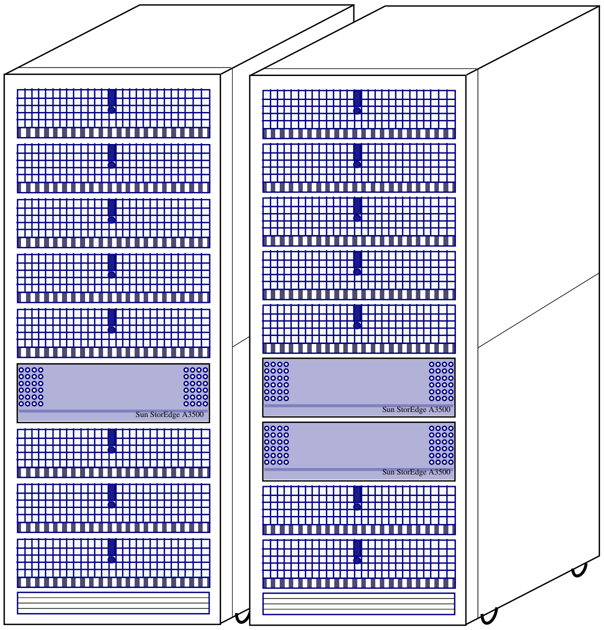
1 x 5 Configuration

Up to1.4-TB disk capacity



2 x 7 Configuration

Up to 2.0-TB disk capacity



3 x 15 Configuration

Up to 4.3-TB disk capacity

Sun StorEdge A3500 Array Key Facts

- To achieve higher density and higher capacity storage solutions, all Sun StorEdge A3500 array configurations use the 73.5-inch Sun StorEdge expansion cabinet.
- High reliability, availability, and serviceability (RAS) features, including controller failover, RAID support, and redundant components:
  - Each Sun StorEdge A3500 controller module contains two controller boards, two cooling units, two power supplies, and one battery back-up unit.
  - The battery back-up unit includes redundant battery cells and charger circuits.
  - The disk trays include dual fans and power supplies, and hot-pluggable disks.
  - Each expansion cabinet uses two power sequencers, each connecting to separate wall outlets and separate power supplies.
- The Sun StorEdge A3500 array data center is supported on the Solaris™ 2.5.1 Operating Environment or later releases with the required operating system patches. Configurations with 18-GB, 10000-rpm, 1-inch disks or 36-GB, 10000-rpm, 1.6-inch disks are supported on the Solaris 2.6 Operating Environment or higher.

Sun StorEdge Expansion Cabinet Key Facts

The 73.5-inch tall Sun StorEdge expansion cabinet is a standard 19 inch rack internally. It has room for a maximum of nine components: up to two controllers and seven disk trays. To support the 3 x 15 configuration, a second expansion cabinet is used.

Sun StorEdge Expansion Cabinet Technical Facts

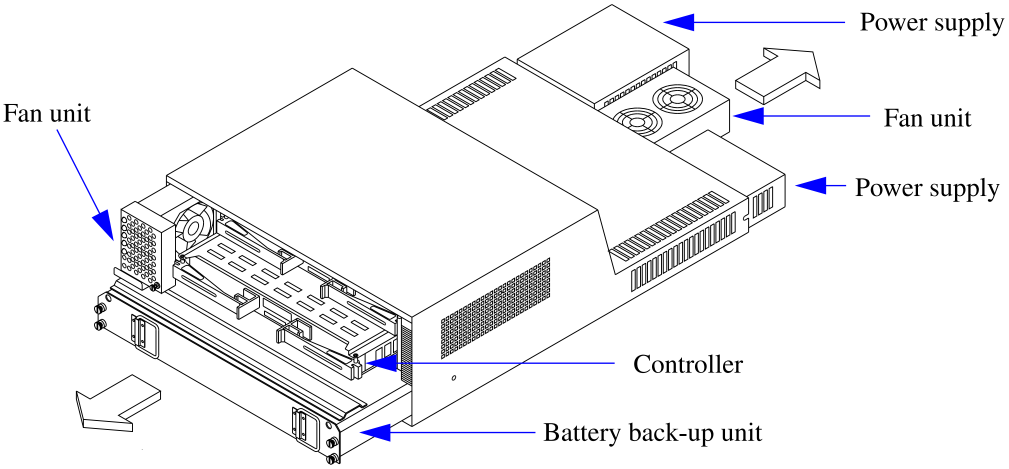
The Sun StorEdge expansion cabinet measures:

- Height: 187.9 cm (73.5 inches)
- Width: 61 cm (24 inches)
- Depth: 93 cm (36.5 inches)
- Internal dimensions conform to EIA RS-310C (RETMA) for 482-mm (19-inch) racks

Each Sun StorEdge expansion cabinet is equipped with two power sequencers to support separate power sources (e.g., from separate wall outlets). Two independent 220-volt or 240-volt power sources are required. Each power sequencer is rated at a maximum 5.4 kW.

Sun StorEdge A3500 Controller Module Key Facts

The heart of the Sun StorEdge A3500 system is the Sun StorEdge A3500 controller module, an intelligent RAID controller with two active RAID controller boards. There are redundant power supplies, cooling units and backup batteries within the module.



Sun StorEdge A3500 Controller Module Technical Facts

The Sun StorEdge A3500 Intelligent RAID controller module contains the following:

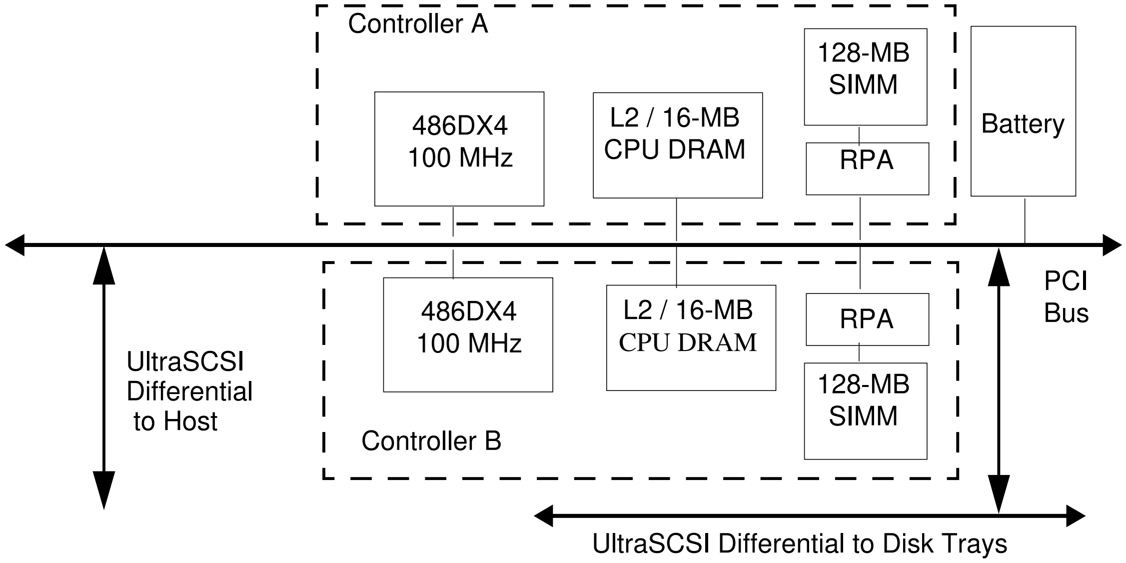
- Two RAID controller boards (see “Sun StorEdge A3500 Controller Board” below)
- One battery backup unit, which provides a minimum three days of power backup for cache memory. The battery module uses redundant batteries and charger circuits. Battery shelf life is rated for two years.
- Two hot-plug power supplies rated at 240 volts, 1.0 Amp, and power-factor corrected (PFC). PFC smooths out input current voltage.
- Redundant rear fans for the power supplies and redundant front fans for the controller boards.
- Five controller module LEDs, indicating module power status, power supply fault, fan fault, controller fault, and fast write cache enabled.

The Sun StorEdge A3500 controller module contains a backpanel circuit board where the module components interconnect.

- Two controller boards plug directly into the controller module backpanel, using a 600-pin TBC+ connector for all SCSI and subsystem interconnections.
- Two SCSI-In connectors attach to the UltraSCSI differential host bus adapters (aggregate 80 MB/sec. available data bandwidth using both channels).
- Two SCSI-Out connectors require two passive differential terminators, or are daisy-chained to another controller module. When daisy chaining controller modules, two terminators are required on the last controller module in the chain.
- Five drive tray interfaces are contained in each controller module. These are 8- or 16-bit, synchronous or asynchronous, differential UltraSCSI (40 MB/sec.).
- The battery module and power supplies also interface to the backpanel circuit board.

Sun StorEdge A3500 Controller Board Key Facts

The Sun StorEdge A3500 controller board includes a 486DX4 100-MHz processor and an upgradable 64-MB mirrored data cache.



Sun StorEdge A3500 Controller Board Technical Facts

- The intelligent Sun StorEdge A3500 controllers support RAID 0, 1, 1+0, 3, and 5. The controller microprocessor performs all RAID parity calculations. This improves system performance by reducing the CPU load and I/O traffic between the host and the array.
- The 100 MHz 486DX4 CPU on the controller board is a socketed PGA part. Each controller board also includes 16 MB of CPU memory and 512 KB of Level 2 cache.
- Each controller board ships with 64 MB (2 x 32-MB SIMMs) of data cache memory. A maximum of 128 MB per controller board is supported. Each board has four SIMM sockets for the data cache SIMMs, which are installed in pairs. To upgrade each controller to 128 MB, add an additional 64 MB (2 x 32 MB) per board. The data cache memory consists of thirty six 70-ns SIMMs organized in a 72-pin package. The data cache is controlled by the RAID Parity Assist (RPA) chipset.
- Each controller board has ten status LEDs visible from the controller module’s front panel. The LEDs report controller fault, power on, controller heartbeat, and controller status (active/passive, SIMM failure, and so on).

Disk Tray and Hot-plug Disk Module Key Facts

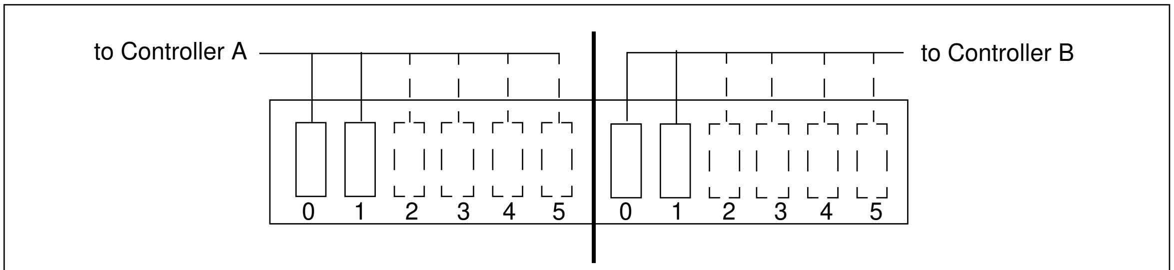
The disk trays used in the Sun StorEdge A3500 subsystem are the same as the Sun StorEdge D1000 arrays. In the Sun StorEdge A3500 array, the trays are populated with either 9-GB, 18-GB, or 36-GB, 10000-rpm disks. The disk trays are easily serviceable, with hot-plug disk modules and hot-plug redundant power and cooling.

Disk Tray and Hot-plug Disk Module Technical Facts

- All drives are 10000 rpm, either the 1-inch, 9.1-GB or 18-GB disks or the 1.6-inch, 36-GB disks.
- Each tray holds a maximum of twelve 1-inch, 9.1-GB or 18-GB disks, or eight 1.6-inch, 36-GB disks. These are the same disk trays as the Sun StorEdge D1000 arrays.
- The 3.5-inch form factor drives are mounted in a plastic bracket for easy installation and removal from the tray.
- In the event of a power supply failure, a single power supply can handle the start-up power surge for all disks. In addition, a power supply can be replaced while the tray and disks are in operation. Each cooling unit can maintain operating temperatures in the event of a single fan failure.
- The drives use SCA-2 connectors in which the ground leads make contact first for hot-plug support. The drives plug directly into the disk tray backplane without any cabling, providing higher reliability.
- An environmental service module (ESM) board at the rear of the disk tray enables the host system to obtain environmental status information over the SCSI bus. The ESM board also provides status and control information for individual drive faults back to the host system.

Sun StorEdge A3500 Array Configuration	Disk and Tray Configurations	# of Disks per System	Total Capacity
A3500-Light	9 GB, minimum	8 disks	72 GB
1 x 5	9 GB, minimum	10 disks	91 GB
	9 GB, maximum	60 disks	546 GB
	18 GB, minimum	10 disks	182 GB
	18 GB, maximum	60 disks	1092 GB
	36 GB, minimum	10 disks	364 GB
	36 GB, maximum	40 disks	1456 GB
2 x 7	9 GB, minimum	20 disks	364 GB
	9 GB, maximum	84 disks	764 GB
	18 GB, minimum	20 disks	364 GB
	18 GB, maximum	84 disks	1528 GB
	36 GB, minimum	20 disks	728 GB
	36 GB, maximum	56 disks	2038 GB
3 x 15	9 GB, minimum	30 disks	273 GB
	9 GB, maximum	180 disks	1638 GB
	18 GB, minimum	30 disks	546 GB
	18 GB, maximum	180 disks	3276 GB
	36 GB, minimum	30 disks	1092 GB
	36 GB, maximum	120 disks	4368 GB

- An “Option” switch on the drive tray determines whether all disks in the tray reside on a single bus or whether the “split bus” option is used. The 2 x 7 configurations include three trays in the split bus configuration, with the drives in a single tray logically divided between two busses. Both trays have a split bus configuration in the Sun StorEdge A3500-Light array.



Drive tray in “split bus” configuration (12 drives per tray shown)

The split bus tray permits the definition of RAID-5 LUNs that span across five trays. In the minimum 2 x 7 configuration, the three split bus trays are each populated with four drives, while the other four trays contain two drives each, for a total of 20 drives. In the case of the minimum 2 x 7 configuration, the split bus tray allows the default LUN configuration to include two 4+1 RAID-5 LUNs, one per controller. (See the default LUN configurations under the discussion of the Sun StorEdge RAID Manager, and also the configuration information in the *Sun StorEdge A3500 Hardware Configuration Guide, 805-4981-10.*)

Host Bus Adapter Key Facts

- For SBus-based hosts—UDWIS/S, SBus to differential UltraSCSI host bus adapter (X1065A)
- For PCI-based hosts—PCI UD2S, PCI differential UltraSCSI adapter (X6541A)

Host Bus Adapter Technical Facts

The UDWIS/S host bus adapter:

- Allows data transfer up to 40 MB/sec. per channel
- Is rated at an average of 10.5 watts (15 watts maximum)
- Measures 5.776 inch x 3.3 inch (146.70 mm x 83.82 mm)
- Weighs less than 1 lb. (0.45 kg)

The PCI Differential UltraSCSI Host Bus Adapter

- Allows data transfer up to 40 MB/sec. per channel
- Provides dual UltraSCSI channels per card.

  To avoid a single point of failure and enhance availability, it is recommended that customers attach controllers in the same Sun StorEdge A3500 controller module to channels on different host bus adapter cards.
- Measures 7.5 inches long by 4 inches wide

- Uses the following input power from the host's PCI slot:
  + 5.0VDC @ 3A max.
  + 3.3VDC @ 130ma max.
  + 12.0VDC @ 50ma max.
- Weighs less than 1 lb. (0.45 kg)

Requirements and Configuration

Sun StorEdge™ A3500 Array Configuration Guidelines

The Sun StorEdge™ A3500 array is supported on the following host platforms.

- Sun Enterprise™ 2 server
- Sun Enterprise 250 server
- Sun Enterprise 450 server
- Sun Enterprise 3X00 server
- Sun Enterprise 4X00 server
- Microsoft Windows NT server*
- Sun Enterprise 5X00 server
- Sun Enterprise 6X00 server
- Sun Enterprise 10000 server
- SPARCcenter™ 2000E/2000 system*
- SPARCserver™ 1000E/1000 system*

Note: ** Supported on 9-GB, 10000-rpm options only.*

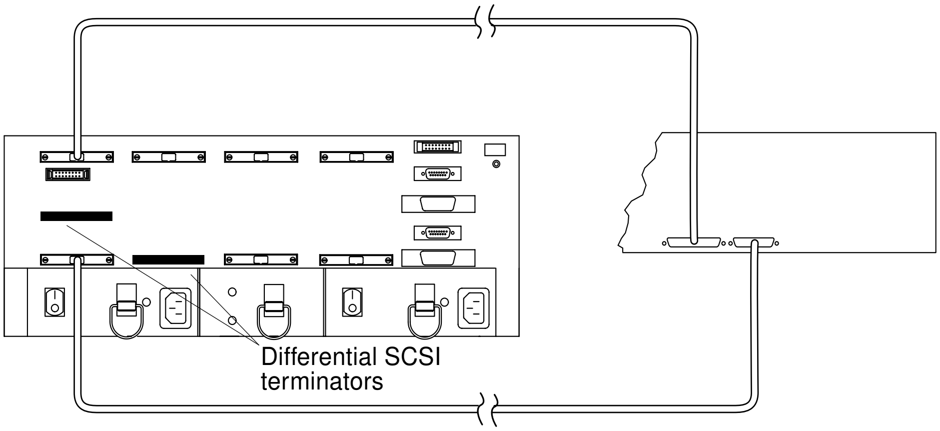
Supported Host Configurations

The Sun StorEdge A3500 array is supported in these configurations:

- Single host
- Daisy chain
- Box sharing—independent controller
- Multi-initiator

Refer also to the *Sun StorEdge A3500 Hardware Configuration Guide*. This guide contains detailed information about correct Sun StorEdge A3500 SCSI cabling, SCSI bus termination requirements, and power sequencing for each of these configurations.

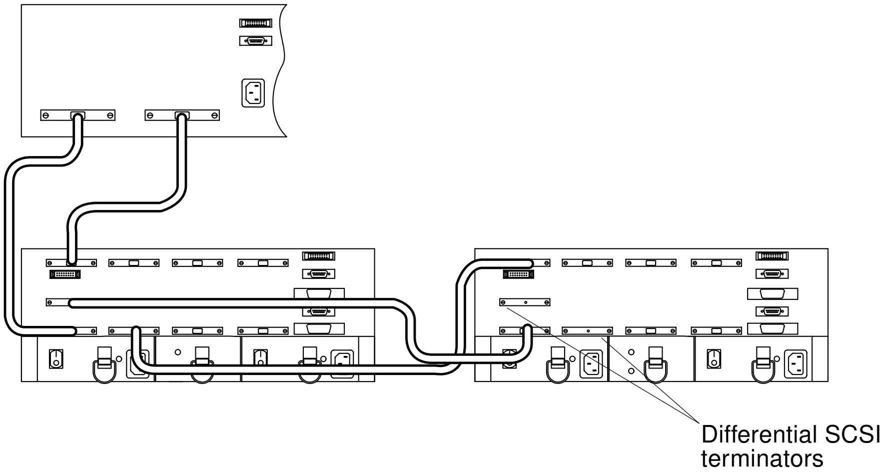
Single Host



This is the basic configuration. Each Sun StorEdge A3500 controller module interfaces to the host via two UltraSCSI differential host bus adapters. Order two host bus adapters for each controller module in the Sun StorEdge A3500 array (i.e., order two adapters for a 1 x 5 or A3500-Light configuration, four for a 2 x 7 configuration, and six for a 3 x 15 configuration).

The SCSI-Out ports on the Sun StorEdge A3500 controller module must both be terminated. (Refer to the *Sun StorEdge A3500 Hardware Configuration Guide*.)

Daisy-chained Configuration



Daisy chaining enables higher capacity storage solutions per host.

- Sun StorEdge A3500 controller modules can be daisy-chained in the same or separate cabinets. Up to a maximum of two controller modules may be daisy chained together.
- The controller modules in the 2 x 7 and 3 x 15 configurations are shipped as individual controllers. The customer may choose to daisy chain controller modules within these configurations, up to the limit of two controller modules in a daisy chain.

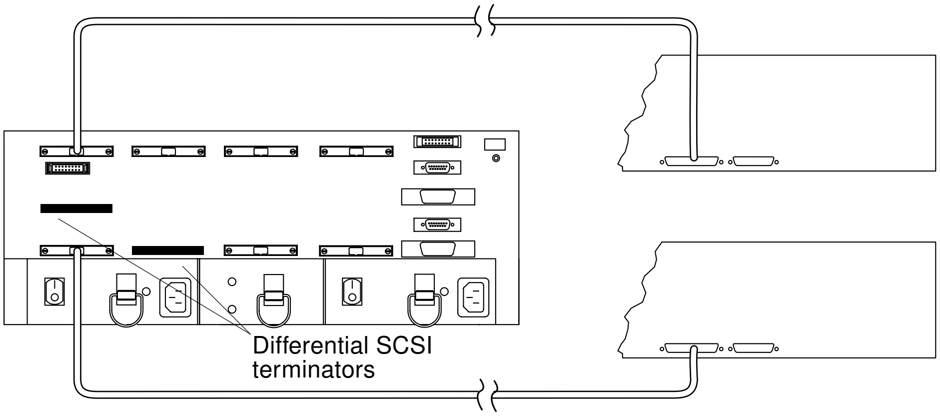
Some customers will require large, multiple-terabyte storage capacities. These customers will need to configure and daisy chain multiple Sun StorEdge A3500 controller modules. The maximum number of Sun StorEdge A3500 controller modules that is supported per host is given in the table below, along with the maximum storage capacity per host (based on the 1 x 5 maximum configuration).

Platforms Supported	**Max. # Controller Modules Single/Daisy Chain**	**Max. Capacity, in KB**					
		9-GB disks		**18-GB disks**		**36-GB disks**	
		Single	**Daisy-Chain**	**Single**	**Daisy-Chain**	**Single**	**Daisy-Chain**
Sun Enterprise 10000 server	21/21	11,466	11,466	22,932	22,932	30,576	30,576
Sun Enterprise 6500/6000 server	21/36	11,466	19,656	22,932	39,312	30,576	52,416
Sun Enterprise 5500/5000 server	10/20	5,460	10,920	10,920	21,840	14,560	29,120
Sun Enterprise 4500/4000 server	10/20	5,460	10,920	10,920	21,840	14,560	29,120
Sun Enterprise 3500 server	6/12	3,276	6,552	6,552	13,104	8,736	17,472
Sun Enterprise 3000 server	4/8	2,184	4,368	4,368	8,736	5,824	11,648
Sun Enterprise 2 server	2/4	1,092	2,184	2,184	4,368	2,912	5,824
Sun Enterprise 450 server	3/4	1.638	2,184	3,276	4,368	4,368	5,824

Platforms Supported	Max. # Controller Modules Single/Daisy Chain	Max. Capacity, in KB					
		9-GB disks		18-GB disks		36-GB disks	
		Single	Daisy-Chain	Single	Daisy-Chain	Single	Daisy-Chain
Sun Enterprise 250 server	2/2	1,092	1,092	2,184	2,184	2,912	2,912
SPARCcenter 2000 system	6/12	3,276	6,552	not supported		not supported	
SPARCserver 1000 systems	6/12	3,276	6,552	not supported		not supported	
Microsoft Windows NT server	2/4	1,092	2,184	not supported		not supported	

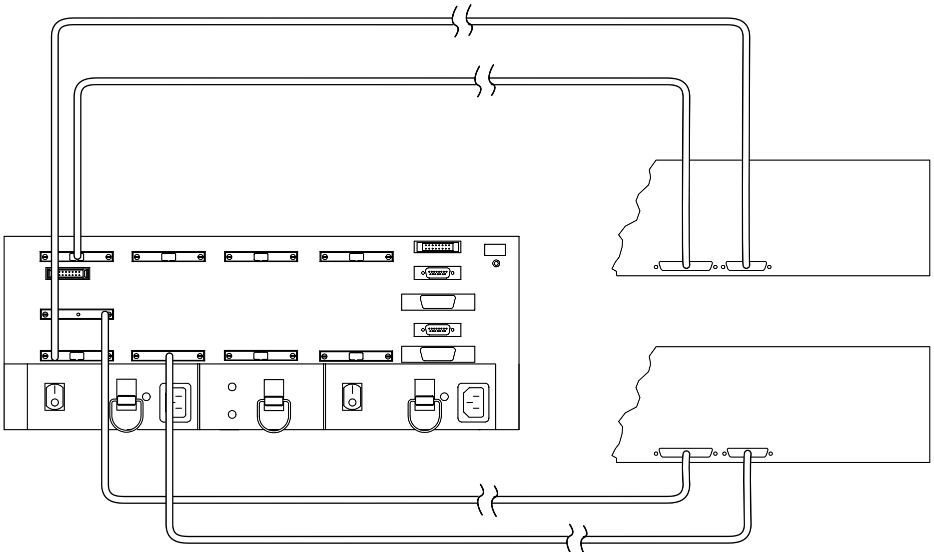
- Order two UltraSCSI differential host bus adapters for each pair of daisy-chained Sun StorEdge A3500 controller modules.
- The last Sun StorEdge A3500 controller module in any daisy chain must have two terminators, one in each SCSI Out port. (Refer to the *Sun StorEdge A3500 Hardware Configuration Guide*.)

Box Sharing—Independent Controller



- Two host systems can share the same Sun StorEdge A3500 disk array.
- The two Solaris™ Operating Environment hosts are completely independent of each other and do not share LUNs. Each host is unaware of the other host's LUNs.
- If the Sun StorEdge A3500 array has a single controller module, each of the controller boards is assigned to one of the two independent hosts. In this case, there is no failover between controllers.

Multi-initiator Clustering



- Sun Enterprise clusters and the Sun StorEdge A3500 array in a multi-initiator configuration can provide a robust, high-availability, clustered solution. Two cluster nodes are attached to the same controller module in the Sun StorEdge A3500 disk array. The nodes share access to the controllers as well as to the LUNs assigned to the controllers. With the multi-initiator cluster configuration, both host and controller failover are supported.
- Daisy-chained controller modules are also supported in the multi-initiator cluster configuration.

Other Configuration Guidelines

The Sun StorEdge A3500 array includes two power sequencers in each cabinet for redundant power. When ordering Sun StorEdge A3500 systems, order two power cord kits as separate line items. For the Sun StorEdge A3500 array 3 x 15 configuration (which uses two expansion cabinets), order a total of four power cord kits.

The total length of all SCSI cables on any one bus should not exceed 25 meters. The Sun StorEdge A3500 array ships with two 12 meter UltraSCSI differential cables for each controller module in the configuration ordered. See the ordering information for part numbers of shorter cables. Cable lengths are as follows:

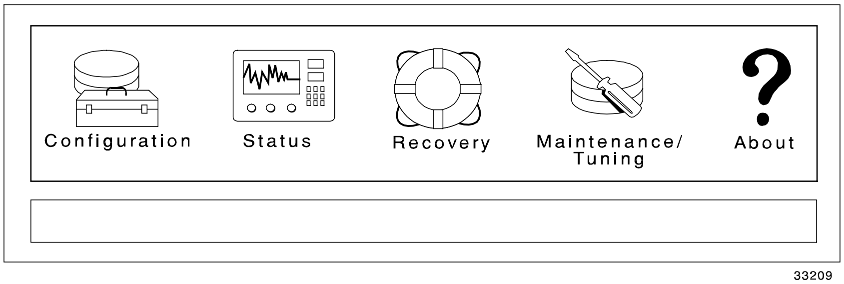
- External differential UltraSCSI cable, 12.0 meters
- UltraSCSI host bus adapter, 0.1 meter of internal cable length
- Sun StorEdge A3000 controller, 0.1 meter of internal cable length

Software Architecture

Sun StorEdge™ RAID Manager Key Facts

The Sun StorEdge™ RAID Manager software includes both graphical and command line interfaces for configuring, monitoring, and maintenance/tuning of the RAID configuration. For the Sun StorEdge A3500 array, version 6.1.1 or above is required. Included with the RAID Manager software is the redundant dual active controller (RDAC) driver, which enables automatic controller failover.

The graphical user interface (GUI) of the Sun StorEdge RAID Manager software displays this menu.



Application	Functions
Configuration Application	Design flexible RAID configurations Locate a drive group Create logical units (LUNs) and hot spares from unassigned drives Add LUNS to an existing drive group Delete LUNs in a drive group or a hot spare drive
Status Application	Real-time view of log files with system information about failures, parity checks, and system events Perform health check on RAID modules View the status of LUN reconstructions or change the LUN reconstruction rate
Recovery Application	On-line instructions for easy restoration of failed components in a RAID module Manual parity check/repair of LUNs Manual recovery of drives and controllers including failing, reconstructing, and reviving drives, formatting and reviving LUNs, and changing the status of controllers Automatic LUN reconstruction

Application	Functions
Maintenance/Tuning Application	Change LUN reconstruction rate Balance LUNs between active controllers View/set cache parameters for each LUN Upgrade controller firmware Change/set automatic parity check Manage error log file
About	Software version information

Sun StorEdge RAID Manager Technical Facts

- The Sun StorEdge RAID Manager software includes both graphical and command line interfaces for configuring and managing the RAID configurations.
- The Sun StorEdge RAID Manager software also includes the redundant dual active controller (RDAC) driver, a kernel-level driver that manages automatic controller failover. The RDAC driver sits logically above the SCSI driver in the Solaris™ Operating Environment kernel, and automatically re-routes active I/So to the remaining controller when a controller failure occurs.
- A RAID module is a set of associated drives, controllers, power supplies, and cooling fans.
- The Solaris Operating Environment sees each LUN as one virtual disk drive. With the Solaris 2.6 Operating Environment (Hardware: 5/98), each SCSI device driver can support a maximum of 32 LUNs, each capable of supporting 7 partitions. For the Sun StorEdge A3500 array, the Sun StorEdge RAID Manager software supports a maximum of 16 LUNs.
- A drive group is a logical grouping of drives. Drive groups are renumbered automatically on the next reconfiguration boot after configuration changes.
- Sun StorEdge RAID Manager uses the standard device code (cX tY dZ s0)
  - cX = host bus adapter with a maximum of 32 LUNS per host bus adapter and two daisy-chained RAID controller modules.
  - tY = the controller SCSI target ID. This is limited to 8 under Solaris 2.5.1 Operating Environment.
  - dZ = the LUN
  - s0 = slice number. With the Sun StorEdge RAID Manager, the slice number is always “0.”
- The RAID Manager supports global hot spares, which are disks that contain no data and act as a standby in case of a drive failure. Once a failed disk has been replaced, data is returned automatically to the original disk to preserve the original configuration and performance; the spare disk is then made available again as a global hot spare.

- The RAID Manager software allows the user to customize how data is cached:
  - Write caching—Data can be written from the host to the controller's cache by enabling Write Caching. This improves overall performance because the host considers the write operation complete once the data is written to cache. By default, write caching is enabled.
  - Write cache mirroring—When enabled, cached data is written to the cache memory of both controllers so that when a controller fails, the second controller completes all outstanding write operations.
  - Cache without batteries—Users can enable write caching when the batteries are discharged.

  Fast writes to the data cache are enabled by default.
- Manual load balancing is provided to enable an administrator to balance the I/O load between controllers and improve overall system performance.
- The Recovery Guru in the RAID Manager GUI provides on-line instructions for easy restoration of failed components. The Recovery Guru provides step-by-step failure recovery instructions to simplify administration and minimize the possibility of error.
- Message/event logging is provided by default, and can be customized to meet customer needs.
- Parity checks are run automatically to verify that there are no parity errors. If any parity errors are found, the parity is automatically repaired and rewritten to disk.
- Simple network management protocol (SNMP) support is provided, enabling integration with network management tools such as Solstice Domain Manager™ (SunNet Manager™) and Sun Enterprise SyMON™ 2.0 software.
- RAID Manager enables on-line rollover upgrades of the controller firmware. All LUNs are rolled over to one controller, the revision of the firmware is downloaded to the idle controller, and then the LUNs are rolled back
- The Sun StorEdge A3500 array comes pre-configured with default LUN configurations, which may be reconfigured to match the customer's specific requirements. In multiple controller configurations, the LUNS are divided evenly among the controllers to balance system performance. The following LUN configurations are the factory defaults:

Sun StorEdge A3500 Configuration	**Disk Type and Configuration**	**Factory Default LUN Configurations (*# of LUN* x *LUN type = # disks used*)**
A3500-Light	9-GB minimum configuration	2 x (2+2) = 8 (RAID 0+1)
1 x 5	9-GB minimum configuration	1 x (4+1) = 5 (RAID 5) 1 x (2+2) = 4 (RAID 0+1) 1 x GHS (global host spare) = 1 (GHS)
1 x 5	18-GB minimum configuration	1 x (4+1) = 5 (RAID 5) 1 x (2+2) = 4 (RAID 0+1) 1 x GHS (global host spare) = 1 (GHS)
1 x 5	36-GB minimum configuration	1 x (4+1) = 5 (RAID 5) 1 x (2+2) = 4 (RAID 0+1) 1 x GHS (global host spare) = 1 (GHS)
1 x 5	9-GB maximum configuration	5 x (4+1) = 25 (RAID 5) 3x (5+5) = 30 (RAID 0+1) 5x GHS (global host spare) = 5 (GHS)
1 x 5	18-GB maximum configuration	5 x (4+1) = 25 (RAID 5) 3x (5+5) = 30 (RAID 0+1) 5x GHS (global host spare) = 5 (GHS)

Sun StorEdge A3500 Configuration	**Disk Type and Configuration**	**Factory Default LUN Configurations (*# of LUN* x *LUN type = # disks used*)**
1 x 5	36-GB maximum configuration	7 x (4+1) = 35 (RAID 5) 1 x (2+2) = 4 (RAID 0+1) 1 x GHS (global host spare) = 1 (GHS)
2 x 7	9-GB minimum configuration	2 x (4+1) = 10 (RAID 5) 2 x (2+2) = 8 (RAID 0+1) 2 x GHS (global host spare) = 2 (GHS)
2 x 7	18-GB minimum configuration	2 x (4+1) = 10 (RAID 5) 2 x (2+2) = 8 (RAID 0+1) 2 x GHS (global host spare) = 2 (GHS)
2 x 7	36-GB minimum configuration	2 x (4+1) = 10 (RAID 5) 2 x (2+2) = 8 (RAID 0+1) 2 x GHS (global host spare) = 2 (GHS)
2 x 7	9-GB maximum configuration	12 x (4+1) = 60 (RAID 5) 2 x (3+3) = 12 (RAID 0+1) 2 x (2+2) = 8 (RAID 0+1) 4 x GHS (global host spare) = 4 (GHS)
2 x 7	18-GB maximum configuration	12 x (4+1) = 60 (RAID 5) 2 x (3+3) = 12 (RAID 0+1) 2 x (2+2) = 8 (RAID 0+1) 4 x GHS (global host spare) = 4 (GHS)
2 x 7	36-GB maximum configuration	8 x (4+1) = 40 (RAID 5) 2 x (3+3) = 12 (RAID 0+1) 4 x GHS (global host spare) = 4 (GHS)
3 x 15	9-GB minimum configuration	3 x (4+1) = 15 (RAID-5) 3 x (2+2) = 12 (RAID 0+1) 3 x GHS (global host spare) = 3 (GHS)
3 x 15	18-GB minimum configuration	3 x (4+1) = 15 (RAID-5) 3 x (2+2) = 12 (RAID 0+1) 3 x GHS (global host spare) = 3 (GHS)
3 x 15	36-GB minimum configuration	3 x (4+1) = 15 (RAID-5) 3 x (2+2) = 12 (RAID 0+1) 3 x GHS (global host spare) = 3 (GHS)
3 x 15	9-GB maximum configuration	15 x (4+1) = 75 (RAID-5) 9 x (5+5) = 90 (RAID 0+1) 15 x GHS (global host spare) = 15 (GHS)
3 x 15	18-GB maximum configuration	15 x (4+1) = 75 (RAID-5) 9 x (5+5) = 90 (RAID 0+1) 15 x GHS (global host spare) = 15 (GHS)
3 x 15	36-GB maximum configuration	21 x (4+1) = 105 (RAID-5) 3 x (2+2) = 12 (RAID 0+1) 3 x GHS (global host spare) = 3 (GHS)

Sun StorEdge A3500 Array Software Requirements

- Solaris 2.5.1 Operating Environment or above with the required operating system patches. Configurations with 18-GB, 1000-rpm, 1-inch disks or 36-GB, 10000-rpm, 1.6 inch disks are supported on Solaris 2.6 Operating Environment or higher.
- Sun StorEdge RAID Manager 6.1.1 Update 1 or Update 2

Alternate Pathing/Dynamic Reconfiguration Support

- The Sun StorEdge RAID Manager software allows the Sun StorEdge A3500 array to be mapped from one Sun Enterprise 10000 server domain to another without requiring a domain reboot. (RAID Manager 6.1.1 has an enhanced RDAC that checks for added devices.)
- Solaris 2.6 Operating Environment adds alternate pathing support for disk and network controllers in Sun Enterprise servers (Sun Enterprise 3X00, 4X00, 5X00, and 6X00 servers). Since the Sun StorEdge A3500 array already includes controller failover functionality, alternate pathing and dynamic reconfiguration in Solaris 2.6 Operating Environment should not be used with the Sun StorEdge A3500 array on the Sun Enterprise 3X00, 4X00, 5X00, and 6X00 servers.

Other Supported Software

- VERITAS Volume Manager software versions 2.4, 2.5, 2.5.x, and 2.6
- Solstice DiskSuite™ software version 4.1
- Sun Cluster 2.1/2.2 software

VERITAS Volume Manager Software Support

The VERITAS Volume Manager (VxVM) software, formerly known as Sun StorEdge Volume Manager software, is supported with the Sun StorEdge A3500 array. However, certain cautions apply:

- **Installation**

  Installation ordering is very sensitive. Sun StorEdge A3500 array installation procedures must be followed exactly as documented in the Sun StorEdge A3500 array Product Release Notes, the Sun StorEdge A3500 System Manual, and the Sun StorEdge RAID Manager manual.
- **Installation Guide**
  - Deviation from the following sequence can and will cause incompatibility between Sun StorEdge A3500 array and VxVM.
  - VxVM should be installed only after the following steps have been completed:
    1. Sun StorEdge A3500 array hardware is properly installed and connected to the host.
    2. Sun StorEdge A3500 array software is properly installed.
    3. Sun StorEdge A3500 array devices (LUNs) are properly configured using RAID Manager.
    4. The host system is rebooted using the `-r` option. On reboot the RAID Manager must recognize the configured LUNs and create the appropriate device nodes.

    It is also important to modify startup scripts as necessary to ensure that Sun StorEdge A3500 array daemons are invoked prior to VxVM.
- **Device Naming**

  Sun StorEdge A3500 array device (LUN) entries in /etc/vfstab which will be encapsulated using VxVM must use the standard Solaris Operating Environment device names (e.g., `/dev/rdsk/c3t4d0s0`). Do not use the device names generated by the Sun StorEdge RAID Manager (e.g., `/dev/rRAID_module01/0s0`).

- **Boot Volumes**

  For information on utilizing the Sun StorEdge A3500 array as a boot device, contact your sales representative for information.
- **Controller Error Recovery**

  Follow Sun StorEdge A3500 array controller error recovery procedures in the documentation. Failure to do so will result in an incompatibility with VxVM.
- **Configuration**

  It is recommended that you do not build VxVM RAID 5 volumes from Sun StorEdge A3500 array devices (LUNs), and in particular, that you do not build them from Sun StorEdge A3500 array RAID-5 LUNs.

RAID Implementation

Hardware versus Software-based RAID

In any RAID storage product, RAID functionality may be implemented in hardware (on the array controller, as with the Sun StorEdge A3500 array), or it may be implemented in software on the host. The advantages of each method are described below:

- In most configurations, controller-based RAID delivers higher performance than host-based RAID. For RAID 5, the system I/O bus traffic is lower because the controller does the parity calculations. This decreases host/array bus traffic and improves system I/O throughput. In the Sun StorEdge A3500 array, an intelligent cache controller does all the multi-stripe I/O and performs prefetch. The controller converts small sequential I/O into full stripe I/O to even further improve RAID-5 performance. In host-based RAID systems, each read/write command requires multiple I/O requests to the disk, which increases bus traffic and impacts I/O performance for RAID-5.
- The primary advantage of host-based software RAID is flexibility. In this type of RAID implementation, software on the host system controls the RAID configuration, as well as management and redundant data synchronization operations. This provides a high degree of flexibility, allowing many different RAID levels to be configured, and even allows RAID groups to span multiple disk controllers. Host software RAID also enables configurations to be easily changed over time, as customers' needs change.

RAID Levels Supported

The Sun StorEdge A3500 array is a controller-based (hardware) RAID subsystem that enables users to achieve the ideal balance of high data availability, performance, capacity, and cost. Furthermore the Sun StorEdge RAID Manager software makes it easy for users to configure, monitor, or reconstruct array configurations while the system is operating.

RAID Level	Characteristics
RAID 0—Striping	• Spreads data across multiple disk spindles for better performance • Can be tuned to optimize either random or sequential I/O performance • No redundant data protection, lower reliability than independent disks • Same low cost per usable megabyte as independent disks
RAID 1—Mirroring	• Maintains duplicate copies of data, so if a disk fails, data is available and applications keep running • Same performance as independent disks • Highest cost per usable megabyte

RAID Level	Characteristics
RAID 1+0—Mirroring and striping	• Combines performance of striping with data protection of mirroring • Duplicate copies of striped data remain available even if a disk fails • Same cost per usable megabyte as mirroring
RAID 3—Striping with parity on single disk	• Good for large sequential data transfers per I/O request, and low I/O request rates • When selecting RAID 3, the Sun StorEdge RAID Manager actually implements RAID 5, eliminating the typical RAID 3 bottleneck of parity information being written to a single disk
RAID 5—Striping with parity	• Provides data protection by storing parity information on all disks in the LUN, so data can be reconstructed if a single disk fails; good for applications with high I/O request rates • Stripes data across multiple disk spindles to optimize random or sequential performance • Higher cost per megabyte than independent disks or RAID 0, but much lower than RAID 1 or 1+0 • Lower performance on small-sized writes than in RAID 0, 1, 1+0 or independent disks

High Availability (HA) with Sun StorEdge A3500 Array RAID Implementations

Features	Benefits
• Independent disks, plus RAID levels 0, 1, 1+0, 3, and 5 are all available at the same time within the same array	• Can easily match data layouts to meet users’ specific requirements for capacity, performance, high availability, and cost
• RAID groups may span multiple arrays	• Greater flexibility; allows creation of fully redundant configurations
• RAID levels 5, 1, and 1+0 yield predicted steady-state uptimes in excess of 99.999 percent per array and mean time between data loss (MTBDL) in the millions of hours.	• High availability, so customers can be confident that data will be available when needed and that it will not be lost
• Hot spares are automatically swapped in to replace any failed disk in a RAID-5, 1, or 1+0 group	• Continuous redundant data protection even if a disk fails; maintenance can be deferred for days, weeks, or even months when needed
• RAID stripe sizes are adjustable to optimize for random or sequential I/O patterns.	• Users can tune performance for their specific applications

RAID Technical Facts

- Each array may have several hot spare drives. If a drive in a RAID 5, 1, or 1+0 volume fails, a hot-spare drive is assigned and the Sun StorEdge RAID Manager detects the failure and automatically rebuilds the data from the failed drive onto a hot spare drive.
- Striped data organizations (RAID 0, 1+0, 3, and 5) can be tuned to optimize for either random or sequential I/O performance.
- To optimize for random performance, the I/O load must be evenly balanced across the disk spindles. This is done by setting the stripe width as large or larger than the typical application I/O request. For example, if the typical I/O request is 8 KB, setting the stripe width to 64 KB might be appropriate. This tends to evenly distribute I/O requests across all the disk spindles in the LUN.
- Sequential performance is optimized when data is spread out so that each application I/O spans all the drives in the RAID group. This requires setting the stripe width so that it is small relative to the size of the typical I/O request. For example, in a RAID group with four data disks, if typical application I/O size is 8 to 16 KB, a stripe width of 2 KB may be best.

System Specifications

RAID-5 Performance (3 x 15 Configuration, 12 x 9-GB drives/tray, 4+1 RAID-5 LUNs, 12 LUNs)

Sequential read	189 MB/sec., sustained
Sequential write	168 MB/sec., sustained
Random writes 2-KB block size	100% cache 7605 IOPS, burst
Random writes, 2-KB block size	4764 IOPS, sustained
Random reads, 2-KB block size	18,042 IOPS, sustained

Sun StorEdge™ A3500 Array Drive Module Performance

Drive Specifications	**9.1 GB 10000 rpm**	**18 GB 10000 rpm**	**36 GB 10000 rpm**
Capacity (formatted, in bytes)	9,056,904,192 (512 bytes/sector)	18,113,808,384 (512 bytes/sector)	36,420,074,496 (512 bytes/sector)
Average Seek Read (ms)	7.5	7.5	7.5
Average Seek Write (ms)	8.3	8.5	8.5
Average Latency (ms)	3.0	3.0	3.0
Burst Data Rate (MB/sec.)	40	40	40
Data Transfer Rate (MB/sec.)	22.7	22.7	19
Rotational Speed (rpm)	10000	10000	10000
Buffer (KB)	512	512	512

Sun StorEdge A3500 Array System Electrical Specifications (2 x 7 configuration with 20 x 18.2-GB drives)

Input Voltage	200 - 240 VAC, single phase 50/60 Hz
Input Current	24 Amps (PDU rating)
Power Output	1390 watts (see chart for other configurations)
VA	~1544 VA
Heat Output	4744 BTU (see chart for other configurations)
Plug Type - U.S.	NEMA L6-30P for 200-240 VAC
Plug Type - International	IEC 309, 32A, 250V

Sun StorEdge A3500 Controller Module Electrical Specifications

Input Voltage	200-140 VAC 50/60 Hz
Input Current	1.0 Amp
Power Output	150 watts
VA	157 VA
Heat Output	510 BTU

Sun StorEdge A3500 Array Drive Tray Electrical Specifications

Input Voltage	100-240 VAC 50/60 Hz
Input Current	24 Amps
Power Output	260 watts
VA	~300 VA
Heat Output	1092 BTU

Sun StorEdge A3500 Array Heat Output and Power Consumption

Configurations	30 Degrees C*	40 Degrees C*
Sun StorEdge-Light, min. (9 GB)	1602 BTU (469 W)	1803 BTU (528 W)
Sun StorEdge-Light, max. (9 GB)	2847 BTU (834 W)	3048 BTU (893 W)
1 x 5, 9 GB min.	2131 BTU (624 W)	2634 BTU (772 W)
1 x 5, 18 GB min.	2206 BTU (646 W)	2709 BTU (794 W)
1 x 5, 36 GB min.	2476 BTU (725 W)	2979 BTU (873 W)
1 x 5, 9 GB max.	6021 BTU (1764 W)	6524 BTU (1912 W)
1 x 5, 18 GB max.	6472 BTU (1896 W)	6975 BTU (2044 W)
1 x 5, 36 GB max.	5845 BTU (1712 W)	6348 BTU (1860 W)
2 x 7, 9 GB min.	3889 BTU (1139 W)	4593 BTU (1345 W)
2 x 7, 18 GB min.	4039 BTU (1183 W)	4744 BTU (1390 W)
2 x 7, 36 GB min.	4579 BTU (1341 W)	5238 BTU (1548 W)
2 x 7, 9 GB max.	8868 BTU (2598 W)	9572 BTU (2804 W)
2 x 7, 18 GB max.	9500 BTU (2783 W)	10204 BTU (2990 W)
2 x 7, 36 GB max.	8621 BTU (2526 W)	9324 BTU (2732 W)
3 x 15, 9 GB min.	6396 BTU (1873 W)	7902 BTU (2315 W)
3 x 15, 18 GB min.	6618 BTU (1939 W)	8126 BTU (2381 W)
3 x 15, 36 GB min.	7427 BTU (2176 W)	8935 BTU (2618 W)
3 x 15, 9 GB max.	18063 BTU (5293 W)	19573 BTU (5735 W)
3 x 15, 18 GB max.	19417 BTU (5689 W)	20925 BTU (6131 W)
3 x 15, 36 GB max.	17532 BTU (5137 W)	19041 BTU (5579 W)

* The temperature-dependent power difference is due to the variable speed fans in the Sun StorEdge A3500 tray. The temperatures of 30 and 40 degrees Centigrade refer to the air flow temperature passing through the Sun StorEdge A3500 fan.

Sun StorEdge A3500 Array Environmental Specifications

Temperature Range (dry bulb)	
Operating	5 to 35 degrees C (41 to 95 degrees F), 10 to 32 degrees C (50 to 90 degrees F) if removable tape media is installed in the Sun StorEdge A3500 array cabinet
Non-operating	-10 to 60 degrees C (-14 to 140 degrees F)
Relative Humidity	

Operating	20% to 80% RH @ 27 C, maximum wet bulb non-condensing
Non-operating	93% RH non-condensing
Altitude	
Operating	3 Km (10,000 feet)
Non-operating	12 Km (40,000 feet)

Sun StorEdge A3500 System Physical Specifications

Height	187.9 cm / 73.5 in.
Width (single rack)	61 cm / 24 in.
Depth (single rack)	93 cm / 36.5 in.
Weight (rack and 2 sequencers)	159 kg / 350 lb
Clearance and Service Area	
• Front	122 cm / 48 in.
• Back	92 cm / 36 in.
Sides (side access required for some service procedure)	92 cm / 36 in.

Controller (with Bezel) Physical Specifications

Height	176.3 mm / 6.94 in.
Width	445 mm / 17.50 in.
Depth	609.6 mm / 24.00 in.
Weight	
• Enclosure	13.6 kg / 30 lb
• Controller Module	37.2 kg / 82 lb
• Power Supply	1.5 kg / 3.3 lb
• Fan	0.9 kg / 2.0 lb
• Battery	10.9 kg / 24 lb
• 1 Controller Board	2.9 kg / 6.5 lb
Bezel Thickness	0.375 to 0.875 in.

Disk Tray Physical Specifications

Height	175 mm / 6.9 in.
Width	445 mm / 17.5 in.
Depth	525 mm / 20.7 in.
Weight (2 power modules)	17.25 kg / 38 lb. without drives; 26 kg / 57 lb. with drives

Sun StorEdge A3500 Array System Regulation

System Regulation	**Specifications**
Safety	UL1950, CSA C22 No.950 EN60950 (TUV) CB Scheme (to IEC 950 and Nordic deviations)
RFI/EMI	VCCI Class 1 FCC Class A DOC Class A EN55022 Class A EN61000-3-2
Immunity	EN50082-1 Sun Specification 990-1151-xx
Product Label	FCC Class A VCCI Class 1 Industry Canada Class A UL Mark cUL Mark TUV Mark CE Mark

Ordering Information

Sun StorEdge™ A3500 Array, 9-GB, 10000-rpm Disk Configurations

Order Number	Description
SG-XARY360A-545G	545-GB Sun StorEdge™ A3500 array fixed configuration including one controller module, five disk trays with 60 x 9-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet with two 2-meter UltraSCSI cables
SG-ARY370A-91G	91-GB Sun StorEdge A3500 array configure-to-order base configuration including five disk trays with 10 x 9-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet
SG-ARY372A-182G	182-GB Sun StorEdge A3500 array configure-to-order base configuration including seven disk trays with 20 x 9-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet
SG-ARY374A-273G	273-GB Sun StorEdge A3500 array configure-to-order base configuration including fifteen disk trays with 30 x 9-GB, 10000-rpm disks mounted in two Sun StorEdge 72-inch expansion cabinets

Sun StorEdge A3500 Array, 18-GB, 10000-rpm Disk Configurations

Order Number	Description
SG-XARY380A-1092G	1092-GB Sun StorEdge A3500 array fixed configuration including one controller module, five disk trays with 60 x 18-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet with two 2-meter UltraSCSI cables
SG-ARY380A-182G	182-GB Sun StorEdge A3500 array configure-to-order base configuration including five disk trays with 10 x 18-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet

Order Number	Description
SG-ARY382A-364G	364-GB Sun StorEdge A3500 array configure-to-order base configuration including seven disk trays with 20 x 18-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet
SG-ARY384A-546G	546-GB Sun StorEdge A3500 array configure-to-order base configuration including fifteen disk trays with 30 x 18-GB, 10000-rpm disks mounted in two Sun StorEdge 72-inch expansion cabinets

Sun StorEdge A3500 Array, 36-GB, 10000-rpm Disk Configurations

Order Number	Description
SG-XARY381A-1456G	1456-GB Sun StorEdge A3500 array fixed configuration including one controller module, five disk trays with 40 x 36-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet with two 2-meter UltraSCSI cables
SG-ARY381A-364G	364-GB Sun StorEdge A3500 array configure-to-order base configuration including five disk trays with 10 x 36-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet
SG-ARY383A-728G	728-GB Sun StorEdge A3500 array configure-to-order base configuration including seven disk trays with 20 x 36-GB, 10000-rpm disks mounted in one Sun StorEdge 72-inch expansion cabinet
SG-ARY385A-1092G	364-GB Sun StorEdge A3500 array configure-to-order base configuration including fifteen disk trays with 30 x 36-GB, 10000-rpm disks mounted in two Sun StorEdge 72-inch expansion cabinets

Ordering Process—Sun StorEdge A3500 Fixed Configurations

Step 1: Choose one:

SG-XARY360A-545G	1 x 5 maximum configuration with 9-GB, 10000-rpm disks
SG-XARY380A-1092G	1 x 5 maximum configuration with 18-GB, 10000-rpm disks
SG-XARY381A-1456G	1 x 5 maximum configuration with 36-GB, 10000-rpm disks

Step 2: Choose one:

3858A	U.S. power cord for cabinet (order two per cabinet)
3859A	International power cord for cabinet (order two per cabinet)

Step 3: Choose options

Ordering Process—Sun StorEdge A3500 Configure-to-Order

Step 1: Choose one:

SG-ARY370A-91G	Base configuration with five trays, 10 x 9-GB, 10000-rpm disks and one Sun StorEdge rack
SG-ARY372A-182G	Base configuration with seven trays, 20 x 9-GB, 10000-rpm disks and one Sun StorEdge rack
SG-ARY374A-273G	Base configuration with fifteen trays, 30 x 9-GB, 10000-rpm disks and two Sun StorEdge racks
SG-ARY380A-182G	Base configuration with five trays, 10 x 18-GB, 10000-rpm disks and one Sun StorEdge rack
SG-ARY382A-364G	Base configuration with seven trays, 20 x 18-GB, 10000-rpm disks and one Sun StorEdge rack
SG-ARY384A-546G	Base configuration with fifteen trays, 30 x 18-GB, 10000-rpm disks and two Sun StorEdge racks
SG-ARY381A-364G	Base configuration with five trays, 10 x 36-GB, 10000-rpm disks and one Sun StorEdge rack

SG-ARY383A-728G	Base configuration with seven trays, 20 x 36-GB, 10000-rpm disks and one Sun StorEdge rack
SG-ARY385A-1092G	Base configuration with fifteen trays, 30 x 36-GB, 10000-rpm disks and two Sun StorEdge racks

Step 2: Order controllers:

6537A	SCSI controller. Order one per 5-tray configuration, two per 7-tray configuration, and three per 15-tray configuration.

Step 3: Choose one:

3858A	U.S. power cord for cabinet (order two per cabinet)
3859A	International power cord for cabinet (order two per cabinet)

Step 4: Choose options

Options

Sun StorEdge A3500 Array Options

Order Number	Option Description	Comments
X7020A	Sun StorEdge A3000 array 64-MB add-on cache memory	Order two 64 MB add-on memory—one for each of two controller boards.
NF-INST-SSA	Sun StorEdge ArrayStart℠ Onsite Installation (Contact SunService representative to order)	Recommended one installation contract per Sun StorEdge A3500
Host Bus Adapters		
X1065A	UDWIS/S—SBus Ultra differential F/W Intelligent SCSI host adapter (40 MB/sec.)	Order two per controller module
X6541A	UD2S—PCI dual-channel differential UltraSCSI host adapter (40 MB/sec.)	Order at least one per controller module; to avoid SPOF, configure controllers to channels on different HBA cards or order additional cards
Disk and Tray Options		
X5235A	9.1-GB, 10000-rpm UltraSCSI disk	Add-on drive for 12 x 9-GB trays
X5233A	18-GB, 7200-rpm UltraSCSI disk	Add-on drive for 8 x 18-GB trays
X5238A	18-GB, 10000-rpm UltraSCSI disk	Add-on drive for 12 x 18-GB trays
X5240A	36-GB, 7200-rpm UltraSCSI disk	Add-on drive for 8 x 36-GB trays
SG-XARY147A-36G	Sun StorEdge D1000 rackmount tray with 4 x 9-GB, 10000-rpm disks	
SG-XARY154A-72G	Sun StorEdge D1000 rackmount tray with 4 x 18-GB, 10000-rpm disks	
SG-XARY164A-145G	Sun StorEdge D1000 rackmount tray with 4 x 36-GB, 10000-rpm disks	
Sun StorEdge A3500 Array Accessories		
X6537A	Sun StorEdge A3500 controller module	
SG-XARY030A	Sun StorEdge expansion cabinet	For A3500-Light
X9818A	Front door assembly for 72-inch Sun StorEdge rack	
X3858A	Power cord—U.S.	Order two per rack
X3859A	Power cord—International	Order two per rack
X3830A	4-meter, 68-pin to UHDC differential SCSI cable	For PCI systems
X3831A	10-meter, 68-pin to UHDC differential SCSI cable	For PCI systems

Order Number	Option Description	Comments
X979A	12-meter UltraSCSI external cable	
ARRAYNT-6221-B	Volume management software for Microsoft Windows NT hosts	

Upgrades

Upgrades will be offered to existing Sun customers to upgrade from previous SPARCstorage™ Array 1XX, 2XX, RSM™ 200 series, RSM 2000, or Sun StorEdge™ A3000 system products to the Sun StorEdge A3500 system array. Customers with non-Sun storage systems will also be offered upgrade paths to the Sun StorEdge A3500 system array.

Sun StorEdge A3500 Array Upgrades

Order Number	Description
UG-AX000-DISK-18G	Upgrade to internal 18.2-GB, 10000-rpm, 1-inch high, UltraSCSI expansion hard drive with barrier plate
UGFA-AX000-DSK-18G	Upgrade to internal 18.2-GB, 10000-rpm, 1-inch high, UltraSCSI expansion hard drive with barrier plate Factory installed; configure to order
UG-AX000-DISK-36G	Upgrade to internal 36.4-GB, 10000-rpm, 1.6-inch high, UltraSCSI expansion hard drive with barrier plate
UGFA-AX000-DSK-36G	Upgrade to internal 36.4-GB, 10000-rpm, 1.6-inch high, UltraSCSI expansion hard drive with barrier plate Factory installed; configure to order
UG-A3500-545G-10K	Upgrade to Sun StorEdge A3500 545-GB (60 x 9.1-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one controller module (two controller cards), redundant fans, drives, and power supplies
UGFA-A3500-91G	Upgrade to Sun StorEdge A3500 91-GB (10 x 9.1-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UGFA-A3500-182G	Upgrade to Sun StorEdge A3500 182-GB (20 x 9.1-GB, 10000-rpm drives) array with seven trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order

Order Number	Description
UGFA-A3500-273G	Upgrade to Sun StorEdge A3500 273-GB (30 x 9.1-GB, 10000-rpm drives) array with 15 trays mounted in two Sun StorEdge expansion cabinets, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UG-A3500SCSI-1092G	Upgrade to Sun StorEdge A3500 1092-GB (60 x 18.2-GB, 10000-rpm drives) array with UltraSCSI host interface, five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one UltraSCSI controller module (two controller cards), redundant fans, drives, and power supplies
UG-A3500FC-182-10K	Upgrade to Sun StorEdge A3500 182-GB (20 x 18.2-GB, 10000-rpm drives) array with five disk trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UG-A3500FC-364-10K	Upgrade to Sun StorEdge A3500 364-GB (20 x 18.2-GB, 10000-rpm drives) array with seven disk trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UG-A3500FC-546-10K	Upgrade to Sun StorEdge A3500 546-GB (30 x 18.2-GB, 10000-rpm drives) array with 15 disk trays mounted in two Sun StorEdge expansion cabinets, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UGFA-A3500-364G	Upgrade to Sun StorEdge A3500 364-GB (10 x 36.4-GB, 10000-rpm drives) array with five disk trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UGFA-A3500-728G	Upgrade to Sun StorEdge A3500 728-GB (20 x 36.4-GB, 10000-rpm drives) array with seven disk trays mounted in a Sun StorEdge expansion cabinet, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order
UGFA-A3500-1092G	Upgrade to Sun StorEdge A3500 1092-GB (30 x 36.4-GB, 10000-rpm drives) array with fifteen disk trays mounted in two Sun StorEdge expansion cabinets, redundant fans, drives, and power supplies; base configuration Factory installed; configure to order

Order Number	Description
UG-A3500SCSI-1456G	Upgrade to Sun StorEdge A3500 1456-GB (40 x 36.4-GB, 10000-rpm drives) array with UltraSCSI host interface, five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one UltraSCSI controller module (two controller cards), redundant fans, drives, and power supplies
UGFA-A3500-CTRL	Upgrade to Controller Sun StorEdge A3500 storage subsystem, rackmount with 128-MB cache memory (supports the Sun StorEdge D1000 trays) Factory installed; configure to order

Note: *For the new factory configure-to-order part numbers, the return materials authorization kit (part number UG-RMA) must be ordered as a separate line item on the same sales order to ship in the same ship set. In addition, there are three required components of the configure-to-order process: a base configuration, SCSI controller(s), and power cords. Order these items as separate line items on the same sales order.*

Sun StorEdge A3500 Array Competitive Upgrades

Order Number	Description
CU-A3500-545G-10K	Upgrade to Sun StorEdge A3500 545-GB (60 x 9.1-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one controller module (two controller cards), redundant fans, drives, and power supplies
CUFA-A3500-91G	Competitive upgrade to Sun StorEdge A3500 91-GB (10 x 9.1-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CUFA-A3500-182G	Competitive upgrade to Sun StorEdge A3500 182-GB (20 x 9.1-GB, 10000-rpm drives) array with seven trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order

Order Number	Description
CUFA-A3500-273G	Competitive upgrade to Sun StorEdge A3500 273-GB (30 x 9.1-GB, 10000-rpm drives) array with 15 trays mounted in two Sun StorEdge expansion cabinets, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CU-A3500SCSI-1092G	Competitive upgrade to Sun StorEdge A3500 1092-GB (60 x 18.2-GB, 10000-rpm drives) array with UltraSCSI host interface, five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one UltraSCSI controller module (two controller cards), redundant fans, and power supplies
CU-A3500FC-182-10K	Competitive upgrade to Sun StorEdge A3500 182-GB (10 x 18.2-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CU-A3500FC-364-10K	Competitive upgrade to Sun StorEdge A3500 364-GB (20 x 18.2-GB, 10000-rpm drives) array with seven trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CU-A3500FC-546-10K	Competitive upgrade to Sun StorEdge A3500 546-GB (30 x 18.2-GB, 10000-rpm drives per tray) array with 15 disk trays mounted in two Sun StorEdge expansion cabinets, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CU-A3500SCSI-1456G	Competitive upgrade to Sun StorEdge A3500 1456-GB (40 x 36.4-GB, 10000-rpm drives) array with UltraSCSI host interface, five trays mounted in a Sun StorEdge expansion cabinet, two 12-meter UltraSCSI cables, one UltraSCSI controller module (two controller cards), redundant fans, and power supplies

Order Number	Description
CUFA-A3500-364G	Competitive upgrade to Sun StorEdge A3500 364-GB (10 x 36-GB, 10000-rpm drives) array with five trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CUFA-A3500-728G	Competitive upgrade to Sun StorEdge A3500 728-GB (20 x 36-GB, 10000-rpm drives) array with seven trays mounted in a Sun StorEdge expansion cabinet, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order
CUFA-A3500-1092G	Competitive upgrade to Sun StorEdge A3500 1092-GB (30 x 36-GB, 10000-rpm drives) array with fifteen trays mounted in two Sun StorEdge expansion cabinets, redundant fans, power supplies, and power supplies; base configuration Factory installed; configure to order

Note: *For the factory configure-to-order part numbers, the return materials authorization kit (part number UG-RMA) must be ordered as a separate line item on the same sales order to ship in the same ship set. In addition, there are three required components of the configure-to-order process: a base configuration, SCSI controller(s), and power cords. Order these items as separate line items on the same sales order.*

Service and Support

The SunSpectrum^{SM} program is an innovative and flexible service offering that allows customers to choose the level of service best suited to their needs, ranging from mission-critical support for maximum solution availability to backup assistance for self-support customers. The SunSpectrum program provides a simple pricing structure in which a single fee covers support for an entire system, including related hardware and peripherals, the Solaris™ Operating Environment software, and telephone support for Sun™ software packages. The majority of Sun's customers today take advantage of the SunSpectrum program, underscoring the value that it represents. Customers should check with their local Sun Enterprise™ Services representatives for program and feature availability in their areas.

FEATURE	SUNSPECTRUM PLATINUM^{SM} Mission-critical Support	SUNSPECTRUM GOLD^{SM} Business-critical Support	SUNSPECTRUM SILVER^{SM} Systems Support	SUNSPECTRUM BRONZE^{SM} Self Support
Systems Features				
Systems approach coverage	Yes	Yes	Yes	Yes
System availability guarantee	Customized	No	No	No
Account Support Features				
Service account management team	Yes	No	No	No
Local customer support management	No	Yes	No	No
Personal technical account support	Yes	Yes	Option	No
SunStart™ installation service	Yes	No	No	No
Account support plan	Yes	Yes	No	No
Software release planning	Yes	No	No	No
On-site account reviews	Monthly	Semiannual	No	No
Skills assessment	Yes	No	No	No
Site activity log	Yes	Yes	No	No
Coverage / Response Time				
Standard telephone coverage hours	7 day/24 hour	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday
Standard on-site coverage hours	7 day/24 hour	8 a.m.–8 p.m., Monday–Friday	8 a.m.–5 p.m., Monday–Friday	N/A
7-day/24-hour telephone coverage	Yes	Yes	Option	Option
7-day/24-hour on-site coverage	Yes	Option	Option	N/A
7-day/12-hour on-site coverage	No	Option	No	No
5-day/24-hour on-site coverage	No	Option	No	No

FEATURE	SUNSPECTRUM PLATINUM^{SM} Mission-critical Support	SUNSPECTRUM GOLD^{SM} Business-critical Support	SUNSPECTRUM SILVER^{SM} Systems Support	SUNSPECTRUM BRONZE^{SM} Self Support
Coverage / Response Time (cont.)				
Customer-defined priority setting	Yes	Yes	Yes	Option
• Urgent (phone/on-site)	Live transfer/ 2 hour	Live transfer/ 4 hour	Live transfer/ 4 hour	4 hour / N/A
• Serious (phone/on-site)	Live transfer/ 4 hour	2 hour/next day	2 hour/next day	4 hour / N/A
• Not critical (phone/on-site)	Live transfer/ customer convenience	4 hour/ customer convenience	4 hour/ customer convenience	4 hour / N/A
2-hour on-site response	Yes	Option	Option	N/A
Additional contacts	Option	Option	Option	Option
Premier Support Features				
Mission-critical support team	Yes	For urgent problems	No	No
Sun Vendor Integration Program (SunVIP^{SM})	Yes	Yes	No	No
Software patch management assistance	Yes	No	No	No
Field change order (FCO) management assistance	Yes	No	No	No
Hardware Support Delivery				
Replacement hardware parts	On-site technician	On-site technician	On-site technician	Courier
Two day parts delivery	N/A	N/A	N/A	Yes
Overnight parts delivery	N/A	N/A	N/A	Option
Same-day parts delivery	Yes	Yes	Yes	Option
Remote Systems Diagnostics				
Remote dial-in analysis	Yes	Yes	Yes	Yes
Remote systems monitoring	Yes	Yes	No	No
Remote predictive failure reporting	Yes	Yes	No	No
Software Enhancements and Maintenance Releases				
Solaris enhancement releases	Yes	Yes	Yes	Yes
Patches and maintenance releases	Yes	Yes	Yes	Yes
Sun unbundled software enhancements	Option	Option	Option	Option
Internet and CD-ROM Support Tools				
SunSolve™ license	Yes	Yes	Yes	Yes
SunSolve EarlyNotifier^{SM} Service	Yes	Yes	Yes	Yes

Warranty

The warranty on the array hardware is two years. In addition, the Sun StorEdge A3500 array carries a one-year, on-site warranty. Software warranty is 90 days.

Education

- Support Readiness Training
- IQ Kit Sales Guide
- IQ Kit Tech Guide
- SunU

Professional Services

Sun StorEdge ArrayStart^{SM} Service

Sun StorEdge ArrayStart^{SM} service provides an installation and custom-configuration service that quickly gets mission-critical data-center applications up and running. For one fixed fee, this service includes consultation for determining the configuration that best meets the customer's needs, installation of the hardware and RAID management software, and configuration to the appropriate RAID profile determined during the consultation.

Solstice DiskSuite^{TM} to VERITAS Volume Manager Software Data Migration

A Sun Professional Service consultant will deliver four days of onsite consulting services to assist customers who wish to migrate their mission-critical data from existing storage system to an array. This service will help customers complete the transition with minimal downtime and without risking loss of their valuable data. Specially trained Sun consultants will use their extensive data-migration expertise to complete the service in the most cost- and time-effective manner available. Sun consultants will also fully integrate and optimize the Sun StorEdge A3500 array into the customer's computing environment.

If desired, customers can choose tasks from the following list to customize the service to meet their specific business needs:

- Design and configuration planning
- Capacity planning
- Performance tuning and optimization

Travel and expenses incur an additional charge for delivery requiring more than 50 miles of travel. When this service is desired by the customer, the account manager will contact the SunPS^{SM} Data and Storage Management Competency Practice to schedule delivery of the service.

Glossary

Active termination, regulated	Terminates the SCSI bus with a series of resistors tied to +5 volts. The terminator is labeled *Regulated* but is often referred to as an *Active Terminator*
Bandwidth	A measure of the capacity of a communication channel, usually specified in MB/sec.
CLI	Command line interface.
Data cache	64 MB to 128 MB of cache memory (per controller board) for fast writes to cache and read ahead cache operations. Cache memory permits intermediate storage of read and write data without physically reading/writing to the disk, increasing overall performance.
Device name	Software device address that identifies the controller/LUN, such as cXtYdZs0, where X is the host bus adapter, Y is the controller, and Z is the LUN. s0 slice number is used by the system, not by RAID Manager.
Disk array	A subsystem that contains multiple disk drives, designed to provide performance, high availability, serviceability, or other benefits.
Drive group	A physical set of drives in the RAID Module. Drive groups are defined during configuration.
Fast write	Allows disk write commands to be safely acknowledged to the host before the data is actually written to the disk media. This can be enabled/disabled through RAID Manager.
Fast/wide SCSI	Data transfer rate of 20 MB/sec. Wide devices can be connected to a standard SCSI interface but the extra data lines need to be terminated.
Full-duplex	Data transmission in both directions at the same time. See also Half-duplex and Simplex.
GB	Gigabyte. A disk GB is 1 billion (1,000,000,000) bytes. A memory GB is 1,073,741,824 bytes (2 to the 30th power).
GUI	Graphical user interface. The Sun StorEdge™ RAID Manager provides a powerful, easy-to-use GUI.
Half-duplex	Refers to an interface, such as SCSI, that can transmit data in only one direction at a time. See also Full-duplex and Simplex.
Host adapter	A card that connects a peripheral device to the computer system’s I/O bus.
Hot plug	The ability to remove, replace, or add a device while current I/O processes continue.

RAS	Reliability, availability, and serviceability. Features that enhance these attributes, including hot-pluggable capability and redundancy, are important for keeping mission-critical applications and data on-line.
RAID Manager	The software that allows the customer to configure and manage the Sun StorEdge A3500 array.
SCA	Single connector attachment. A SCSI disk connector technology co-invented by Sun Microsystems. The SCA provides all SCSI, power, and control signals in a single connector, and enables easy servicing and highly reliable, pluggable disk drives.
SCSI address	The octal representation of the unique address (0–7) assigned to a narrow device; or he

Materials Abstract