

Sun StorEdge™ L5500 Tape Library

Just the Facts



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Positioning



Figure 1. Sun StorEdge™ L5500 tape library

Introduction

The growing complexity of heterogeneous distributed systems and the extremely rapid growth of enterprise-wide requirements to store and protect exploding amounts of mission-critical information are causing considerable interest in datacenter-class solutions for backing up, restoring, and archiving data. One of the significant trends in enterprise storage is data consolidation. For tape, this means having a single large automated tape library to handle backups among multiple servers. The advantages of consolidation are:

- Reduced capital expenses on the library itself — A large library has a lower cost per cartridge slot, translating into a lower cost per TB than multiple small libraries.
- Reduced capital expenses on tape drives — Tape drives within a large library can be shared across multiple servers, so the customer does not have to buy as many drives as would be required for dedicated small libraries.
- Reduced management expenses — A single large library is much easier to manage than multiple small libraries. Replacing multiple "islands of automation" with a single large library avoids the management headaches of balancing capacity across libraries.
- Reduced footprint — Large libraries are much more efficient in their use of floor space than multiple small libraries.



General Description

The Sun StorEdge™ L5500 library is a high-end, datacenter-class, automated data storage and retrieval tape library. The Sun StorEdge L5500 library was designed to support extremely demanding tape applications. This library consists of the following major components, as provided by StorageTek:

- The library storage module (LSM) is a 12-sided structure containing a free-standing, vision-assisted robot, and storage for up to 5,500 cartridges. From one to four drive cabinets containing up to twenty LTO drives or seventeen 9840A and B drives can be attached to the exterior of the LSM, allowing the robot to insert cartridges into the tape drives. Up to 24 LSMs can be interconnected. Cartridges can be passed from one LSM to another through a pass-thru port in the walls of adjacent LSMs. This allows for a cartridge located in one LSM to be routed to the destination drive which may be located on another LSM. Each LSM has a door in the outer wall for human access to the interior. The access door contains two cartridge access ports (CAP) and a priority cartridge access port (PCAP).
- The library management unit (LMU) is the interface between the controlling software and the library control unit (LCU). A single LMU manages from 1 to 24 LSMs. When a mount request is received, the LMU sends commands to the LCU attached to the correct LSM.
- A library control unit (LCU) is attached to each LSM. When an LCU receives a request from the LMU, the LCU microprocessor commands the LSM robot to do the following:
 - Move to the location of the cartridge
 - Make sure that the cartridge is correct by reading the VOLSER label
 - Retrieve the cartridge from the cell location
 - Move the cartridge to the specified destination cell
 - Place the cartridge into the transport, pass-thru port (PTP), cartridge access port (CAP), or priority cartridge access port (PCAP)
- A cabinet which is capable of containing up to 20 tape drives which attaches to the outside of the LSM.
- A server on which the ACSLS software runs on.

The library robotic controller features an independent, serial interface requiring a supplier (StorageTek) proprietary robotic interface control software package (ACSLs). The ACSLS package is able to communicate with and is only supported with VERITAS NetBackup and Solstice Backup™ software.

ACSLs Software

Automated Cartridge System Library Software (ACSLs) is StorageTek's server software that controls a StorageTek Automated Cartridge System (ACS). ACSLS software accesses and manages information stored in the ACS through command processing across a network. The software includes a system administration component, interfaces to client system applications, and library management facilities.

Sun does not sell ACSLS software. However, it is required for the Sun StorEdge L5500 library. For any Sun StorEdge L5500 library sale, ACSLS must be purchased through Sun PS or directly through StorageTek at 800.786.7835.

General Drive Description

The Sun StorEdge L5500 tape library with starts at 1500 cartridges and provides up to 550 TB of native storage capacity. As the highest capacity tape library currently offered by Sun, the Sun StorEdge L5500



tape library effectively addresses growing data volumes as well customer concerns about the accessibility and integrity of business-critical data.

9840, 9840B, and LTO are complementary tape drives that are designed to co-exist in the same Sun StorEdge L5500 tape library. The 9840 is designed for super fast access times (about 12 seconds to first byte instead of a minute or more) and the LTO is designed for high capacity (100 GB native per cartridge vs. 20 GB) and low media cost (\$/GB). A summary of these technologies in the Sun StorEdge L5500 tape library is shown in the following table.

Feature	Sun StorEdge L5500 Tape Library Configured Drives		
	9840	9840B	LTO
Maximum Number of Drives	80 per LSM 816 per ACS	80 per LSM 816 per ACS	80 per LSM 960 per ACS
Maximum Native Throughput	10 MB/sec. per drive 2.9 TB/hour per LSM 34.6 TB/hour per ACS	19 MB/sec. per drive 5.5 TB/hour per LSM 65 TB/hour per ACS	15 MB/sec. per drive 4.3 TB/hour per LSM 51.9 TB/hour per ACS
Maximum Number of Data Cartridge Slots	2000 to 3500 per LSM 84,000 per ACS	2000 to 3500 per LSM 84,000 per ACS	1500 to 5500 per LSM 132,000 per ACS
Maximum Native Capacity	120 TB per LSM 2880 TB per ACS	120 TB per LSM 2880 TB per ACS	550 TB per LSM 13.2 PB per ACS
<p>Note: Theoretically, the 9840B tape drive has a maximum native throughput of 19 MB/sec. Sun is typically experiencing 18 to 19 MB/sec. transfer rates. Likewise, the LTO has a theoretical maximum of 16 MB/sec. with Sun achieving typical transfer rates of 15 MB/sec.</p>			

Note: This table assumes that the library is partially populated with 9840/9840B technology or fully populated with LTO technology (drives and cartridges). The drive types can be mixed in the same library in two separate combinations. Mixing drives in the same library allows customers to use the optimum technology for each application and is an excellent differentiator.

Storage Management Systems

Today, tape libraries are sold as a collection of tapes organized to perform backup and archival tasks. With increasing numbers of tape libraries and a higher demand for backup and archival solutions in mission-critical environments, automated tape backup solutions have a number of requirements:

- **Quicker access to data:** In today's competitive marketplace, it is essential that customers and businesses access backed up data more quickly.
- **Reliability:** Accurate storage and retrieval of data that has been backed up and archived.
- **System availability:** Many organizations run 24 hours a day, 7 days a week. In these environments, it is imperative for data that has been backed up to be available on demand.
- **Management of large amounts of data:** Users are generating more data than ever before. Organizations need a method for organizing data (through activity) such that data reliability is maintained.
- **Simplified administration:** Monitoring a large number of tapes can be daunting and challenging. System administrators require simplified administration when backing up their data to free up time for more important tasks.



- **Integration:** Hardware and software must fit seamlessly into existing customer server and client environments.

Choosing a Storage Solution

There are many factors to consider in choosing a storage solution, beginning with an evaluation of the computing environment.

- **Access time:** Access time affects how quickly customers and employees can access backed up information and data.
- **Performance:** Performance is the speed of transfer of data to the backup system and how fast data backups can be completed. System and media performance must be compatible.
- **Capacity:** Capacity is the amount of data that can be stored. Compression algorithms, which increase media capacity and data transfer rate, are available for several technologies.
- **Economics:** The economics of a storage solutions are measured in the cost per unit of storage in gigabytes, the cost and time it takes to transfer data (cost per hour per GB or TB), and the capital cost for equipment, hardware, or software.
- **Availability of robotic mechanisms:** Robotic mechanisms that can handle multiple cartridges increase storage capacity and offer unattended operations.
- **Media stability:** Storage media stability determines the length of time data is readable from stored files.
- **Standards:** Standard form factors and formats help ensure backward compatibility between older files and current drives.

Key Messages

- **Key component of a complete tape backup solution:** Combined with Sun Enterprise™ and Sun Fire™ servers and software (like VERITAS NetBackup and Solstice Backup software), the Sun StorEdge L5500 tape library comprises an essential part of a complete tape backup solution for datacenter environments.
- **Quick access time:** 9840B technology used in the Sun StorEdge L5500 tape library changes the rules of archiving by allowing fast information retrieval. The typical access time to first byte is about 16 seconds. This is especially advantageous for hierarchical storage management (HSM) applications.
- **Largest capacity tape library that Sun offers:** With LTO technology, each library storage module (LSM) has a maximum native capacity of 550 TB. Up to 24 LSMs can be connected and managed as a single library using Automated Cartridge System Library Software (ACSL), providing a maximum native capacity of 13.2 PB.
- **Investment protection:** Sun offers this library with the latest 9840B and LTO technologies available in the marketplace, thus supporting customers' investments in either of these technologies.
- **Heavy-duty tape library for enterprise applications in mission-critical environments:** At the high-end of Sun's tape library line, the Sun StorEdge L5500 tape library allows customers to backup 5.5 TB per hour (using the 9840B tape drive) for each library storage module. In a maximum configuration of 24 LSMs and 960 9840B drives, the maximum native throughput is 65.7 TB per hour.
- **High performance, reliability, and availability:** Proven as the industry standard for enterprise tape, the Sun StorEdge L5500 tape library has scalable performance. Each library storage module (LSM) has its own pair of redundant robotic hands so that performance is increased as the customer's capacity



is increased. Competitors use a single robot that is forced to service more and more cartridges as capacity is added, providing less and less performance as the customer actually needs more performance. The Sun StorEdge L5500 tape library has options for redundant management units and redundant AC power input.

- **Outstanding quality:** Sun has an extremely rigorous qualification testing and design collaboration process.
- **Easy manageability:** The ACSLS software allows the Sun StorEdge L5500 tape library to be shared nearly seamlessly in heterogeneous environments. In addition to allowing different kinds of servers to share the library, the software also allows different backup software to run simultaneously. This is a key customer benefit of the Sun StorEdge L5500 tape library in supporting data consolidation since the customer does not have to force each server to run the same backup software to migrate to a consolidated library architecture.
- **One-stop shopping:** In addition to hardware and software, the Sun StorEdge L5500 library is part of a complete family of tape automation from Sun. Customers have one point of contact for all of the tape needs.

Note: StorageTek must be notified if a sales rep plans to sell a Sun StorEdge L5500 tape library, as the installation and services are provide by StorageTek personnel.

Product Availability

The Sun StorEdge L5500 tape library is currently available.

This library is initially available **only** with the 9840, 9840B, and LTO drives. 9940 drive technology is scheduled for a subsequent release later in 2002. Sun expects to release 9940 media in conjunction with the 9940 drive.

Note that StorageTek provides installation and service for the Sun StorEdge L5500 library. For information on selling, installing, and servicing this library, contact a Sun Services representative.

ACSLs software is required for the Sun StorEdge L5500 library and is available through Sun PS or directly through StorageTek at 800.786.7835.

Target Users

- **Large datacenters:** The high density and ability to scale to very large configurations coupled with a choice of 9840 and/or LTO drives makes the Sun StorEdge L5500 library an ideal solution for customers who need to accommodate explosive growth while minimizing total cost of ownership. These customers also require a proven, reliable storage solution to support 24x7 availability. The Sun StorEdge L5500 tape library is an industry standard for true enterprise-class storage.
- **Telco, banking, medical, and insurance:** High reliability and ability to support heterogeneous servers and backup software enables the Sun StorEdge L5500 tape library to provide an excellent library for storage consolidation, which results in a lower purchase price, a smaller footprint, and requires less management than multiple, distributed, small libraries. The fast access times of the 9840 when used with the Sun StorEdge L5500 tape library provide an excellent storage solution for medical imaging.
- **High-performance computing:** Enterprise-class storage with quick restore times and outstanding availability makes the Sun StorEdge L5500 tape library the library of choice for high-performance computing environments. The scientific community and other research and development applications often generate tremendous amounts of information that is much less expensive to store on fast tape, provided by the Sun StorEdge L5500 tape library with the 9840, than on disk.



- **Government and education:** Ability to secure the latest enterprise-class technology at a departmental price.

Target Markets

Industry/Customer	Key Features to Highlight
High-Performance Computing	One of the fastest tape solutions available, excellent density designed to minimize floor-space requirements
Banking, Medical, Finance, and Insurance	Cost competitive entry point to mission-critical back-up solutions, also ideal for check, medical, and document imaging with LTO tape drives
Retail and Distribution	Large database back-up capabilities
Oil and Gas	Remote site backups and high capacity of the Sun StorEdge L5500 tape library with 9840 and LTO tape drives
Government and Military	Remote site backups, as well as departmental price into an enterprise class product for mission-critical applications

Product Family Placement

Because the optimal choice of a secondary storage system depends on customer requirements and sensitivities, Sun offers a family of solutions to help customers make the best choice for their specific requirements and sensitivities. Sun's tape library offerings include the following (note that all capacities listed are native):

- Sun StorEdge L9 tape autoloader (360-GB DLT1 or DLT8000, 900-GB LTO)
- Sun StorEdge L20/40/60 tape library (800-GB to 2.4-TB DLT8000, 2-TB to 6-TB LTO)
- Sun StorEdge L180 tape library (3.48-TB T9840B to 6.96-TB DLT8000 library, or multimedia)
- Sun StorEdge L700 tape library (13.8-TB T9840B library, 27.6-TB DLT8000 library, or 67.8-TB LTO library)
- Sun StorEdge L6000 tape library (120 TB/LSM, 2880 TB/ACS 9840B to 360 TB/LSM, 8640 TB/ACS 9940A library, or multimedia)
- Sun StorEdge L5500 tape library (550 TB/LSM, 13.2 PB/ACS with LTO)

Internationalization and Localization

The documentation provided with the Sun StorEdge L5500 tape library is scheduled to be localized into the following five languages in Q3FY03: French, Japanese, Korean, Simplified Chinese, and Traditional Chinese. The operator panel is in English only.

Installation

There is an installation fee for the Sun StorEdge L5500 tape library. Furthermore, a site survey and several checklists need to be completed, reviewed, and approved a MINIMUM of 21 days prior to delivery of the unit to the customer's site. Information regarding this entire process can be found at <http://gsops.central/sdeskproc/OSP/p2>



Installation is not included with Sun StorEdge L5500 tape library part numbers, but is required for purchase. Part numbers for installation services are listed in the Ordering Information section of this document.



Selling Highlights

Typical Applications

- Backup for active-use databases of 28 TB of disk or more

To allow capacity for multiple backups of data (daily, weekly, and monthly), tape capacity should be configured for three to five times the capacity of on-line storage. The Sun StorEdge™ L5500 tape library should be considered for applications that exceed or expect to grow beyond the capacity of two Sun StorEdge L700 libraries, which is about 140 TB native (LTO). Thus, dividing by 5 yields 28 TB as a rough minimum. Note that since the Sun StorEdge L5500 tape library is designed to support storage consolidation across multiple servers, the 28-TB threshold is the sum of all the server disk storage that the customer needs to backup.

- Archival

With LTO media, the Sun StorEdge L5500 library holds up to 550 TB of data per silo and up to 24 silos can be mated together. This makes the Sun StorEdge L5500 library the highest capacity tape libraries on the market and well suited for archiving data.

- Quick information retrieval, such as medical, check, and document imaging

The 9840 and 9840B tape drives within the Sun StorEdge L5500 library allow for fast access to the first byte and frees the library to service other mount/dismount requests. For industries where quick information is important, with the 9840 and 9840B, time to data can be as little as 12 seconds.

Software Compatibility

The Sun StorEdge L5500 tape library is supported by most of the leading storage management software applications including:

- VERITAS NetBackup DataCenter
- Solstice Backup™ software

Third-Party Software Support

For information on the third-party application software supported by the Sun StorEdge L5500 library, consult the following web site:

<http://webhome.ebay/networkstorage/products>

Ease of Management with ACSLS Software

The Sun StorEdge L5500 library is controlled by Automated Cartridge System Library Software (ACSLs), which provides the application program interface to the backup software listed above. ACSLS automatically manages the database of cartridges and their locations in the automated cartridge system, handling the movement of cartridges to drives and vice versa. One of the customer benefits of ACSLS is that as a Sun StorEdge L5500 tape library grows beyond a single library storage module, it appears to the user as a single, integrated library. Furthermore, ACSLS allows servers from a variety of vendors, running different backup software programs, to all share a single Sun StorEdge L5500 tape library simultaneously.



Note: *Sun does not sell ACSLS software. However, it is required for the Sun StorEdge L5500 library. For any Sun StorEdge L5500 library sale, ACSLS must be purchased through Sun PS or directly through StorageTek at 800.786.7835.*



Enabling Technology

The Sun StorEdge™ L5500 tape library includes a number of features that makes it especially well-suited to datacenter environments. They include:

- 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, or 5500 slot capacity per library storage module (LSM), and pass-thru capability to grow to 24 LSMs (132,000 maximum slots) in a single automated cartridge system (ACS) to accommodate explosive data growth rates and support storage consolidation
- 9840B tape technology helps decrease access times and increase data transfer rates
- LTO tape technology to provide high capacity and low cost per GB storage
- Simultaneous support of 9840, 9840B, and LTO drives in the same library, allowing customer to select the optimum tape drive technology for each application
- Up to 80 drives per LSM, 960 drives per automated cartridge system (ACS) to provide extremely high throughput capability
- Tapes drives (and their data cartridges) can be shared by multiple hosts seamlessly via Automated Cartridge System Library Software (ACSL)S)
- Redundant robotic hands to provide high availability and reliability
- An optional TCP/IP interface between the library and the ACSLS server to provide more convenient connectivity is available from Sun PS or StorageTek

Highly Reliable Robotic Technology

The Sun StorEdge L5500 tape library uses advanced rotational robotics, which employ a rotational mechanism for horizontal positioning. The unit needs no adjustments or lubrication, and is designed for a cycle life of over 1 million cycles. The rotational robotics provide superior density and extremely fast access.

Notes: *If the controller fails, the library is considered nonfunctional. Since the robotics controller communicates with the robot and all functional controls and calibration values are held on that board, the library is "dead" to the outside world (even in a manual mode) if a failure occurs. Customers can purchase redundant controllers that automatically switch-over should one fail.*

9840 Tape Technology Overview

The 9840 tape drive is a high-performance tape drive designed for the enterprise and multiplatform environments. Performance characteristics of the drive are shown in the table below.

Feature	Specification
Tape load and initialize to ready	5 seconds
Search time	8 seconds (first search) and 11 seconds (average)
Maximum rewind time	16 seconds
Data buffer size	8 MB/drive
Maximum block size	256 KB



The 9840 tape cartridge is a 0.5-inch cartridge and includes both the supply and takeup reels. This design allows for 5 second load and 11 seconds average access time. When inserted in the drive, the cartridge and tape are pressed against the read/write path in the drive, and the drive servo mechanisms engage the supply and takeup reels in the cartridge. Each cartridge weighs 262 grams or 9.17 ounces. The media itself is based on advanced media particle technology with polyethylene naphthalate (PEN) substrate. Native capacity of each cartridge is 20 GB and archival life is estimated at 15 to 30 years.

The 9840 was designed to work in automated environments and specifically targets environments needing fast cartridge loads (that is, fast cartridge hand-offs from the library gripper to the drive). This allows for fast access to the first byte and frees the library to service other mount/dismount requests. With a load time of five seconds, the 9840 significantly outperforms any other tape drive. The following table lists the rates for several characteristics of the 9840 drive.

Feature	Specification
Data transfer rate (uncompressed)	10 MB/second
Load time	5 seconds
Unload time (includes rewind)	4 seconds
Average search time (excluding load)	8 seconds
Average rewind time	8 seconds
Time to backup 100 MB	21 seconds
Time to locate (load and search)	12 seconds

9840B Tape Technology Overview

The 9840B tape drive is a high-performance tape drive designed for open systems and mainframe environments. Performance characteristics of the drive are shown in the table below.

Feature	Specification
Tape load to Beginning of Tape (BOT)	3.5 seconds
Search time	8 seconds (first search)
Maximum rewind time	15 seconds
Data buffer size	8 MB/drive
Maximum block size	256 KB

The 9840B tape cartridge is a half-inch cartridge and includes both the supply and take-up reels. This design allows for 5 second load and 11 seconds average access time. When inserted in the drive, the cartridge and tape are pressed against the read/write path in the drive, and the drive servo mechanisms engage the supply and take-up reels in the cartridge. Each cartridge weighs 262 grams or 9.17 ounces. The media itself is based on advanced media particle technology with polyethylene naphthalate (PEN) substrate. Native capacity of each cartridge is 20 GB and archival life is estimated at 15 to 30 years.

The 9840B was designed to work in automated environments and specifically targets environments needing fast cartridge loads (that is, fast cartridge hand-offs from the library gripper to the drive). This allows for fast access to the first byte and frees the library to service other mount/dismount requests. With a load time of 5 seconds, the 9840B significantly outperforms any other tape drive. The following table lists the rates for several characteristics of the 9840B drive.



Feature	Specification
Data transfer rate (uncompressed)	19 MB/second
Transfer rate peak — FC-AL	100 MB/second
Transfer rate peak — parallel SCSI	40 MB/second
Unload time from BOT	15 seconds
Average access time (random file from insertion to ready)	16.5 seconds

LTO Technology Overview

LTO technology was created through the joint efforts of Seagate, IBM, and HP to address specific customer requirements in the high-capacity, high-performance segment of the tape marketplace. Based on 0.5-inch linear recording technology, the Ultrium format offers users a clear choice in high-capacity, high-performance tape solutions by delivering on the promises of a credible four-generation roadmap, an open format approach to the market, and solutions designed to meet data protection requirements both today and into the foreseeable future.

The Ultrium format has enjoyed broad early adoption for a number of reasons including:

1. This is the only open format in midrange tape market; multiple manufacturers produce technologically independent products that are tested rigorously to help ensure data interchange between the mechanisms
2. Broad support from automation and system OEM manufacturers
3. A proven ability to meet the growing demands placed on backup technology from both a capacity and performance standpoint

Some of the primary advantages of the Ultrium format include:

- Compared to other formats, the Ultrium format is the fastest available, with a format potential data rate of up to 40 GB compressed and an actual product data rate of 30 to 32 MB per second.
- Compared to DLT, SDLT, AIT, and Mammoth, the Ultrium format is the only format that is a true open format, bringing all the associated benefits to the reseller and user.
- Compared to SDLT, the Ultrium format provides a much lower logical adoption risk as the enabling technologies of the Ultrium format are evolutionary (or field proven) in nature while SDLT technology are revolutionary (new and unproven).
- The Ultrium format is backed and supported by Seagate, IBM, and HP as well as the major media manufacturers. No other format offers such broad support.

For more detailed technical information on the Ultrium format of LTO technology, visit the LTO Program web site at <http://www.lto-technology.com>.

Vision System

The Sun StorEdge L5500 tape library uses a vision system for cartridge management, adaptive targeting, and self-calibration. Due to this advanced capability, there is no scheduled manual calibration or other maintenance of the Sun StorEdge L5500 tape library. In addition, this system not only reads regular bar code labels, but also marginal bar code labels that scanning systems have difficulty reading. Another



function of the vision system is the ability to read multiple types of bar codes including the traditional StorageTek Tri-Optic bar code labels, CompacTape IV, and 9840 Tri-Optic labels.

Cartridge Access Port (CAP)

The Sun StorEdge L5500 library is sold with an 80-cartridge access port (CAP) that includes removable magazines. A priority cap (PCAP) allows for quick insertion of a cartridge.

The cartridge access port can be controlled via either software or the front panel. If using backup software, it is recommended that the software be used to transfer cartridges from the bins to the cartridge access ports (and vice versa), as this keeps the inventory correct within both the software and the hardware. In the offline mode, the CAPs can be accessed via the front panel.

Removable Magazines

The removable magazines boast a patented easy-loading feature that enables them to swing out for loading and unloading, or lift out for remote storage or vaulting.

Gripper Mechanism

The Sun StorEdge L5500 tape library's gripper mechanism enhances cartridge stability and enables faster moves. The gripper and cartridge slot design allow efficient handling of both 9840 and LTO cartridges. In addition, the advanced cartridge-cell design provides pinpoint cartridge location resulting in simpler mechanics. That means that the gripper mechanism need not reposition the cartridge, thus allowing faster, more accurate, and reliable movements.

ACSL software maintains a database of cartridges and their locations to help minimize the need for library audits.

Operator Panel

The operator panel contains buttons, indicators, and a graphic display. The panel shows cartridge access port information, tape library status, error and event information, and more.

Architectural Design

The major external components of the Sun StorEdge L5500 tape library are listed below.

- Library storage module (LSM)
- Door, including cartridge access port (CAP) and priority cap (PCAP)
- Operator panel
- Library control unit (LCU)
- Drive cabinet
- Library management unit (LMU)



Reliability, Availability, and Serviceability (RAS)

Reliability

The Sun StorEdge™ L5500 library robotics are designed, built, and tested for extreme durability.

Mean Time Between Failures (MTBF)

The overall composite MTBF, or mean failure interval (MFI), specification for the library robotics (i.e., not including drives) at various duty cycles is 33,336 hours (full operation). Full operation is defined as a typical customer environment. This equation assumes 450 exchanges per day.

The MTBF for the supported drives is 110,000 hours, both for the 9840 parallel SCSI and 9840 FC-AL drives.

Mean Exchanges Between Failures (MEBF)

MEBF measures the number of robotic exchanges between each failure, to move cartridges from one slot to another or from a slot to a drive. An exchange is two gets and two puts (so four robotic movements, not one get and one put).

The mean exchanges between failures (MEBF) for the Sun StorEdge L5500 library is 2,000,000 exchanges.

Maintainability

The mean time to repair (MTTR) is the average time taken by a trained service person to diagnose and repair a unit malfunction.

MTTR for the Sun StorEdge L5500 library is 60 minutes or less.

Head and Tape Path Cleaning

Drive cleaning is via automatic, library, or software initiation. Use only authorized Type STK1U cleaning cartridges to clean 9840 tape drives.

Availability

The Sun StorEdge L5500 library offers high availability through several functional characteristics.

Tape Drives and Trays

The tape drives and power supplies reside in the external drive frame, the 9741E, making drive replacement easy. One to twenty drives can be placed in each 9741E drive frame.

Optional Library Management Units

The Sun StorEdge L5500 tape library features optional library management units. Normally one is active and the other is a hot backup. Should the active library management unit fail, the other automatically takes control without interrupting service.



Maintenance

The Sun StorEdge L5500 tape library requires no periodic maintenance. No lubrication or belt re-tensioning are required.

Vision System

Self-calibration of the Sun StorEdge L5500 tape library's patented vision system allows it to adapt to any mechanical parameters that change over time. It makes a more robust, reliable library that performs dependably over the long run with minimal user intervention.

9840 and LTO Media

The 9840 and LTO media does not require re-tensioning, which means that the cartridge does not periodically have to be loaded into a drive and the media re-tensioned. The benefit is that the data and all drives are continuously available. No drives need to be dedicated to maintenance functions. In addition, the 9840 and LTO media can be stored flat or on edge without media distortion or loss of data.

Serviceability

Service Access Requirements

The Sun StorEdge L5500 tape library has a full-size door that provides access to the interior, including the cartridges. There are also service access requirements for the drive frame and other components of the Sun StorEdge L5500 library. The service access requirements are detailed in the installation guide and highlight the need for a site survey to be completed prior to shipment of the Sun StorEdge L5500 library.

Service clearance requirements once installed are as follows:

- Front: 81 cm (32 inches)
- Rear: 81 cm (32 inches)



Specifications

Feature	Specifications
Functional Data	
Number of cartridge slots	1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000, or 5500 per library storage module (LSM). Up to 132,000 cartridges (24 LSMs) per library under ACSLS control
Number of tape drives/types	<ul style="list-style-type: none"> • One to four drive cabinets per LSM (standalone) • One to two drive cabinets per LSM in a dense pack configuration • One to twenty LTO drives per cabinet, or one to seventeen 9840A and B drives per cabinet or in any combination.
Capacity and Performance	
Capacity, native (uncompressed) (maximum configurations)	<p>Single LSM:</p> <ul style="list-style-type: none"> • 9840 (20 GB/cart.) — 120 TB • 9840B (20 GB/cart.) — 120 TB • LTO (100 GB/cart.) — 550 TB <p>24 LSMs:</p> <ul style="list-style-type: none"> • 9840 (20 GB/cart.) — 2880 TB • 9840B (20 GB/cart.) — 2880 TB • LTO (100 GB/cart.) — 13.2 PB
Throughput per hour, native (uncompressed) (maximum configurations)	<p>Single LSM:</p> <ul style="list-style-type: none"> • 9840 (10 MB/sec.) — 680 MB/sec. or 2.448 TB/hr (68 drives) • 9840B (19 MB/sec.) — 1.2 GB/sec. or 4.651 TB/hr (68 drives) • LTO (15 MB/sec.) — 1.2 GB/sec. or 4.3 TB/hr <p>24 LSMs:</p> <ul style="list-style-type: none"> • 9840 (10 MB/sec.) — 29.3 TB/hr (48 cabinets x 17 drives = 816 drives) • 9840B (19 MB/sec.) — 55.8 TB/hr (48 cabinets x 17 drives = 816 drives) • LTO (15 MB/sec.) — 51.8 TB/hr (48 cabinets x 20 drives = 960 drives)
Library Features	
Exchanges per hour	300 EPH base
Average cell to drive time	4 sec. in all configurations (1500 to 144,000 slots)
Media management	Adaptive Media Technology provides nonpartitioned full, mixed-media capabilities; any cartridge can be placed in any cell
Robotics control interfaces	TCP/IP (IEEE 802.3, 10BASE-T, half-duplex) RS423
Digital vision system	Digital vision system performs continuous calibration and reads bar codes
Continuous automation calibration	No periodic maintenance or alignment required
AutoClean	Library or software-initiated tape drive cleaning uses dedicated cleaning cartridge slot
Cartridge access port (CAP)	80-cartridge capacity
Pass-thru port (PTP)	Up to four PTPs per library storage module



Feature	Specifications
Operator panel	User-friendly configuration, diagnostic controls and status display Large viewing window (optional)
Automatic self discovery	Self-configuring for cells, drives and CAP
Nondisruptive serviceability	Redundant robotic hands Redundant AC input (optional) Redundant library management units (optional)
Maintenance	No periodic maintenance required
Physical Data	
Dimensions (W x H x D) • Library storage module • Library control unit • Library management unit	128 in. diameter across flats of walls x 92.5 in. high (325 x 234.9 cm) 15.6 x 63.5 x 22.5 in. (39.7 x 161.3 x 57.2 cm) 29 x 37 x 23 in. (74 x 94 x 58 cm)
Weight • Library storage module • Library control unit • Library management unit	5200 lb. (249 kg) unloaded 300 lb. (136 kg) 250 lb. (113 kg)
Environmental Data	
Temperature • Operating • Nonoperating	+60 to +90° F (+16 to +32° C) +40 to +90° F (+4.4 to +32° C)
Humidity • Operating • Nonoperating	20 to 80% 10 to 95%
Power Source	
Power input	220/240VAC @ 50/60 Hz single phase
Power consumption/dissipation (operating maximum continuous — not peak) • Library storage module and library control unit • Library management unit	8.4A @ 180VAC, 1.512 kW, 5161 BTU/hr 4A @ 180VAC, 0.72 kW, 2458 BTU/hr
Drives	Drive power consumption varies; refer to individual drive specification sheets
Agency Certifications	
Safety	CSA standard CAN/CSA-C22.2, no. 950-95 UL Listed to UL 1950 GS licensed to EN 60950
Emissions	FCC #47, Part 15, Subpart B, Class A VCCI Class A European Union CE EN55022 Class A, EN50082-1, EN55024, EN61000-3-2, EN61000-3-3 AS/NZS 3548:1996 (Australia, N.Z.) ICES-003 (Canada)
Immunity	European Union CE immunity standards



Requirements and Configuration

The system requirements for the Sun StorEdge™ L6000 library are provided below.

Operating Environment Support

- SCSI: Solaris™ 2.6, 7, or 8 Operating Environment or later
- Fibre Channel: Solaris 8 Update 4 (04/01) Operating Environment or later
- Minimum 64-MB RAM (128 MB or more recommended, especially in applications exceeding 120 tape mounts per hour)

Sun Hardware

The Sun StorEdge L5500 tape library supports the following Sun™ hardware:

- Sun Enterprise™ 220R, 250, 420R, 450, 3500–6500, and 10000 servers
- Sun Fire™ 280R, V880, 3800, 4800, 4810, 6800, 12000, and 15000 servers

Other Sun hardware is not recommended due to Sun StorEdge L5500 tape library performance demands. Refer to the section "Maximum Connect for Drive Technologies by Platform," below, for additional system support information.

Host Adapters and SCSI Configurations

- SBus Ultra differential fast/wide intelligent SCSI (UDWIS) host adapter (X1065A)
- Dual-channel differential UltraSCSI host adapter (X6541A)
- cPCI dual channel differential host adapter (Sun Fire 3800, 4800, 4810, 6800 servers) (X6749A)

The X6541A and X6749A are dual-port, ultra fast/wide host adapter. "Dual port" means that the host adapter can independently communicate via two SCSI buses.

The Sun StorEdge L5500 tape library is not supported on any on-board host adapter. A minimum of one differential host adapter is required.

Host Adapters and Fibre Channel Configurations

- SBus dual channel Fibre Channel host adapter (X6757A)
- PCI single channel Fibre Channel host adapter (X6799A)
- PCI dual Fibre Channel host bus adapter (X6727A)
- cPCI dual Fibre Channel host bus adapter (X6748A)

Switches/GBICs

- Sun StorEdge network FC switch 8-port (X6746A)
- Sun StorEdge network FC switch 16-port (SG-XSW16-32P)



- Shortwave FC-AL GBIC module (X6731A)
- Longwave GBIC module (6737A)

Notes: There is no space inside the Sun StorEdge L5500 library for the mounting of switches.

Sun Fibre Channel Tape configurations are NOT supported in direct connect solutions and are only supported in switched Sun SAN environments.

FC-Tape Configuration Guidelines

- Compliant with FC-Tape configuration rules for Sun StorEdge network FC switch-16
- Switch zoned to allow for up to four initiators (hosts) per loop
- Maximum three 9840FC, 9840BFC, or LTO FC drives per loop (zone)
- Non-tape and or non-library devices not allowed on same loop
- Tape products not supported in direct connect environment, support is only in switched Sun SAN configurations.
- 1 Gb/sec. capable interface
- Class 3
- 50 um (micrometer) multi-mode optical (no GBICs on drive)
- SC-type duplex connector
- FCP-2 error recovery enabled in Sun SAN configuration
- Assume GBIC quantities for switches will be calculated based on customer target (drive/library) and initiator (host) requirements.

Maximum Connect for Drive Technologies by Platform

The table below lists the maximum connect for drive technologies by platform. Note that these figures assume the maximum speed processors for each system listed.

Platform	HvD SCSI HBA Support	FC HBA Support	Max. 9840 SCSI	Max. 9840 FC	Max. 9840 LTO
Sun Fire 15000	X6541A	X6727A, X6799A	176	294	164
Sun Enterprise 10000	X1065A	X6727A, X6799A	60	72	36
Sun Fire 6800	X6541A, X6749A	X6727A, X6799A, X6748A	76	96	72
Sun Fire 4800/4810	X6541A, X6749A	X6727A, X6799A, X6748A	36	48	36
Sun Fire 3800	X6749A	X6748A	36	48	36
Sun Enterprise 6500	X1065A, X6541A	X6727A, X6799A (X6757A)	42	48	36
Sun Enterprise 4500/5500	X1065A, X6454A	X6727A, X6799A	20	30	40
Sun Enterprise 3500	X1065A, X6541A	X6727A, X6799A (X6757A)	12	16	18
Sun Enterprise 450	X6541A	X6727A, X6799A	16	16	10



Platform	HvD SCSI HBA Support	FC HBA Support	Max. 9840 SCSI	Max. 9840 FC	Max. 9840 LTO
Sun Enterprise 250	X6541A	X6727A, X6799A	8	8	16
Sun Fire V880	X6541A	X6727A, X6799A	30	36	20
Sun Enterprise 420R	X6541A	X6727A, X6799A	6	6	6
Sun Fire 280R	X6541A	X6727A, X6799A	8	12	8

The following table depicts the maximum number of Sun StorEdge L5500 tape libraries as well as tape drives that can be hooked up to each server.

- For the latest information, go to Sun's Tape Library Calculator located at the internal web site: <http://RMQual.Ebay>
- Sharing of tapes/drives by multiple hosts is possible.
- Do not mix disk and tape devices on the same parallel SCSI bus or in the same FC-AL zone.
- Robotics are controlled via a separate RS423 or TCP/IP connection to a server running Automated Cartridge System Library Software (ACSLs).
- 10-meter Fibre Channel cables come with each FC drive. However, FC cable limitations are 0.5 km.
- The longest supported length of the SCSI bus is 12 meters. Note that this is NOT merely the SCSI cable length, but the total length the SCSI signal has to travel. Sun includes a 6-meter SCSI cable with each drive. This cable is part of the total SCSI signal length. There is an additional 1.5 feet of SCSI cable length within the library for each tape drive.

System Configuration

- Media compatibility: 9840B drives are read and write compatible back to the original 9840 format.
- Tape drive cleaning: Dedicated cleaning cartridge locations are provided.
- Diagnostics cartridges: Dedicated slots for diagnostic tapes are part of the basic configuration. These tapes do not contain any diagnostic software, but are used to determine if the library robot is functioning properly.



System Management

Tape Drive Interfaces

9840/LTO Parallel SCSI Bus

Drives operating on the industry-standard parallel SCSI bus implement the features described below:

1. High-voltage, differential drivers/receivers
2. No internal SCSI bus termination
3. Hard reset option
4. Disconnect/reconnect, with a minimum of 10 re-selection attempts
5. SCSI-2 re-selection time-out option 'b'
6. SCSI bus parity checking and generation
7. The signal interface is the high-voltage differential implementation of the ANSI SCSI-2 interface standard. A high-density, keyed, double row, 68-pin, male connector is used.
8. The drives are not internally terminated. The library drive frame provides provision for external termination using a SCSI-2, wide, high voltage differential terminator.
9. There are no Sun unique SCSI command requirements for the tape drives.
10. The SCSI target addresses for the library and the drives are addressable through the library front panel.

9840/LTO Fibre Channel Interface

Drives operating on the industry standard Fibre Channel interface implements the features described below:

1. 100 MB/sec. transceivers
2. Arbitrated, private loop
3. Class 3
4. 50 (um) multi-mode, optical lasers
5. FCP-2 error recovery protocols
6. FCP_CONF
7. SC-type duplex connector.
8. The following basic link service frames are supported: ABTS, BA_ACC, BA_RJT
9. The following extended link services frames are supported: ACC, ADISC, LOGO, PDISC, PLOGI, PRLI, PRLO, REC, RLS (LESB), RRQ
10. The following FC-4 link services frames are supported: SRR
11. Port WWN(s) and node WWN are all unique within the device, as well as within all devices in the marketplace.



VERITAS NetBackup and Solstice Backup™ Software

The Sun StorEdge L6000 tape library is supported by VERITAS NetBackup software, Solstice Backup™ software, and many other storage management software applications. If VERITAS NetBackup software is used, a robotics license is required for every drive that is used in the library. If Solstice Backup software is used, a silo software module (with unlimited volumes) is required.

Note: *Solstice Backup software does not currently support multimedia. Also note that some versions of VERITAS NetBackup and Solstice Backup software may require patches.*

For information on the third-party application software supported by the Sun StorEdge L6000 library, consult the following web site:

<http://webhome.ebay/networkstorage/products/software-compatibility.html>

The Sun StorEdge L6000 library is supported on leading database applications as shown in the table below.

Database	Solstice Backup	VERITAS NetBackup
Oracle on UNIX®/Solaris Operating Environment	X	X
Informix on UNIX/Solaris Operating Environment	X	X
SAP on UNIX/Solaris Operating Environment	X	X
SAP on Microsoft Windows NT	X	X
Microsoft Exchange	X	X
Microsoft SQL Server	X	X
Oracle on Microsoft Windows NT	X	X
Lotus Notes on Microsoft Windows NT	X	Starts with 3.4
Lotus Notes on UNIX/Solaris Operating Environment	X	Starts with 3.4
Sybase on UNIX/Solaris Operating Environment	X	X



Ordering Information

Sun StorEdge™ L5500 Tape Library Part Numbers

Sun's L5500 is available in three base packages:

- SG-XLIBL5500-BASE1 LTO only (starting with 1500 active slots)
- SG-XLIBL5500-BASE2 LTO (2000 active slots) and 9840/9840B (3500 active slots)
- SG-XLIBL5500-BASE3 LTO (3500 active slots) and 9840/9840B (2000 active slots).

Due to software limitations, there is little flexibility with Sun StorEdge L5500 library Base2 and Base3 configurations. All slots are active, whether they are balanced more towards LTO or 9840/9840B. L5500 Base1 offers the most flexibility, the most capacity, and will be referenced more often throughout the rest of this document.

The additional items have circumstances you should be aware of:

- **Media (pre-barcode labeled)**

Pre-barcode media is not available from Sun at this time. Pre-barcode media can be purchased from Sun PS or StorageTek, and individual bar code labels can be purchased from EDP/Colorflex. For additional information, see Bar Bode Label Support, below. The following table shows media (non-labeled) available for the Sun StorEdge L5500 library.

Part Number	Description
SG-XMED9840-STRKIT	9840 media starter kit (only package which includes bar codes (0-199))
SG-XMED9840-20 SG-XMEDLTO100GB-10	9840 media, package of 20 (works with both 9840 and 9840B) LTO media, package of 10 (works with both LTO SCSI and FC)
SG-XMED9840CL-5 SG-XMEDLTOSEACL-10	9840 cleaning cartridge, package of 5 (works with both 9840 and 9840B) LTO cleaning cartridge, package of 10 for LTO SCSI only

Note: A special LTO cleaning cartridge is required for the LTO FC drive from IBM. A universal cleaning cartridge is expected on the market, and to be offered by Sun, in the summer of 2002. Until this universal cartridge is available, the IBM LTO FC cleaning cartridge can be purchased from STK, Sun PS, or a variety of other sources.

Cartridge labels can be purchased in the following ways:

- Through StorageTek by calling 1-800-905-8502 (US).
- By contacting EDP/Colorflex, either by mail or phone:

USA

EDP/Colorflex
697 South Pierce Street
Louisville, CO 80027
(888) 438-8362

Europe

EDP/Colorflex
43 Redhills Road
South Woodham Ferrers
Chelmsford, Essex
CM35UL, UK44-1245-322380

- Via the Web at <http://www.colorflex.com>



Click Tri-Optic Media Labels, then either use the "Find a Label" tab to search by Library number, or the "Label Specs" tab to see PDF images of the various labels they produce (arranged by technology).

Sun StorEdge L5500 Library Part Number Summary

Part Number	Description
SG-XLIBL5500-BASE1	L5500 LIB-BASE LTO 1500 slots
SG-XL5500-ADDBASE1	L5500 ADD BASE LTO 1500 slots
SG-XLIBL5500-BASE2	L5500 mixed drive LIB BASE2
SG-XL5500-ADDBASE2	L5500 mixed drive LIB ADD BASE2
SG-XLIBL5500-BASE3	L5500 mixed drive LIB BASE3
SG-XL5500-ADDBASE3	L5500 mixed drive LIB ADD BASE3
SG-XLIBL5500-2000	L5500 LTO slot 1500 to 2000
SG-XLIBL5500-2500	L5500 LTO slot 2000 to 2500
SG-XLIBL5500-3000	L5500 LTO slot 2500 to 3000
SG-XLIBL5500-3500	L5500 LTO slot 3000 to 3500
SG-XLIBL5500-4000	L5500 LTO slot 3500 to 4000
SG-XLIBL5500-4500	L5500 LTO slot 4000 to 4500
SG-XLIBL5500-5000	L5500 LTO slot 4500 to 5000
SG-XLIBL5500-5500	L5500 LTO slot 5000 to 5500
SG-XL5500-ADDCABNT	L5500 drive cabinet
SG-XL5500-ADDPORT	L5500 2nd silo cartridge mover
SG-XL5500-ADDLMU	L5500 ADD 2nd LMU
SG-XL6000-ADDLMU	L5500 ADD 2nd LMU
SG-XL5500-LTOS	L5500 LTO SCSI drive
SG-XL5500-LTOFC	L5500 LTO FC drive (Sold for "L5500 Solutions" only)
SG-XL5500-9840BFC	L5500/6000 9840B FC drive
SG-XL6000-9840FC	L5500/6000 9840 FC drive
SG-XL6000-9840AS	L5500/6000 9840SCSI drive

Sun StorEdge L5500 and L6000 Libraries, Base Offerings Overview

A La Carte Offer	L6000 (9840 drives)	L5500 (Mixed drives = 9840 heavy)	L5500 (Mixed drives = LTO heavy)	L5500 (LTO drives)
Drive Type	9840 and 9840B	9840, 9840B, LTO	9840, 9840B, LTO	LTO
Base Unit	SG-XLIBL6000-BASE	SG-XLIBL5500-BASE2	SG-XLIBL5500-BASE3	SG-XLIBL5500-BASE1
Add-On Base Unit	SG-XL6000-ADDBASE	SG-XL5500-ADDBASE2	SG-XL5500-ADDBASE3	SG-XL5500-ADDBASE1
Slot Count (Same for both base and add-on base)	9840 and/or 9840B 2000 slots active	3500 slots 9840 and 2000 slots LTO (5500 active slots)	3500 slots LTO and 2000 slots 9840 (5500 active slots)	LTO only 1500 active slots



A La Carte Offer	L6000 (9840 drives)	L5500 (Mixed drives = 9840 heavy)	L5500 (Mixed drives = LTO heavy)	L5500 (LTO drives)
Drives	SG-XL6000-9840AS SG-XL6000-9840FC SG-XL5500-9840BFC	SG-XL6000-9840AS SG-XL6000-9840FC SG-XL5500-9840BFC SG-XL5500-LTOS SG-XL5500-LTOFC	SG-XL6000-9840AS SG-XL6000-9840FC SG-XL5500-9840BFC SG-XL5500-LTOS SG-XL5500-LTOFC	SG-XL5500-LTOS SG-XL5500-LTOFC
Drive Cabinet (Base unit comes with one; add-on base unit does not come with any)	SG-XL6000-ADDCABNT (one cabinet holds 20 x 9840 drives)	SG-XL5500-ADDCABNT (one cabinet holds 17 x 9840 or 20 x LTO drives)	SG-XL5500-ADDCABNT (one cabinet holds 17 x 9840 or 20 x LTO drives)	SG-XL5500-ADDCABNT (one cabinet holds 20 x LTO drives)
Pass-Thru Port	SG-XL6000-ADDPORT	SG-XL5500-ADDPORT	SG-XL5500-ADDPORT	SG-XL5500-ADDPORT
Speed Upgrade (from 350 to 450 EPH)	SG-XL6000-ADDSPEED	300 EPH only	300 EPH only	300 EPH only
Redundant LMU	SG-XL6000-ADDLMU	SG-XL5500-ADDLMU	SG-XL5500-ADDLMU	SG-XL5500-ADDLMU
Slot Upgrades (Note: L5500 slot upgrades must be ordered sequentially)	SG-XL6000-ADDCPCTY activates 1000 additional slots via the software key. The L6000 ships with 2000 slots active, so up to 4 upgrades (max.) with each silo can be ordered.)	Not needed. Base unit comes with 5500 slots active.	Not needed. Base unit comes with 5500 slots active.	SG-XL5500-2000 SG-XL5500-2500 SG-XL5500-3000 SG-XL5500-3500 SG-XL5500-4000 SG-XL5500-4500 SG-XL5500-5000 SG-XL5500-5500
Media	SF-XMED9840-20 (98A&B data) SG-XMED9840CL (98A&B clean)	SF-XMED9840-20 (98A&B data) SG-XMED9840CL (98A&B clean) SG-XMEDLTO100GB-10 SG-XMEDLTOSEACL-10	SF-XMED9840-20 (98A&B data) SG-XMED9840CL (98A&B clean) SG-XMEDLTO100GB-10 SG-XMEDLTOSEACL-10	SG-XMEDLTO100GB-10 SG-XMEDLTOSEACL-10
Sun SAM-FS Software	NWSFS-LCO-E929 (181-2000 slots) NWSFS-LCO-S929 (2001 to 9000 slots)	NWSFS-LCO-E929 (181-2000 slots) NWSFS-LCO-S929 (2001 to 9000 slots)	NWSFS-LCO-E929 (181-2000 slots) NWSFS-LCO-S929 (2001 to 9000 slots)	NWSFS-LCO-E929 (181-2000 slots) NWSFS-LCO-S929 (2001 to 9000 slots)

Configuration Information

The following is information regarding what the customer receives with each part number when ordered through Sun:

- **Library enclosure (SG-XLIBL5500-BASE1)**
 - Eighty-cartridge access port (CAP)
 - Ultra™ 10 system
 - Drive cabinet (holds up to twenty LTO drives drives)
 - Library Control Unit (LCU)
 - Library Management Unit (LMU)
 - 1500 cartridge slot capacity
 - 300 exchanges per hour (EPH) performance
 - Large viewing window
 - Power distribution unit
 - Power supply cords (domestic and International)
 - Power cord



- Operations manual

Note: Most cables are included with the Sun StorEdge L5500 base unit. The cables for the Ultra 10 workstation to the LMU, and from the LMU to the LCU are included. Cables for the host to the Ultra 10 workstation are not included.

- **Library enclosure (SG-XLIBL5500-BASE2)**

- Eighty-cartridge access port (CAP)
- Ultra 10 system
- Drive cabinet (LTO = holds up to 20 drives; 9840/9840B = holds up to 17 drives)
- Library Control Unit (LCU)
- Library Management Unit (LMU)
- 5500 cartridge slot capacity (9840/9840B = 3500 slots and LTO = 2000 slots)
- 300 exchanges per hour (EPH) performance
- Large viewing window
- Power distribution unit
- Power supply cords (domestic and International)
- Power cord
- Operations manual

Note: Most cables are included with the Sun StorEdge L5500 base unit. The cables for the Ultra 10 workstation to the LMU, and from the LMU to the LCU are included. Cables for the host to the Ultra 10 workstation are not included.

- **Library enclosure (SG-XLIBL5500-BASE3)**

- Eighty-cartridge access port (CAP)
- Ultra 10 system
- Drive cabinet (LTO = hold up to 20 drives; 9840/9840B = holds up to 17 drives)
- Library Control Unit (LCU)
- Library Management Unit (LMU)
- 5500 cartridge slot capacity (9840/9840B = 3500 slots and LTO = 2000 slots)
- 300 exchanges per hour (EPH) performance
- Large viewing window
- Power distribution unit
- Power supply cords (domestic and International)
- Power cord
- Operations manual

Note: Most cables are included with the Sun StorEdge L5500 base unit. The cables for the Ultra 10 workstation to the LMU, and from the LMU to the LCU are included. Cables for the host to the Ultra 10 workstation are not included.

- **Library additional silo (SG-XLIBL5500-ADDBASE1, SG-XLIBL5500-ADDBASE2, or SG-XLIBL5500-ADDBASE3)**

- Adds another silo (library storage module) to the library



Note: This includes the same features as the base library enclosure described above (SG-XLIBL5500-BASE1, 2, and 3) without the library management unit (LMU), since only one LMU is required per automated cartridge system.

- **L5500 Base1 Library capacity upgrades**

SG-XL5500-2000	Upgrades slot count from 1500 to 2000
SG-XL5500-2500	Upgrades slot count from 2000 to 2500
SG-XL5500-3000	Upgrades slot count from 2500 to 3000
SG-XL5500-3500	Upgrades slot count from 3000 to 3500
SG-XL5500-4000	Upgrades slot count from 3500 to 4000
SG-XL5500-4500	Upgrades slot count from 4000 to 4500
SG-XL5500-5000	Upgrades slot count from 4500 to 5000
SG-XL5500-5500	Upgrades slot count from 5000 to 5500

Note: The LTO base configuration with one drive cabinet can house a maximum of 5582 slots. With each drive cabinet added, the customer loses 338 slots. With four drive cabinets on a single silo, the maximum slot count is 4568.

Upgrades must be ordered sequentially. If 5500 slots are required, the customer must purchase the SG-XL5500-5500 part PLUS the seven preceding part numbers (eight part numbers total).

- **Additional drive cabinet (SG-XL5500-ADDCABNT)**

- Additional drive frame to house another twenty LTO drives or seventeen 9840/9840B drives
- Power distribution unit
- Power cord

Note: A maximum of four cabinets can be attached to each standalone library storage module. Only one or two frames can be attached in a dense-pack configuration. Customers should complete the site survey before determining the configuration. The LTO base configuration with one drive cabinet can house a maximum of 5582 slots. With each drive cabinet added, the customer loses 338 slots. With four drive cabinets on a single silo, the maximum slot count is 4568.

- **Pass-thru port (SG-XL5500-ADDPOR)**

This connects two library storage modules together. Each library storage module can have up to four pass-thru ports in a dense pack configuration.

- **9840 20-GB SCSI tape drive (SG-XL6000-9840AS)**

- 9840 drive with Sun StorEdge L6000 tray, and power supply (no power cable required)
- User reference manual
- Installation kit
- 6-meter SCSI cable

- **9840 20-GB Fibre Channel tape drive (SG-XL6000-9840FC)**

- 9840 drive with Sun StorEdge L6000/L5500 tray, and power supply (no power cable required)
- User reference manual
- Installation kit
- 10-meter Fibre Channel cable



- **9840B 20-GB FC tape drive (SG-XL5500-9840BFC)**
 - 9840B drive with Sun StorEdge L5500/L6000 tray and power supply (no power cable required)
 - User reference manual
 - Installation kit
 - 10-meter Fibre Channel cable (FC to FC connection)
- **LTO 100-GB SCSI tape drive (SG-XL5500-LTOS)**
 - LTO drive with Sun StorEdge L5500 tray and power supply (no power cable required)
 - User reference manual
 - Installation kit
 - 6-meter SCSI cable
- **LTO 100-GB FC tape drive (SG-XL5500-LTOFC)**
 - LTO drive with Sun StorEdge L5500 tray and power supply (no power cable required)
 - User reference manual
 - Installation kit
 - 10-meter Fibre Channel cable
- **Media starter kit (SG-XMED9840-STRKIT)**
 - 100 data cartridges
 - Five 9840 cleaning cartridges
 - One set of 200 barcode labels
- **9840 media (SG-XMED9840-20)**
 - Twenty 9840 data cartridges
- **9840 cleaning cartridges (SG-XMED9840CL-5)**
 - Five 9840 cleaning cartridges
- **LTO media (SG-XMEDLTO100GB-10)**
 - Ten LTO data cartridges (SCSI and FC)
- **LTO cleaning cartridges (SG-XMEDLTOSEACL-10)**
 - Ten LTO cleaning cartridges (SCSI only)



Ordering Flowchart for SCSI Configurations

The following depicts typical ordering process for the Sun StorEdge L5500 tape library of 1500 slots using LTO technology. Note: The same general "rules" apply for the 9840 SCSI drive.

Step Number	Marketing Part No.	Req./Optional
1. Order library enclosure, 1500 slots.	SG-XLIBL5500-BASE1	Required
2. Order additional 500 slot increments as needed.	SG-XL5500-2000 SG-XL5500-2500 SG-XL5500-3000 SG-XL5500-3500 SG-XL5500-4000 SG-XL5500-4500 SG-XL5500-5000 SG-XL5500-5500	For Base1 only; must be ordered sequentially
3. Order second library enclosure if greater than 5500 slots are required.	SG-XLIBL5500-ADDBASE1	Optional (max. of 23-silo upgrades (24 total))
4. Connect the two library storage modules with a pass-thru port.	SG-XL5500-ADDPOR	Optional (quantity of 1 in this example)
5. Order required no. of SCSI drives. Refer to Maximum Connect for Drive Technologies by Platform table in the Requirements and Configuration section.	SG-XL5500-LTOS	Optional
6. Order media.	SG-XMEDLTO100GB-10	Optional
7. Order required no. of host bus adapters <ul style="list-style-type: none"> - X6541A for PCI based servers; One adapter per four LTO SCSI drives - X1065A for SBus based servers; One adapter per two LTO SCSI drives - X6749A for cPCI based servers; One adapter per four LTO SCSI drives 	X6541A <i>or</i> X1065A <i>or</i> X6749A	Optional
8. Order additional drive frame if more than twenty drives are used per library storage module.	SG-XL5500-ADDCABNT	Optional
9. Order additional cleaning cartridges as appropriate.	SG-XMEDLTOSEALC-10	Optional
10. Order backup/restore application of choice, such as VERITAS NetBackup or Solstice Backup software	See price book for part numbers and ordering information	Optional



Ordering Flowchart for Fibre Channel Configurations

The following depicts typical ordering process for the Sun StorEdge L5500 tape library of 1500 slots using 9840B FC technology. Note: The same general "rules" apply for the 9840A FC and 9840B FC drives.

Step Number	Marketing Part No.	Req./Optional
1. Order library enclosure, 2000 slots.	SG-XLIBL5500-BASE2 <i>or</i> SG-XLIBL5500-BASE3	Required
2. Order additional 500 slot increments as needed.	BASE2 and BASE3 come with 5500 active slots - no upgrade necessary.	For base1 only; must be ordered sequentially
3. Order second library enclosure if greater than 5500 slots are required.	SG-XLIBL5500-ADDBASE2 <i>or</i> SG-XLIBL5500-ADDBASE3	Optional (max. of 23 add-on silos) (24 total)
4. Connect the two library storage modules with a pass-thru port.	SG-XL5500-ADDPOR	Optional (quantity of 1 in this example)
5. Order required number of FC drives. Refer to Maximum Connect for Drive Technologies by Platform table in the Requirements and Configuration section.	SG-XL5500-9840BFC	Required
6. Order media:	SG-XMED9840-20 (9840)	Optional
7. Order required no. of host bus adapters Rules: <ul style="list-style-type: none"> - Minimum of one initiator (port) per 9840B FC drive - Maximum of three drives per initiator (port) per 9840B drive. 	X6757A <i>or</i> X6799A <i>or</i> X6727A <i>or</i> X6748A	Required
8. Order switches/ports/GBICs. Requirements: <ul style="list-style-type: none"> - One pair of switches is required. - One GBIC is required per port. Configuration rules: <ul style="list-style-type: none"> - One port from switch per 9840B FC drive (max. of three drives per zone) - One port per initiator from the host(s) to switch (max. of four initiators per zone) 	<i>Switches:</i> 8-port (X6746A) <i>or</i> 16-port (SG-XSW16-32P) <i>GBIC:</i> Shortwave FC-AL GBIC module (X6731A)	Required
9. Order additional drive frame if more than seventeen 9840 drives are used per library storage module.	SG-XL5500-ADDCABNT	Optional
10. Order backup/restore application of choice, such as VERITAS NetBackup or Solstice Backup software.	See price book for part numbers and ordering information.	Optional



Service and Support

The SunSpectrumSM 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 SolarisTM 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 it represents. Customers should check with their local Sun Enterprise Services representative for program/feature variance and availability in their area.

Mission Critical Sales Process (MCSP)

Due to the size and complexity of the Sun StorEdgeTM L5500 tape library, the library and all associated options must follow a MCSP prior to order shipment. The MCSP must be initiated at least 21 days prior to the requested delivery date.

Information regarding this process can be found at the following URL:

<http://gsops.central/sdeskproc/OPS/P2>. As support is outsourced to StorageTek, it is also critical that customers verify supportability prior to sale. The worldwide supportability matrix is located at the website shown above.

Support Contracts

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. For more information on the SunSpectrum program offerings refer to the following URL:

http://service.central/TS/ESP/SunSpectrum/Feature_Matrix/index.html.

The four levels of SunSpectrum support contracts are outlined below.

SunSpectrum Program Support

Program	Description
Mission-Critical SunSpectrum PlatinumSM 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 GoldSM 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 SilverSM Support	Combines the service expertise, responsive on-site support and technical support by telephone and SunSolve TM CD/on-line services. Support is provided 8 a.m. to 8 p.m. Mon. through Fri.



The Sun StorEdge™ L5500 tape library is supported only by the SunSpectrum Gold or SunSpectrum Platinum program levels.

Warranty

The warranty for the Sun StorEdge L5500 library is one year, with same extended business day (12 hour) on-site response service. **The goal for same extended local business day response is four business hours from the time of the customer call.** The response time is dependent upon factors such as customer availability. Service activity takes place only during Sun's normal local extended business hours. Telephone support is available 24x7. Customers can also reference the Sun global warranty site which is listed below: <http://www.sun.com/service/support/warranty/terms.html>

Sun Professional Services

Professional Services has several offerings for the Sun StorEdge L5500 tape library. For specific information contact a SunPS representative or refer to the following URL: <http://sunps.central>



Glossary

ACS	Automated cartridge system.
ACSLs	Automated Cartridge System Library Software. StorageTek's server software that controls a StorageTek automated cartridge system
Actuators	Robotic components that move inside the library to manipulate cartridges. These include the gripper, extension axis, and vertical and horizontal axes.
Archive	The process of moving data from one medium to another where it is stored for later use.
Autoloader	A peripheral device that contains <ul style="list-style-type: none">– A mechanism for moving cartridges sequentially or under program control– Several storage locations for storage media– One drive capable of reading or writing the media– Interface circuitry When commanded by a host system, autochangers can transport media back and forth between storage locations and the drive residing in the autoloader.
Automatic tape library	A robotic storage and retrieval system for digital linear tape cartridges.
Backup	The process of copying data to a secondary medium for protection in the event that the original copy is lost and needs to be recovered.
Bar code label	The identification label on digital linear tape cartridges.
Bin	A storage receptacle for a tape cartridge.
Cartridge access port (CAP)	The operator-accessible component of the library that allows cartridges to be import/export loaded and unloaded into/from the library.
Compression	A procedure in which data is transformed by the removal of redundant information in order to reduce the number of bits required to represent the data.
Control panel	The panel on the front of the library that contains the Status Display Area, as well as the indicators and control button.
cPCI	The "c" in cPCI stands for compact. PCI connectors on board-level devices can use compact PCI (cPCI) connectors.
Differential	<i>See</i> Single-ended.
DLT	Digital linear tape. Linear tape recording technology (contrasted with helical scan). Digital linear tape technology segments tape media into parallel, horizontal tracks, and records data by running the tape past a stationary head. digital linear tape provides higher performance than helical scan technology.



Fast/wide SCSI	Data transfer rate of 20 MB per second. Wide devices can be connected to a narrow SCSI interface, but the extra data lines must be terminated.
Helical scan	A means of recording data in narrow tracks that run diagonally across the tape. Formats include 4-mm, 8-mm, and 19-mm, and half-inch tape.
Host	The host computer system acting as controller for the drive.
Host adapter	A device that connects a peripheral device I/O protocol and medium to the computer system's I/O bus.
Host computer	The computer that issues SCSI commands to control the library robotics.
HSM	Hierarchical storage management. A method for keeping infrequently used data in secondary storage, then restoring it automatically when a user calls for the data. The underlying premise behind HSM is that if the most frequently used data is kept in the fastest (primary) storage, most of the time users perceive the overall system performance as if all the data were in fast storage. HSM software transparently "migrates" least frequently used data to more economical media, then restores it automatically as needed. HSM systems can provide users with performance and economy without sacrificing application portability or storage system transparency.
IOPS	Input/output operations per second, a measure of I/O performance usually used to quote random I/O performance.
LCD	Liquid crystal display.
LMU	Library management unit.
Load	The process in which a drive takes in an inserted cartridge and goes online.
Load port	The operator-accessible component of the library that allows cartridges to be import/export loaded and unloaded into/from the library.
LSM	Library storage module.
Magazine	A holder for tape cartridges used in robotic handling of media.
MCBF	Mean cycles between failures, an activity-dependent measure of reliability for a robotic cartridge handling system.
MSBF	Mean swaps between failures. A measure of reliability for the robotic cartridge handling system, this is the average expected number of full cartridge exchanges (i.e., the cartridge is unloaded from the digital linear tape drive and placed back into its storage slot, and a new cartridge is removed from its storage slot and loaded into the tape drive) between failures of equipment.
MTBF	Mean time between failures. This is the average expected time between failures of equipment, usually measured in operating hours.
MTTR	Mean time to repair.



Offline	A drive is offline if a tape is currently unloaded or not in the drive. The host has limited access, and cannot perform any commands that would cause tape motion. The host can, however, load a tape if one is inserted and can execute any diagnostic tests that do not require tape motion.
Online	A drive is online when a tape is loaded. The host has access to all command operations, including those that access the tape, set configurations and run diagnostic tests.
PCAP	Priority cartridge access port. This feature allows for quick insertion of a cartridge.
PCI	Peripheral component interconnect. PCI is an industry-standard bus used in servers, workstations, and PCs.
Pick	Preparation for placing it in another location.
Rear panel	The rear cosmetic panel of the library that contains the AC power switch, AC power receptacle and connectors for attaching external cabling to the library.
Robotics	The library robotics consist of the following components: gripper mechanism, vertical actuator, horizontal actuator, and extension actuator.
SBus	An I/O (input/output) bus used with host systems or boards designed according to SPARC™ processor architecture.
SCSI	Small computer system interface. A standard command specification and command set that enables computers and peripherals to communicate with each other. Sun's current family of tape drives adhere to the SCSI-2 specification.
SCSI address	The octal representation of the unique address (0-7) assigned to a narrow device, or hexadecimal representation of the unique address (0-15) assigned to a wide SCSI device.
Sequential access	Sequential access devices store data sequentially in the order received. Tape devices are the most common sequential access devices. By contrast, disk drives are direct access devices, where data is stored in blocks, not necessarily sequentially.
Single-ended	SCSI devices can be single ended or differential. Single-ended devices transmit signals by setting a line in the cable to a pattern of high and low voltages in relation to a ground line. Differential devices send signals by swapping over high and low states between two lines. This is more expensive to implement, but reduces interference and allows longer cable lengths. Single-ended and differential devices must not be mixed on one SCSI bus.
SWIS/S	Single-ended, wide, intelligent SCSI/SBus host adapter.



Termination	A SCSI bus (or cable) can have many devices plugged into it, but the end of the cable furthest from the host computer must always be terminated to avoid signals being reflected back and interfering with other signals. The terminator both absorbs signals and provides power to the lines in the cable. For this reason, it must itself be provided with power. Terminators can be of two types, active and passive.
Tape library	Type of tape autochanger that allows media to be accessed randomly.
Throughput	A measure of sequential I/O performance, quoted in MB per second. See IOPS.
Transfer rate	The rate at which data is transferred from one device to another, for example from the host computer to the tape drive during backup.



Materials Abstract

All materials are available on SunWIN except where noted otherwise.

Collateral	Description	Purpose	Distribution	Token # or COMAC Order #
References				
– <i>Sun StorEdge™ L5500 Tape Library, Just the Facts</i>	Technical Overview (this document)	Training, Sales Tool	SunWIN, Reseller Web, E-mail	344304
– <i>Sun StorEdge L5500 Tape Library Customer Presentation</i>	Customer Presentation	Sales Tool	SunWIN, Reseller Web	334336
– <i>Sun StorEdge Product Family Overview Quick Reference Card</i>	Quick Reference Card	Sales Tool	SunWIN	73691
– <i>Planning Your Backup Architecture</i>	White Paper	Training, Sales Tool	SunWIN, Reseller Web	101273
External Web Sites				
– <i>Sun StorEdge L5500 Tape Library, General Information</i>	http://www.sun.com/storage/L5500			
– <i>Tape Backup Solutions Main Page</i>	http://www.sun.com/storage/tape.html			
Internal Web Sites				
– <i>Sun StorEdge L6000 Product Overview</i>	http://webhome.ebay/networkstorage/products/L5500			
– <i>Installation Information</i>	http://scope.central			
– <i>MCSP and Installation Information</i>	http://gsops.central/sdeskproc/OSP/p2			

