Sun StorEdge™ 3511 Fibre Channel Array

Just the Facts

Sun Internal/Partner Version

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Source Materials

The latest documentation for the Sun StorEdge 3511 FC array is located at:

http://www.sun.com/products-n-solutions/hardware/docs/Network_Storage_Solutions/Workgroup/3511/

and

http://webhome.ebay/networkstorage/sales/matrix.html

This website provides the following documentation:

- Sun StorEdge 3511 FC Array Release Notes for detailed support information
- Sun StorEdge 3510 and 3511 FC Array Installation, Operation, and Service Manual
- Sun StorEdge 3510 and 3511 FC Array Best Practices Manual
- Sun StorEdge 3000 Family RAID Firmware 4.15 User's Guide
- Sun StorEdge 3000 Family Configuration Service 2.3 User's Guide
- Sun StorEdge 3000 Family Diagnostic Report 2.3User's Guide
- Sun StorEdge 3000 Family FRU Installation Guide
- Sun StorEdge 3000 Family Safety, Regulatory, and Compliance Manual
- Sun StorEdge 3000 Family Rack Installation Guide for 2U Arrays

Additional reference materials and web sites are listed in the Materials Abstract section of this document.

Positioning

Figure 1. The Sun StorEdge™ 3511 Fibre Channel Array

Introduction

The Sun StorEdge™ 3511 Fibre Channel array is the latest offering in the Sun StorEdge 3000 family. The StorEdge 3511 Fibre Channel array supports SATA disks and is based upon Fibre Channel to Serial ATA RAID technology providing low cost, high capacity storage while preserving the enterprise class benefits of the StorEdge 3500 series.

Customers of Sun's server products should find the Sun StorEdge 3511 FC Fibre Channel array an excellent storage complement to IT infrastructures requiring either multiple classes (price/performance) of storage solutions or for streaming-focused applications. Thus Sun StorEdge 3511 FC Array with SATA is well suited for cost sensitive environments with Sun Servers, such as:

- Information Lifecycle Management (ILM)
- Content Addressable Storage (CAS)
- Disk to disk backup and restore
- Secondary SAN storage
- Near-line DAS storage
- Static reference data storage

Key technical highlights of the Sun StorEdge 3511 Fibre Channel array include:

- Available with a single RAID controller, dual redundant RAID controllers, or as an expansion unit, all in a 2U high (3.5-inch) chassis
- Six 2-Gb FC host ports per RAID controller, resulting in twelve host ports in dual RAID controller configurations
- Servers can be directly attached to arrays without requiring external switches
- Up to eight Sun StorEdge 3511 Fibre Channel array storage expansion units can be attached to a single RAID array, for a total raw storage capacity of up to 54TB (using 500GB drives)
- In-band management through FC host connection or out-of-band management via serial or Ethernet connections
- Menu-driven VT100 terminal interface for efficient configuration control
- CLI for scripting control

- Intuitive, simple setup and management; single management GUI provides intuitive RAID and LUN configuration for every array in the environment
- Support for up to 1024 LUNs private or public loop and 64 LUNs in point to point/full fabric mode (in both single and dual RAID controller configurations)
- Support for Sun SAN 4.4 or higher
- Dual redundant, hot-swappable power supplies (AC or DC options)
- Full NEBS level 3 certification and MIL-STD-810F compliance for air, land, and marine deployment

Key Features

The initial release of the Sun StorEdge 3511 FC Array includes the following features:

Feature	Specifications
Host Interface	2-Gb Fibre Channel
Number of Host Interfaces	Single controller: six FC ports for host connectivity Dual controller: twelve FC ports for host connectivity Expansion: four FC ports for disk connectivity
Number of Drives	Per controller tray: 12 hot-swappable Per expansion tray: 12 hot-swappable Per single system: 72 hot-swappable (6 arrays x 12 drives)
Rack Height of Tray	2U
Drive Midplane	Dual-ported Serial ATA
RAID Options	Single controller or dual redundant controllers
RAID Level Support	RAID 0, 1, 1+0, 3, 5, 3+0, and 5+0 Supports global hot-sparing where applicable
Power and Cooling Options	100-240VAC at 50/60 Hz or -48VDC/-60VDC dual hot-swap/redundant Dual hot-swap/redundant fans (integrated with power supplies)
RAID Controller	1-GB cache per controller; cache battery backup module; eight FC ports per controller; hot-swap redundant mirrorable configuration (paired controllers); 1024 LUNs private loop DAS or public loop fabric/switch enabled , 64 LUNs point to point/full fabric per array; 256 command tag queues (CTQs) per controller or controller pair
Daisy Chain Support	Yes, expansion units off of RAID controller equipped arrays
NEBS Compliance	Level 3 certified by Telcordia
MIL-STD Certification	MIL-STD-810F subset compliant for air, land, and marine applications

Additional features of the Sun StorEdge 3511 Fibre Channel array include the following:

- Density of 6.0-TB raw capacity in 2U format (with 500-GB drives)
- Redundant hot-swappable (FRUs)
- Mirrored cache RAID controller configuration
- Two power supplies, each with power inlet
- Two cooling fans integrated into each power and cooling unit FRU
- In-band and out-of-band host-based management
- Non-disruptive firmware upgrades (no downtime for firmware upgrades) in dual-controller RAID configuration
- Dynamic storage capacity expansion (DSCE) and dynamic LUN expansion (DLE)

- Event monitoring and reporting
- Component health monitoring including disk, power, thermal, fans, SES, and SMART-compliant in band and (except for expansion units) out of band

Product Family Placement

The Sun StorEdge 3511 Fibre Channel array is the latest product of the Sun StorEdge 3000 family and is positioned at the entry-level secondary storage market segment. Primary target markets include small- to medium-sized businesses, Linux and Windows environments, streaming applications, and ruggedized environments including the government and telecommunications industry. The Sun StorEdge 3511 Fibre Channel array meets the requirements of a wide range of secondary storage or streaming applications providing a powerful set of flexible and easy-to-use tools. With the Sun StorEdge 3511 Fibre Channel array, customers can pay for what they need today and can easily scale in capacity as their business grows providing compelling solutions for businesses and streaming applications. The Sun StorEdge 3511 Fibre Channel array is Telcordia certified and ruggedized for telecommunication, industrial, military, air, land, and marine applications.

Target Markets

Flexibility is a key selling featuring of the Sun StorEdge 3511 Fibre Channel array. The flexible architecture is primarily targeted at traditional small- to medium-sized deployments and business. However, the feature targets secondary storage applications and carrier-grade/telecommunications-hardened applications.

The Sun StorEdge 3511 Fibre Channel array is ideal for any environment where space is at a premium and FC flexibility is required. Customers should appreciate this array's outstanding versatility which combines enterprise-class high availability features, cost-sensitive environments, flexible configurability, easy-to-use common management options, remote control functionality, and a highly ruggedized package.

The most common applications for a Sun StorEdge 3511 Fibre Channel array include the following:

- Information Lifecycle Management
- Content Addressable Storage
- Backup and restore
- Secondary SAN storage
- Near-line DAS storage
- Static reference data storage

Selling Highlights

Market Value Proposition

The Sun StorEdge 3511 Fibre Channel array delivers a robust product with an open and flexible architecture featuring the combination of FC host connections and SATA disks. The features extend the capabilities of SANs and enable new, more cost-effective data management solutions without compromising key enterprise features, functionality, and reliability.

Key Features, Technical Functions, and Benefits

Feature	Technical Function	Benefit
▪ Up to 6.0 TB in a 2U high enclosure.	▪ Supporting up to 126 TB of storage per rack	▪ High density with small footprint
▪ NEBS Level 3 certified and MLI-STD-10F altitude, temperature, humidity, shock, vibration, and salt fog corrosion resistant compliant system.	▪ Tested for ruggedness and meets a high standard for continuous operation through a wide variety of environmental extremes.	▪ Carrier-grade array (Military standard enhanced) – offering customers increased reliability and assurance in their attempt at delivering higher levels of service to their customers.
▪ Equipped with SATA disk drives`	▪ 2 Gb/s Fibre Channel front-end to a SATA disk infrastructure	▪ Excellent combination of high capacity with throughput and low-cost.
▪ Redundant power supplies, fans and RAID controllers	▪ Enhanced system availability. Monitors and reports power supply faults, fan failures and RAID controller errors	▪ Provides continuous operation due to failed power supply, fan or RAID controller.
▪ Hot-swappable drives, fans, power supplies and RAID controllers	▪ Allows for on-line failed component replacement	▪ Provides easy serviceability and continuous operation.
▪ Terminal, GUI, Web interfaces for configuration and management.	▪ Allows administrator to configure and manage through a variety of interfaces.	▪ Provides greater flexibility for management/configuration purposes
▪ Industry-standard rack/system cabinet mounting options	▪ Universal 19” rack sliding rails, center post or four post option kits for wide mounting compatibility	▪ Flexibility in fitting the Sun StorEdge 3511 FC Array in a wide range of IT environments.
▪ 1024 LUN Support	▪ Allows flexible LUN configurations within a single subsystem. 1024 LUNs using private and public loop attach, and 64 LUNs in fabric point to point	▪ Provides more granularity and flexibility for host and application configurability.
▪ Up to 5 expansion arrays	▪ Daisy chain to multiple expansion units	▪ Provides high density cost effective capacity within a rack

Support Information and System Requirements

Please refer to the Sun StorEdge 3511 FC-SATA – What Works With What matrix for detailed information on the latest Operating Systems, HBA and drivers (Solaris and non-Solaris), peripherals, cables, expansion cabinet/racks and mounting option support. The 3511 WWWW can be found by selecting the Sun StorEdge 3511 FC-SATA Array matrix link at http://webhome.ebay/networkstorage/sales/matrix.html

Fibre Channel Switch Equipment Qualified with the 3511:

Please refer to the 3511 FC-SATA WWWW matrix for detailed information on the latest qualified Switches.

For the most current information, please refer to the "SAN 4.4.X and Solaris 10 WWWW" http://sundoc.central/SunWinPublicView.jsp?token=397802

System Architecture

The Sun StorEdge 3511 Fibre Channel arrays are rackmountable, NEBS Level 3 certified, mass storage subsystems. The 2U-high Sun StorEdge 3511 Fibre Channel array utilizes 2-Gb Fibre Channel interface externally to the host ports.

Configuration management and enclosure event reporting are enabled through an in-band FC or out-of-band 10/100 BASE-T Ethernet port and a DB9 serial port. Sun's host-based Sun StorEdge Configuration Service software is used for management and event monitoring. This software can be also be launched from a web browser.

Each Sun StorEdge 3511 Fibre Channel RAID array holds up to twelve dual-ported Serial ATA drives and allows up to five expansion drive arrays. The Sun StorEdge 3511 Fibre Channel array supports single or dual redundant FC disk array controllers. Each 2-Gb FC controller has 1-GB battery-backed data cache with intelligent caching algorithms and supports support RAID levels 0, 1, 1+0, 3, 5, 3+0, and 5+0; up to 1024 LUNs in private loop DAS and 1024 LUN public loop/full fabric/half duplex and 64 LUNs in point to point mode, full fabric with full duplex support; and 256 command tag queues (CTQs).

Each 2U-high drive array can contain one or two identical 1-GB caching RAID controllers. With two RAID controllers installed, they are configured for redundancy and mirrored write cache so if either controller fails or is removed, the remaining controller takes over the workload (failover). The dual RAID controller in active-active failover configurations is designed to provide fail-safe, continuous, online protection.

Each RAID controller can support up to six direct-attached host I/O ports when in a non-redundant path mode.

Note: In dual controller configurations, the maximum number of direct-attached host I/O ports is twelve when in non-redundant path mode.

Both the RAID array and expansion array support up to twelve 1-inch high (low-profile) dual-ported Serial ATA disk drives. A maximum configuration (one RAID array plus five expansion drive arrays) supports up to 72 disk drives. Drive arrays are connected to each other via optional external FC cables.

This rackmountable NEBS Level 3 certified system is an extremely reliable storage system with redundant hot-swappable field-replaceable units (FRUs).

Note: The Sun StorEdge 3511 array can be installed in either a Sun StorEdge expansion rack or the Sun™ Rack 900 series.

Dual hot-swap/redundant load-sharing/load-balancing 100 to 240VAC or -48 or -60VDC power and cooling units each have separate power inputs and contain two high-velocity (52 CFM) fans with detection circuitry to monitor degraded performance provides superior temperature control.

Fan rotation sensors watch for degraded cooling performance which provides superior over-temperature protection.

Each RAID controller includes one event monitoring integrated circuit. This circuit monitors all internal +12 and +5 DC voltage outputs per power and cooling unit. Seven temperature sensors and two fan speed sensors from each unit are monitored by the event monitoring integrated circuit. This circuit controls front and rear panel display LEDs and buzzer alarm.

Hardware Features

- High-performance hot-swap RAID controller with two FC-AL loops for the attachment of expansion units and four dual-purpose FC-AL llops for servers, FC switches, or expansion units
- Dual FC RAID controllers can be configured in active-to-active failover mode
- Supports 5 to 12 low-profile 3.5-inch Serial ATA disk drives per RAID array or expansion unit
- Dynamic disk drive storage expansion capabilities within and across RAID and expansion unit chassis
- Supports up to five expansion units per RAID array for a total of 72 disk drives
- Supports 250GB 7200 rpm and 500GB 7200 rpm disk drives
- All major components such as SATA disk drives, RAID controllers, lithium-ion batteries, and power and cooling are redundant hot-swappable field replaceable units (FRUs)
- All FRUs are easily removed without the use of tools; thumbscrews are used to secure all FRUs
- Configuration management and event reporting enabled through in-band Fibre Channel or out-of-band 10/100 Base-T Ethernet port and serial port
- The 2u Sun StorEdge 3511 Fibre Channel array incorporates System Enclosure Services (SES) circuits to monitor enclosure environmental information:
    - The SES circuitry alarm buzzer and green/amber LED indicators on front and rear panels provide environmental and hardware status on enclosure and FRUs.
    - The SES controller intelligence monitors all internal +12 and +5 voltages per power and cooling unit. The SES controller chip monitors the various temperature sensors located throughout the enclosure, and monitors each fan.
    - Both RAID and expansion unit enclosures can support dual SES failover capabilities for fully redundant event monitoring reliability.
    - The SES protocol can be connected in-band (via FC cable) from one Sun StorEdge 3511 RAID array to a Sun StorEdge 3511 expansion array without the need for other external cables.
    - Auto detection of installation of all major components such as disk drives, fan trays, power supplies, and RAID controllers are monitored by the SES logic.
- Dual Redundant hot-swap power supplies provides N+1 high availability
- Power supplies feature load-sharing/load balancing, and auto ranging AC and DC voltage input capability
- Four high-speed (52-CFM) fans provide redundancy N+1 high availability and efficient cooling
- Redundant hot-swappable or hot-serviceable FRUs
    - Active/active RAID controller modules
    - Hot-swappable disk drives (air management sleds are placed in empty drive slots)
    - N+1 redundant hot-swappable power and cooling units with common power rail for continuous fan operation even if one unit has been shut down
    - Hot-swappable battery cache modules
    - All FRUs easily accessible from the front or rear of the system
- Front and rear green/amber bi-color LEDs and resettable audible alarm for fault isolation
- Designed and tested to pass NEBS Level 3; GR-63-CORE, GR-1089-CORE
- Designed and tested to pass a subset of MIL-STD-810F air, land, and marine deployment
- Web-based 10/100BASE-T Ethernet support for management and monitoring
- Serial port out-of-band management and monitoring with remote monitoring support
- 1-GB ECC cache memory per controller, fixed non-upgradeable
- Battery backup for cache, approximately 72 hours hold time

Firmware Features

- Simultaneous support for RAID levels 0, 1, 3, 5, 1+0, 3+0, 5+0
- Local and global spare disk drives, with applicable RAID levels
- Up to 1024 LUNs private loop DAS, 1024 LUNs public loop/full fabric switch enabled/half duplex, 64 LUNs point to point/full fabric/switch enabled/full duplex.
- Firmware LUN masking
- Non-disruptive controller firmware upgrades (no downtime for firmware upgrades) in dual-controller RAID chassis
- Logical volume support (spanning logical drives)
- Write back and write through cache control (factory default is write back)
- In-band and out-of-band SES support for RAID arrays
- Built-in SNMP traps and MIB support
- Online drive firmware flash support via the CLI
- Supports Sun StorEdge Enterprise Storage Manager Advanced Applications Management software for SE 3511 RAID Arrays

Input Power Options

- Dual-input load-sharing/load-balancing 100 to 240VAC universal input, load sharing
- Dual-input load-sharing/load-balancing –48VDC (-36VDC to –75VDC) or –60VDC input capabilities available

Power and Cooling Units

The Sun StorEdge 3511 Fibre Channel array has two fully redundant 420-Watt power supplies with load-sharing and load-balancing capabilities. Each AC power and cooling unit has auto-ranging capability from 90VAC to 264VAC and 47Hz to 63Hz. With these redundant power supplies, one maintains electrical power to the system if the other fails.

A single power and cooling unit can spin up, maintain, and sustain power for a fully loaded Sun StorEdge 3511 Fibre Channel array unit.

DC output voltages have over-voltage protection, over current, and short circuit protection. Output current capacity is shown in the table below:

DC Output	Minimum Load	Maximum Load
+5 V	0 A	35 A
+12 V	250 mA	25 A

Both power and cooling units are removable canisters that slide into one of two slots in the back of the system. Each power and cooling unit canister has a locking handle, power status LED, AC power cord connector, and power switch.

Each power and cooling unit housing contains two axial 52 CFM fan assemblies. Each fan is electrically isolated and powered by +12-volt common rail. This allows the fans to continue to run from the redundant power and cooling unit even though their power and cooling units are turned off. Both 80-mm axial fans are connected together in series to allow blade synchronization upon power on.

Each power and cooling unit is hot-swappable and can be replaced while the Sun StorEdge 3511 Fibre Channel array controller and expansion arrays are in operation. Only one power and cooling unit can be hot-swapped at a time.

Sun StorEdge 3511 Fibre Channel Array I/O Architecture

There are two sections on this topic:

- The Fibre Channel I/O ports as they relate to the RAID and expansion arrays.
- Example connectivity rules and guidelines for certain storage and server scenarios.

Major Components, RAID Array

The Sun StorEdge 3511 Fibre Channel RAID array includes the following major components, as shown in the figure below:

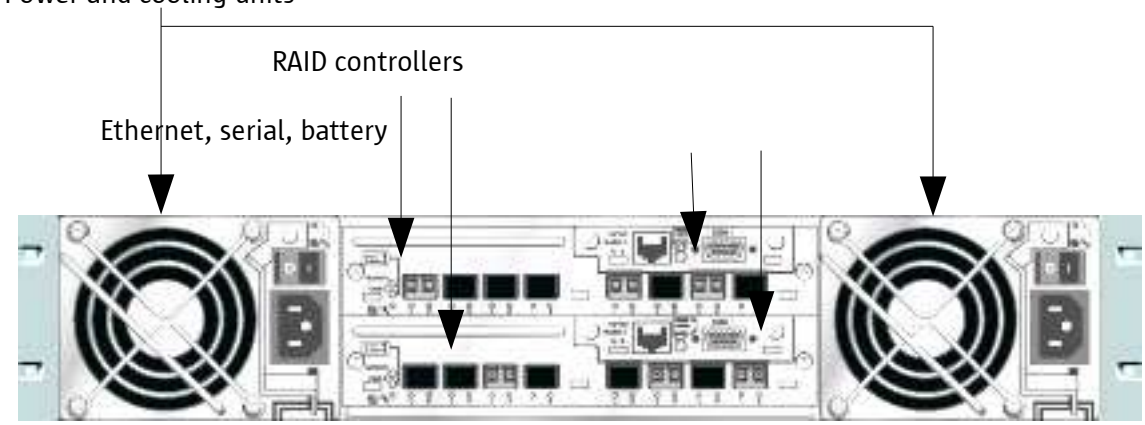


Figure 2. Major components, RAID array

Connector Type	Location
Ethernet RJ-45 10BASE-T connector	Battery module
DB9 serial connector	Battery module
Fibre Channel connectors	RAID-I/O module
AC power outlets	Power and cooling unit
DC power outlets	Power and cooling unit

Note: Each array can support either AC or DC power, not both simultaneously.

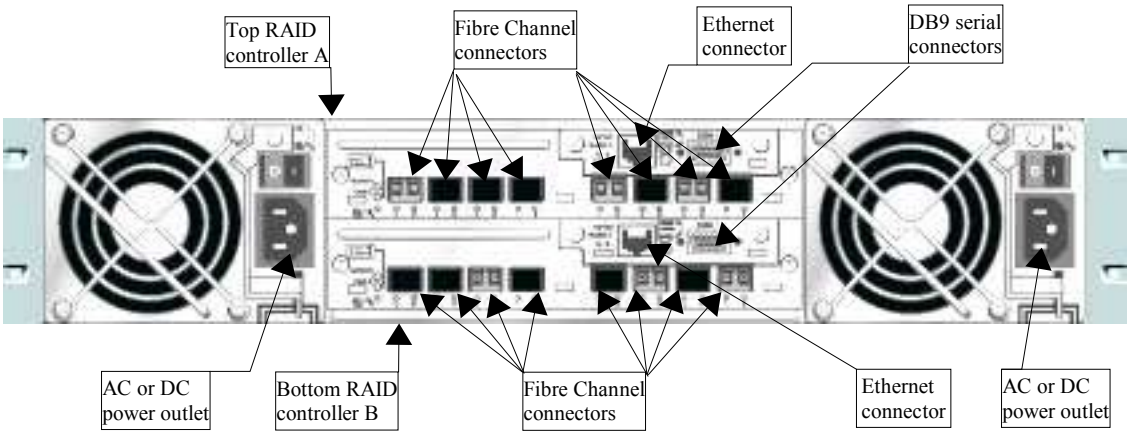


Figure 3. Rear panel of RAID array, dual controller configuration

RAID Fibre Channel I/O Ports

Important notes:

Note 1: All Fibre Channel ports require SFP modules before they can be used. Some configurations ship with factory-installed SFP modules.

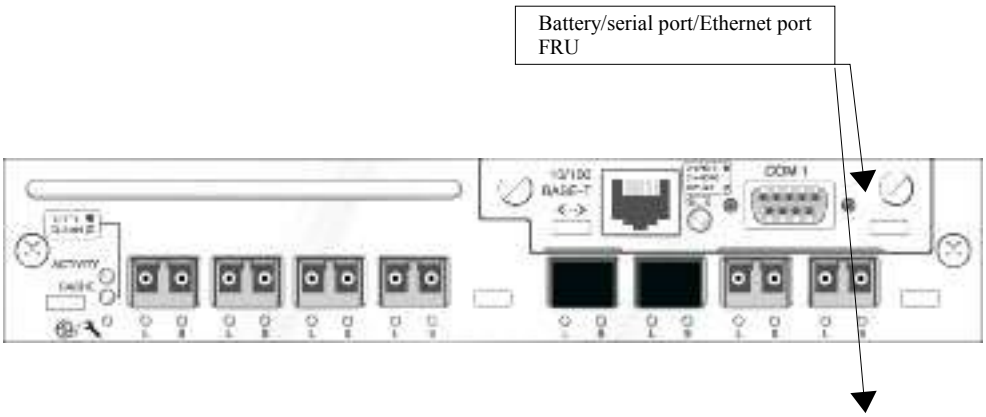
Note 2: In the single RAID controller, these SFPs are installed in Fibre Channel ports 0, 1, 4, and 5. In a dual RAID controller, they are installed in ports 0, 2 and 4 in the top controller and 1, 3 and 5 in the bottom controller.

Note 3: In the expansion unit, SFPs are installed in the top left and bottom right ports.

Note 4: The default SFPs are short-wave (part number XSFP-SW-2GB). Optional long-wave SFPs are available (XSFP-LW-2GB).

Figure 4. Small form factor pluggable (SFP) modules

Each RAID controller integrates Fibre Channel I/O ports, 0, 1, 2, 3, 4, and 5 within each RAID FRU module. Therefore, in a dual controller configuration, there are two RAID I/O modules, each with eight Fibre Channel ports for a total of 16 ports.



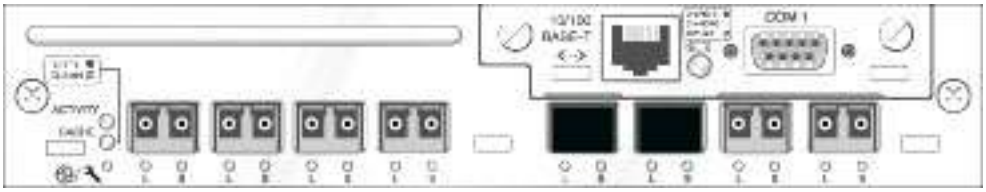
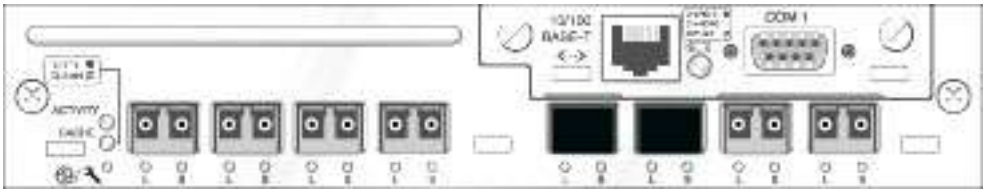


Figure 5. RAID-I/O FRU, Sun StorEdge 3511 Fibre Channel array (dual RAID controller configuration)

Note 1: All Fibre Channel ports can be used for drive connectivity.

Note 2: FC ports 0, 1, 4, and 5 can be used for host or drive connectivity.

Note 3: FC ports 2 and 3 can only be used for drive connectivity.



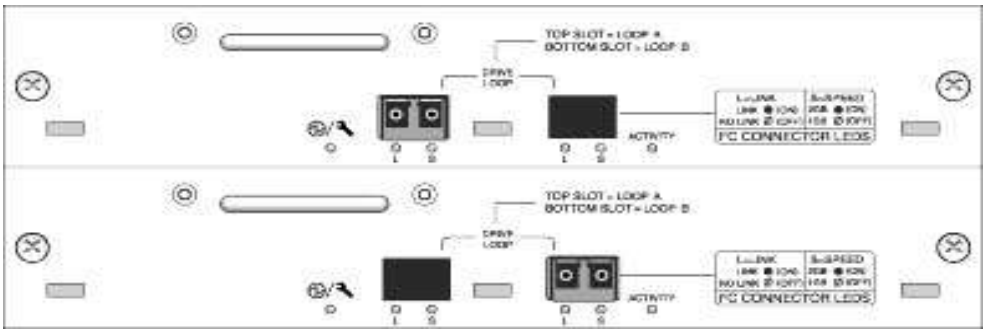


Figure 6. RAID-I/O FRU, Sun StorEdge 3511 Fibre Channel array (single RAID controller configuration)

These components are located on the RAID Fibre Channel I/O FRU of the Sun StorEdge 3511 Fibre Channel array (dual RAID controller version):

- Eight Fibre Channel I/O ports per RAID controller (16 in dual controller configuration)
- Hot-swappable battery module with integrated 10/100 Ethernet port and 9-pin serial port per RAID controller

Rear Panel Connectors, Expansion Array

The following connectors are located on the modules of the rear panel of the expansion unit.

Connector Type	Location
Fibre Channel connectors	I/O module
AC power outlets	Power and cooling unit
DC power outlets	Power and cooling unit

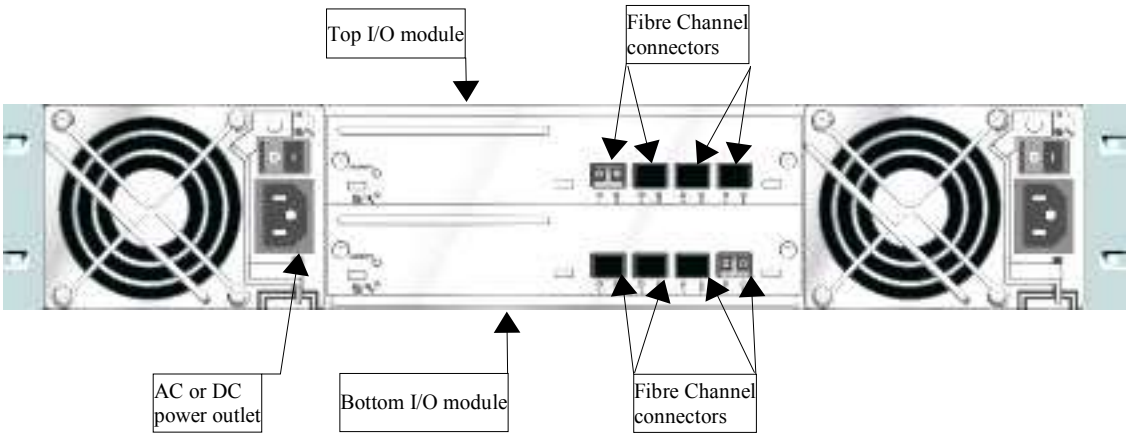


Figure 7. Rear panel of the expansion array

Storage Expansion Fibre Channel I/O Ports

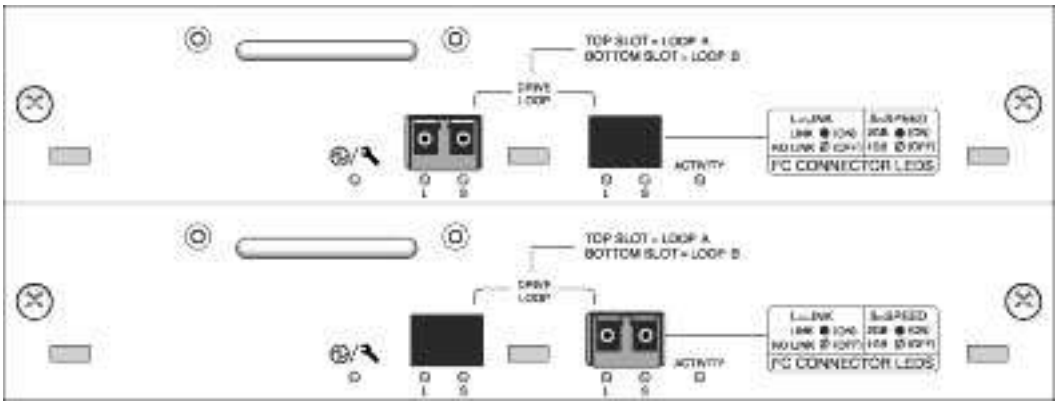


Figure 8. Expansion-I/O modules, Sun StorEdge 3511 Fibre Channel array

Note: Each Sun StorEdge 3511 FC expansion unit ships with both the top and the bottom I/O module, as depicted in the figure above.

Logical Drive and LUN Configuration Guidelines

There are limitations in regards to the maximum number of disk and logical drive configuration with specific RAID sets. The tables below show the correspondence between the number of disks supported, LUN capacity, and RAID levels.

Note: Random optimization uses a 32-KB block size and supports a 512-GB LUN capacity. Sequential optimization uses a 128-KB block size and supports a 2-TB LUN capacity.

Maximum Number of Disk Drives per Logical Drive and per Configuration

Note: Because of a limitation of firmware version 3.27 logical drives were limited to a capacity of 2TB. That constraint has been eliminated in firmware version 4.1x. Each logical drive and partition can now be up to 64TB.

Maximum Number of Disk Drives of any capacity (250 GB or 500 GB) per Logical Drive for any configuration is 60.

Section 2: Connectivity Rules and Guidelines

The Sun StorEdge 3511 Fibre Channel array can be configured in three modes:

1. Private loop (DAS connectivity)
2. Point to point, fabric switch attached (switch fan out, full duplex)
3. Public loop, fabric switch attached (switch fan out, half duplex)

The internal hub ASIC that enable this configuration change is configurable via the management software. The selection for "Loop Only" or "Point to Point" plus the correct cabling allows the three configurations.

The following screen shot shows the actual GUI where the selection is made to configure the array for private loop or point to point mode.

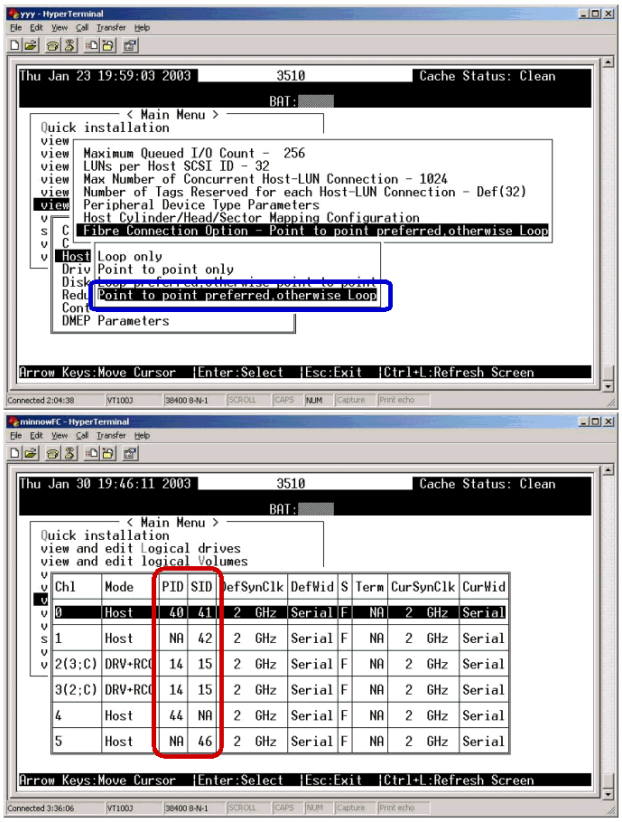


Figure 9. Configuration menu for private loop or point to point mode

Private Loop Mode — Direct Attached Connection (DAS)

Features

- Cost-effective path failover support without switches
- Six redundant host port connections
- Twelve non-redundant host port connections
- Maximum port utilization
- Maximum LUN utilization (up to 1024 LUNs)

Caveats

- Limited to six redundant host connections
- No duplex support for increased performance
- No external networked storage capability

Private Loop – Four Discrete Loop Segments

- I/O cards provide four discrete channels for host attachment
- The four channels are implemented as four separate loop segments using FC-AL hub technology
- Each loop segment allows two host connections to both the primary and the secondary controller

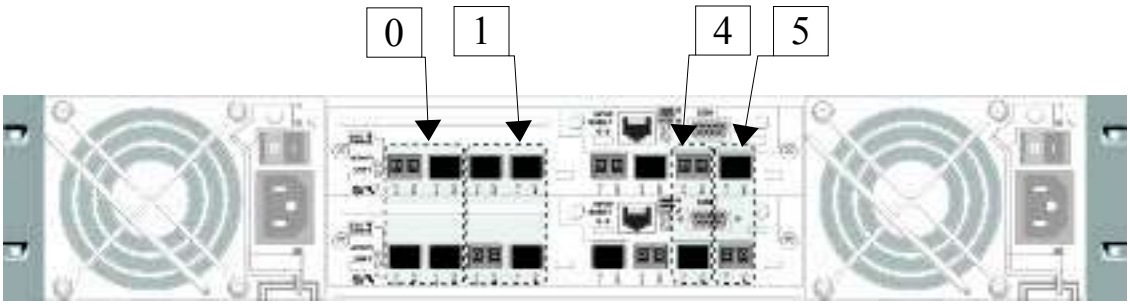


Figure 10. Four discrete loop segments (host port channels 0, 1, 4, 5)

Scenario 1 – Point to Point Connectivity

Dual controllers with four direct-attached servers in non-redundant path mode and no expansion units.

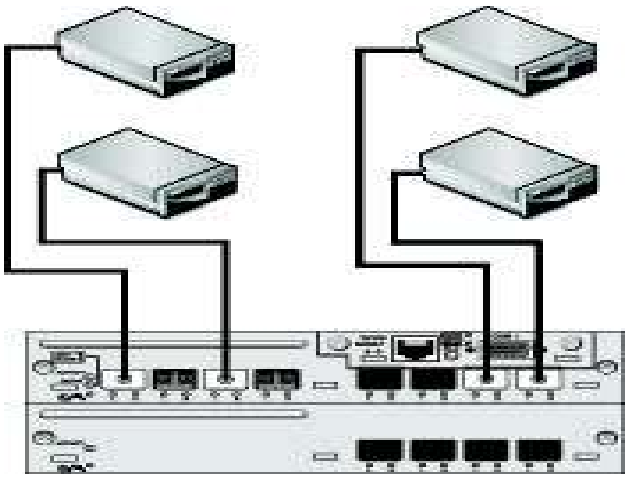


Figure 11. Scenario 1, private loop connectivity option

Note: Controllers are NOT hot-swappable in this configuration.

Scenario 2 – Point to Point Connectivity

Dual controllers with four direct-attached servers in redundant path mode and no expansion units.

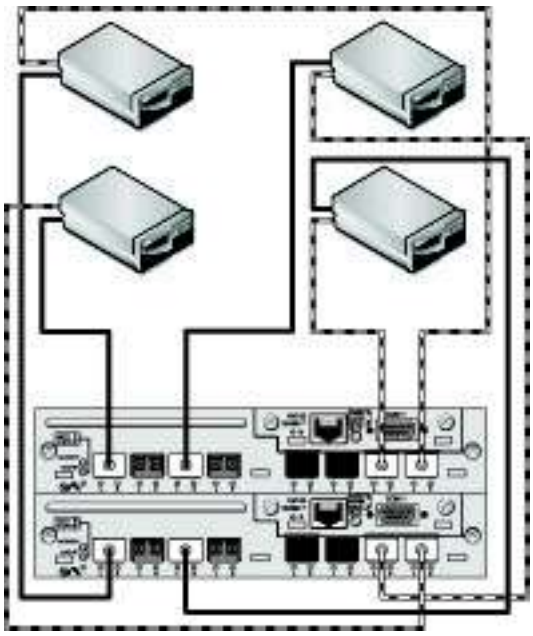
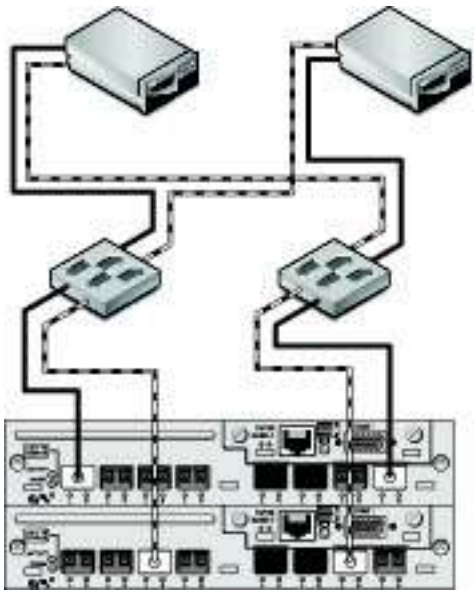


Figure 12. Scenario 2, private loop connectivity option

Note: Controllers ARE hot-swappable in this configuration when used in conjunction with Sun StorEdge Traffic Manager alternate pathing software.

Dual controllers with two SAN-attached servers in redundant path mode and no expansion units.



Note: Controllers ARE hot-swappable in this configuration when used in conjunction with Sun StorEdge Traffic Manager alternate pathing software.

Figure 13. Scenario 4, private loop connectivity option

Point-to-Point Mode — Fabric Switch Attached

- Features
    - External networked storage
    - Sun SAN 4.1/4.2/4.4 support
    - Maximum number of host connections via switch fan out
    - Best performance with full duplex support
- Caveats
    - Limited to two redundant/four switch port connections
    - Used in pairs for LUN/path failover
    - Limited to 64 LUNs maximum (16 mirrored LUNs per loop pair)

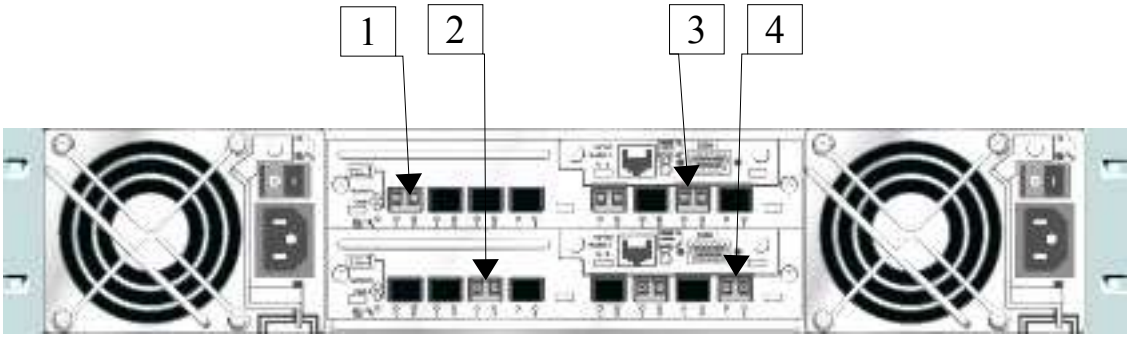


Figure 14. Four 2-Gb Fibre Channel point to point connections

- Up to 14 hosts may be attached via dual 16 port fabric switches for high availability
- Two channels are used per fabric
- LUNs are mapped in an interlaced fashion across both controllers
- Two channels per controller

Public Loop Mode — Fabric Switch Attached

Features

- External networked storage
- Sun SAN 4.4 and higher support
- Maximum LUNs for fabric switch attached (1024 LUNs)
- Maximum number of host connections via switch fan out

Caveats

- Half duplex only (paths are in a loop vs. parallel)
- No full duplex support for increased performance (vs. point to point full duplex)
- Limited to two redundant/four switch port connections
- Used in pairs for LUN/path failover

Configuring for Point-to-Point or Public Loop Mode

- Verify that the controller port personality is set for "point to point mode" or "loop mode." This selection is made via the management software option and sets the internal hub and port bypass circuits to the appropriate configuration. Point to point mode provides full duplex/best performance but is limited to 64 LUNs total. Loop mode provides 1,024 LUNs total but is half duplex with less performance vs. point to point mode (assuming duplex software configuration support).
- Port/cable connectivity is the same for "point to point mode" or "loop mode."

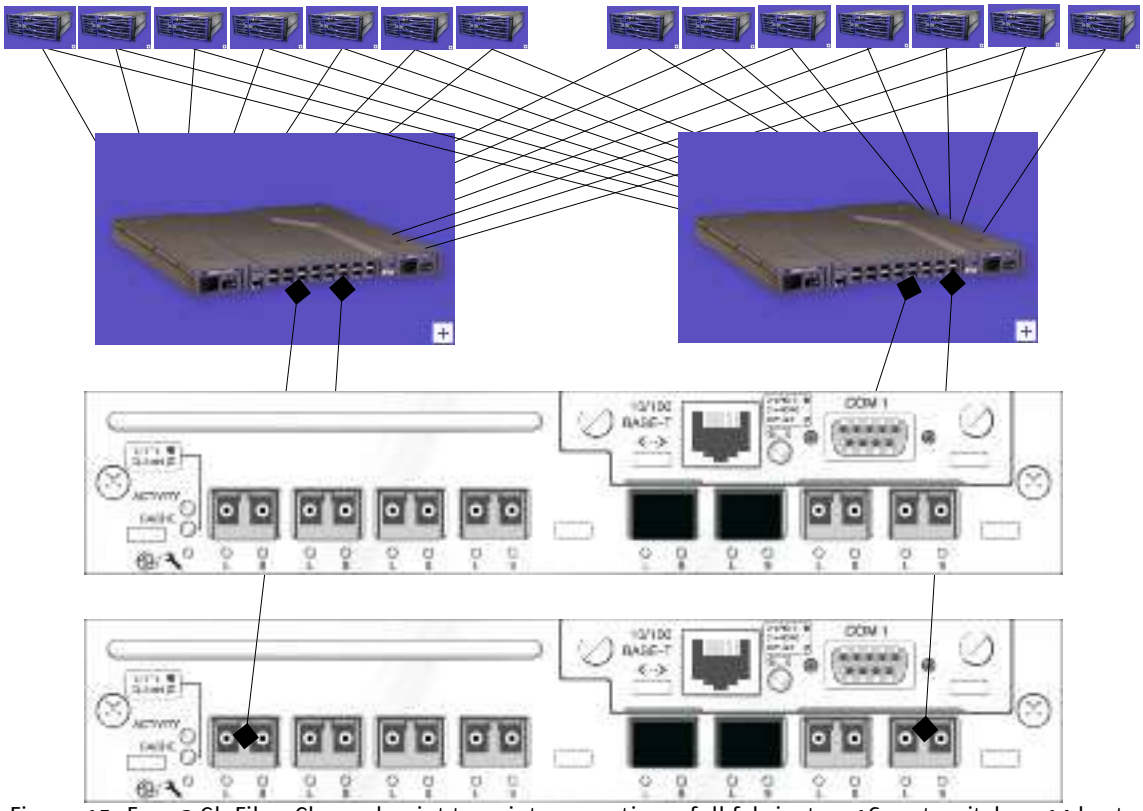


Figure 15. Four 2-Gb Fibre Channel point to point connections, full fabric, two 16-port switches, 14 hosts

Connecting COM Port to a VT100 Terminal or Workstation

For a first-time configuration, users must assign an IP address to the chassis via the COM port of either controller module. Users can configure the RAID controller drive array via the COM port, or via the Ethernet port after they set up the IP address.

When users configure the RAID controller drive array for the first time, it automatically configures the primary controller and transfers the same configuration to the secondary controller.

Connecting Ethernet Port to LAN/WAN

To connect a RAID controller drive array to an Ethernet port, users must first assign an IP address to the RAID controller drive array via the Sun 2U COM port and a VT100 terminal or workstation.

Connect the Ethernet port of one of the controllers to the LAN connection. This connection allows for configuration and monitoring of RAID controller and expansion drive arrays remotely.

Note: In a dual-controller configuration, the Ethernet ports on both controllers must be connected in order to fully manage the array when one controller fails.

Front Panel Indicators

This section describes the components accessed at the front of the Sun StorEdge 3511 Fibre Channel array.

- Light indicators at the far right hand side of panel indicating (from top to bottom):
    - Power
    - Fan
    - Temperature
    - Event

Immediately below the Event LED is an audible-alert RESET push button. Behind the lockable front door are:

- Drive bays containing plug-n-disk drives (drive sleds)
- Light indicators (LEDs) inidicating drive status adjacent to each drive bay

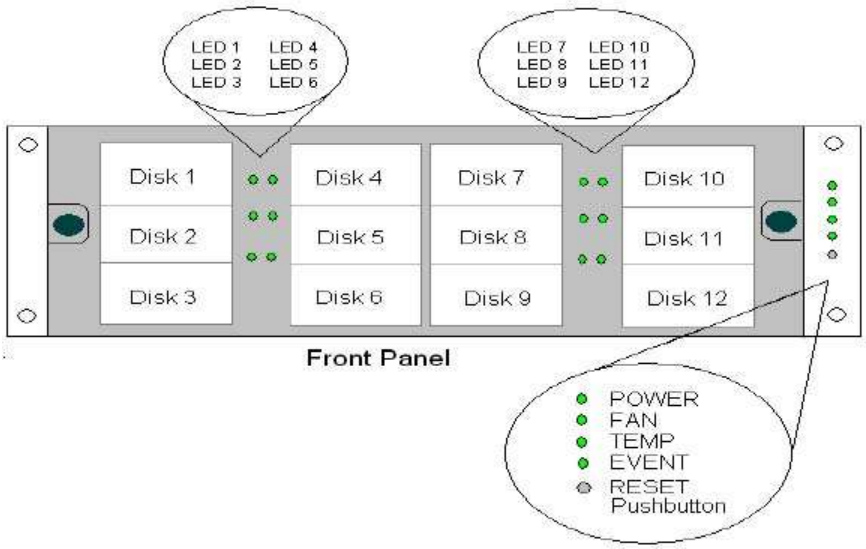


Figure 16. Front panel of the Sun StorEdge 3511 Fibre Channel array

Status LEDs

The Sun StorEdge 3511 Fibre Channel array's LEDs are listed in the following tables.

Front Panel LEDs on Right Side (arranged from top to bottom as listed)

LED	Purpose	Color Code
Power	Power and cooling unit status - DC output voltage within tolerance specification. Over-current protection shutting down any voltage output is also displayed. Voltage thresholds: • +5VDC +/-0.25 VDC • +12VDC +/-0.6 VDC Current thresholds: • +5VDC 35 A • +12VDC 25 A	Static Green = Good Static Amber = Failed = One or more output voltages out of range
Fan	Fan speed within nominal operational rpm specification of 5000 rpm Failed Fan RPM Threshold: 3150 rpm	Static Green = Good = Over 3150 rpm Static Amber = Faulty/Failed = Under 3150 rpm
Temp	Temperature level status indicating violations of internal temperature thresholds of 55° and 60°C	Static Green = Good = Under temperature threshold of 55°C Static Amber = Failed = Temperature threshold equal to or over 55°C Blinking Amber = Failed = Temperature threshold equal to or over 60°C Blink Frequency of 4 Hz +/− 1 Hz
RAID I/O	Status indicator to indicate any failure event in RAID controller or I/O board	Static Green = Good = Normal functional operation of RAID controller or I/O board Static Amber = Failed RAID controller or I/O board

Drives	Drive power up and spin up OK Drive activity Drive failure	Static Green Flashing Green (random blink pattern) Static Amber

Rear Panel LED on RAID Controller

LED	Purpose	LED Color Definition
Busy Status LED	Busy status of host and disk ports	Static Green = not busy Blinking Green = Busy
I/O FRU Status LED	Status of RAID controller and I/O module	Static Green = Good Static Amber = Failed RAID controller or I/O module
Battery Charge LED	Status of battery	Static Green = Battery charged Blinking Green = Battery charging Static Amber = Battery failed
Dirty Cache LED	Status of memory cache; dirty cache indicates if data is not written to disk.	LED off = Clean cache Static Amber = Dirty cache

LED	Purpose	LED Color Definition
SFP Left LED	SFP status	Static Green = Good Fibre Channel connection Off = Empty or failed FC connection
SFP Right LED	SFP speed status	Static Green = 2 Gb Off = 1 Gb
Power and Cooling LED	Power and cooling unit status; DC output voltage within tolerance specification. Over-current protection shutting down any voltage output is also displayed. Voltage thresholds: • +5 VDC +/-0.25 VDC • +12VDC +/-0.6 VDC Current thresholds • +5VDC 35A • +12VDC 25A	Static Green = Good Static Amber = Failed = One or more output voltages out of range /fan speed under 3150 rpm
Ethernet Link LED	Status of Ethernet link	Static Green = Active link Off = Inactive connection
Ethernet Active LED	Status of Ethernet activity	Flashing Green = Busy

Reliability, Availability, and Serviceability (RAS)

The Sun StorEdge™ 3511 Fibre Channel array includes the reliability, availability, and serviceability (RAS) features listed below.

Reliability

The reliability features of the Sun StorEdge 3511 Fibre Channel array include:

- NEBS Level 3 certified
- MIL-STD-810F compliant for air, land, and marine deployment
- Load-sharing/load-balancing extends power and cooling unit life

Availability

Availability features of the Sun StorEdge 3511 Fibre Channel array include:

- Dual hot-swap/redundant load-sharing/load-balancing power supplies with separate inputs
- Hot-swap/redundant high-velocity (52 CFM) electrically isolated cooling fans are powered by a +12-volt common rail and contain detection circuitry to monitor degraded performance provide superior temperature control. Fans continue to run from the redundant power and cooling unit even though their power and cooling unit is turned off. The twin 80-mm axial fans in each power and cooling unit are connected together in series to allow blade synchronization upon power up.
- Hot-swap redundant event monitoring units
- Hot-swap redundant RAID controllers with mirrored synchronized-write cache (optional configuration)

Serviceability

Failover

The Sun StorEdge 3511 Fibre Channel array supports both hard- and soft-failover capabilities.

- **Hard failover**

  The Sun StorEdge 3511 Fibre Channel array automatically switches from the failed component to the redundant component.

- **Soft failover**

  The Sun StorEdge 3511 Fibre Channel array provides the ability to manually failover a component for hardware upgrades, and so on.

Field-Replaceable Units (FRUs)

The Sun StorEdge 3511 Fibre Channel array's major components are field-replaceable units (FRUs) and are easily accessible from the front or rear of the unit. Each FRU has a set of LEDs which indicate health and status of the array. Virtually any single hot-swap field-replaceable unit (FRU) can be removed quickly and easily from the subsystem while running applications. All FRUs are easily accessible from the front or rear of the subsystem.

The Sun StorEdge 3511 Fibre Channel array consists of four types of FRUs that are easily removed without tools. These are:

- RAID controllers (one or two) (Sun StorEdge Traffic Manager alternate pathing software and specific cabling methodology is required for hot-swap RAID controllers)
- Battery backup module (one or two)
- Two power supplies, AC or DC with integrated power and cooling unit
- Up to twelve Serial ATA disk drives (hot-swappable)

Specifications

Physical Specifications

Description	Desktop	Rackmount
Height	3.64 in. (9.25 cm)	3.5 in. (8.89 cm) (2U)
Width	19 in. (48.26 cm)	17.6 in. (44.70 cm) (body)
Depth • Main chassis • Chassis with fan modules • Chassis with fan modules and handles	 18.0 in. (45.72 cm) 20.0 in. (50.80 cm) 21.5 in. (53.34 cm)	
Unpackaged Weight (without drives)	30 lb. (13.61 kg)	
Packaged Weight (without drives)	37 lb. (16.78 kg)	
Weight (fully loaded with 12 drives)	59.1 lb. (26.2 kg)	
Packaged Weight (fully loaded with 12 drives)	70.5 lb. (31.9 kg)	

Heat and Air Flow

- Air flow for the Sun StorEdge™ 3511 array is from front to rear.
- A fully populated array dissipates a maximum of 1105 BTU per hour.

Primary Input Voltage/Frequency Range

Input selection is automatic, and the power supply operates continuously over the required range.

The AC power supply is capable of suplying full rated output power in the input voltage range of 90 VAC to 250 VAC from a single phase source.

The following table shows input power at different voltage s, 50Hz (worst case), and states of operation for 2 AC power supplies in Watts, Amps and BTUs:

Watts per Input Voltage/Frequency	Idle	Operating	Spin Up
90 VAC / 50 Hz	302.4 Watts	315.9 Watts	415.8 Watts
115 VAC / 50 Hz	296.7 Watts	311.7 Watts	402.5 Watts
264 VAC / 50 Hz	314.2 Watts	330.0 Watts	403.9 Watts
Amps per Input Voltage/Frequency	**Idle**	**Operating**	**Spin Up**
90 VAC / 50 Hz	3.36 Amps	3.51 Amps	4.62 Amps
115 VAC / 50 Hz	2.58 Amps	2.71 Amps	3.50 Amps
264 VAC / 50 Hz	1.19 Amps	1.25 Amps	1.53 Amps
BTU's per Input Voltage/Frequency	**Idle**	**Operating**	**Spin Up**
90 VAC / 50 Hz	1032 BTU's	1078 BTU's	1419 BTU's
115 VAC / 50 Hz	1012 BTU's	1064 BTU's	1373 BTU's
264 VAC / 50 Hz	1072 BTU's	1126 BTU's	1378 BTU's

The following table shows input power at different voltages, 60 Hz, and states of operation for 2 AC power supplies in Watts, Amps, and BTU's.

Watts per Input Voltage/Frequency	Idle	Operating	Spin Up
90 VAC / 60 Hz	302.4 Watts	320.4 Watts	414.9 Watts
115 VAC / 60 Hz	297.9 Watts	313.9 Watts	403.7 Watts
264 VAC / 60 Hz	332.6 Watts	345.8 Watts	419.8 Watts
Amps per Input Voltage/Frequency	**Idle**	**Operating**	**Spin Up**
90 VAC / 60 Hz	3.36 Amps	3.56 Amps	4.61 Amps
115 VAC / 60 Hz	2.59 Amps	2.73 Amps	3.51 Amps
264 VAC / 60 Hz	1.26 Amps	1.31 Amps	1.59 Amps
BTU's per Input Voltage/Frequency	**Idle**	**Operating**	**Spin Up**
90 VAC / 60 Hz	1032 BTU's	1093 BTU's	1416 BTU's
115 VAC / 60 Hz	1016 BTU's	1071 BTU's	1377 BTU's
264 VAC / 60 Hz	1135 BTU's	1180 BTU's	1432 BTU's

Power Input/Output

Numbers shown for the Sun StorEdge 3511 Fibre Channel array are for a single power and cooling unit mode of operation, and these numbers are double in a dual redundant power and cooling unit mode.

AC Primary Input Voltage/Frequency Range

- Input selection is automatic, and the power and cooling unit operates continuously over the required input range.
- The power and cooling unit is capable of supplying full rated output power in the input voltage range of 90VAC to 264VAC from a single phase source.

- Input current meets the limits shown in the following table:

Input Voltage	Maximum Input Current	Maximum Inrush Current
115VAC	10 A	50 A peak
230VAC	5 A	100 A peak

Inrush current shall be less than 100A peak for 2 msec. and 30A peak for 50 msec., at peak nominal line from a cold start. Inrush current shall be measured after the power and cooling unit has idled for a minimum of 10 minutes at an ambient temperature of 25ºC, with the input voltage source removed.

DC Output Voltage/Current/Power

- The power and cooling unit provides two DC output voltages, +5VDC and +12VDC.

- The voltage outputs are capable of supplying the output current shown in the following table, subject to a combined maximum output power of 420 Watts.

Output	Nominal Output (VDC)	Minimum	Maximum	Units	Conditions
1	5 V	0.0	35	A	
2	12 V	0.25	25	A	Peak 35A/15 sec.

Capacitive Loads

The power and cooling unit can to power up and operate normally with the following capacitances simultaneously present on the DC outputs.

Output	+12VDC	+5VDC
Capacitive load (uF)	6,000	10,000

- DC input voltages/currents/power: Optional -48VDC (-36VDC to -72VDC) or -60 input capabilities available.

AC and DC Input Power Version

- AC input power version (both power supplies operating)
    - Nominal input voltage: 100VAC to 240VAC
    - Input voltage range: 90VAC to 264VAC
    - Input frequency range: 47 Hz to 63 HZ

- DC input power version (both power supplies operating)
    - Nominal input voltage: -48 or -60VDC
    - Input voltage range: -36VDC to 75VDC

- Power and cooling unit output voltages
    - +5VDC
    - +12VDC

Environmental Specifications

Feature	Specifications
Temperature	
Operating	5º to 40ºC (41º to 104ºF)
Nonoperating	-40º to 65ºC (-40º to 149ºF)
Stock (non-operating)	55ºC, 80% RH @ 5 hours -10ºC @ 10 hours, 20ºC 10% RH @ 5 hours
Cold Starts (operating)	5 times powered on at 5ºC
Humidity	
Operating	10% to 90% relative to 27ºC max. wet bulb, noncondensing
Non-operating	93% relative to 38ºC max. wet bulb, noncondensing
Altitude	
Operating	-30 m to 3,048 m (-100 to 10,000 ft.)
Non-operating	-30 m to 12,192 m (-100 to 40,000 ft.)
Acoustical Noise	Sun declared value, based upon measurement of the final product

Compliance

Standard	Specifications
Safety	
IEC 60950 (C22.2-60950) (EN60950) (UL60950)	CUL Notice of Authorization
EMC and Safety	Telcordia GR-1089-CORE test report
Emissions and Immunities	
RF Radiated Emissions	CISPR22 (EN55022), Class B – European Union FCC Part 15, Class B – USA, Industry of Canada
Conducted Emissions	CISPR22 (EN55022), Class B – European Union FCC Part 15, Class B – USA, Industry of Canada
Harmonic Emissions	IEC 61000-3-2:2000 (No Limits) – European Union
Voltage Flicker	IEC 61000-3-3:1995/A1:2001 (No Limits)
ESD Immunity	CISPR 24 (EN55024; 8kV Contact, 15kV Air) IEC 61000-4-2
RF Field Immunity	CISPR 24 (EN55024, 10V/m) IEC 61000-4-3
Electrical Fast Transient/Burst Immunity	CISPR 24 (EN55024; 1kV I/O, 2kV Power) IEC 61000-4-5
Surge Immunity	CISPR 24 (EN55024; 1kV I/O, 1kV Power L-L, 2kV Power L-G) IEC 61000-4-5
RF Conducted Immunity	CISPR 24 (EN55024; 3V I/O and Power) IEC 61000-4-6
Power Frequency Magnetic Field Immunity	CISPR 24 (EN55024) IEC 61000-4-8
Voltage Dip and Interruption	CISPR 24 (EN55024; 0v/0.5 cycle, 70%V/0.5 sec., 0V/5 sec.)
Voltage Dips/Short Interruptions/Voltage Variation Immunity	IEC 61000-4-11
NEBS Compliance (Environmental and Physical)	Telcordia GR-63-CORE, Certified Level 3 (No margin requirement) (Telco, - 48VDC Only) GR-1089-CORE
ETSI (Environmental and Emissions)	EN 300 386

Standard	Specifications
MIL-STD-810F	Method 500.4 Altitude Method 501.4 High Temperature Method 502.4 Low Temperature Method 507.4 Humidity Method 509.4 Salt Fog Method 514.5 Category 4 Transportation Vibration Method 514.5 Category 21 Watercraft Vehicle Method 516.5 Functional Shock (15G's operational) Method 516.5 Bench Handling
Acoustic Noise	ISO 7779:1988

Country	Standard
U.S.	UL Listed to UL60950:2000, 3rd Edition

Canada	CSA Standard CAN/CSA-C22.2 No. 60950-00 3rd Edition
Germany	TUV GS mark (ergonomics) (Rheinland)
European Union	EN60950:2000
Japan	Part of World-wide CB Scheme
Australia	Part of World-wide CB Scheme
China *	CCC mark
Russia *	Hygienic Mark (ergonomics)
Argentina	Resolution 92-98 (S-Mark)

Electromagnetic Interference

Test	Standard
Harmonics Emissions	EN 61000-3-2:2000 (No Limits)
Voltage Flicker	EN 61000-3-3:1995/A1:2001 (No Limits)
ESD	EN 55024 (8kV Contact, 15kV Air)
RF Field	EN 55024 (10V/m)
Electrical Fast Transient Burst	EN 55024 (1kV I/O, 2kV Power)
Surge	EN 55024 (1kV I/O, 1kV Power L-L, 2kV Power L-G)
RF Conducted	EN 55024 (3V I/O and Power)
Power Frequency Magnetic Field	EN 55024 (N/A monitors only)
Voltage Dip and Interruption	EN 55024 (0v/0.5 cycle, 70%V/0.5 sec., 0V/5 sec.)

Electromagnetic Compatibility by Country

Items marked with an asterisk (*) are scheduled for compliance one quarter after general availability.

Country	Standard
U.S.	FCC #47, Part 15, Subpart B, Class A (standalone minimum)
Canada	ICES-003
Japan	VCCI Class A
European Union Germany	EN 55022:1998 Class A (standalone minimum)
Australia/New Zealand	AS/NZS 3548:1996
China	GB4943-1995, GB9254-1998, GB17625,1-1998 (CCC mark)
Taiwan	BSMI CNS 13438 Class A (standalone minimum)
Korea	MIC Korea
Russia	GOST-R mark
Argentina	S mark

System Configuration and Management

Configuration and Management Software

There are four ways to configure and manage a Sun StorEdge™ 3511 Fibre Channel array:

1. Terminal menu interface — This method allows the MOST control over the Sun StorEdge 3511 FC, since it "taps" directly into the array's RAID controller firmware.

   Examples of the terminal menu interface are shown below.

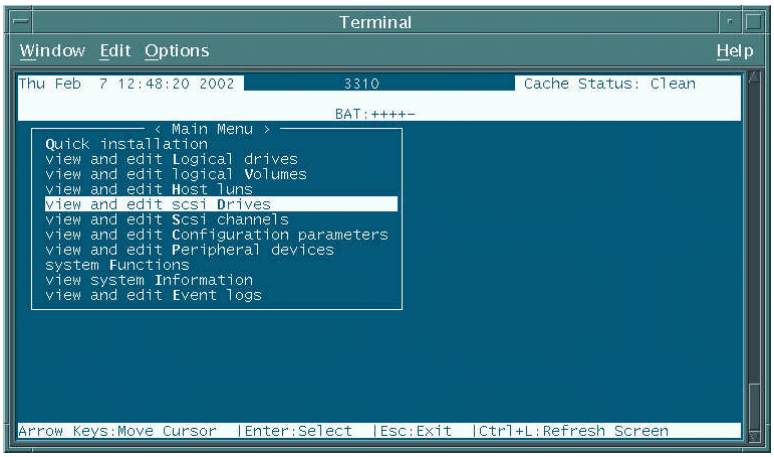


Figure 17. Terminal menu interface, main menu

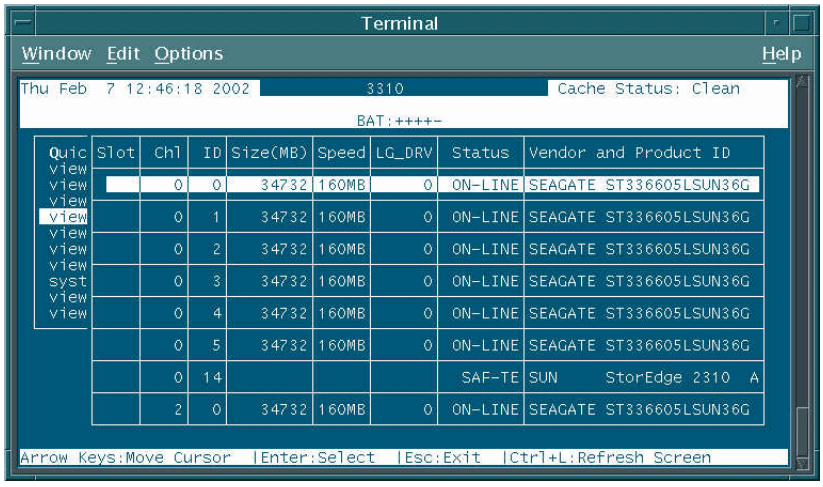


Figure 18. Terminal menu interface, cache status

Note: To configure an X86/Linux, HP-UX, or IBM AIX server, only method 1 (the terminal menu interface) is applicable.

2. Sun StorEdge Configuration Service (SSCS) Graphical User Interface

A. This requires that an SSCS agent utility be loaded onto a Solaris Operating Environment server that is connected to a Sun StorEdge 3511 Fibre Channel array that is to be managed/monitored.

B. An SSCS console utility must also be loaded onto a Solaris Operating Environment workstation.

C. From an SSCS console, the user can manage an X number of SSCS agents/Sun StorEdge 3511 Fibre Channel arrays.

D. SSCS can also be used to dynamically change RAID controller firmware (when there are dual redundant controllers installed).

E. SSCS agent/console utilities for the Solaris Operating Environment are included in the Sun StorEdge 3511 FC software CD shipping package.

F. More details on SSCS are found in the sections below.

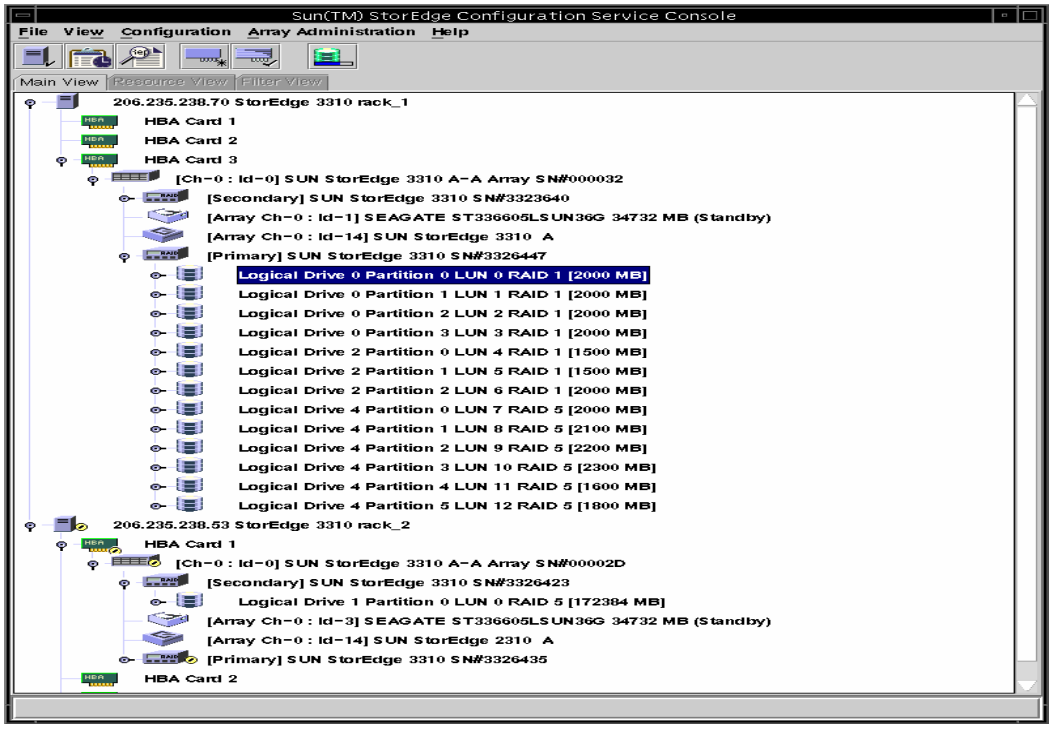


Figure 19. Sun StorEdge Configuration Service GUI

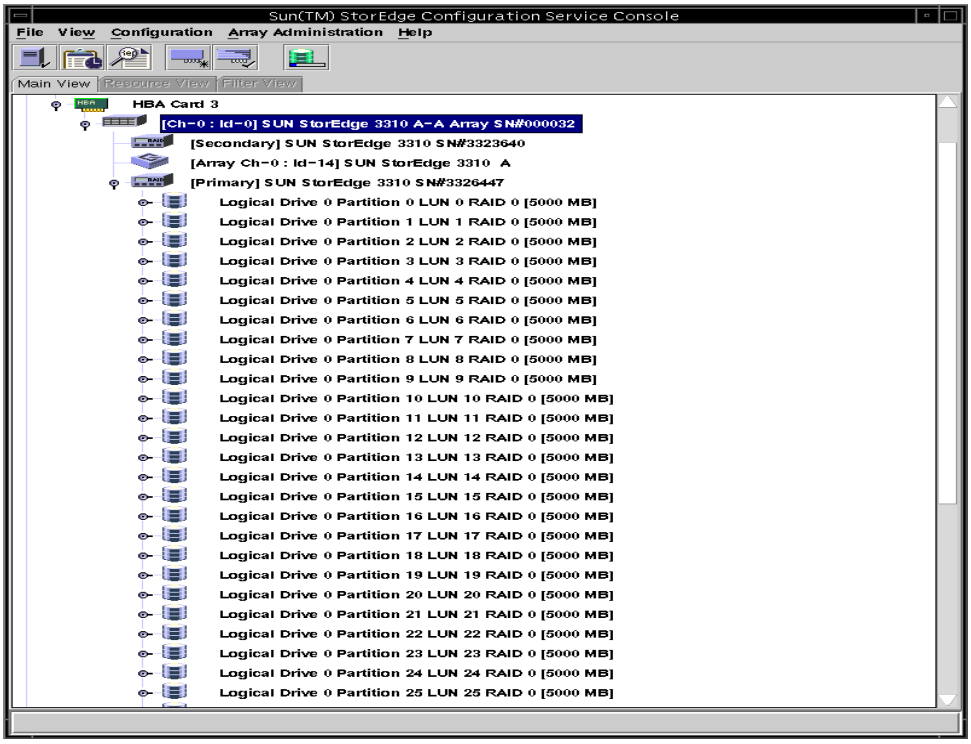


Figure 20. Sun StorEdge Configuration Service GUI

3. Web Browser — This method allows SSCS to be launched from a web browser (Netscape™ 4.7+). The functionality is the same as SSCS itself.

Figure 21. Sun StorEdge Configuration Service GUI, launched via web browser

Note 1: The three methods discussed above can be used when the array is attached to a Solaris

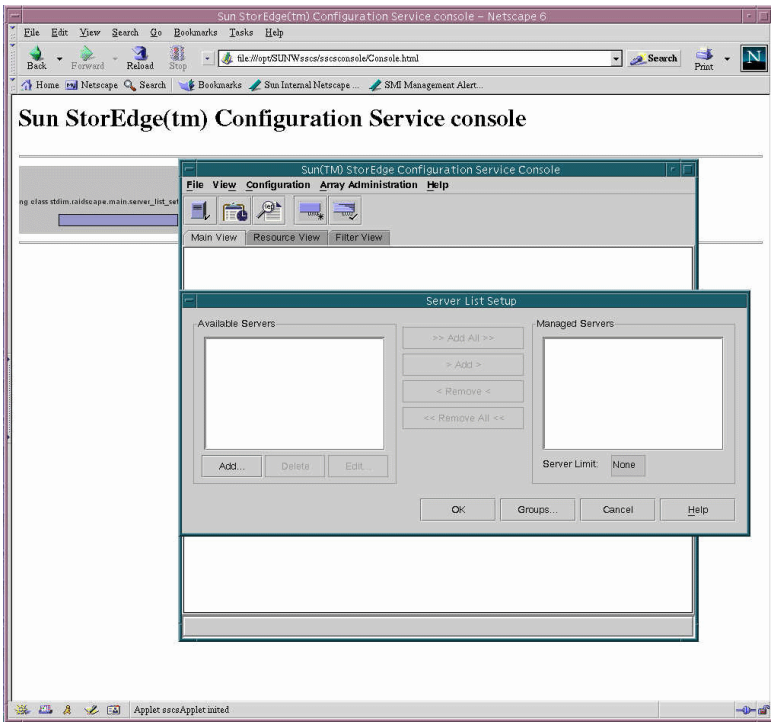


Figure 22. Sun StorEdge Configuration Service GUI, from web browser

Note 2: Operating Environment or Microsoft Windows 2000/NT-based server only.

To configure an X86/Linux, HP-UX, or IBM AIX server only method 1 (the terminal menu interface) is applicable.

4. Command Line Interface (CLI) – This method allows configuration of the Sun StorEdge 3511 array through traditional scripting methods.

Sun StorEdge Configuration Service Software

Sun StorEdge Configuration Service (SSCS) software is a Java™ technology-based software program that combines storage configuration, maintenance, and monitoring tools into a single, easy-to-use application. SSCS software provides centralized administration of Sun StorEdge 3511 FC storage systems across existing local and wide area networks. This software helps simplify storage management and can reduce its administration costs.

The Sun StorEdge Configuration Service software graphical interface uses intuitive controls and graphics to present configuration options, maintenance features, and status information for storage systems and servers. A color-coded design provides feedback and clear status information for each component. Critical conditions that require immediate attention are always easily identified and simple to locate. Configuration features and controls are well marked and operate smoothly. SSCS software is very easy to learn through its use of familiar

interface elements.

Sun StorEdge Configuration Service software provides complete monitoring of Sun StorEdge 3511 RAID controllers, disk drives, etc. From a single Sun StorEdge Configuration Service console, system administrators can view and make changes to entire Sun StorEdge 3511 storage systems. In the event of a status change, Sun StorEdge Diagnostic Reporter software sends real-time, proactive alerts to the system administrator via its console display, e-mail, or through an alphanumeric pager, allowing users to monitor the system remotely.

Storage setup and management is easy with Sun StorEdge Configuration Service software. Custom configuration options allow network administrators to configure storage volumes, RAID levels, cache modes, stripe sizes, and other storage parameters to meet particular server and application requirements.

Sun StorEdge Configuration Service also allows dynamic array firmware upgrades when there are dual redundant controllers configured. With SSCS software's ease of use and attention to detail, even ambitious storage installations are simple to manage.

Configuration services features include the following:

- GUI based management and monitoring
- Phone home alert support (email alerts)
    - Defines the types of message traps sent, the timing of messages sent, forward encrypted messages, and receive messages on the Diagnostic Reporter which functions as an email viewing program.
    - Operates in background mode continuously on the computer where it is installed and also has a controlling Sun StorEdge Configuration Service Agent (a controlling agent is the only agent which talks to a specific array).
    - Enhanced battery expiration and hardware status reporting.

Sun StorEdge Traffic Manager Alternate Pathing Software

To help maximize data accessibility and path redundancy, Sun recommends that customers implement Sun StorEdge Traffic Manager software. This software is independent of Sun StorEdge Configuration Service software and provides a path failover mechanism in the event of HBA, switch, or cable failure.

On the Sun StorEdge 3511 Fibre Channel array, Sun StorEdge Traffic Manager software supports the following operating systems:

- Solaris 8,9 and 10 Operating Environment
- HP-UX 11.0 and 11i IBM
- AIX 4.3.3 and 5.1L (32 and 64 bit)
- Microsoft Windows NT and 2000

Sun StorEdge Traffic Manager software for the Solaris 8 and 9 Operating Environments is included with each UltraSPARC™ III server from Sun at no additional charge. For more information on the use of Sun StorEdge Traffic Manager software in operating environments other than the Solaris Operating Environment, refer to

http://www.sun.com/storage/san/multiplatform_support.html.

Sun StorEdge Traffic Manager for Microsoft Windows, IBM AIX, and HP-UX is available to purchase from Sun Microsystems and its authorized resellers.

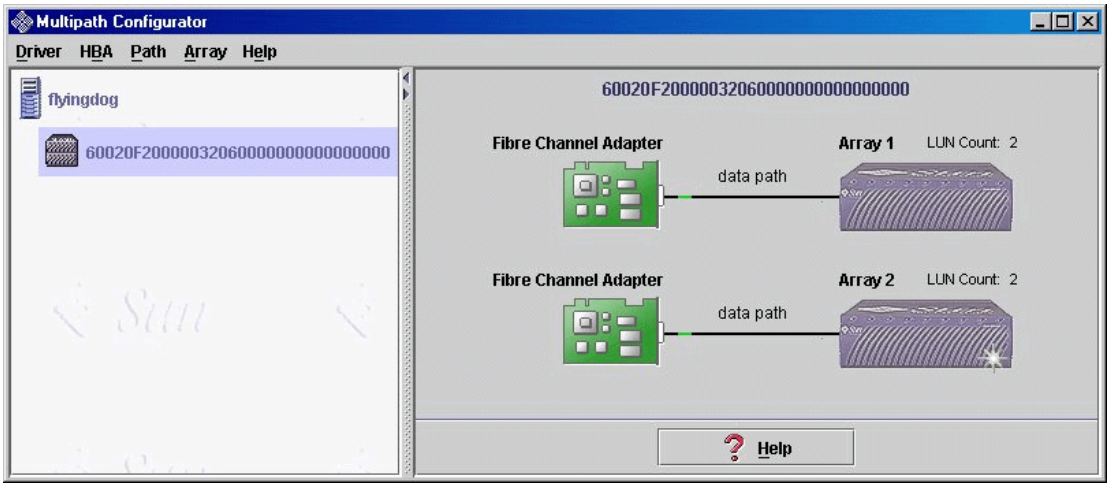


Figure 23. Sun StorEdge Traffic Manager software, main screen

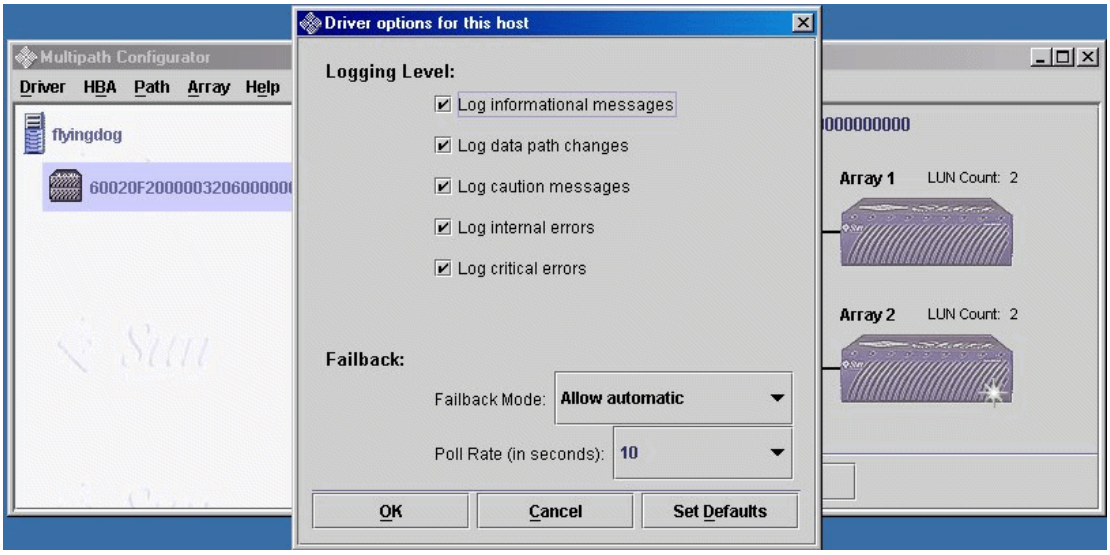


Figure 24. Driver options screen

Figure 25. HBA properties screen

Sun SAN Support

The Sun StorEdge 3511 Fibre Channel array is fully supported under Sun's SAN 4.1/4.2/4.4 release. Refer to the SAN 4.1/4.2/4.4 WWWW (SunWIN token number 347688) for a complete list of supported switches and other interconnects and the SAN 4.1/4.2/4.4 Just the Facts (SunWIN token number 345251) for supplementary information. This matrix is also located at the following URL: http://webhome.sfbay/networkstorage/sales/matrix.html.

Ordering Information

Shipping Configurations

The shipping configurations for the Sun StorEdge™ 3511 Fibre Channel array are shown below.

Note: For all configurations, AC power cord country kits are ordered separately. DC power configurations include two -48 volt DC power cords.

JBOD Expansion Unit Base Configuration

The Sun StorEdge 3511 Fibre Channel array JBOD expansion unit base configuration ships with the following accessories:

- Two short-wave SFPs
- One 12-inch Fibre Channel Expansion Cable (RAID controller to JBOD Expansion)
- Software, installation and configuration documents
- Two power cord lock kits

Single RAID Controller Base Configuration

The Sun StorEdge 3511 Fibre Channel array single RAID controller base configuration ships with:

- Four short-wave SFPs
- One 25-foot CAT 5 cable (for out-of-band management)
- One 25-foot serial null modem cable (for out-of-band management)
- One DB9 to DB25 adapter
- Software, installation and configuration documents
- Two power cord lock kits

Dual RAID Controller Base Configuration

The Sun StorEdge 3511 Fibre Channel array dual RAID controller base configuration ships with:

- Six short-wave SFPs
- One 25-foot CAT 5 cable (for out-of-band management)
- One 25-foot serial null modem cable (for out-of-band management)

- One DB9 to DB25 adapter
- Software, installation and configuration documents
- Two power cord lock kits The basic system configuration can be determined from the components of each part number. Here is an example part number, with each component explained.

Note: For single and dual controller base configurations (RoHS and non-RoHS compliant): The single CD containing Sun StorEdge Configuration Service Management and Diagnostic Reporter Software, installation and configuration documents, and SE3000 Family Documentation is NOT automatically included with the Sun StorEdge 3511 FC Array configurations. The contents of this CD are available via the Sun Download Center located at the following URL:

http://www.sun.com/software/download/

The CD is available by ordering the following no charge part number: NCSS9-200-W9NR (Sun StorEdge 3000 Family software and documentation 2.0 and 2.1)

Note 1: The single CD containing Sun StorEdge Configuration Service Management and Diagnostic Reporter Software, installation and configuration documents, and SE3000 Family Documentation is NOT automatically included with the Sun StorEdge 3510 FC Array configurations. The contents of this CD are available via the Sun Download Center located at the following URL:

http://www.sun.com/software/download/

Note 2: All configurations ship with dual redundant power supplies standard. Customers can order
either AC or DC equipped versions.

Note 3: All configurations ship with the nameplate "Sun StorEdge 3500" affixed on the front bezel.

Note 4: All RAID controller versions ship with one serial cable and one Ethernet cable for management.
All expansion versions ship with two Fibre Channel cables.
RAID-equipped arrays DO NOT come with any Fibre Channel cables.

Refer to "Cables" later in this section for a list of supported cables.

Note 5: For five-drive configurations, the five corresponding drive carriers are included and installed with the drives in the array. The remaining seven empty drive bays do NOT come
with empty drive carriers. Customers can purchase additional Sun StorEdge 3511 Fibre Channel array specific X-option drives, which do come with drive carriers.

Note 6: The Sun StorEdge 3511 Fibre Channel array drive carriers are UNIQUE – Sun StorEdge T3, A5200, etc. drive carriers CANNOT be used in the Sun StorEdge 3511 Fibre Channel array.

Note 7: All drive bays MUST be populated with either 1) a drive; or 2) an air management sled.
This is critical to maintain proper air flow and cooling in the system.

Note 8: All RAID controller configurations ship pre-configured with RAID level zero

Note 9: Rack-ready configurations do NOT come with any rackmount rail kits. Customers need to
order one of the following, depending on their needs:

- Rack kit, 2U 19-inch cabinet 24 to 36-inch (part number XTA-3000-2URK-19U(Z)); use with Sun StorEdge cabinet/Sun Fire rack
- Rack kit, 2U 19-inch cabinet Telco center mount (part number XTA-3000-2URK-19C(Z))
- Rack kit, 2U 19-inch cabinet Telco front mount (part number XTA-3000-2URK-19F(Z))

Note 10: All pricing for the Sun StorEdge 3511 Fibre Channel array is listed under discount Category P for the 250GB drive configuration, Category P for the 500GB drive configurations.

Part Number Scheme for the StorEdge 3000 Family products:

XTA3120R01A0R145Z

X	T	A	3	1	2	0	R	0	1	A	0	R	145Z

RoHS Compliance ("Z" indicates compliance)

Array Capacity in GB

Drive Size/ RPM

0DISK=No Disk Drives
R = 36GB/10K
S = 36GB/15K
T = 73GB/10K
U = 146GB/10K
V = 73GB/15K
W = 250GB/7K
X = 300GB/10K
Y = 400GB/7K
Z = 146GB/15K
A = 500GB/7K

Number of Controllers Per Array

0 = JBOD
1 = 1 Controller
2 = 2 Controllers

Power Supplies

A = AC
D = DC
N = No Power Supplies

RAID Controller Support*

00 = JBOD only (No controller upgrade supported)
01 = Supports addition of RAID controller

Physical Configuration

D = Deskside
T = Tabletop
R = Rack Ready (X-Option "PTO" or ATO)
M = Rack Mounted (Factory configurations/CRS)

Product Model Number

3120 SCSI
3310 SCSI
3320 SCSI
3510 FC
3511 SATA

Product Revision Level

A = First Release
B = Second Release, Etc.

Product Designator

T = StorEdge (only option)

Product Placement

X = X-Option
No Character = Factory Configured/CRS

***Notes:**

1)The StorEdge 3310 does not follow the scheme above.
2)The StorEdge 3510 "Drive size/RPM" is inconsistent with the character "R" as defined above. For the 3510, the character "R" represents either 73/10Krpm or 146/10Krpm disk drives.

RAID Controller Drive, AC Power Part Numbers

Part Number	Description
250-GB 7200 rpm Disk Configurations	
XTA3511R01A0W1250	Sun StorEdge 3511 Fibre Channel array, rack ready, 1250 GB (5 x 250-GB 7200-rpm disks) with JBOD, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
XTA3511R01A0W3000	Sun StorEdge 3511 Fibre Channel array, rack ready, 3000 GB (12 x 250-GB 7200-rpm disks) with JBOD, two AC power supplies, and Sun StorEdge Configuration Service software
XTA3511R01A1W1250	Sun StorEdge 3511 Fibre Channel array, rack ready, 1250 GB (5 x 250-GB 7200-rpm disks) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
XTA3511R01A1W3000	Sun StorEdge 3511 Fibre Channel array, rack ready, 3000 GB (12 x 250-GB 7200-rpm disks) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software
XTA3511R01A2W1250	Sun StorEdge 3511 Fibre Channel array, rack ready, 1250 GB (5 x 250-GB 7200-rpm disks) with 2FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
XTA3511R02A2W3000	Sun StorEdge 3511 Fibre Channel array, rack ready, 3000 GB (12 x 250-GB 7200-rpm disks) with 2FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software
TA3511M01A0W1250	Sun StorEdge 3511 Fibre Channel array, rack mounted, 1250 GB (5 x 250-GB 7200-rpm disks) with JBOD, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
TA3511M01A0W3000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 3000 GB (12 x 250-GB 7200-rpm disks) with JBOD, two AC power supplies, and Sun StorEdge Configuration Service software

TA3511M01A1W1250	Sun StorEdge 3511 Fibre Channel array, rack mounted, 1250 GB (5 x 250-GB 7200-rpm disks) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
TA3511M01A1W3000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 3000 GB (12 x 250-GB 7200-rpm disks) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software
TA3511M01A2W1250	Sun StorEdge 3511 Fibre Channel array, rack mounted, 1250 GB (5 x 250-GB 7200-rpm disks) with 2FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
TA3511M02A2W3000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 3000 GB (12 x 250-GB 7200-rpm disks) with 2FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software

Part Number	Description
500-GB 7200 rpm Disk Configurations	
XTA3511R01A0A2500	Sun StorEdge 3511 Fibre Channel array, rack ready, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with FC-JBOD, and two AC power supplies
XTA3511R01A0A6000	Sun StorEdge 3511 Fibre Channel array, rack ready, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with FC-JBOD and two AC power supplies
XTA3511R01A1A2500	Sun StorEdge 3511 Fibre Channel array, rack ready, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
XTA3511R01A1A6000	Sun StorEdge 3511 Fibre Channel array, rack ready, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software
XTA3511R01A2A2500	Sun StorEdge 3511 Fibre Channel array, rack ready, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with 2FC RAID controllers, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
XTA3511R01A2A6000	Sun StorEdge 3511 Fibre Channel array, rack ready, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with 2FC RAID controllers, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software

TA3511M01A0A2500	Sun StorEdge 3511 Fibre Channel array, rack mounted, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with FC-JBOD and two AC power supplies.
TA3511M01A0A6000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with FC-JBOD and two AC power supplies.
TA3511M01A1A2500	Sun StorEdge 3511 Fibre Channel array, rack mounted, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
TA3511M01A1A6000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with 1FC RAID controller, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software
TA3511M01A2A2500	Sun StorEdge 3511 Fibre Channel array, rack mounted, 2500 GB (5 x 500-GB 7200-rpm SATA drives) with 2FC RAID controllers, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software (Standard Configuration)
TA3511M01A2A6000	Sun StorEdge 3511 Fibre Channel array, rack mounted, 6000 GB (12 x 500-GB 7200-rpm SATA drives) with 2FC RAID controllers, 1GB cache, two AC power supplies, and Sun StorEdge Configuration Service software

Cables

Please refer to the 3510 FC-SATA WWWW matrix for detailed information on the latest qualified cables.

For the most current information, please refer to the "SAN 4.4.X and Solaris 10 WWWW"
http://sundoc.central/SunWinPublicView.jsp?token=397802

The following is a text representation of WEBDESK's GUI order flow for the Sun StorEdge 3511 Fibre Channel array.

Section 1: Configure Primary Array (required)

STEP 1: Number of FC-AL RAID Controllers

Select 0 Expansion, 1, or 2.

STEP 2: Storage Location

Select Rack Ready or Table Top.

STEP 3: Power Type

Select AC or DC.

STEP 4: Disk Type

Select 250-GB 7200 rpm disk drive or 400-GB 7200 rpm disk drive.

STEP 5: Number of Disks per Array (total capacity)

Select any value from 5 to 12. 5-bay and 12-bay configurations come with drives factory installed.
Selecting values 6, 7, 8, 9, 10, or 11 yields extra drives shipped as X-options (field configurable).

STEP 6: Number of External FC I/O Connections

Select 1 or 2 for expansion, 1 to 4 for one RAID controller, or 1 to 8 for two RAID controllers. Each connection selected yields one FC cable. Cables are auto-inserted according to selected part number in Section 1, Step 7.

STEP 7: Preferred Cable(s)

Select one and only one of the selectable cable options found in Webdesk. Up to eight are auto-inserted by the configurator. (Quantity depends on selection in Section 1, Step 6).

STEP 1: Number of Disks per Expansion Array (total capacity)

Select any value from 5 to 12. 5-bay and 12-bay configurations come with drives factory installed. Selecting values 6, 7, 8, 9, 10, or 11 yield extra drives shipped as X-options (field configurable).

STEP 2: Connect To

If you selected "0 Expansion array" under Number FC-AL of RAID Controllers, the only selection

available is "Existing Expansion Array (Daisy Chained)."
If you selected "1" or "2" under Number FC-AL of RAID Controllers, select "RAID array (Direct)" or
"Existing Expansion Array (Daisy Chained)."

Note: Selecting "RAID array (Direct)" connects the expansion array directly to the RAID array, utilizing the on-board FC ports of this device. Selecting "Existing Expansion Array (Daisy Chained)" daisy-chains the expansion array to a device that has been connected directly to the RAID array. You may only select "Existing Expansion Array (Daisy Chained)" AFTER a direct connection to the RAID array has been configured.

STEP 3: Preferred Cable(s) for Expansion Array(s)

Select one and only one of the selectable cables found in Webdesk. One cable is added for every "Existing Expansion Array (Daisy Chained)." One cable is added for every "RAID array (Direct)" when "1" RAID controller is selected. Two are added for every "RAID array (Direct)" when "2" RAID controllers are selected.

STEP 4: Add Expansion Arrays

Press the "Add" button. This add SAN expansion array to the configuration. Currently, one expansion array may be added to a "0 Expansion array" configuration, and two may be added to a "1" or "2" RAID controller configuration.

Note: You may not change your selection in "Number of FC-AL RAID controllers" if expansion arrays exist in your configuration. You must delete all expansion arrays if you desire to modify this selection (See Step 5).

STEP 5: Delete Expansion Arrays

If you make a mistake or simply wish to modify the configuration, select an expansion array from the "Configured Expansion Arrays" table and press the "Delete" button. This deletes the array from your configuration.

STEP 1: Rackmount Kit (rack-ready arrays only)

Select any of the following.

No Rackmount kit

XTA-3000-2URK-19U(Z)	19-inch rackmount kit for 24 to 36-inch cabinets (use with Sun StorEdge expansion cabinet and Sun Fire rack)
XTA-3000-2URK-19C(Z)	19-inch rackmount kit for Telco cabinets, center mount
XTA-3000-2URK-19F(Z)	19-inch rackmount kit for Telco cabinets, front mount

Note: Rack rails are not included with any Sun StorEdge 3511 Ship Kit.

STEP 2: SFPs

Short-wave SFPs are auto-inserted when required. Long-wave SFPs are optional items.

A minimum pre-set quantity of short-wave SFPs for JBOD expansion, single RAID and dual RAID configurations are automatically included via the WEBDESK configurator. The WEBDESK configurator will add additional SFPs as need to complete the requested configuration.

The pre-set quantity of SFPs are:

- JBOD expansion unit includes two short-wave SFPs
- Single RAID controller includes four short-wave SFPs
- Dual RAID controller includes six short-wave SFPs

STEP 3: Power Cords

Two geo-specific power cords are added to each Sun StorEdge 3511 array configured.

X311L Localized power cord kit, North American/Asian
X312L Localized power cord kit, Continental European
X314L Localized power cord kit, Swiss
X317L Localized power cord kit, U.K.
X383L Localized power cord kit, Danish
X384L Localized power cord kit, Italian
X386L Localized power cord kit, Australian

STEP 4: Add Host Bus Adapter

When configuring a single server and Sun StorEdge 3511 Fibre Channel array, select a minimum of one (X)6768A for every two external FC connections required, or one (X)6767A per external FC connection required. If you do not add sufficient options to meet this requirement, WEBDESK auto-inserts the required number of (X)6767 as the default card.

When configuring "Standalone Storage," you have several choices:

1. Select "Add default HBAs." The configurator adds one X6767A for every external FC I/O connections required.
2. Select "Add custom HBAs." The configurator does not add any HBAs and you have the option of selecting any type and quantity of HBAs that you would like (this configuration is NOT validated).
3. Select "No HBAs Required." The configurator does not add any HBAs.

Note: Co-existence of a Sun StorEdge 3511 Fibre Channel array and any other storage device on the same host bus adapter is not allowed.

Warranty, Service, and Support

Warranty

The Sun StorEdge™ 3511 Fibre Channel array comes with a 2-year warranty: 1st year, second business day, on-site. 2nd year, 15-day parts exchange.

Support Contracts

The SunSpectrum℠ 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.

SunSpectrum program support contracts are available both during and after the warranty program. Customers may choose to uplift the service and support agreement to meet their business needs by purchasing a SunSpectrum contract.

The four levels of SunSpectrum support contracts are outlined below.

SunSpectrum Program Support

Program	Description
Mission-Critical SunSpectrum Platinum℠ Support	Designed to support client-server, mission critical solutions by focusing on failure prevention, rapid recovery and year round technical services planning. Support is provided 24 x 7.
Business-Critical SunSpectrum Gold℠ Support	Includes a complete package of proactive and responsive services for customers who require maximum uptime for their strategic business-critical systems. Support is provided 24 x 7.
System Coverage SunSpectrum Silver℠ Support	Combines the service expertise, responsive on-site support and technical support by telephone and SunSolve™ CD/on-line services. Support is provided 8 a.m. to 8 p.m. Mon. through Fri.
Self-Directed SunSpectrum Bronze℠ Support	Provided for customers who rely primarily upon their own in-house service capabilities. Allows customers to deliver high quality service by giving them access to UNIX® expertise, Sun certified replacement parts, software releases and technical tools. Support is provided 8 a.m. to 5 p.m. Mon. through Fri.

This service includes site preparation review, installation planning, installation, configuration verification, and system turnover for one Sun StorEdge 3511 Fibre Channel array. The specific tasks and deliverables included in this service are:

- Site preparation review including environmental states

- On-site installation planning including schedule and resources
- Development of System Installation Specification including RAID characteristics and recommendations
- Verify supported configuration and customer sign-off to start installation
- Installation of array hardware and cabling
- Installation of array software and patches
- Configuration and customization of the array including RAID levels and logical volumes
- Verification of installation and array functionality
- System turnover

Glossary

Bandwidth	A measure of the capacity of a communication channel, usually specified in MB/second.
Cache	Memory on the RAID controller card which permits intermediate storage of read and write data without physically reading/writing from/to the disk, which can increase overall performance under certain conditions.
CLI	Command line interface.
Device name	Software device address that identifies the contoller/LUN, such as cXtYdZs0, where X is the host bus adapter, Y is the contoller, and Z is the LUN. S0 slice number is used by the system, not by RAID Manager.
Disk array	Two or more drives configured as a drive group (see next).
Drive group	A physical set of drives configured as an array. Drive groups are defined during configurtion.
Expansion drive array	An enclosure containing a group of drives, power supplies, cooling fans, I/O cards, and midplanes (no RAID controller/controllers); generally, an external drive array that is used to daisy-chain to an existing hardware-based RAID 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 enable/disabled through the storage management software.
Full-duplex	Data transmission in both directions at the same time. See also Half-duplex and Simplex.

Half-duplex	Refers to an interface, such as FC, that can transmit data in only one direction at a time. See also Full-duplex and Simplex.
Host bus 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.
Hot-serviceable	The ability to remove, replace or add a device while power is still applied but all I/O processes are suspended.
Hot-spare or hot-sparing	A drive in an array that is held in reserve to replace any other drive that fails. After reconstruction, the hot-spare drive is returned to the standby status.
Hot-swap or hot-swappable	A specific case of hot-plug which involves replacing a device with another of the same size, type, and layout, without any notification to the operating environment.
IOPS	Input/output operations per second. A measure of I/O performance, this is usually used to quote random I/O performance. See throughput.
LUN	Logical unit number. A LUN is a set of physical drives in a RAID configuration which are seen by the operating system as one virtual drive.
MTBF	Mean time between failures. A measure of reliability, this is the average expected time between failures of equipment, usually measured in operating hours.
MTBDL	Mean time between data loss. In a RAID system, this is the average expected time between two rapid disk failures that would cause irreparable data loss.
MTTR	Mean time to repair. A measure of availability, this is the average time the system is out of commision to complete a repair process.
Parity	Additional information stored along with the data that allows the controller to reconstruct lost data on a RAID 3 or 5 LUNs if a single drive fails.
Reconstruction	Process used to restore a degraded RAID 1, 3, or 5 LUN to its original state after replacing a single failed drive.
RDAC	Redundant disk array controller. The RDAC driver is included in the

	RAID Manager software, and manages the rerouting of active I/O operations when a controller fails.
RAID	Redundant Array of Independent Disks. A RAID is a set of disk drives appearing as a single logical disk drive to a system host. Different RAID levels provide different capacity, performance, availability, and cost characteristics.
RAID controller drive array	An enclosure containing one or two RAID controllers, a group of drives, power supplies, cooling fans, I/O cards, and midplanes.
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.
SAF-TE	FC Accessed Fault-Tolerant Enclosures.
SCA	Single connector attachment. A FC disk connector technology co-invented by Sun Microsystems. The SCA provides all FC, power, and control signals in a single connector, and enables easy servicing and highly reliable, pluggable disk drives.
FC address	The octal representation of the unique address (0–7) assigned to a narrow device: or hex representation of the unique addresss (0-15) assigned to a wide FC device.
Simplex	Transmission in one preassigned direction only. See also Full-duplex and Half-duplex.
SNMP	Simple network management protocol. SNMP enables RAID events to be remotely monitored by designated network management stations.
Split channel	Inside the same drive array enclosure, when the drive channel is evenly divided into two separate channels; for example, when a 12-drive channel is cleaved into two independent channels.
Striping	Spreading, or interleaving, logically contiguous blocks of data across multiple independent disk spindles. The amount of data written on each disk before moving to the next drive is the stripe width.
Throughput	A measure of sequential I/O performance, quoted in MB/sec. See IOPS.
Volume	In VERITAS Volume Manager software, a volume is a virtual disk partition into which a file systems, DBMS, or other application can place date. A volume can physically be a single disk partition or multiple disk partitions.

	on one or more physical disk drives. Applications that use volumes do not need to be aware of their underlying physical structure. The VERITAS Volume Manager software handles mapping of virtual partition address to physical addresses.
Warm plug	The ability to remove, replace or add a device while power is still applied but all I/O processes are suspended.
XOR	Exclusive OR. A binary mathematical operation performed on data to produce parity information. In RAID levels 3 and 5, parity is generated from the user data, stored and used to regenerate lost data if a drive failure occurs.

Materials Abstract

Collateral	Description	Purpose	Distribution	Token #
Product Literature ▪ Sun StorEdge™ 3511 Product Introduction	Customer Presentation	Sales Tool	SunWIN,	408132
▪ Sun StorEdge™ 3511 Fibre Channel Arrays, Just the Facts	Reference Guide (this document)	Sales Tool	SunWIN, Reseller Web	407094
▪ Sun StorEdge 3500 Technical Overview Paper	3510 and 3511 Technical differences	Sales Tool	SunWIN, First Resort, Reseller Web	407095
▪ Sun StorEdge 3511 Fibre Channel Array, Data Sheet	Two-page Color Data Sheet	Sales Tool	SunWIN, Reseller Web	407084
▪ Sun StorEdge 3511 Fibre Channel Array, WWWW	What Works With What matrix	Sales Tool	SunWIN, Reseller Web	407093
▪ Sun StorEdge 3511 Fibre Channel Array, Beat Sheets	3511 Competitive Information	Sales Tool	SunWIN, Reseller Web	407648
▪ Sun StorEdge 3511 Array Pocket Facts	Quick Reference Card	Sales Tool	SunWIN, First	
▪ Sun StorEdge Product Overview Quick Reference Card	Sun Product Quick Reference Card	Sales Tool	SunWIN, First Resort, Reseller Web	
External Web Sites : ▪ Sun StorEdge Array Information Site ▪Additional Information ▪Upgrades Information	http://www.sun.com/storage/ http://www.sun.com/products_n_solutions/hardware/docs http://www.sun.com/ibb			

Internal Web Sites	
Sun StorEdge 3511 FC Array WWWW	http://webhome.ebay/networkstorage/sales/matrix.html
One Stop for the 3511 FC Array	http://onestop/storage/3511.shtml?menu
[redacted]SSA Sun Center – SE Handbook	Http://xmen.east/