



# Sun StorageTek™ Crypto Key Management System

Version 2.0

**Systems Assurance Guide**

Part Number: 316194803

Revision: BA





# Crypto Key Management System

Version 2.0

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## Systems Assurance Guide

Sun Microsystems, Inc.  
[www.sun.com](http://www.sun.com)

Part Number: 316194803  
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Revision: BA

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# Summary of Changes

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EC Number	Date	Revision	Description
EC000227	February 2008	A	Initial release.
EC000496	May 2008	B	Refer to this revision for the list of changes (included T9840D tape drives)
EC000594	June 2008	BA	This revision includes: <ul style="list-style-type: none"><li>■ Information about the HP LTO4 encryption capable tape drive</li><li>■ Change of the document short name from KMA to KMS 2.0 (on the page footer)</li></ul>

**Note** – Change bars are included in this revision.



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# Preface

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This guide is intended for Sun StorageTek representatives, customers, and anyone responsible for planning the installation of the Sun StorageTek encryption solution.

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## Organization

This guide has the following organization:

<b>Chapter</b>	<b>Use this chapter to:</b>
<a href="#">Chapter 1, "Introduction"</a>	Introduce you and the customer to the Sun StorageTek encryption solutions.
<a href="#">Chapter 2, "Systems Assurance"</a>	Describe and plan for the systems assurance process.
<a href="#">Chapter 3, "Site Preparation"</a>	Prepare for the installation.
<a href="#">Chapter 4, "Ordering"</a>	Help order the encryption solution and additional components—libraries and tape drives—for your customers requirements.
<a href="#">Appendix A, "Work Sheets"</a>	Complete work sheets that can help prepare for the installation.
<a href="#">"Glossary"</a>	Learn the terms and abbreviations used in this publication.

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## Related Information

These publications contain the additional information mentioned in this guide:

Publication Description	Part Number
Important Safety Information for Sun Hardware Systems	Sun: 816-7190-10
Sun SunFire X2100 Server Installation Guide	Sun: 819-6589-10

These publications are for Sun StorageTek personnel or authorized third parties who install StorageTek brand tape and library products.

Publication Description	Part Number
T10000 Tape Drive Systems Assurance Guide	StorageTek: TM0002
T9x40 Tape Drive Systems Assurance Guide	StorageTek: MT5003
SL8500 Modular Library Systems Assurance Guide	StorageTek: MT9229
SL3000 Modular Library Systems Assurance Guide	StorageTek: 3161941xx
SL500 Modular Library Systems Assurance Guide	StorageTek: MT9212
L700/1400 Library Ordering and Configuration Guide	StorageTek: MT9112
L180 Library Ordering and Configuration Guide	StorageTek: MT9112
9310 PowderHorn Library Systems Assurance Guide	StorageTek: ML6500
Service Delivery Platform Systems Assurance Guide	StorageTek: 11042004

These publications are related to the Key Management System:

Publication Description	Part Number
Crypto Key Management System Installation and Service Manual	StorageTek: 3161949xx
Crypto Key Management System Administrator Guide	StorageTek: 3161951xx

## Reference Documentation

When planning to support data encryption, the following documents are available to help identify and define encryption:

- Federal Information Processing Standards Publication FIPS PUB 46-3  
*Data Encryption Standard*
- Federal Information Processing Standards Publication FIPS PUB 140-2  
*Security Requirements for Cryptographic Modules*
- Federal Information Processing Standards Publication FIPS PUB 171  
*Key Management*
- National Institute of Standards and Technology NIST Publication 800-57  
*Recommendation for Key Management Parts 1 and 2*
- International Standard Organization ISO/IEC 1779  
*Security Techniques—Code of Practice for Information Security Management*

# Documentation Content and Purpose

This table shows the specific documents for the Crypto Key Management System and the audience that document is intended for.

**TABLE P-1** Documentation and Audience Map

Task/Purpose	Documentation & Audience								
	AE	SE	PS	TS	T3	SR	Partner/OEM	Customer	
Site Preparation/Pre-sales	Systems Assurance Guide								
Installation & Service				Installation & Service Manual					
User / Operation				Administrator Guide					
Online Help				Online Help					
<b>Legend:</b> AE = Account executive, sales and marketing SE = Systems engineer PS = Professional services				TS = Technical specialists (NSSE) T3 = Support (Frontline and Backline) SR = Service representative (CSE)					

This table contains an overview of the documentation, intended audience, general content, and purpose.

**TABLE P-2** Documentation Content and Purpose

Document	Audience	General Content	Purpose
Systems Assurance Guide	<ul style="list-style-type: none"> <li>■ Marketing &amp; Sales</li> <li>■ Systems Engineers</li> <li>■ Installation Coordinators</li> <li>■ Professional Services</li> <li>■ Technical Specialists</li> <li>■ Service Representatives</li> <li>■ Customer</li> </ul>	<ul style="list-style-type: none"> <li>■ Product description</li> <li>■ Dimensions</li> <li>■ Weights &amp; measures</li> <li>■ Configurations</li> <li>■ Capacities</li> <li>■ Site preparation</li> <li>■ Models and features</li> <li>■ Order numbers</li> </ul>	<ul style="list-style-type: none"> <li>■ Pre-Sales</li> <li>■ Site Planning</li> <li>■ Product introduction</li> <li>■ Readiness</li> </ul>
Installation and Service Manual	<ul style="list-style-type: none"> <li>■ Installation Coordinators</li> <li>■ Technical Specialists</li> <li>■ Service Representatives</li> </ul>	Installation: <ul style="list-style-type: none"> <li>■ Procedures</li> <li>■ Checklists</li> <li>■ Configurations</li> </ul> Service: <ul style="list-style-type: none"> <li>■ Fault isolation</li> <li>■ Removal/Replacement</li> </ul>	<ul style="list-style-type: none"> <li>■ Installation</li> <li>■ Configuration</li> <li>■ Embedded Lights Out Manager (ELOM)</li> <li>■ QuickStart</li> </ul>
Administrator Guide	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Technical Specialists</li> <li>■ Service Representatives</li> </ul>	<ul style="list-style-type: none"> <li>■ Introduction</li> <li>■ Operator Roles</li> <li>■ How to...</li> </ul>	<ul style="list-style-type: none"> <li>■ Usage</li> <li>■ Support</li> <li>■ Graphical user interface (KMS GUI)</li> </ul>

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## Additional Information

Sun Microsystems, Inc. (Sun) offers several methods to obtain additional information.

### Sun's External Web Site

Sun's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the external Web site is: <http://www.sun.com>

The URL for StorageTek™ brand-specific information is:  
<http://www.sun.com/storagetek/>

### Documentation and Download Web Sites

Web sites that enable customers, members, and employees to search for technical documentation, downloads, patches, features, and articles include:

- Documentation: <http://docs.sun.com/app/docs> (customers)
- Documentation: <http://docs.sfbay.sun.com/app/docs> (internal)
- Sun Partner Exchange: <https://spe.sun.com/spx/control/Login> (partners)

Firmware and graphical user interface download sites:

- Sun Download Center: <http://www.sun.com/download/index.jsp> (customers)
- Uniform Software Repository: <http://dlrequest.sfbay.sun.com:88/usr/login> (internal)

If your customer does not already have a Sun Online Account they will need to register. For a new account, go to: <https://reg.sun.com/register>

For more information about Sun StorageTek products, got to:  
[http://sunsolve.sun.com/handbook\\_pub/validateUser.do?target=STK/STK\\_index](http://sunsolve.sun.com/handbook_pub/validateUser.do?target=STK/STK_index)

### Partners Site

The Sun StorageTek Partners site is a Web site for partners with a StorageTek Partner Agreement. This site provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek Partners. Access to this site, beyond the Partners Login page, is restricted. On the Partners Login page, employees and current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for partners with a Sun Partner Agreement is:  
<http://www.sun.com/partners/>

## Introduction

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Encryption is based on the science of **cryptography** and is one of the most effective ways to achieve data security today. To read an encrypted file, you must have access to the key that will enable you to decipher the file.

This chapter also introduces you to the Sun StorageTek encryption solutions.

---

## Planning for Encryption

Are your customer accounts concerned with:

- **Data security?**
- **Data protection and sensitive information?**
- **Government regulations and retention?**
- Data security is a major concern for IT professionals today—what happens if and when data falls into the wrong hands?
- Access to sensitive data can happen when it is:
  - Sent over networks
  - Written on disk or tape
  - Stored in archives
- Your customers may also be required to take measures to protect their data because of government regulations or contractual obligations with business partners. A number of regulations require organizations to *encrypt* their data.

Encryption can occur during three points in the life of the data. When data is:

- Created (host-based encryption)
- Transported (appliance-based)
- Stored (device-based encryption)

Sun StorageTek offers device-based implementations, or a data-at-rest solution, for encryption. This offering provides an excellent solution for mixed environments with a variety of operating system types—both enterprise mainframe and open systems platforms.

Choosing device-based encryption is the *least disruptive* to an existing system infrastructure because the encryption functionality is built directly in to the tape drive, so there is no need to maintain special software specifically for encrypted data.

# Encryption Standards

Sun StorageTek encryption solutions are enhanced versions based on industry standards and functionality, including:

- Federal Information Processing Standards
  - **FIPS PUB 140-2**, Security Requirements for Cryptographic Modules
  - **FIPS PUB 46-3**, Data Encryption Standard
  - **FIPS PUB 171**, Key Management

FIPS are standards and guidelines adopted and declared under the provisions of Section 5131 of the Information Technology Management Reform Act of 1996.

FIPS defines four levels of security.

**Level 1**—The lowest level with production-grade requirements.

**Level 2**—Adds requirements for physical tamper evidence and role-based authentication. Built on a validated operating platform.

**Level 3**—Adds requirements for physical tamper resistance and identity-based authentication. Requires additional physical or logical separations.

**Level 4**—Makes the physical security requirements more stringent and requires robustness against environmental attacks.

The Sun StorageTek solution will be certified at Level 2.

- **National Institute of Standards and Technology (NIST)** AES-standard defining a cryptographic cipher using the Rijndael symmetric block cipher algorithm.  
**NIST 800-57 Part 1**, Key Life Cycle document.
- Institute of Electrical and Electronics Engineers **IEEE 1619**, working groups:
  - 1619.1 Standard for Tape Encryption—complete
  - 1619.2 Standard for Disk Encryption—in process
  - 1619.3 Standard for Key Management—in process
- **Common Criteria (CC)**, an International Consortium sponsored by the National Security Agency (NSA) that sets requirements for IT security.
- International Standard Organization **ISO/IEC 1779** Security Techniques
- **CCM-AES-256 encryption**
  - CCM = “Counter with CBC-MAC,” is a mode of encryption that provides for both a strong form of privacy (security) and efficient authentication.
  - CBC-MAC = “Cipher Block Chaining–Message Authentication Code,” a message integrity method in which each block of plain text is encrypted with a cipher.
  - AES = “**Advanced Encryption Standard**,” is a block cipher encryption algorithm that uses both of these cryptographic techniques—Counter mode and CBC-MAC (CCM).
- **Symmetric encryption**, uses one key to both encrypt and decrypt data.  
This is a computationally efficient, high-strength cipher type sometimes called the “secret key algorithm” because the key is never made available to the public and must be kept secure. *Synonymous with Asymmetric keys*, which use two different keys, one to encrypt and one to decrypt. This cipher type is computationally difficult, lower-strength and used for public key implementations.
- **Nonce**, a non-repeating number that is incorporated into the mode of operation to ensure that repetitive plaintext does not result in repetitive ciphertext.
- **Cipher-suite**
  - TLS 1.0 = Transport layer security
  - RSA = A 2048-bit key encryption algorithm
  - SHA1 = A widely used and secure hash algorithm
  - HMAC = Hash message authentication code (Hash-MAC)
  - Mutual authentication using x509 v3 certificates

# Sun StorageTek Encryption Solutions

Sun StorageTek offers two device-based solutions using:

- Federal Information Processing Standard (FIPS) approved appliances called the Crypto Key Management System.
- Sun StorageTek T10000—state-of-the-art—tape drives with either Fibre Channel or IBMs FICON interfaces.
- Supporting infrastructure and network.

There are two types of Crypto Key Management Systems (KMS); they include:

**TABLE 1-1** Key Management System Versions

<b>Version 1.x</b>	A Sun Ultra 20 Workstation—called a key management station
<b>Version 2.x</b>	A Sun Fire X2100 Server—called a key management appliance

Both systems are based on the AMD Opteron processor and run a pre-loaded version of the Solaris™ 10 operating system.

Both of these systems manage all cryptographic keys and administrative functions. Each system contains a MARs card (SCA6000), a FIPS-approved, random number generator that generates the raw keys.

## Key Management System Configurations

All of the following configurations contain the same components; the difference is with the customer needs, requirements, and how the components are installed.

**FIGURE 1-1** shows three **Version 1.x configurations** using a key management workstation (KMS):

- Air Gap
- Network—local area network
- Network—wide area network

These configurations require the use of a token and token bay.

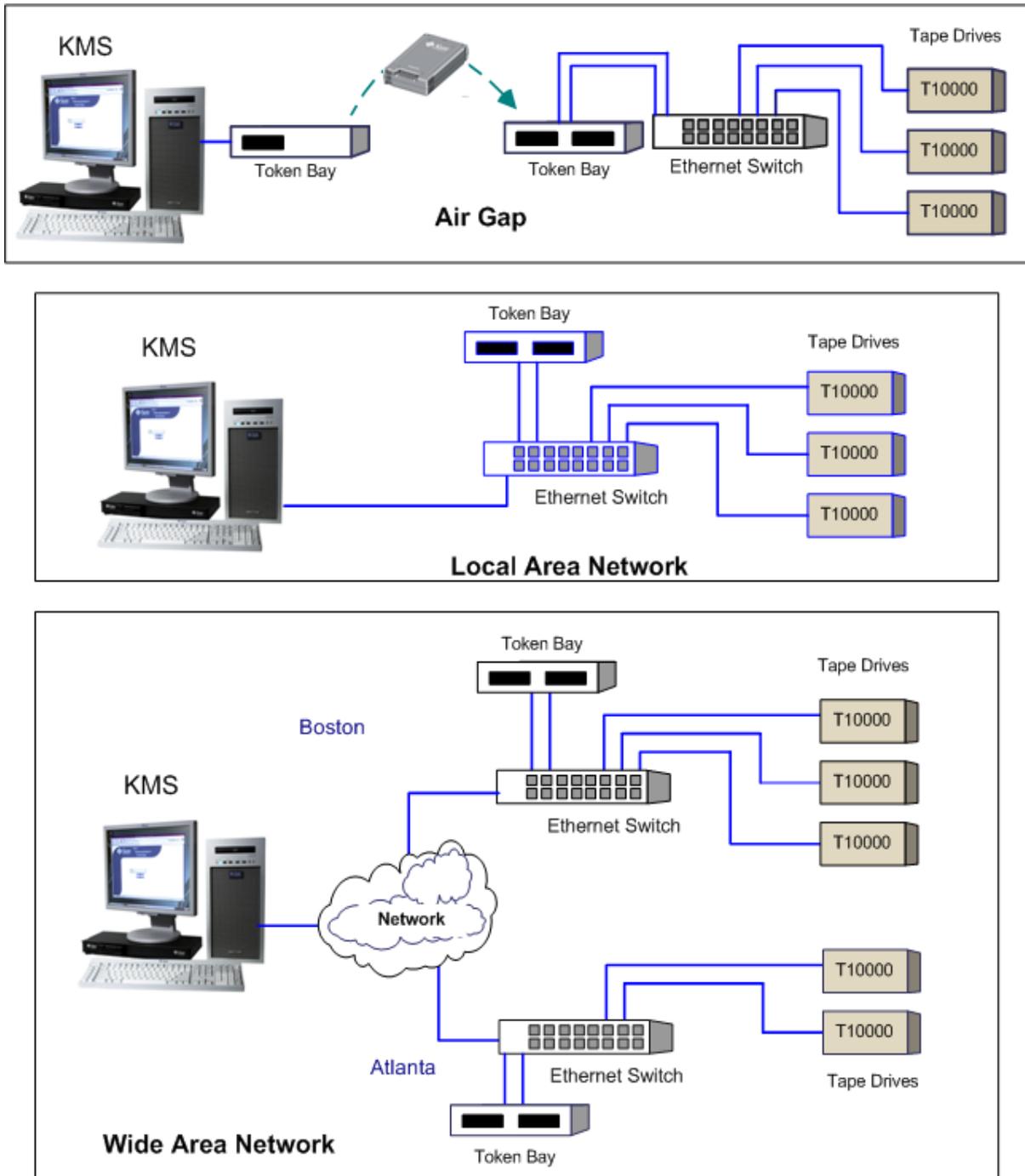
**FIGURE 1-2** shows three **Version 2.x configurations** for the key management appliance (KMA):

- Single site—local area network
- Multiple sites—wide area network
- Multiple sites—wide area network—grouped by specific key groups

These configurations require the use of a KMS cluster.

## Version 1.x Key Management Station Configurations

**FIGURE 1-1** Key Management Station Configurations



## Version 1.x Air Gap Configuration

The air gap configuration provides the highest levels of security. With the air gap configuration, the KMS and token bay are physically and logically isolated. Transferring keys from the key management station to the tape drives requires direct user intervention.

The hardware components are configured as:

- The KMS and token bay are separated from the library and tape drives by an “air gap,” such as in a different room.
- The token bay is connected to the KMS through an Ethernet port.
- A second token bay is attached to the encryption-capable tape drives through a separate local network.

### To write encryption keys to a token:

1. Insert a token in the KMS token bay.
2. Write to the token.
3. Physically carry the token (with the keys) to the drives.
4. Insert the token in the token bay attached to the tape drive network.

You can display the status of token only if it is inserted in the KMS token bay.

## Version 1.x Network Configurations

With the network configuration, the KMS, tape drives, and token bays all reside on a local or wide area network (LAN or WAN).

The hardware components are configured as:

- The KMS is connected to the network through an Ethernet port.
- Any number of token bays can be connected to the network.
- Tokens have static IP addresses.
- Any number of encryption-capable tape drives can be connected to the network.

### To write encryption keys to any token:

1. Inserted a token into a token bay on the network.
2. Write to the token using the static IP address.

Once the token receives the keys, it automatically transmits them across the network to the tape drives. You do not need to physically carry the tokens from one token bay to another.

You can display information about the token at the KMS.



#### **Important:**

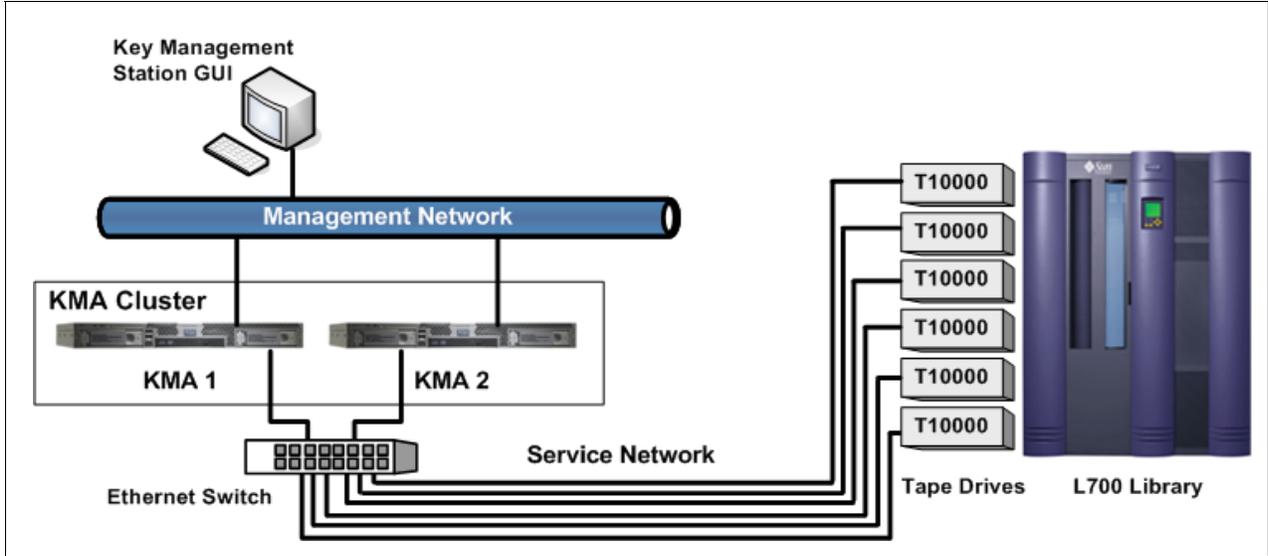
The remaining chapters in this document contains specific information for Version 2.0 of the Crypto Key Management System.

Refer to the *Crypto Key Management Station Systems Assurance Guide* PN TM0018 for more information about the Version 1.x encryption solution.

## Version 2.x Key Management Appliance Configurations

**FIGURE 1-2** Key Management Appliance Configurations

A) Single site—local area network—using the service network for the tape drive connections



B) Multiple sites—wide area network—using the management network for the tape drive connections

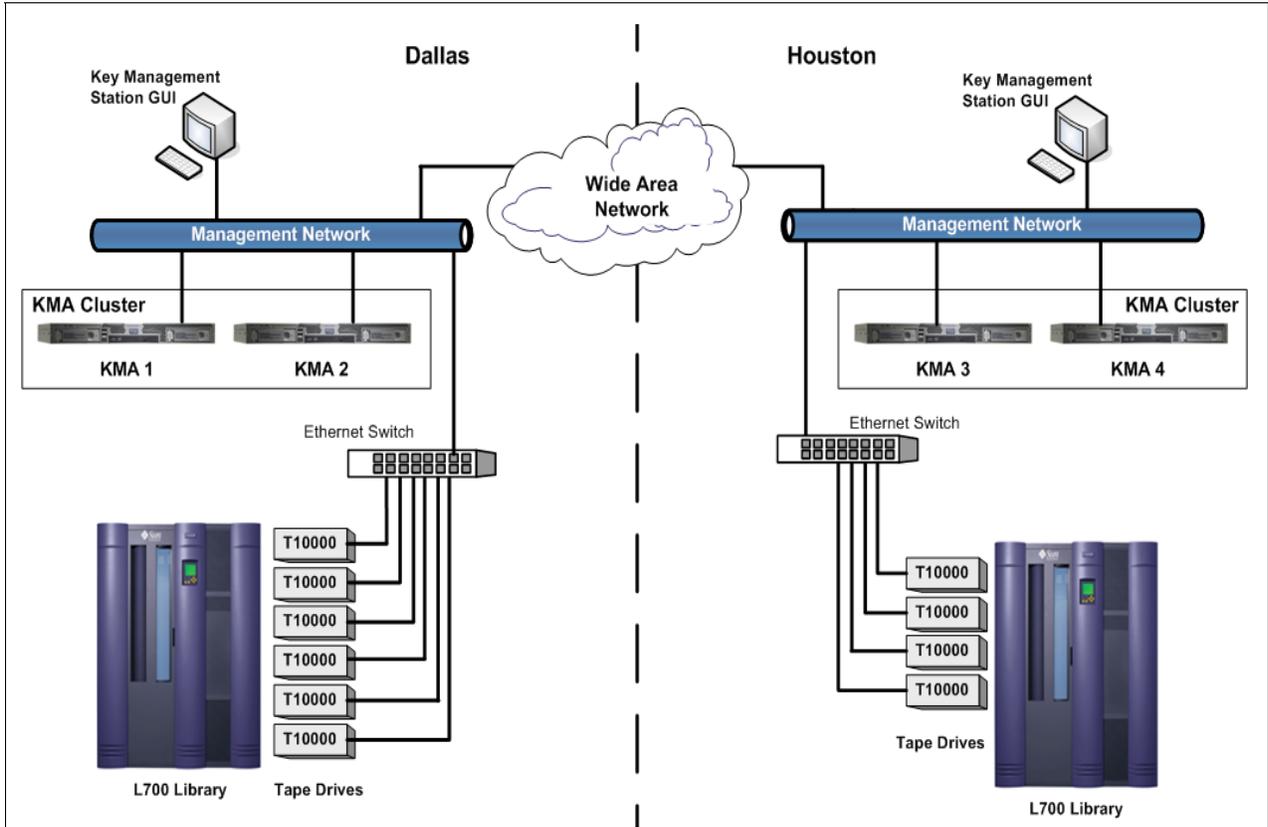
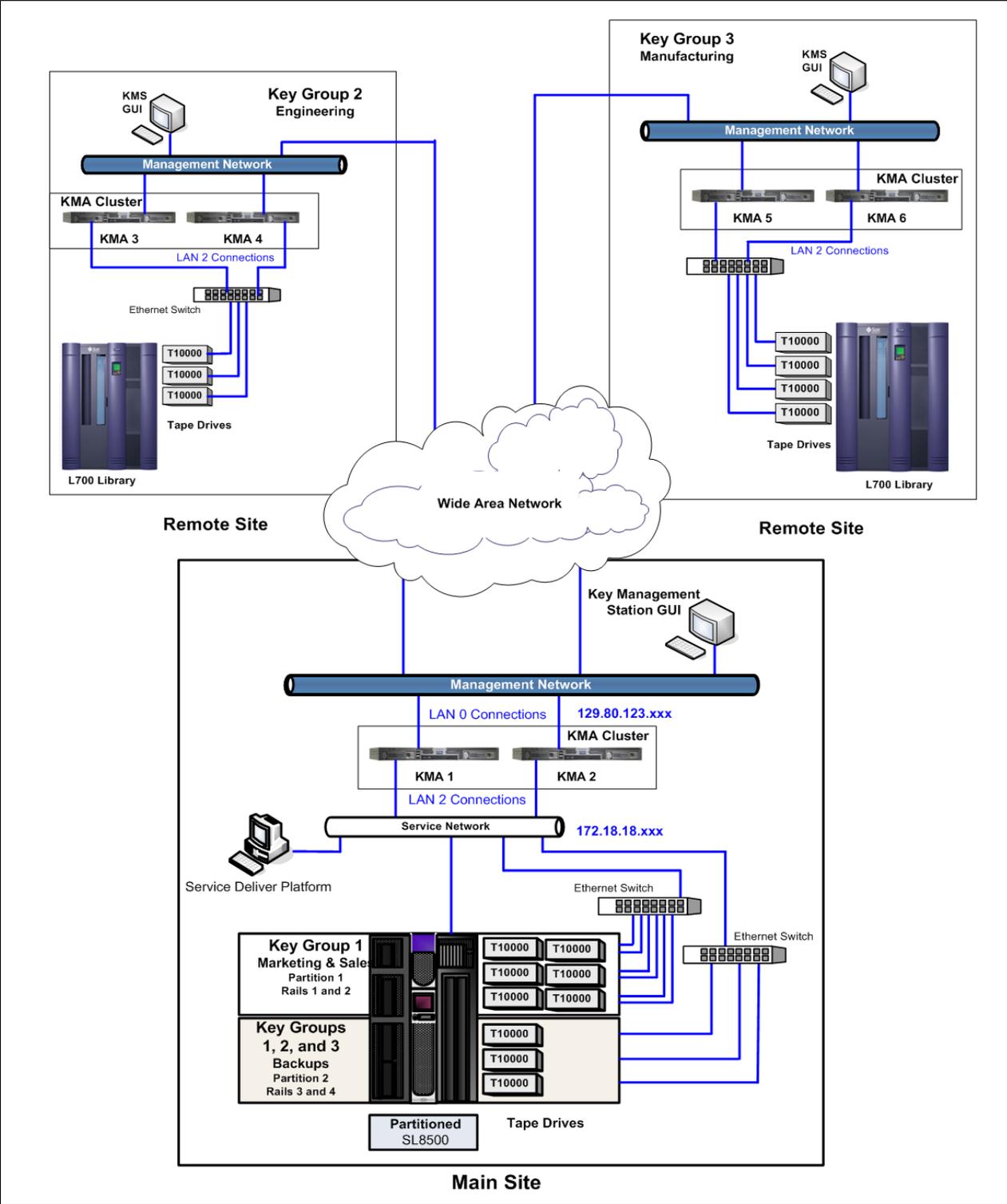


FIGURE 1-2 Key Management Appliance Configurations (Continued)

C) Multiple sites—wide area network—specific key groups—local disaster recovery in a partition. Uses the both the management (remote) and service (local) networks for the tape drive connections.



## Version 2.0 Configuration Descriptions

The architecture for the Version 2.0 encryption solution consists of:

- **Key Management Appliance (KMA)**—A proven, dual-core processor with Sun Microsystems' Solaris 10 operating system that delivers policy-based key management and key provisioning services.
- **KMS Manager or KMS Manager GUI**—A software component with a graphical user interface (GUI), that incorporates and uses the management API to communicate with the KMAs in a cluster.



The KMS Manager is Web-based; and must be installed on a **customer-provided**, network-attached, PC, server, or workstation running Windows XP, or Solaris x86.

- **KMS Cluster**—A full set of KMAs in the system. All of the KMAs are aware of each other, and replicate information to each other.

The maximum number of KMAs in a cluster is 20.

- **Agent**—A device (tape drive) that performs encryption using keys managed by the KMA Cluster and KMS Manager.
- **Data Unit ID**—The media—a data cartridge.
- **Key Groups**—Provide organization for keys and associates them with a Key Policy. Key Groups also enforce access to the key material by the Encryption Agents.
- **Network connections**—There are two networks that provide tape drive connectivity, the management network and the service network.

The service network is the preferred connection scheme for the tape drives; however, both networks support tape drive connectivity.

For additional security and to cut down on LAN traffic, the customer may want to consider using Virtual Local Area Networks<sup>1</sup> (VLANs) when connecting tape drives to the management network. VLANs are created using special

Note: A third network is available for the embedded Lights Out Manager.

### Important:

Key management appliances *must be* installed in pairs as show in the configuration drawings in [FIGURE 1-2](#). Some key points include:

- Multiple clusters may exist on a dedicated, private, local or wide area network.
- The KMAs in a KMS Cluster provide automatic failover and backups as required.
- Tape drives—called Agents—must be, and remain, connected to the network.
- Any KMA can service any tape drive on the network.
- By default, Agents are serviced by the local KMA if available.
- Any KMA can be used for administration functions.
- All changes to any KMA are replicated to all other KMAs in the cluster.

For example:

- New keys generated at any site are replicated to all other KMAs in the cluster.
- All administrative changes are propagated to all other KMAs in the cluster.
- All administration functions can be centralized to one KMS or site.

---

1. VLANs are broadcast domains that exist within a defined set of switches. Ports on these switches can be grouped together to provide a logical network to provide the services traditionally created by traditional routers in network configurations.

## Networks

There are two networks where communications normally occur, the:

<b>Management network</b>	<b>Note – Customers are expected to provide this network.</b> The management network services the KMAs and the tape drives when installed in that configuration.
<b>Service network</b>	The service network is provided by Ethernet switches that come in the library accessory kits. The service network is intended to connect between the KMAs and drives, and could also include a Service Delivery Platform (SDP), an optional appliance if available.
Both of these networks and connections are shown in <a href="#">FIGURE 1-2 on page 7</a> .	

## Communications Process

The communications process between a:

- Drive and KMA
- KMA to KMA
- User and KMA

are all the same. They use a passphrase to perform a Challenge & Response Protocol. If successful, the drive, KMA, or user are provided with a **certificate** and a corresponding **private key**.

- This certificate and private key establish a TLS 1.0 (secure sockets) channel<sup>2</sup>.
- Establishing this secure sockets channel uses a 2048 bit RSA<sup>3</sup>.
- Authenticating this session results in an agreed upon, 256 bit AES<sup>4</sup> key; where all subsequent communications are encrypted with an AES 256 key.

Using these certificates, both ends of any connection authenticate the other.

This process is performed during the enrollment phase.

- For a drive, this is done using a Virtual Operator Panel (VOP) session.
- For a KMA, it is part of the QuickStart program.
- For users, the process is repeated every time the user logs in.

This process is also repeated every time a tape drive comes back online (after an IPL) and after a reboot of a KMA.

All latter communications, such as a drive requesting a key, one KMA sending replication to another, or a user making a request with the KMS Manager interface, are done using the already established secure sockets session.

---

2.Transport Layer Security = A cryptographic protocol that provide secure communications.

3. RSA = An algorithm for public-key cryptography.

4.Advanced Encryption Standard = A FIPS-approved, National Institute of Standards and Technology (NIST) cryptographic standard used to protect electronic data.

## Backups

Unlike Version 1.x, there is no external USB hard drive for backups. This is because of the KMA cluster—a minimum of two KMAs are required to create the cluster—and that each KMA replicates the others. This way, if one KMA goes down and is replaced, you would join into an existing KMA cluster to restore the database on the new KMA. A cluster and network established backup.

### Core Security Backup

During the initial configuration, after the QuickStart program completes, and the Key Split Credentials and Quorum are defined, the Security Officer can preform a “Core Security Backup” from the KMS Manager. This backup contains the system master key—which is split using a Shamir Shared Secret algorithm<sup>5</sup> into the number of splits define by the Key Split Credentials. A Quorum is then required to re-establish the system master key.

**Note** – Once this backup is complete, it only needs to be done when the Key Split Credentials are changed, such as a change in assignments or personnel.

### Periodic Backup

Periodically a regular backup should be done by the Backup Operator using the KMS Manager. This backup creates two files, a backup file and a backup key file.

A backup file contains all the information (database and keys) and is encrypted with an AES 256 key specific to the backup. This key is placed in the backup key file, and is wrapped with the master key.

To restore a backup, you need a backup file and its corresponding backup key file, and the core security backup. A quorum of the Key Split Credentials must supply their passphrases, which are used to extract the master key from the core security backup. That allows the backup key file to be decrypted, producing the backup key. Then, the backup must be decrypted, and this is used to restore the system.

## Encryption Hardware Kits

Encryption hardware kits come complete with Ethernet switches, cables, power distribution units, and mounting hardware for connection to the tape drives in either a library or standalone configuration.

The type of configuration determines how the tape drives are installed—**each has its own kit**—see [Chapter 4, “Ordering”](#) for specific information and contents.

Refer to the *Crypto Key Management System Installation and Service Manual* and the individual *product installation manuals* for specific installation instructions.

---

5. An algorithm in cryptograph where a secret is divided into parts, giving each participant its own unique part, where some of the parts or all of them are needed in order to reconstruct the secret.

## Encryption Version Comparisons

TABLE 1-2 shows a comparison between Version 1.x and Version 2.0 encryption solutions.

**TABLE 1-2** Encryption Solution Comparisons

Comparison	Key Management Workstation 1.x	Key Management Appliance 2.x
<b>Protocols</b>	Robust but uses manual protocols	Robust and uses automated protocols
<b>Encryption Method</b>	AES 256	AES 256
<b>KMS Platform</b>	Ultra 20 Workstation	Sunfire X2100 appliance
<b>Key Update</b>	Asynchronous	On each tape mount
<b>Drive Key Strategy</b>	<ul style="list-style-type: none"> <li>■ 1 Write Key per drive</li> <li>■ 32 Cached Read Keys</li> </ul>	<ul style="list-style-type: none"> <li>■ Drive requests keys from KMA</li> <li>■ Drive still has 32-key cache</li> </ul>
<b>Key Transmission</b>	<ul style="list-style-type: none"> <li>■ Out-of-Band Ethernet TCP/IP</li> <li>■ Token as secure local key store</li> </ul>	<ul style="list-style-type: none"> <li>■ Out-of-Band Ethernet TCP/IP</li> <li>■ Direct KMS to Drive communication</li> </ul>
<b>Transmission Key Protection</b>	AES-256 CCM Mode	TLS/RSA/SHA1/AES-256 HMAC
<b>Key Assignment</b>	Manual	Automated
<b>Large Key Management</b>	Unwieldy with a large number of keys	Designed for large number of keys
<b>KMS Clustering</b>	Mirrored hot-spare	Full clustering
<b>KMS Administration</b>	Console or remote GUI	Remote GUI
<b>Key Sharing and Data Recovery</b>	Manual, with tokens	Public key based exchange
<b>Supported tape drives</b>	T10000A	T10000A (currently available) T10000B ( <i>future – check on availability</i> ) T9840D (currently available) HP LTO4 (currently available)
<b>Support other non-Tape devices</b>	No	Planned
<b>Customer Roles</b>	Three	Five
		<b>Additional Features:</b> <ul style="list-style-type: none"> <li>■ One-time setup from console</li> <li>■ Management from remote GUI</li> <li>■ Quorum for critical operations</li> <li>■ KMS/Drives use private network</li> <li>■ Multiple KMAs connected over WAN</li> <li>■ Unique write key for each tape</li> <li>■ High performance, 150ms key retrieval</li> <li>■ Data sharing with partners supported</li> <li>■ Compatible with 1.0 keys</li> </ul> <b>Support:</b> <ul style="list-style-type: none"> <li>■ 10 Sites</li> <li>■ 2 KMAs per site</li> <li>■ Up to 3,000 tape drives</li> </ul>

## Tape Drives

Well known for its *state-of-the-art* tape technology, StorageTek—a division of Sun Microsystems—has over 35 years of experience and leadership in tape and tape automation. Today, StorageTek, with its proven technology, continues to provide storage solutions for:

- Small to large businesses and organizations
- Enterprise and client-server platforms
- Stand-alone and automated tape environments

There are four tape drive models to choose from:

- T10000A
- T10000B (*check on availability*)
- T9840 Model D only
- Hewlett Packard (HP) LTO4

### About the T10000

The T10000 tape drive is a small, modular, high-performance tape drive designed for high-capacity storage. There are two models of the T10000 that support encryption:

- T10000A
- T10000B (*check on availability*)

#### **Dimensions:**

The tape drive is 8.89 cm (3.5 in.) high, 14.6 cm (5.75 in.) wide, and 42.5 cm (16.75 in.) deep.

#### **Capacity:**

The T10000 uses a technology called partial response, maximum likelihood (PRML) to provide the high-density data format that allows the tape drive to record and store up to:

- **T10000 A** = 500 gigabytes (GB) of uncompressed data
- **T10000 B** = 1 terabyte (TB) of uncompressed data (*when available*)

#### **Media:**

The tape cartridge for this drive uses a single-reel hub for high capacity; the supply reel is inside the cartridge and the take-up reel is inside the tape drive.

#### **Interfaces:**

The host connections to the T10000 are fiber-optic to provide a high rate of data transfer. The T10000 drives support both Fibre Channel and FICON interfaces.

#### **Configurations:**

The T10000 supports two configurations for encryption: library and standalone.

For a variety of operating system platforms:

- Enterprise mainframes (z/OS and OS/390)
- Open system platforms (Windows, UNIX, and Linux)

## About the T9840D Tape Drive

The T9840D tape drive is a small, high-performance, **access-centric** tape drive that has an average access time of just 8 seconds.

This drive obtains its high-performance by using a unique *dual-hub* cartridge design with midpoint load technology. This enables fast access and reduces latency by positioning the read/write head in the middle of the tape.

There are four models of the T9840; however, only the T9840D supports encryption.

### **Dimensions:**

The tape drive is 8.25 cm (3.25 in.) high, 14.6 cm (5.75 in.) wide, and 38.1 cm (15 in.) deep.

### **Capacity:**

The T9840D uses a variable rate randomizer with partial response, maximum likelihood (PRML) as the recording format. This allows the tape drive to record and store up to:

- **T9840D** = 75 gigabytes (GB) of uncompressed data

### **Media:**

With the unique dual-hub design of the 9840 cartridge, the entire tape path is contained inside the tape cartridge. This design reduces contamination and enables the drives fast access.

### **Interfaces:**

Host interfaces to the T9840D tape drive includes: Fibre Channel (FC), IBM's Fibre Connection (FICON), and IBM's Enterprise System Connection (ESCON).

### **Configurations:**

The T9840 supports two configurations for encryption: library and standalone.

For a variety of operating system platforms:

- Enterprise mainframes (z/OS and OS/390)
- Open system platforms (Windows, UNIX, and Linux)

## About the HP LTO4 Tape Drive

**Overview** The Hewlett Packard (HP) LTO4 is the fourth-generation of Ultrium, Linear Tape-Open tape drives. This generation offers more capacity and increased performance than earlier versions of LTO tape drives.

**Encryption Capable** The Hewlett Packard LTO4 is the *first*, non-StorageTek T-Series tape drive to support the Crypto Key Management System Version 2.0.

This encryption-capability requires a special, custom designed, Ethernet card—called the Dione card—that enables the LTO4 drive to connect to and interface with the Key Management System (KMS) network.

With this connection, the LTO4 is capable of communicating with the KMS to transfer encryption keys over the secure network.

*Note:* The HP LTO4 can only use *one encryption key at a time*. During a read operation, if another encryption key is found, the Dione card requests the key directly from the KMS.

**Media (Native capacity)** The HP LTO4 drive with LTO4 media can store up to 800 GB of data. This drive can also read and write on LTO3 media (400 GB), and provides read-only capabilities with LTO2 media (200 GB).

The LTO4 tape drive also supports Write Once, Read Many (WORM) secure media. This non-erasable, non-rewritable media meets several compliance regulations such as HIPAA, Sarbanes-Oxley, and SEC 17A-4.

*Note:* Encryption is only possible using LTO4 media, including LTO4 WORM media, with the HP LTO4 tape drive. If you insert LTO2 or LTO3 media, encryption will be disabled.

**Interfaces (Native rates)** The HP LTO4 drive supports up to 120 MB/s data transfer rates using Data Rate Matching (DRM). This feature allows the tape drive to dynamically and continuously adjust the speed of the drive, from 40 to 120 MB/s for maximum performance

Interface support for the HP LTO4 includes:

- Ultra 320 Small Computer System Interface (SCSI)
- 4 Giga-bits per second (Gbps) Fibre Channel

Installing this tape drive in one of Sun StorageTek's automated tape configurations offers customers with an even wider choice of tape-based storage solutions.

- **Server compatibility:** Fibre Channel and SCSI models on popular (qualified) platforms from vendors such as Sun, HP, IBM, and Dell.
- **Software compatibility:** Support for an extensive list of software applications such as ACSLS, HP, CA, VERITAS, Legato, Tivoli, and many more.
- **Support for WORM media:** Allows for unalterable backups using Write-Once Read-Many (WORM) media to meet compliance regulations.
- **Mid-range class:** Delivers confidence with a wide variety of supported backup applications.

# Tape Drive Comparison

**TABLE 1-3** Tape Drive Comparisons

<b>Physical Specifications</b>	<b>T10000A</b>	<b>T10000B</b>	<b>T9840D</b>	<b>LTO4</b>
Height	8.25 cm (3.25 in.)	8.25 cm (3.25 in.)	8.25 cm (3.25 in.)	8.25 cm (3.25 in.)
Width	14.6 cm (5.75 in.)	14.6 cm (5.75 in.)	14.6 cm (5.75 in.)	14.6 cm (5.75 in.)
Length (depth)	42.5 cm (16.75 in.)	42.5 cm (16.75 in.)	38.1 cm (15 in.)	20.3 cm (8 in.)
Weight	5 kg (11 lb)	5 kg (11 lb)	3.9 kg (8.5 lb)	2.24 kg (4.94 lb)
<b>Performance Specifications</b>				
Capacity (native)	500 GB	1TB	75GB	800 GB
Transfer rate (native)	2 Gb/s - 4 Gb/s	4 Gb/s	30 MB/s	4 Gb/s
Throughput (native)	120 MB/s	120 MB/s	30 MB/s	120 MB/s
Data Buffer size	256 MB	256 MB	64 MB	128 MB
Number of tracks	768	1152	576	896
Tape Thread & Load	16 sec	16 sec	8.5 sec	19 sec
Access Time	46 sec	46 sec	8 sec	62 sec
Tape speed	2.0 and 4.95 m/s	2.0 & 3.74 m/s 4.95 m/s legacy	3.4 m/s	7.00 m/s
Rewind time	90 sec	90 sec	16/8 sec	124 sec
Tape Unload	23 sec	23 sec	12 sec	22 sec
Emulation Modes	3490E, 3590, 3592, T9940	3490E, 3592	Native, 3490E, 3590H	—
Interface Support	FC2, FC4, FICON	FC4, FICON	FC2, FICON. ESCON	FC4, SCSI Ultra320
MTBF (100% duty cycle)	290,000 hrs	290,000 hrs	290,000 hrs	250,000 hrs
<b>Media/Format Compatibility</b>				
Read/Write	Proprietary Format- T10000 Cartridge		Proprietary Format	LTO2 = Read only LTO3 = Rd/Write LTO4 = Rd/Write
VolSafe/WORM?	Yes		Yes	Yes
<b>Power</b>				
Auto-ranging / Amperage	88-264 VAC, 48-63 Hz			100–240 VAC 50–60 Hz 0.8A max.
Consumption	90 W		82 W	52 W

## Tape Drive and Media Comparisons

For your information, the following tables provide tape drive and media support comparisons.

### T-Series Tape Drives (T10000 and T9840)

TABLE 1-4 shows the media compatibilities for:

- Encryption-capable T-Series tape drives
- Non-encryption T-Series tape drives

**TABLE 1-4** T-Series Tape Drive Media Compatibilities

Task	Encryption-capable	Non-encryption
Write new data encrypted	Yes	No
Write new data not encrypted	No	Yes
Read encrypted data with key available	Yes	No
Read non-encrypted data	Yes	Yes
Append non-encrypted data to encrypted tape	No	No

TABLE 1-5 shows a comparison between:

- Encryption-enabled and non-encrypted tape drives
- Encrypted and non-encrypted media

**TABLE 1-5** Tape Drive and Media Support

Tape Drive Types	Media Types	
	Non-encrypted Tapes	Encrypted Tapes
<b>Standard drive</b> (non-encrypted)	<ul style="list-style-type: none"> <li>■ Fully compatible</li> <li>■ Read, write, and append</li> </ul>	<ul style="list-style-type: none"> <li>■ <b>Not capable</b> of reading, writing to or appending to this tape</li> <li>■ Can re-write from the beginning of tape (BOT)</li> </ul>
<b>Encryption-capable drive</b>	<ul style="list-style-type: none"> <li>■ <b>Read</b> capability only</li> <li>■ Not capable of appending to this tape</li> <li>■ Can re-write from the beginning of tape (BOT)</li> </ul>	<ul style="list-style-type: none"> <li>■ Fully compatible</li> <li>■ Read with correct keys</li> <li>■ Write with current write key</li> </ul>

## HP LTO4 Tape Drives

HP LTO Ultrium 4 drives are specified to interchange with un-encrypted data cartridges from other tape drives that comply to the LTO U-28, U-316 and U-416 specifications:

Future compatibility:

In the future, HP LTO Ultrium drives will be capable of:

- Reading and writing tapes from the current generation
- Reading and writing tapes from one earlier generation
- Reading tapes from two earlier generations

HP LTO Ultrium drives will always maintain write and read compatibility with other manufacturers' LTO Ultrium drives and tapes that meet the LTO Ultrium format specification.

**TABLE 1-6** LTO Media Compatibility

Native Capacity (Length)	Format	Capability	
		Write	Read
800 GB WORM	LTO4	Yes	Yes
800 GB (820m)	LTO4	Yes	Yes
400 GB WORM	LTO3	Yes	Yes
400 GB (680m)	LTO3	Yes	Yes
200 GB (580m)	LTO2	No	Yes
100 GB (580m)	LTO1	No	No
50 GB (290m)	LTO1	No	No



**Note** – Currently, only LTO4 media is encryption-capable on the LTO4 tape drives.

While LTO4 can read and “write” to LTO3 media, if an LTO4 drive encrypted data on LTO3 media, then LTO3 drives could not read those tapes. Therefore, when LTO3 media is inserted into an LTO4 drive, the encryption capability is disabled and the drive will write non-encrypted data without notification.

# Key Management Appliance Specifications

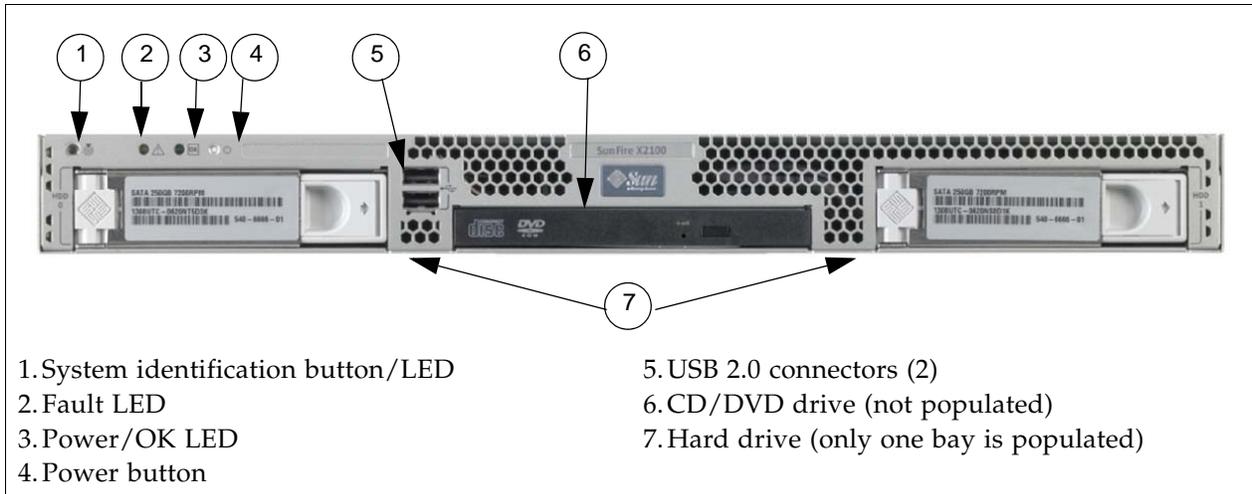
TABLE 1-7 lists the specifications for the SunFire X2100 server.

**TABLE 1-7** Sun Fire X2100 Specifications

<b>Processor</b>	<ul style="list-style-type: none"> <li>■ One dual-core AMD Operton processor</li> <li>■ Processor frequencies: 2.2 GHz</li> <li>■ Up to 1 MB level 2 cache</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>■ Four DIMM slots (up to 4 gigabytes)</li> <li>■ Unbuffered ECC memory</li> </ul>
<b>IPMI 2.0</b>	<ul style="list-style-type: none"> <li>■ Service processor standard</li> <li>■ embedded Lights Out Manager</li> </ul>
<b>Mass storage</b>	One SATA disk drive
<b>PCI Slots</b>	Two PCI-Express slots (PCIe) PCIe-0 contains the Sun Crypto Accelerator 6000 (SCA6000)
<b>Networking</b>	<ul style="list-style-type: none"> <li>■ Four USB 2.0 connectors on the rear panel</li> <li>■ Two USB 2.0 connectors on the front panel</li> <li>■ Two ports: Serial port with DB-9; VGA with DB-15 connectors</li> <li>■ Four 10/100/1000 Base-T Ethernet ports</li> </ul>
<b>Dimensions:</b>	
Height	43 mm (1.7 in.)
Width	425.5mm (16.8 in.)
Depth	633.7 mm (25 in.)
Weight (maximum)	10.7 kg (23.45 lb)
Mounting options	19-inch rackmount kit; Compact 1 rack-unit (1.75 in.) form factor
<b>Environmental parameters:</b>	
Temperature	5°C to 35°C (41°F to 95°F)
Relative humidity	27°C (80°F) max wet bulb
Altitude	Up to 3,000 m (9,000 ft)
Power supply	One 6.5 Amps at 345 Watts Heat output is about 850 BTU/hour
<b>Regulations meets or exceeds the following requirements:</b>	
Acoustic Noise Emissions declared in accordance with ISO 9296	
Safety IEC 60950, UL/CSA60950, EN60950, CB scheme	
RFI/EMI FCC Class A, Part 15 47 CFR, EN55022, CISPR 22, EN300-386:v1.31, ICES-003	
Immunity: EN55024, EN300-386:v1.3.2	
Certifications: Safety CE Mark, GOST, GS Mark, cULus Mark, CB scheme, CCC, S Mark	
EMC CE Mark, Emissions and Immunity Class A Emissions Levels: FCC, C-Tick, MIC, CCC, GOST, BSMI, ESTI, DOC, S Mark	

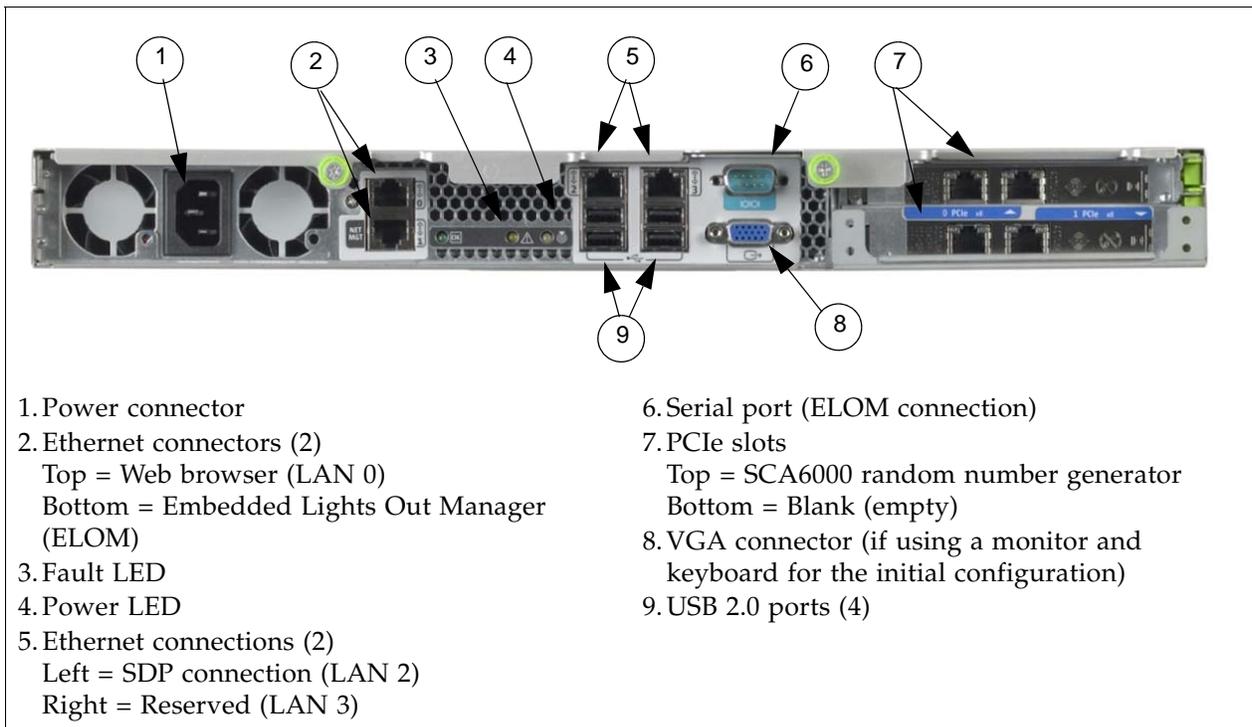
- FIGURE 1-3 is an example for the front of the appliance
  - FIGURE 1-4 is an example for the rear of the appliance
- Note: The rear of the appliance is where all of the cable connections are made.

**FIGURE 1-3** Key Management Appliance—Front Panel



- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. System identification button/LED</li> <li>2. Fault LED</li> <li>3. Power/OK LED</li> <li>4. Power button</li> </ul> | <ul style="list-style-type: none"> <li>5. USB 2.0 connectors (2)</li> <li>6. CD/DVD drive (not populated)</li> <li>7. Hard drive (only one bay is populated)</li> </ul> |
|---|---|

**FIGURE 1-4** Key Management Appliance—Rear Panel



- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Power connector</li> <li>2. Ethernet connectors (2)<br/>Top = Web browser (LAN 0)<br/>Bottom = Embedded Lights Out Manager (ELOM)</li> <li>3. Fault LED</li> <li>4. Power LED</li> <li>5. Ethernet connections (2)<br/>Left = SDP connection (LAN 2)<br/>Right = Reserved (LAN 3)</li> </ul> | <ul style="list-style-type: none"> <li>6. Serial port (ELOM connection)</li> <li>7. PCIe slots<br/>Top = SCA6000 random number generator<br/>Bottom = Blank (empty)</li> <li>8. VGA connector (if using a monitor and keyboard for the initial configuration)</li> <li>9. USB 2.0 ports (4)</li> </ul> |
|--|--|



## Systems Assurance

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This chapter contains information about the systems assurance process.

The system assurance process is the exchange of information among team members to ensure that no aspects of the sale, order, installation and implementation for the Sun StorageTek Crypto Key Management System are overlooked. This process promotes an error-free installation and contributes to the overall customer satisfaction.

The system assurance team members (customer and Sun StorageTek) ensure that all aspects of the process are planned carefully and performed efficiently. This process begins when the customer accepts the sales proposal. At this time, a Sun representative schedules the system assurance planning meetings.

# Planning Meetings

The purpose of the system assurance planning meetings is to:

- Introduce the customer to the Sun StorageTek encryption products
- Explain the system assurance process and establish the team
- Identify and define the customer requirements
- Identify any additional items needed (such as cables, tokens, and switches)
- Prepare for the installation and implementation
- Schedule and track the entire process

**TABLE 2-1** System Assurance Task Checklist

Task	Completed?
Introduce the Sun team members to the customer. Complete the Team Member Contact sheets. Make copies as necessary.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Explain the Sun StorageTek the encryption solutions to the customer. See <a href="#">Chapter 1, "Introduction"</a> for topics and information.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Complete the Team Member Contact sheets.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Use <a href="#">"Configuration Planning"</a> on page 25 to help define the customer requirements.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review and complete <a href="#">"Site Planning Checklist"</a> on page 28. <i>Comments:</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review and identify <a href="#">"User Roles Work Sheet"</a> on page 51. <i>Comments:</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review <a href="#">"Supported Configurations"</a> on page 53. <i>Comments:</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review <a href="#">"Order Numbers, Descriptions, and Contents"</a> on page 61. <i>Comments:</i>	Yes <input type="checkbox"/> No <input type="checkbox"/>
Determine the installation schedule:  <b>Date:</b> _____  <b>Time:</b> _____	Yes <input type="checkbox"/> No <input type="checkbox"/>
Download and provide the customer with a copy of the <i>Crypto Key Management System Administrator's Guide</i> PN 316195101. <a href="http://docs.sun.com/app/docs">http://docs.sun.com/app/docs</a>	Yes <input type="checkbox"/> No <input type="checkbox"/>

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# Customer Team Member Contact Sheet

Complete the following information for the customer team members:

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

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**Note** – Customer representatives may include: security officers, finance managers, IT managers, network administrators, systems administrators, site planning managers, and anyone else involved in installations.

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# Sun Team Member Contact Sheet

Complete the following information for the Sun Microsystems team members:

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

**Name:** \_\_\_\_\_  
Title: \_\_\_\_\_  
Telephone Number: \_\_\_\_\_  
FAX Number: \_\_\_\_\_  
Cell Phone / Pager: \_\_\_\_\_  
E-mail Address: \_\_\_\_\_

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**Note** – Sun StorageTek Representatives may include: marketing, sales, and account representative, systems engineers (SEs), Professional Services (PS), installation coordinators, and trained services personnel.

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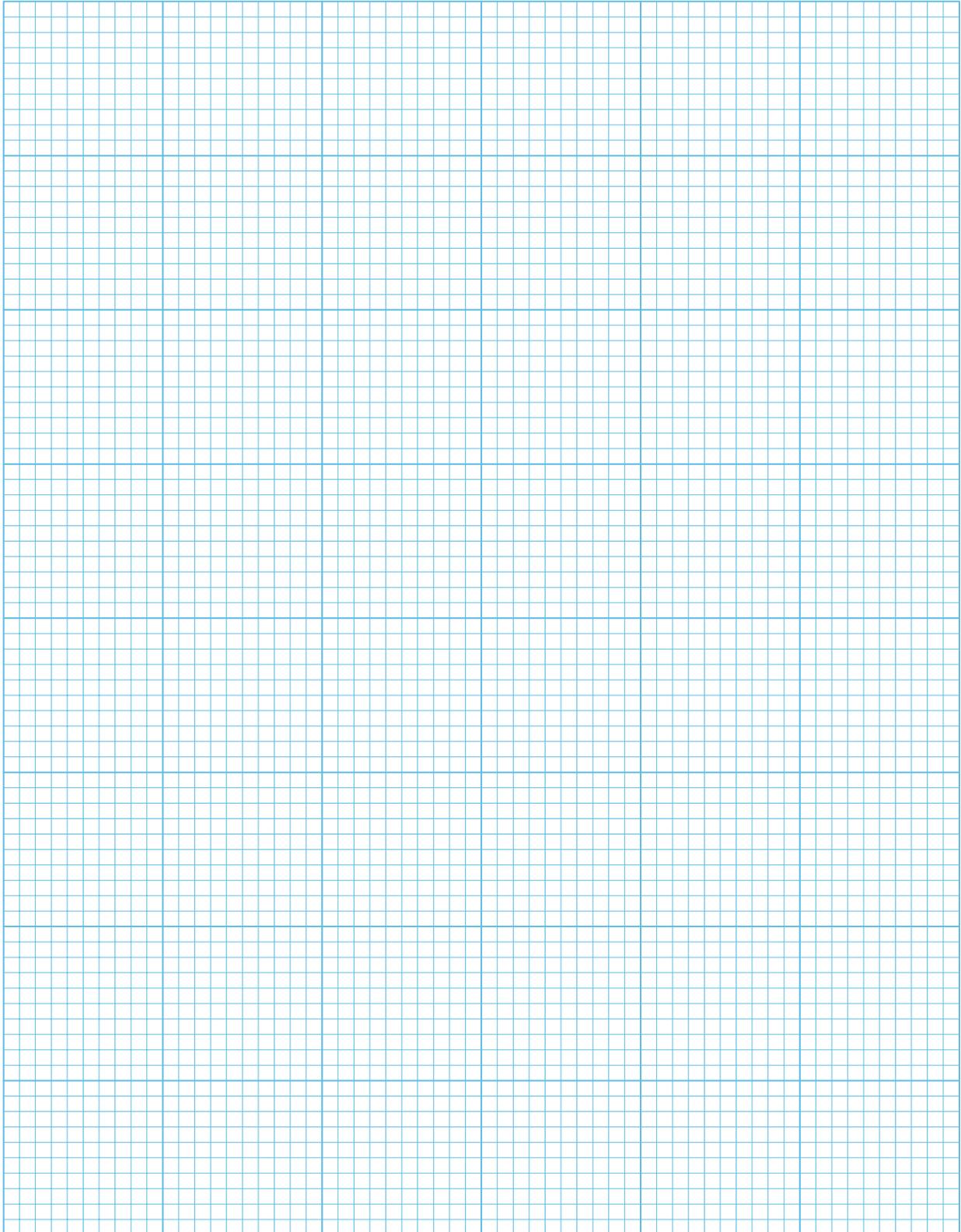
# Configuration Planning

Complete the following checklist and make a conceptual drawing of to help with the installation. Provide this information and drawing to the installers.

**TABLE 2-2** Solution Planning Checklist

Question	Selection / Comments
Which encryption solution does the customer want?	<input type="checkbox"/> <b>KMS 2.x</b> (Continue with this checklist) <input type="checkbox"/> KMS 1.x
What type of configuration does the customer want? <b>Notes:</b> <ul style="list-style-type: none"> <li>■ The maximum number of sites with KMAs is 10. It is possible to have sites without KMAs connected across a customer supplied wide area network (WAN).</li> <li>■ Also, the 10 site limit is within a single cluster. The customer may choose to have multiple clusters; however, KMAs in one clusters are unaware of KMAs in other clusters.</li> </ul>	<input type="checkbox"/> Single site  <input type="checkbox"/> Multiple sites How many: _____  <input type="checkbox"/> Disaster recovery ?
How many KMA appliances are needed? <b>Notes:</b> <ul style="list-style-type: none"> <li>■ The maximum number of KMAs is 20.</li> <li>■ KMAs <i>must be</i> installed in pairs.</li> </ul>	
How many and of what type of encryption hardware kits are needed?	<input type="checkbox"/> SL8500 How many: _____ <input type="checkbox"/> SL3000 (Future—check on availability) <input type="checkbox"/> SL500 (LTO4 only—check on availability) <input type="checkbox"/> 9310 9741E How many: _____ <input type="checkbox"/> L-Series How many: _____ Type: <input type="checkbox"/> L180, <input type="checkbox"/> L700, <input type="checkbox"/> L1400 <input type="checkbox"/> Rackmount How many: _____
How many and of what type of encryption tape drives are needed?	<input type="checkbox"/> T10000A How many: _____ <input type="checkbox"/> T10000B (Future—check on availability)  <input type="checkbox"/> T9840D How many: _____  <input type="checkbox"/> HP LTO4 How many: _____
Identify customer requirements and expectations.	

## Customer Conceptual Drawing



## Site Preparation

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Use this chapter to prepare for the installation.

- [“Site Planning Checklist” on page 28](#)

There are a few things to be aware of to install encryption hardware into a supported configuration, such as:

- [“Rack Specifications” on page 31](#)
  - [“SL8500 Rack Guidelines” on page 31](#)
  - [“External Rack Installations” on page 32](#)
- [“Redundant Power” on page 33](#)
- [“Service Delivery Platform” on page 34](#)
- [“Content Management” on page 35](#)
  - [“Capacity on Demand” on page 36](#)
  - [“RealTime Growth Technology” on page 36](#)
  - [“Partitioning” on page 36](#)
  - [“Planning the Data Path” on page 37](#)
  - [“Tasks” on page 38](#)
- [“Required Tools” on page 43](#)
- [“Supported Platforms and Web Browsers” on page 43](#)
- [“Required Firmware Versions” on page 44](#)
- [“Role-Based Operations” on page 46](#)
  - [User Roles Work Sheet on page 51](#)

# Site Planning Checklist

Use the following checklist to ensure that the customer is ready to receive the Key Management System and to ensure that you are ready to start the installation.

**TABLE 3-1** Site Planning Checklist

Question	Completed?	Comments:
<b>Delivery and Handling</b>		
<b>Important:</b> The Key Management Systems and appliances are considered “secure” items. Follow the customers security guidelines for delivery and installation.		
Does the customer have a delivery dock? If <i>no</i> , where will the equipment be delivered?  If a delivery dock <i>is</i> available, what are the hours of operation?	Yes <input type="checkbox"/> No <input type="checkbox"/>  _____	
Are there street or alley limitations that might hinder delivery?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Will authorized personnel be available to handle the delivery?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is the delivery location close to the computer room where the equipment will be installed?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is an elevator available to move the equipment to the appropriate floors?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is there a staging area where the equipment can be placed close to the installation site?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Environmental Planning</b>		
Does the site meet the environmental requirements for temperature, humidity, and cooling?	Yes <input type="checkbox"/> No <input type="checkbox"/>	KMA: 5°C to 35°C (41°F to 95°F)
Are there special requirements to dispose of or recycle the packing material, pallets, and cardboard?	Yes <input type="checkbox"/> No <input type="checkbox"/>	

**TABLE 3-1** Site Planning Checklist (Continued)

Question	Completed?	Comments:
<b>Power Requirements</b>		
Does the intended site meet the power requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>	<b>KMA:</b> 90 to 132 VAC   180 to 264 VAC 57 to 63 Hz   47 to 53 Hz 2.3 to 4.6 Amps Maximum continuous power is 300W
Have you identified the circuit breakers locations and ratings?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the customer want <b>redundant power</b> options? If so, an additional APC power switch is required to create an uninterrupted power configuration.	Yes <input type="checkbox"/> No <input type="checkbox"/>	APC Switch = XSL8500-AC-SW-Z
Are there any power cable routing concerns?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Personnel:</b>		
Are there trained/qualified Sun StorageTek representatives locally to install and maintain the encryption equipment?	Yes <input type="checkbox"/> No <input type="checkbox"/>	<b>Names:</b>
Are there trained/qualified Sun StorageTek representatives locally to install and maintain the supported configurations?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
<b>Connectivity:</b> Cabling is <i>very important</i> to establish a reliable network between the KMS GUI, KMAs, Ethernet switches, and tape drives.		
Have you completed a: ■ Cable plan? ■ Configuration drawing?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Have you determined the type and number of Ethernet cables required? <i>Customer supplied:</i> ■ KMS Manager to the network ■ Network to the KMAs  <i>Supplied in the encryption kits:</i> ■ Switch to each tape drive	Yes <input type="checkbox"/> No <input type="checkbox"/>	<b>Note:</b> ■ Ethernet cables come with the accessory kits. ■ Lengths are dependant on the location of the switches and devices.

**TABLE 3-1** Site Planning Checklist (Continued)

Question	Completed?	Comments:
<b>Configurations</b>		
Does the customer have adequate rack space to hold the KMAs and Ethernet switches?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See "Rack Specifications" on page 31 for information. <b>Note:</b> A half-rack (20-units) can be ordered to hold the KMAs, switches, and PDUs. Kit <b>CRYPTO-20U-Z</b>
What type of support configurations does the customer want?	<input type="checkbox"/> SL8500 <input type="checkbox"/> SL3000 <input type="checkbox"/> SL500 <input type="checkbox"/> 9310/9741e <input type="checkbox"/> L-Series <input type="checkbox"/> Rackmount	HP LTO4 only
Does the customer have existing tape drives to use?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are they already installed in a library?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the customer need to order more drives? ■ How many tape drives? ■ T10000 A ■ T10000 B ( <i>Check on availability</i> ) ■ T9840D ■ HP LTO4 ■ Interface types? ■ Fibre Channel (all tape drives) ■ FICON (T-Series only) ■ ESCON (T9840D) ■ SCSI (SL500 library and LTO4 only)	Yes <input type="checkbox"/> No <input type="checkbox"/>	<b>Check on availability</b> Not all versions of tape drives and interfaces will be available with this initial release of Version 2.x.  Currently supported tape drives: ■ T10000A ■ T9840D ■ HP LTO4
<b>Media</b>		
Are additional cartridges required? ■ Data cartridge ■ Cleaning cartridges ■ VolSafe cartridges ■ Labels	Yes <input type="checkbox"/> No <input type="checkbox"/>	<b>Note:</b> All 3 versions of encryption tape drives use different, unique cartridges. ■ T9840 = 9840 cartridges ■ T10000 = T10000 cartridges ■ LTO4 = LTO-compatible cartridges All versions of each cartridge-type are supported, for example: standard, sport, VolSafe, and WORM.
<b>Notes:</b>		
<b>Configurations:</b>		
<b>Tape Drives:</b>		
<b>Media:</b>		

## Rack Specifications

The KMAs can be installed in standard, RETMA<sup>1</sup> 19-inch, four post racks or cabinets. Note: Two-post racks are *not* supported.

The slide rails are compatible for a wide range of racks with the following standards:

- Horizontal opening and unit vertical pitch conforming to ANSI/EIA 310-D-1992 or IEC 60927 standards.
- Distance between front and rear mounting planes between 610 mm and 915 mm (24 in. to 36 in.).
- Clearance depth to a front cabinet door must be at least 25.4 mm (1 in.).
- Clearance depth to a rear cabinet door at least 800 mm (31.5 in.) to incorporate cable management or 700 mm (27.5 in.) without cable management.
- Clearance width between structural supports and cable troughs and between front and rear mounting planes is at least 456 mm (18 in.).

### SL8500 Rack Guidelines

An SL8500 library can have up to 4 *optional* accessory racks, (PN XSL8500-RACK-Z). If the customer wants power redundancy, a minimum of 2 racks is required.

Each rack can hold up to 6 units—called Us<sup>2</sup>—of equipment, such as the key management appliances and the Ethernet switches. Each rack has a six-connector power distribution unit (PDU) that provides power, and two cooling fans that provides additional air flow. [Table 3-2](#) lists the rack guidelines.

**TABLE 3-2** SL8500 Accessory Rack Guidelines

Guideline	Descriptions
<b>Rack numbering</b>	Rack numbering is top-down from 1 to 4. Rack 1 is on the top; Rack 4 is on the bottom.
<b>Rack mounting</b>	Components must be able to function in a vertical orientation.
<b>Dimensional restrictions</b>	Rack module depth is 72 cm (28 in.). Recommended safe length is 66 cm (26 in.).
<b>Equipment weight</b>	The accessory rack itself is mounted on slides rated for 80 kg (175 lb). The recommended safe load is 64 kg (140 lb). <b>The KMA is 10.7 kg (23.45 lb), the Ethernet switch is 1.5 kg (3.1 lb)</b>
<b>Power consumption</b>	Per rack module is 4 Amps (maximum). Per outlet strip is 200–240 VAC, 50 to 60 Hz. <b>The KMA is 185 W, the Ethernet Switch is 20 W.</b>
<b>Power cord</b>	Power plug to connect to the rack PDU is: IEC320 C13 shrouded male plug. Minimum cord length is component <i>plus</i> 46 cm (18 in.) for a service loop.
<b>Thermal requirements</b>	Maximum power dissipation is 880 watts (3,000 Btu/hr) per rack module.
<b>Regulatory compliance</b>	Minimum requirements are: Safety—UL or CSA certification and Electromagnetic—Class A certification from agencies such as FCC or BSMI.

1. RETMA = Radio Electronics Television Manufacturers Association.

2. U stands for rack units. One unit is equal to 4.4 cm (1.75 in.).

## External Rack Installations

Because some configurations might not have enough internal rack space to install the encryption hardware, an external rack is available for these configurations.

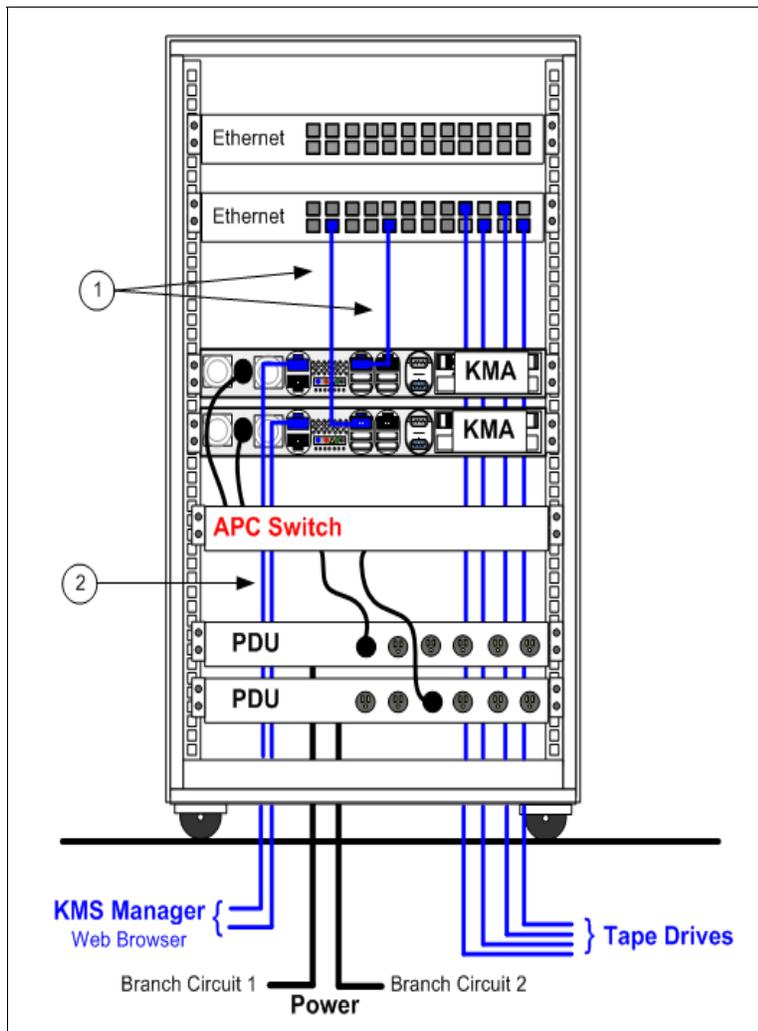
Customer's can either use existing racks or they can order this kit: **CRYPTO-20U-Z**.

This is a half-high external rack.

- 20-units high (approximately 3 ft)
- 19-inches wide

Designed to hold the encryption hardware.

**FIGURE 3-1** External Rack



### Components and Part Numbers:

- Rack kit = CRYPTO-20U-Z
- APC Switch = XSL8500-AC-SW-Z
- PDUs = PN 10124140

1. Service Network (LAN 2)
2. Management Network (LAN 0)



**Note** – Depending on the number of tape drives installed, you may need more than one Ethernet Switch. Remember, each tape drive needs an Ethernet connection.

## Redundant Power

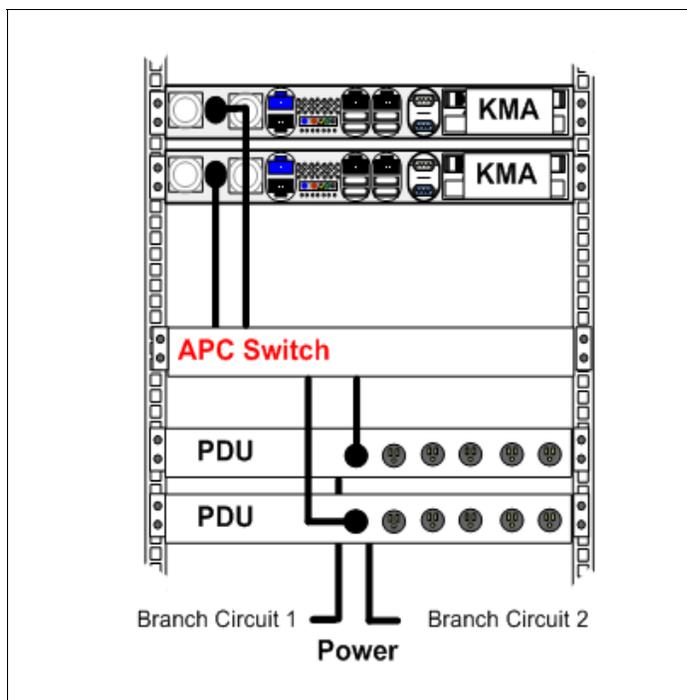
Customer may require a redundant power configuration.

When installing equipment to support *power redundancy*, make sure there are two separate branch circuits available. Should a power supply or branch circuit fail, the other equipment or circuit can maintain power to at least some of the configuration until the problem is fixed.

Because the additional hardware only has a single power supply, power distribution units are required to provide this redundancy.

FIGURE 3-2 shows an example:

**FIGURE 3-2** Power Redundancy



### Components and Part Numbers:

- APC Switch = XSL8500-AC-SW-Z
- PDUs = PN 10124140

Use the customer's existing power distribution or they can order an APC Power Switch, order number: **XSL8500-AC-SW-Z**.

# Service Delivery Platform

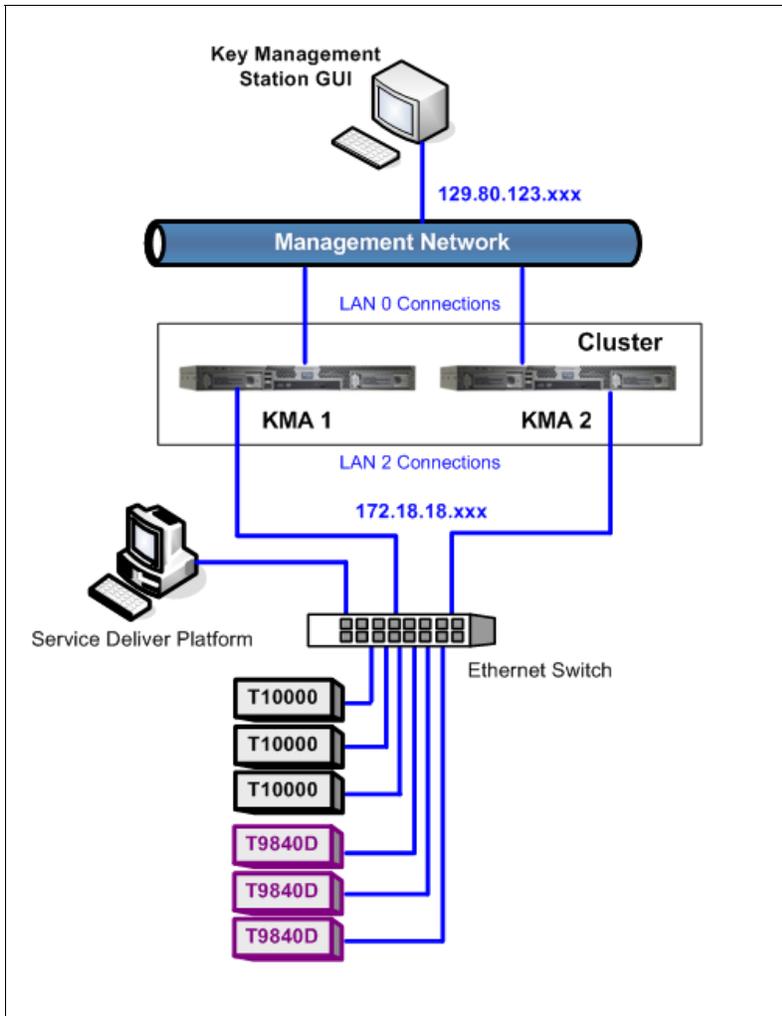
The Service Delivery Platform (SDP) is a support solution for Sun StorageTek libraries and tape drives that consists of a smart appliance and dedicated network.

The Key Management Appliance includes a specific Ethernet connection (LAN 2 port) for connection to this network.

The SDP appliance uses the Dynamic Host Configuration Protocol (DHCP) to automate the assignment of IP addresses for device connections. When incorporating the KMAs into an SDP network, it is best to use the established addresses provided by the SDP; the IP address range is 172.18.18.xxx.

FIGURE 3-3 shows an example of an SDP network with connection to a KMA cluster.

**FIGURE 3-3** Systems Delivery Platform



In this figure, the KMS Manager interfaces with the KMAs using a customer created network and IP addresses of 129.80.123.xxx.

Each KMA connects to this network using LAN 0.

The KMA interfaces with the tape drives using the Service Network. SDP IP addresses = 172.18.18.1.

Each KMA connects to this network using LAN 2. IP address range is: 172.18.18.2 through 172.18.18.59.

The tape drives connect to the Service Network using an assigned IP address from the SDP.

The SDP will likely come with an Ethernet switch that connects to the KMA service network (for example).

**Note:**

The default tape drive IP address is 10.0.0.1 and must be changed in any connection scheme.

**Important:**

The SDP *does not* support HP LTO4 tape drives



If the customer wants this support option as part of the encryption solution, use and complete the information in the *SDP Systems Assurance Guide*. Go to: <http://csa-wiki.central.sun.com/display/SDP>

# Content Management

Encryption-capable tape drives adds another element to the design for content management in an SL8500, SL3000, and SL500 library installation. All three libraries have a different design, all three libraries share similar elements; however, some considerations include:

**TABLE 3-3** Content Management Planning

Element	SL8500	SL3000	SL500
Drive Quantity	You may need to order multiple kits or additional Ethernet switches to support all of the encryption-capable tape drives.		
	<ul style="list-style-type: none"> <li>■ Single: 1 to 64 drives</li> <li>■ 10 library complex: up to 640 drives</li> </ul>	<ul style="list-style-type: none"> <li>■ 1 to 56 tape drives</li> </ul>	<ul style="list-style-type: none"> <li>■ 1 to 18 tape drives</li> </ul>
Encryption Drives Supported	<ul style="list-style-type: none"> <li>■ T10000 A&amp;B</li> <li>■ T9840D</li> <li>■ HP LTO4</li> </ul>	<ul style="list-style-type: none"> <li>■ T10000 A&amp;B</li> <li>■ T9840D</li> <li>■ HP LTO4</li> </ul>	<ul style="list-style-type: none"> <li>■ HP LTO4 only</li> </ul>
Non-encryption Drives Supported	<ul style="list-style-type: none"> <li>■ T10000 A &amp; B</li> <li>■ T9840 A, B, &amp; C</li> <li>■ LTO 2, 3, &amp; 4</li> </ul>	<ul style="list-style-type: none"> <li>■ T10000 A&amp;B</li> <li>■ T9840 C</li> <li>■ HP LTO 3 &amp; 4</li> </ul>	<ul style="list-style-type: none"> <li>■ LTO 2, 3, &amp; 4 (HP, IBM)</li> <li>■ SDLT 600</li> <li>■ DLT-S4</li> </ul>
Interfaces:	Note: The library interface and tape drive interfaces may be different.		
<ul style="list-style-type: none"> <li>■ Libraries</li> </ul>	<ul style="list-style-type: none"> <li>■ TCP/IP only</li> </ul>	<ul style="list-style-type: none"> <li>■ TCP/IP only</li> <li>■ Fibre Channel</li> </ul>	<ul style="list-style-type: none"> <li>■ TCP/IP only</li> <li>■ Fibre Channel</li> </ul>
<ul style="list-style-type: none"> <li>■ Tape Drives</li> </ul>	T10000 A&B FC and FICON T9840D FC, FICON, ESCON HP LTO4 FC only	T10000 A&B FC and FICON T9840D FC, FICON, ESCON HP LTO4 FC only	Fibre Channel SCSI
Media*	All libraries support true-mixed media—Any Cartridge, Any Slot™		
	<ul style="list-style-type: none"> <li>■ T10000 (Std, Sport, VolSafe)</li> <li>■ 9840 (Std and VolSafe)</li> <li>■ LTO 2, 3, 4, &amp; T-WORM</li> <li>■ DLTtape III</li> <li>■ Super DLTtape I &amp; II</li> </ul>	<ul style="list-style-type: none"> <li>■ T10000 (Std, Sport, VolSafe)</li> <li>■ 9840 (Std and VolSafe)</li> <li>■ LTO 2, 3, 4, &amp; T-WORM</li> </ul>	<ul style="list-style-type: none"> <li>■ LTO 1, 2, 3, 4, &amp; T-WORM</li> <li>■ DLTtape III</li> <li>■ Super DLTtape I &amp; II</li> </ul>
Partitioning	Yes	Yes	Yes
SNMP	Yes	Yes	Yes
SDP	Yes	Yes	No
Power Redundancy	Yes	Yes	No
Operating Systems	Enterprise and Open Systems	Enterprise and Open Systems	Open systems
Library Management	<ul style="list-style-type: none"> <li>■ ACSLS</li> <li>■ HSC</li> </ul>	<ul style="list-style-type: none"> <li>■ ACSLS</li> <li>■ HSC</li> <li>■ ISV</li> </ul>	<ul style="list-style-type: none"> <li>■ ACSLS</li> <li>■ HSC</li> <li>■ ISV</li> </ul>
FC = Fibre Channel FICON = IBMs fiber connection SNMP = Simple Network Management Protocol SDP = Service Delivery Platform		ACSLS = Automated Cartridge System Library Software HSC = Host Software Component ISV = Independent Software Vendor (Veritas, Legato, TSM)	
* Only LTO4 media (LTO4 and LTO4-WORM) is encryption-capable on the LTO4 tape drives.			

When planning for content, the most important aspect is to evaluate *content* (tape drives and data cartridges) with respect to the *physical structure* of the library.

These libraries provide several ways to accommodate growing data storage needs:

- Addition of library modules—in front, to the left, right, or up and down.
- Capacity on Demand
  - Activation of slots without service representative involvement
  - Requires the installation of slots or modules up front
- Flexible partitions
- Easily re-allocate resources as needs change
- Real-Time Growth

## Capacity on Demand

Capacity on Demand is a *non-disruptive* optional feature that allows the customer to add capacity to the library using previously installed, yet inactive slots.

The installed physical capacity is separate from the licensed capacity. The advantage of Capacity on Demand is that the customer only buys the storage that they need and not all the storage that is installed.

Licensed capacity can be purchased in multiple increments:

When a customer purchases a license to use more physical storage an encrypted *license key file* is sent through e-mail. The file is then loaded into the library using the StorageTek Library Console (SLC).

## RealTime Growth Technology

Because the physical and the licensed slot capacities are separate, the customer has the option of installing physical capacity in advance before they are ready to activate these slots.

The advantage of installing physical capacity in advance is that now, scaling the library is non-disruptive, quick, and easy to accomplish.

Whenever building an SL3000 configuration, there are two basic slot capacity questions you need to answer:

1. How many slots does the customer need to license or use?
2. How many cartridge slots does the customer want to physically install?

## Partitioning

The definition of a partition is to divide into parts or shares.

**Benefits:** Partitioning a library means the customer can have:

- Multiple libraries from one physical piece of hardware.
- More than one operating system and application manage the library.
- An improvement in the protection or isolation of files.
- An increase in system and library performance.
- An increase in user efficiency.

**Customized fit:**

Partitions may be customized to fit different requirements, such as:

- Separating different encryption key groups.
- Isolating clients as service centers.
- Dedicating partitions for special tasks.
- Giving multiple departments, organizations, and companies access to appropriately sized library resources.

**Tip:**

When using encryption-capable tape drives, partitions can add an additional layer to data security. Customers can assign partitions that limit the access to the tape drives and data cartridges.

Ideally, you would want to set up partitions that allow for future. Allowing room for growth allows the customer to activate slots within a partition using Capacity on Demand. This is the easiest and least disruptive growth path:

1. Install extra physical capacity.
2. Define partitions large enough to accommodate future growth.
3. Adjust the library capacity to meet current demands.

Essential guidelines for understanding partitions are:

- Clear communication between the system programmers, network administrators, library software representatives and administrators, and Sun service representatives.
- Knowing what partitions exist, their boundaries, and who has access to the specific partitions that are configured.
- Setting up a partition requires some important considerations:
  - Slots and tape drives are allocated to a specific partition and cannot be shared across other partitions.
  - Partition users must anticipate how much storage is needed for their resident data cartridges and the amount of free slots required for both current use and potential growth.
- Remember:
  - Each partition acts as an independent library.
  - One partition will not recognize another partition within the library.

## Planning the Data Path

When planning for partitions, you also need to be aware of the location, quantity, type, and need for the tape drives and media.

Having an understanding about how to logically group and install the tape drives and locate the media for the different hosts, control data sets, interface types, and partitions is necessary. When planning for partitions:

- Make sure the tape drive interface supports that operating system.
  - Open system platforms do not support ESCON or FICON interfaces.
  - Not all mainframes support Fibre Channel interfaces or LTO tape drives.
- Make sure the media types match the application.
- Install tape drives that use the same media types in the same partition.
- Make sure there are enough scratch cartridges and free slots to support the application and workload.

## Tasks

One essential message for content management and partitioning is planning.

**TABLE 3-4** Steps and Tasks for Partitioning

✓	Step	Task	Responsibility*
<input type="checkbox"/>	<b>1. Team</b>	Create a Team. When planning for content and partitions, use a process similar to that of the system assurance process; which is the exchange of information among team members to ensure all aspects of the implementation are planned carefully and performed efficiently. Team members should include representatives from both the customer and Sun Microsystems.	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Administrators</li> <li>■ Operators</li> <li>■ Sun SE, PS</li> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>2. Codes</b>	Review the software and firmware requirements. Update as required.	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Sun SE, PS</li> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>3. Planning</b>	<ul style="list-style-type: none"> <li>■ Define the customer expectations</li> <li>■ Complete the assessment</li> <li>■ Identify the configurations</li> <li>■ Complete the planning diagrams</li> <li>■ Service Delivery Platform (SDP)</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Administrators</li> <li>■ Sun SE, PS</li> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>4. Encryption</b>	<ul style="list-style-type: none"> <li>■ Complete an encryption survey (PS)</li> <li>■ Select the type of tape drive, interface, and configuration</li> <li>■ Select location</li> <li>■ Ensure there is adequate media</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Sun SE, PS</li> <li>■ Sun Representatives</li> </ul>
<input type="checkbox"/>	<b>5. Media</b>	<ul style="list-style-type: none"> <li>■ Verify the distribution of cartridges and required tape drives are available and ready.</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Operators</li> </ul>
<input type="checkbox"/>	<b>6. Library</b>	<ul style="list-style-type: none"> <li>■ Install and configure a library (if necessary).</li> </ul>	<ul style="list-style-type: none"> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>7. License</b>	<ul style="list-style-type: none"> <li>■ License the required features: <ul style="list-style-type: none"> <li>■ Library</li> <li>■ Tape drives</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Administrators</li> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>8. Partitions</b>	<ul style="list-style-type: none"> <li>■ Create partitions.</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Administrators</li> <li>■ Operators</li> </ul>
<input type="checkbox"/>	<b>9. Hosts</b>	<ul style="list-style-type: none"> <li>■ Momentarily stop all host activity if currently connected.</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> </ul>
<input type="checkbox"/>	<b>10. Use</b>	Instruct the customer how to: <ul style="list-style-type: none"> <li>■ Use and manage the library</li> <li>■ Use the KMS GUI</li> </ul>	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Sun SE, PS</li> <li>■ Sun Svc Rep</li> </ul>
<input type="checkbox"/>	<b>11. Reference</b>	Make sure the customer has access to the appropriate documents.	<ul style="list-style-type: none"> <li>■ Customer</li> <li>■ Sun SE, PS</li> <li>■ Sun Svc Rep</li> </ul>
<ul style="list-style-type: none"> <li>■ SE = Systems engineer</li> <li>■ PS = Professional services representative</li> <li>■ Service = Sun Service representative (Svc Rep)</li> <li>■ Customer = System administrators, network administrators, system programmers, operators</li> </ul>			

# Preparing the Tape Drives

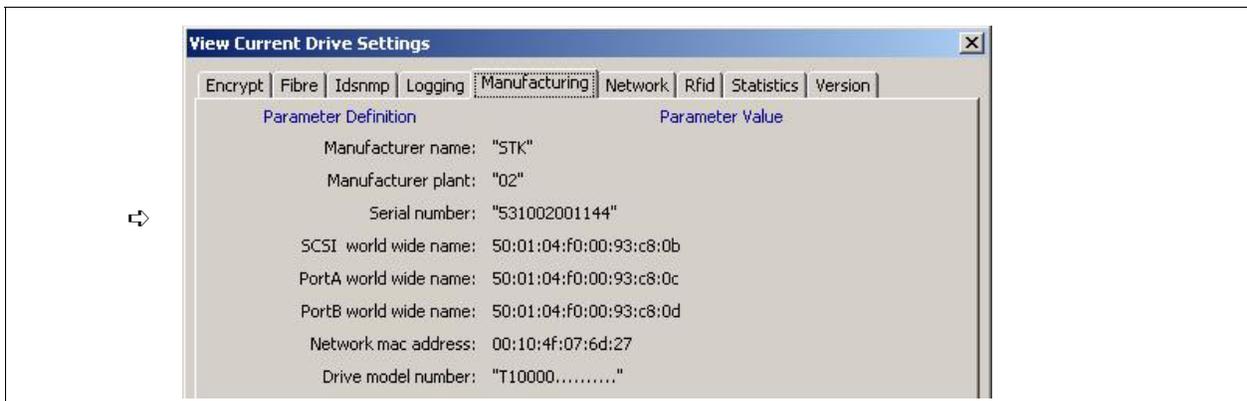
The tape drives should be installed and tested in their appropriate configuration before adding the encryption capability to them. Each drive type has its own requirements.

## T-Series Drive Data Preparation

To obtain the drive data for *each* T-Series (T10000 and T9840) tape drive:

1. Using the Virtual Operator Panel, connect to each tape drive and record the last *eight* digits of the tape drive serial number.
  - Select: File ⇄ Connect to Drive
  - Select: Retrieve ⇄ View Drive Data ⇄ Manufacturing

**FIGURE 3-4** Tape Drive Serial Number—VOP



2. Use [TABLE A-3 on page 74](#) to build information about the tape drives. You will find this information helpful during the installation, licensing, and enrollment process for the tape drives (agents).
3. Request an Encryption Key File:
  - a.) Log in to the Applications Web site at: <http://crcapplications/keyswebapp/>
  - b.) Select Request an Encryption key.

**FIGURE 3-5** Request an Encryption Key Application



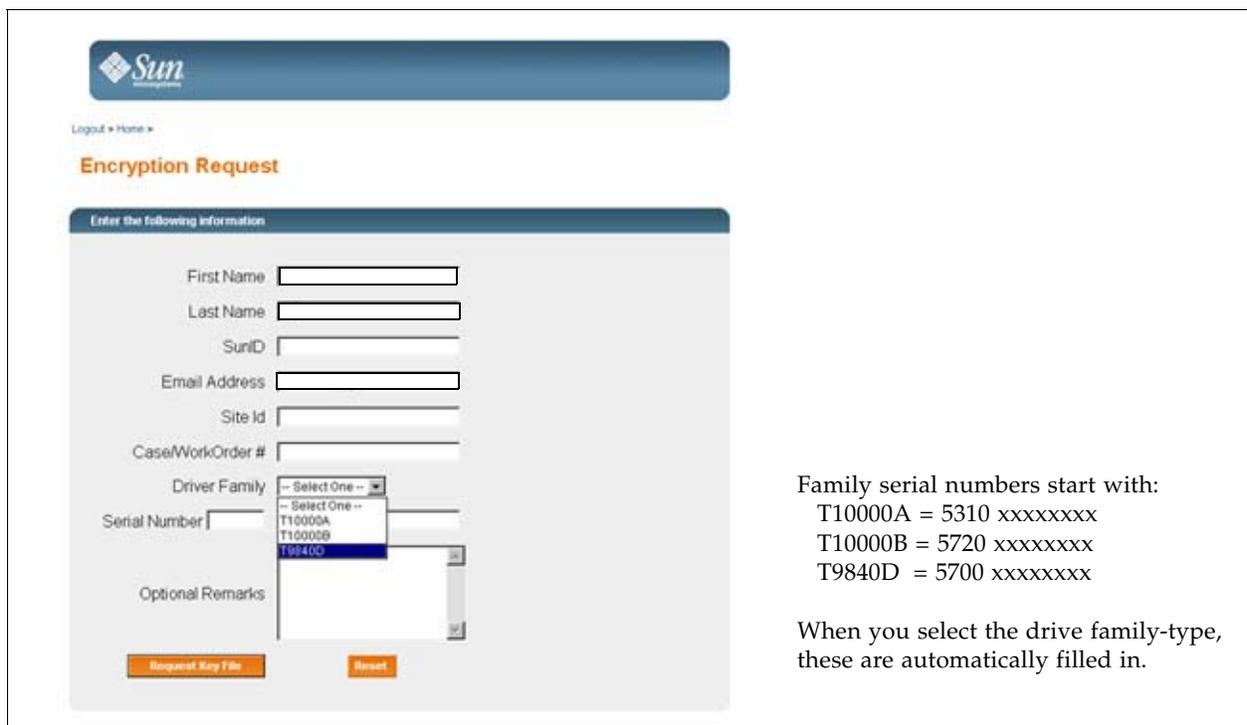


**Access is Limited:** You must be a Sun employee, have completed the training courses, and have your name included on the list to access this link.

4. Complete the Encryption Request form.
  - a. First name, last name, and e-mail address are automatically included.
  - b. Provide a site ID and order number.
  - c. Select the tape drive type (T10000A, T10000B, or T9840D).
  - d. Complete the serial number for the selected tape drive.
  - e. Add any optional remarks and click Request Key File.
 

After submitting the Encryption File Request you will be prompted to download the file. This file contains the drive data you need to enable and enroll the drive.

**FIGURE 3-6** Encryption File Request for Drive Data



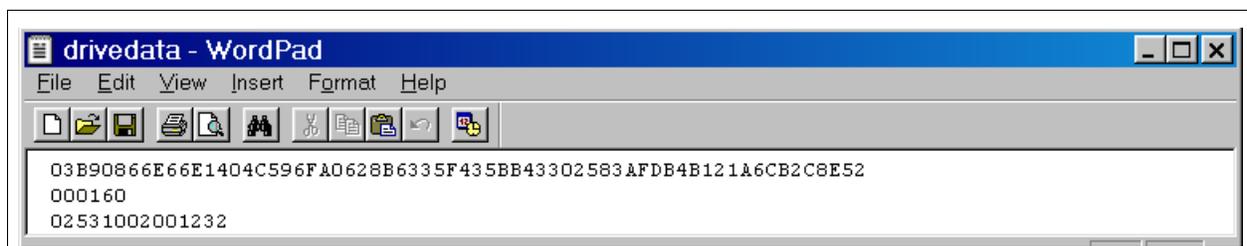
Family serial numbers start with:  
 T10000A = 5310 xxxxxxxx  
 T10000B = 5720 xxxxxxxx  
 T9840D = 5700 xxxxxxxx

When you select the drive family-type, these are automatically filled in.

5. Continue with this process until you obtain all the drive data files for each tape drive you are going to enable.

If you open the drive data file, using WordPad for example, you can see and verify the drive serial number, PCKey, and crypto serial number (CSN).

**FIGURE 3-7** Encryption File Request for Drive Data



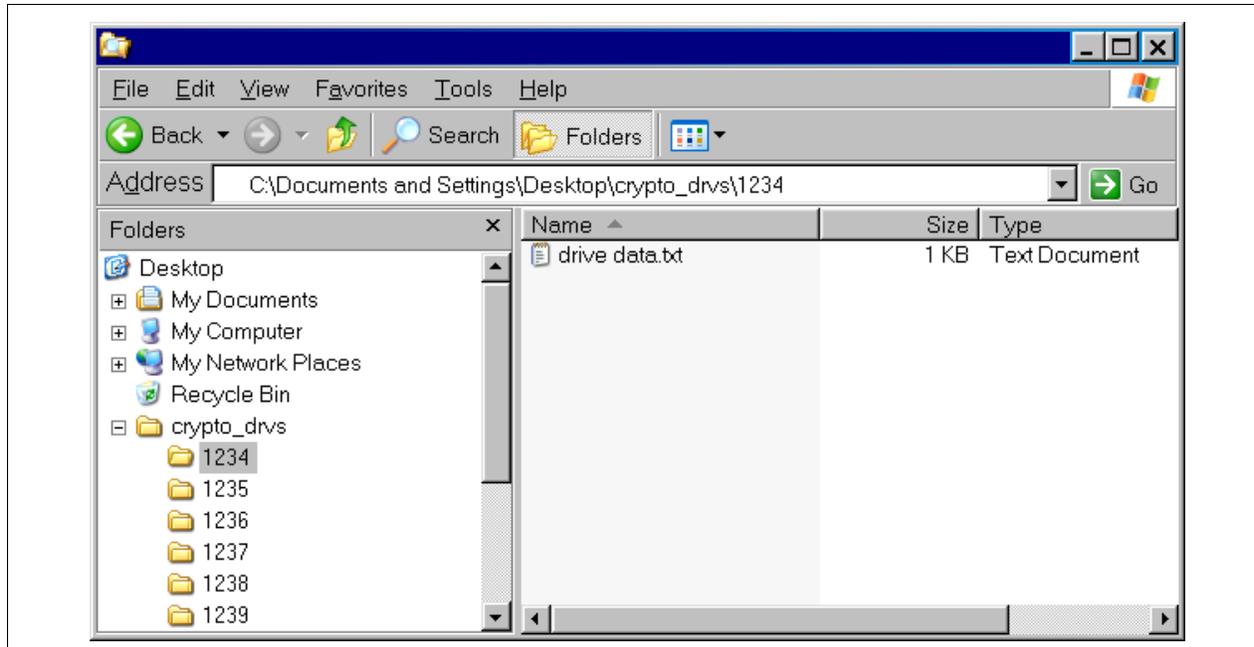
```
03B90866E66E1404C596FA0628B6335F435BB43302583AFDB4B121A6CB2C8E52
000160
02531002001232
```

## Create a Drive Data File Structure

When enabling multiple drives, it is best to create a file structure where each tape drive has its own folder. For example:

1. [FIGURE 3-8](#) uses a top-level folder name of **crypto\_drvs** placed on the Desktop. (This is only for grouping of the other folders.)
2. Under **crypto\_drvs** are the folders for each tape drive using the serial numbers.
3. In each serial number folder is the drive data file for that specific tape drive.

**FIGURE 3-8** Drive Data File Structure



When licensing the tape drives, the VOP requests a download location.

4. Complete [TABLE A-4 on page 75](#) to help with the licensing and enrollment of the tape drives. What you need to know before beginning:
  - What is the drive number (serial or system) and IP address?
  - What are the Agent IDs and Passphrases?
  - Is this drive going to use **tokens** (KMS Version 1.x) to get media keys (OKT)? Or use the **appliance** (KMA Version 2.x) to get the encryption keys?
  - Does the customer want this drive to remain in encryption mode? Or do they want the ability to switch encryption on and off?
5. Make copies of this page as necessary.

### Notes:

- Agent names (IDs) cannot be changed; however, an agent can be deleted and re-enrolled it with a different name.
- If you replace the agent, you can reuse the name; however, passphrases can only be used once, you will need to give the agent a new passphrase.
- Which means, the replacement drive will need to be enrolled using the existing name and a new passphrase.

## HP LTO4 Tape Drive Preparation

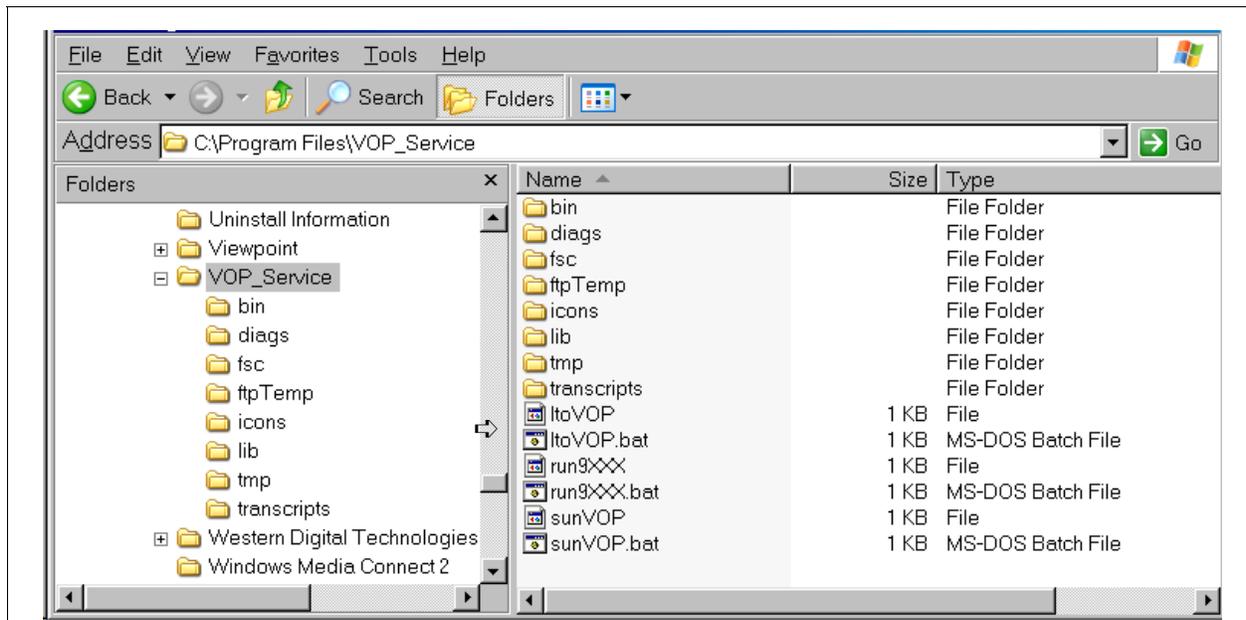
No PCKey or drive data is required for the LTO4 tape drives. The only preparation is to make sure the customer has the information to assign the IP addresses and Agent names for the tape drives for the KMS manager.

**Note** – The Virtual Operator Panel must be at Version 1.0.12 and higher to provide support for the HP LTO4 tape drive. To use the VOP for LTO4 tape drives, you need to launch a special file:

- **Windows:** Launch the batch file (**ltoVOP.bat**)
- **Solaris/Linux:** Launch the **ltoVOP** file (above the batch file)

FIGURE 3-9 shows an example of the VOP 1.0.12 download contents.

**FIGURE 3-9** VOP LTO Files



## Required Tools

The required tools to install and initially configure the KMAs are:

- Standard field service tool kit, including both standard and Phillips screwdrivers, Torx driver and bits, and side cutters; tools necessary to mount the servers in a rack.
- Serial or null modem cable (P/N 24100134) with DB-9 connector
- Adapter (P/N 10402019)
- Straight Ethernet cable (P/N 24100216) 10-ft
- Cross-over Ethernet cable (P/N 24100163) 10-ft
- Service laptop (or personal computer)
- Virtual Operator Panel (VOP) at Version 1.0.11 or higher
- Virtual Operator Panel for LTO4 tape drives at Version 1.0.12 or higher

## Supported Platforms and Web Browsers

### KMS Manager Platforms:

The KMS Manager (graphical user interface—GUI) must be installed on either a Windows XP or Solaris 10 updates 3x86 or 4x86 platform.

**Note** – Windows Vista and Solaris 9 are *not* supported.

### Web Browsers:

Embedded Lights Out Manager is sensitive to Web browser and Java versions.

TABLE 3-5 lists the supported operating systems and Web browsers:

**TABLE 3-5** Operating Systems and Web Browsers

Client OS	Supports these Web browsers	Requires this version of Java Runtime Environment Including Java Web Start
<ul style="list-style-type: none"> <li>■ Microsoft Windows XP</li> <li>■ Microsoft Windows 2003</li> <li>■ Microsoft Windows Vista</li> </ul>	<ul style="list-style-type: none"> <li>■ Internet Explorer 6.0 and later</li> <li>■ Mozilla 1.7.5 or later</li> <li>■ Mozilla Firefox 1.0</li> </ul>	JRE 1.5 (Java 5.0 Update 7 or later)
<ul style="list-style-type: none"> <li>■ Red Hat Linux 3.0 and 4.0</li> </ul>	<ul style="list-style-type: none"> <li>■ Mozilla 1.7.5 or later</li> <li>■ Mozilla Firefox 1.0</li> </ul>	
<ul style="list-style-type: none"> <li>■ Solaris 9</li> <li>■ Solaris 10</li> <li>■ Solaris Sparc</li> <li>■ SUSE Linux 9.2</li> </ul>	<ul style="list-style-type: none"> <li>■ Mozilla 1.7.5</li> </ul>	
You can download the Java 1.5 runtime environment at: <a href="http://java.com">http://java.com</a> The current version of the ELOM guide is located at: <a href="http://dlc.sun.com/">http://dlc.sun.com/</a>		

## Required Firmware Versions

The required firmware (microcode) versions for the tape drives and other products to support the KMS 2.x encryption solution are:

**TABLE 3-6** Tape Drive Firmware Versions

Tape Drive	Interface Type	Firmware Version (or higher)
T10000 A	Fibre Channel	1.37.108
	FICON	1.37.114
T10000 B	Fibre Channel	To be supplied
	FICON	Check on availability
T9840 D	Fibre Channel	1.42.104
	FICON	1.42.104
	ESCON	1.42.104
HP LTO4	Fibre Channel	H45S Fibre Channel
	SCSI	B44S SCSI

**TABLE 3-7** Other Product Versions

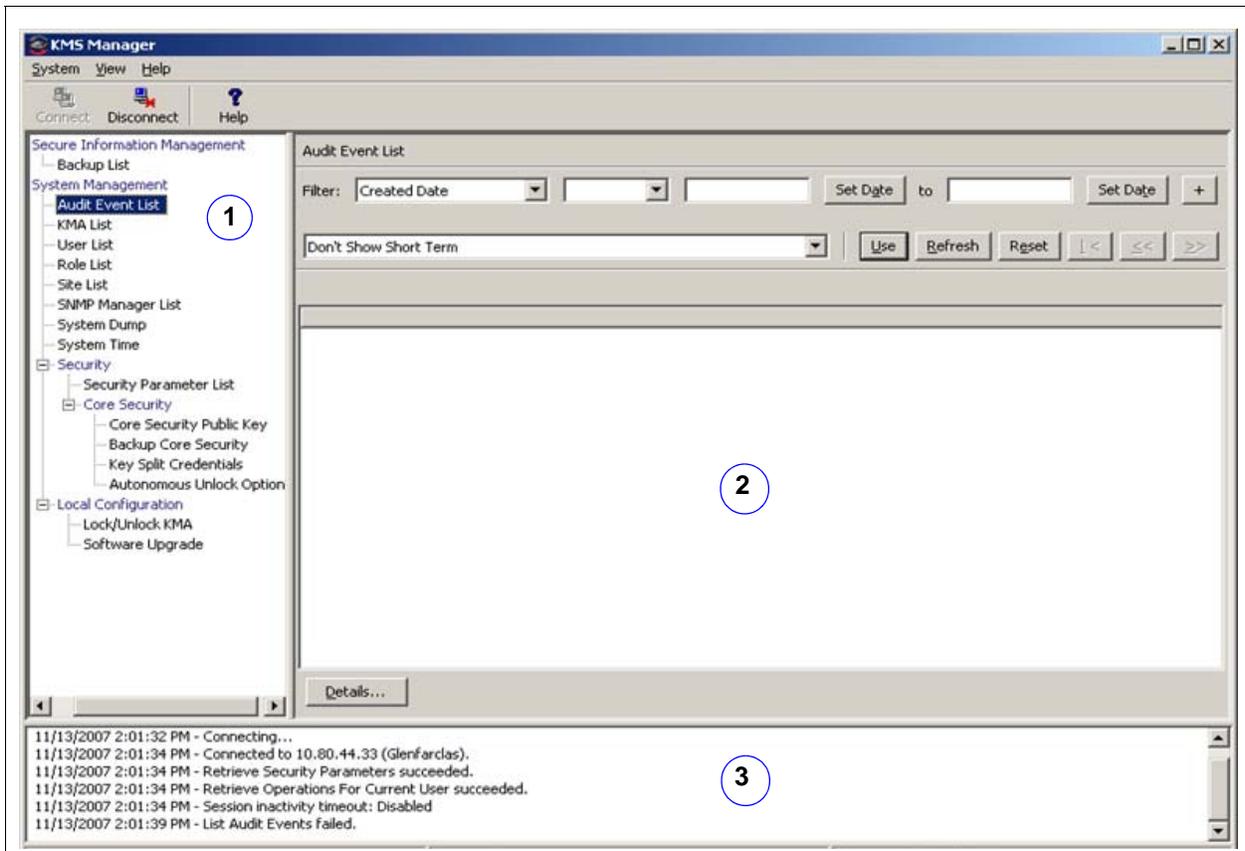
Component	Version (or above)
Dione card	1.178
KMS Version 2.0	2.02
ACSLs	7.1 and 7.1.1 with PUT0701, or 7.2, and 7.3
SL8500 library	3.98B
SL3000 library	2.01 (SPS)
SL500 library	i15; 1300 (SPS)
L-Series	3.18.xx
Virtual Operator Panel (VOP)	1.0.11 (T-Series)
Virtual Operator Panel (VOP)	1.0.12 (HP LTO4)

# KMS Manager

The KMS Manager graphical user interface (GUI) consists of a three-paned display:

1. On the left is a navigational pane or tree
2. In the center is an operations detail pane for the selection on the left
3. On the bottom is a session events pane

**TABLE 3-8** KMS Manager Display



The KMS Manager is an easy-to-use, text-based interface that allows users to configure functions of the KMAs depending on the roles that user is assigned (see [“Role-Based Operations”](#) on page 46).

The manager contains convenient System, View, and Help menus in the upper left corner of the display with toolbar buttons that provide shortcuts to several menu options.

## Role-Based Operations

The KMS manager defines and uses the following roles. Completing and assigning roles is a customer task, service representatives should only advise.

■ <b>Security Officer</b>	Full authority to view, modify, create, and delete Sites, KMAs, Users, and Transfer Partners.
■ <b>Compliance Officer</b>	Management for <i>key policies</i> and <i>key groups</i> . Determines which Agents and Transfer Partners can use key groups.
■ <b>Operator</b>	Manages Agents, Data Units, and Keys.
■ <b>Backup Operator</b>	Performs backups.
■ <b>Auditor</b>	Views information about the KMS Cluster.



**Note:** Each person or user may fulfill one or more of these roles.

FIGURE 3-10 shows an example of the Users Detail screen.

Use TABLE 3-10 on page 51 to help prepare for the assignments.

**FIGURE 3-10** User Roles Detail Screen

1. Enter a User ID  
Between 1 and 64 characters
2. Provide a description  
Between 1 and 64 characters

3. Click the Passphrase tab and  
Enter a Passphrase—twice

Passphrases must use:

- 8 to 64 characters
- 3 of 4 classes  
(upper and lower case, numbers, symbols)
- and not include the users name

The KMA verifies that the requesting user has permission to execute an operation based on the user's roles. Unavailable operations typically indicate the wrong role.

There are four basic operations a user/role can have: Create, Delete, Modify, and View. TABLE 3-9 on page 47 shows the system entities and functions that each user role can perform. In the "Roles" columns:

- **Yes** means the role is allowed to perform the operation.
- **Quorum** the role is allowed to perform the operation but must belong to a quorum.
- **Blank** means the role is not allowed to perform the operation.

**TABLE 3-9** Operator Roles and Functions

Entity	Function	Roles				
		Security Officer	Compliance Officer	Operator	Backup Operator	Auditor
<b>Console</b>						
	Log In	Yes	Yes	Yes	Yes	Yes
	Set KMA Locale	Yes				
	Set KMA IP Address	Yes				
	Enable Tech Support	Yes				
	Disable Tech Support	Yes		Yes		
	Enable Primary Administrator	Yes				
	Disable Primary Administrator	Yes		Yes		
	Restart KMA			Yes		
	Shutdown KMA			Yes		
	Log KMS into Cluster	Quorum				
	Set User's Passphrase	Yes				
	Reset KMA	Yes				
	Zeroize KMA	Yes				
	Logout	Yes	Yes	Yes	Yes	Yes
<b>Connect</b>						
	Log In	Yes	Yes	Yes	Yes	Yes
	Create Profile	Yes	Yes	Yes	Yes	Yes
	Delete Profile	Yes	Yes	Yes	Yes	Yes
	Set Config Settings	Yes	Yes	Yes	Yes	Yes
	Disconnect	Yes	Yes	Yes	Yes	Yes
<b>Key Split Credentials</b>						
	List	Yes				
	Modify	Quorum				
<b>Autonomous Unlock</b>						
	List	Yes				
	Modify	Quorum				
<b>Lock/Unlock KMA</b>						
	List Status	Yes	Yes	Yes	Yes	Yes
	Lock	Yes				
	Unlock	Quorum				

**TABLE 3-9** Operator Roles and Functions (Continued)

Entity	Function	Roles				
		Security Officer	Compliance Officer	Operator	Backup Operator	Auditor
<b>Site</b>						
	Create	Yes				
	List	Yes		Yes		
	Modify	Yes				
	Delete	Yes				
<b>Security Parameters</b>						
	List	Yes	Yes	Yes	Yes	Yes
	Modify	Yes				
<b>KMA</b>						
	Create	Yes				
	List	Yes		Yes		
	Modify	Yes				
	Delete	Yes				
<b>User</b>						
	Create	Yes				
	List	Yes				
	Modify	Yes				
	Modify Passphrase	Yes				
	Delete	Yes				
<b>Role</b>						
	List	Yes				
<b>Key Policy</b>						
	Create		Yes			
	List		Yes			
	Modify		Yes			
	Delete		Yes			
<b>Key Group</b>						
	Create		Yes			
	List		Yes	Yes		
	List Data Units		Yes	Yes		
	List Agents		Yes	Yes		
	Modify		Yes			
	Delete		Yes			

**TABLE 3-9** Operator Roles and Functions (Continued)

Entity	Function	Roles				
		Security Officer	Compliance Officer	Operator	Backup Operator	Auditor
<b>Agent</b>						
	Create			Yes		
	List		Yes	Yes		
	Modify			Yes		
	Modify Passphrase			Yes		
	Delete			Yes		
<b>Agent/Key Group Assignment</b>						
	List		Yes	Yes		
	Modify		Yes			
<b>Data Unit</b>						
	Create					
	List		Yes	Yes		
	Modify			Yes		
	Modify Key Group		Yes			
	Delete					
<b>Keys</b>						
	List Data Unit Keys		Yes	Yes		
	Destroy			Yes		
	Compromise		Yes			
<b>Transfer Partners</b>						
	Configure	Quorum				
	List	Yes	Yes	Yes		
	Modify	Quorum				
	Delete	Yes				
<b>Backup</b>						
	Create				Yes	
	List	Yes	Yes	Yes	Yes	
	List Backups with Destroyed Keys		Yes	Yes		
	Restore	Quorum				
	Confirm Destruction				Yes	

**TABLE 3-9** Operator Roles and Functions (Continued)

Entity	Function	Roles				
		Security Officer	Compliance Officer	Operator	Backup Operator	Auditor
<b>Core Security Backup</b>						
	Create	Yes				
<b>SNMP Manager</b>						
	Create	Yes				
	List	Yes		Yes		
	Modify	Yes				
	Delete	Yes				
<b>Audit Event</b>						
	View	Yes	Yes	Yes	Yes	Yes
	View Agent History		Yes	Yes		
	View Data Unit History		Yes	Yes		
	View Data Unit Key History		Yes	Yes		
<b>System Dump</b>						
	Create	Yes		Yes		
<b>System Time</b>						
	List	Yes	Yes	Yes	Yes	Yes
	Modify	Yes				
<b>NTP Server</b>						
	List	Yes	Yes	Yes	Yes	Yes
	Modify	Yes				
<b>Software Version</b>						
	List	Yes	Yes	Yes	Yes	Yes
	Upgrade			Yes		





# Ordering

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This chapter contains the order numbers and descriptions for the Sun StorageTek key management appliance (KMA) and encryption solution.

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## Supported Configurations

The following components can be ordered to support customer requirements and configurations for the Sun StorageTek Version 2.0 encryption solution:

- [“Key Management Appliance” on page 54](#)  
This is a required component for key creation, management, and assignments.

If you are implementing an encryption solution using a Sun StorageTek library, review the following information and requirements:

- [“SL8500 Modular Library System” on page 55](#)
- [“SL3000 Modular Library System” on page 56](#)
- [“SL500 Modular Library System” on page 57](#)
- [“9310 Automated Cartridge System” on page 58](#)
- [“L-Series–L180, L700e, and L1400 Libraries” on page 59](#)

If you are implementing an encryption solution using tape drives in a rack or standalone configuration, review the following information and requirements:

- [“Rack Mount” on page 60](#)

## Supported Tape Drives

The currently supported tape drives include:

- T1000A
- T9840D
- HP LTO4

Check on Availability for these Drives

- T1000B

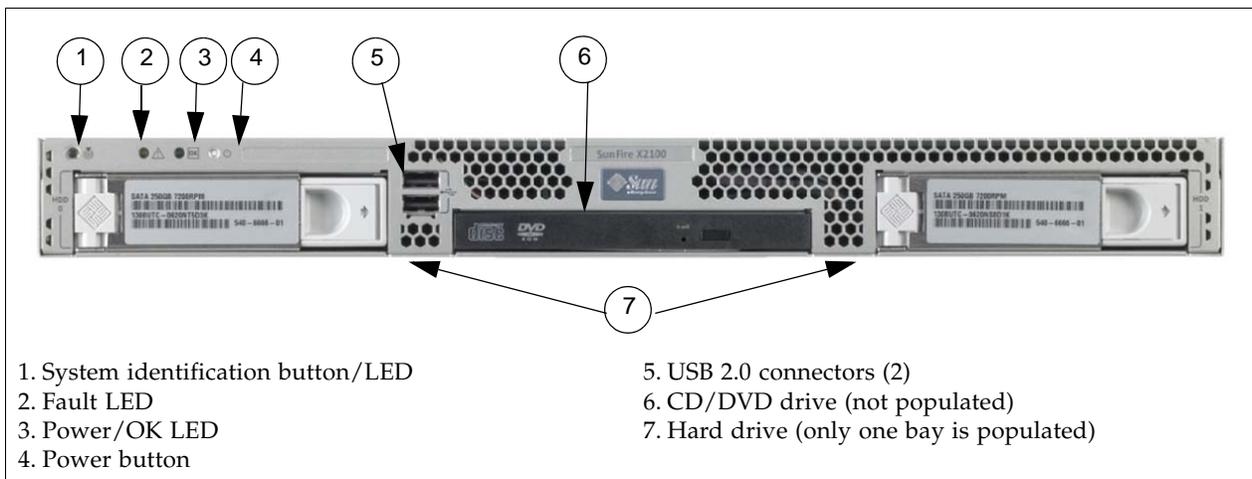
See [“Tape Drive Comparison” on page 15](#) for drive specifications and [TABLE 3-6 on page 44](#) for supported firmware versions.

# Key Management Appliance

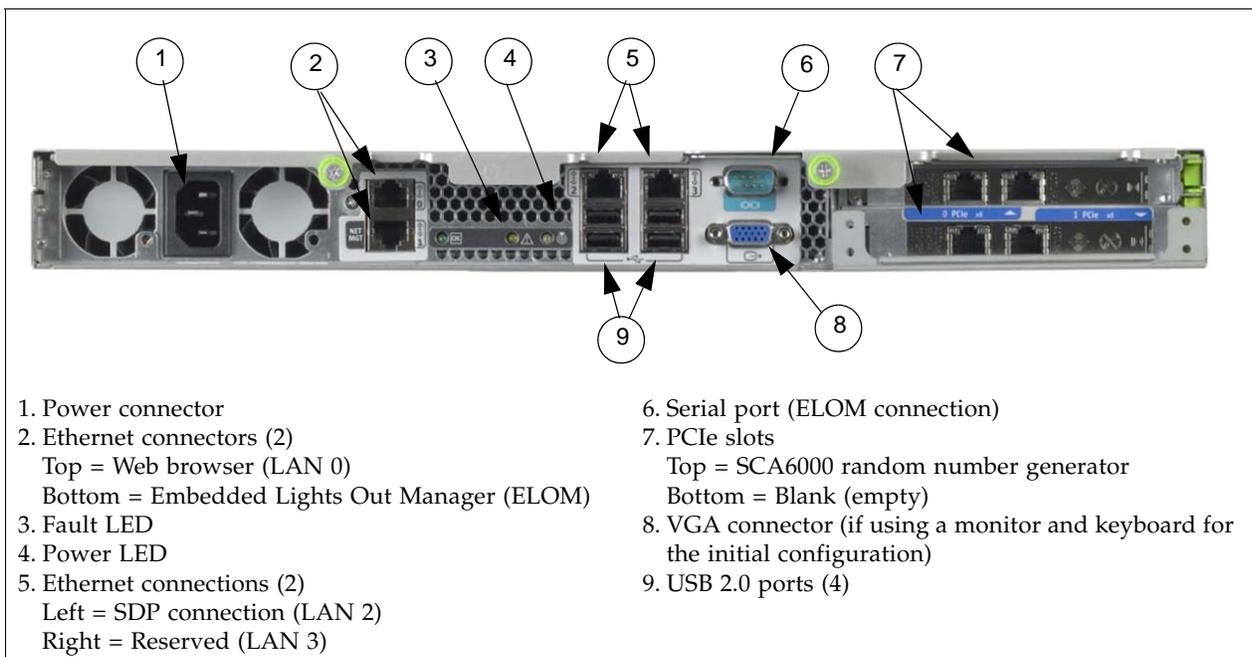
The key management appliance order number is: **CRYPTO-KMA-2-Z**, which includes:

- Key Management Appliance (KMA)
- Rackmount Model
- Includes Sun Fire X2100 Server with
- Pre-loaded Solaris 10 operating system and key management system software
- Installation included

**FIGURE 4-1** Key Management Appliance—Front Panel



**FIGURE 4-2** Key Management Appliance—Rear Panel



# SL8500 Modular Library System

**TABLE 4-1** SL8500 Modular Library System Requirements

<p><b>High-level Description:</b> A single SL8500 library can store up to:</p> <ul style="list-style-type: none"> <li>■ 1,448 to 10,000 tape cartridges and</li> <li>■ 64 tape drives.</li> </ul> <p>An SL8500 Library Complex of 10 libraries can store up to:</p> <ul style="list-style-type: none"> <li>■ 100,000 tape cartridges and</li> <li>■ 640 tape drives</li> </ul> <p><b>Operating System Support:</b> The SL8500 supports all major operating systems; enterprise <i>and</i> open systems.</p> <p><b>Host-to-Library Interface:</b></p> <ul style="list-style-type: none"> <li>■ Single Ethernet* (TCP/IP) 1x</li> <li>■ Dual TCP/IP* (optional feature) 2x</li> <li>■ Multi-host (optional feature) 4x</li> </ul> <p>* Supports Partitioning</p> <p>The SL8500 provides internal rack space for the addition of the encryption hardware.</p>	
--	--

Order Number	Description
CRYPTO-2X-SL8500-Z	<p>SL8500 accessory kit. Installation included.</p> <p><b>Note:</b> If the customer wants to install the encryption hardware—such as the KMAs and network switches—inside the SL8500 library, make sure the library has accessory racks to hold the equipment. A minimum of 2 racks with a 2N power configuration are required for redundant power features.</p> <p><b>Rack component order numbers:</b> XSL8500-RACK-Z = 6RU Rack XSL8500-RACK-HW-Z = Rack component hardware kit XSL8500-AC-SW-Z = AC Transfer Switch</p>

### Firmware Levels

Library	3.72 (3.98 or higher is recommended and to support LTO4)
StreamLine Library Console	3.38
Tape Drives: <ul style="list-style-type: none"> <li>■ T10000A</li> <li>■ T10000B</li> <li>■ T9840D</li> <li>■ HP LTO4</li> </ul>	1.34.208 or higher <i>(Check on availability)</i> 1.42.104 or higher H45S Fibre Channel
Virtual Operator Panel (VOP)	Version 1.0.11 or higher Version 1.0.12 or higher for LTO4

# SL3000 Modular Library System

**TABLE 4-2** SL3000 Modular Library System Requirements



**High-level Description:**

- The SL3000 library offers customers the benefits of:
- Scalability in storage capacity from 200 to 4500 slots
  - Performance from 1 to 56 tape drives
  - Heterogeneous attachments using standard interfaces
  - Multiple library management software options and programs

**Operating System Support:**

The SL3000 supports all major operating systems; enterprise *and* open systems.

**Host-to-Library Interface:**

- Single Ethernet\* (TCP/IP) 1x
- Dual TCP/IP\* (optional feature) 2x
- Fibre Channel\* 1x

\* Supports Partitioning

**Order Number**

**Description**

- SL3000 Kit 1 XSL3000-ETHRNT1-Z
- SL3000 Kit 2 XSL3000-ETHRNT2-Z
- SL3000 Kit 3 XSL3000-ETHRNT3-Z
- SL3000 Kit 4 XSL3000-ETHRNT4-Z

The SL3000 uses four different part numbers for Ethernet switches and cables to 1 to 56 tape drives.  
**Note:**  
 The SL3000 has limited internal rack space. Depending on the number of drives, customers may need to order an external rack.  
 See [“External Rack Installations”](#) on page 32 if necessary.

**Firmware Levels**

Library	FRS_2.0 (2.01 required for LTO4)
StreamLine Library Console	4.0
Tape Drives: <ul style="list-style-type: none"> <li>■ T10000A</li> <li>■ T10000B</li> <li>■ T9840D</li> <li>■ HP LTO4</li> </ul>	1.34.208 or higher <i>(Check on availability)</i> 1.42.104 or higher H45S Fibre Channel
Virtual Operator Panel (VOP)	Version 1.0.11 or higher Version 1.0.12 or higher for LTO4

# SL500 Modular Library System

**TABLE 4-3** SL500 Modular Library System Requirements

<p><b>High-level Description:</b> The SL500 library, is a self contained, fully automated, cartridge tape storage system that is scalable and mounts into a standard 483 mm (19 in.) rack or cabinet. The library can consist of 1 to 5 modules (one base and up to four expansion modules). Because of the scalability, the capacity of an SL500 library can store:</p> <ul style="list-style-type: none"> <li>■ From: 2 tape drives with 530 data cartridge slots</li> <li>■ To: 18 tape drives with 395 data cartridge slots</li> <li>■ A cartridge access port that holds 5 to 45 slots (depending on the number of modules)</li> </ul> <p>With a variety of tape drives and cartridges slots in-between.</p> <p><b>Operating System Support:</b> The SL500 supports all major operating systems; enterprise <i>and</i> open systems.</p> <p><b>Host-to-Library Interface:</b></p> <ul style="list-style-type: none"> <li>■ Single Ethernet* (TCP/IP) 1x</li> <li>■ Fibre Channel</li> </ul> <p>* Supports Partitioning</p>	
<p>Encryption hardware can be installed in the same rack as the library; depending on the number of modules installed.</p>	

Order Number	Description
CRYPTO-2X-SL500B-Z	SL500 base library ( <i>required</i> ). Installation included.
CRYPTO-2X-SL500X-Z	SL500 expansion modules ( <i>optional</i> ) Up to 4 additional expansion modules may be added. Installation included.
	<p><b>Note:</b> The SL500 is a rack-installed library.</p> <ul style="list-style-type: none"> <li>■ With 3 or fewer expansion modules, encryption hardware can be installed in the same rack.</li> <li>■ With 4 expansion modules, there is no room for the encryption hardware and customers may need to order an external rack.</li> </ul> <p>See “<a href="#">External Rack Installations</a>” on page 32 if necessary.</p>

Firmware Levels	
Library	i15 — 1300 (SPS)
StreamLine Library Console	
Tape Drives:	
■ HP LTO4	H45S Fibre Channel or B44S SCSI
Virtual Operator Panel (VOP)	Version 1.0.12 or higher

# 9310 Automated Cartridge System

**TABLE 4-4** 9310 Automated Cartridge System Requirements

<p><b>High-level Description:</b> The 9310—also called PowderHorn—can store:</p> <ul style="list-style-type: none"> <li>■ From 2,000 up to 6,000 tape cartridges</li> <li>■ Up to 4 drive cabinets with space for up to 20 drives per cabinet (80 drives total)</li> </ul> <p><b>Operating System Support:</b> The 9310 library supports all major operating systems; enterprise <i>and</i> open systems.</p> <p><b>Host-to-Library Interface:</b></p> <ul style="list-style-type: none"> <li>■ TCP/IP</li> </ul> <p>The 9310 requires additional hardware consisting of Ethernet switches and 19-inch rack.</p>	
--	--

Order Number	Description
CRYPTO-2X-9310-Z	9310 accessory kit. Includes Ethernet switches plus cabling. <b>Important:</b> This kit include the hardware for the first 9741e. If customer has more than one 9741E they must order additional 9741E accessory kits. Installation included.
9310 libraries require: CRYPTO-2X-9741E-Z	9741E Drive Cabinet accessory kit. Includes 24-port switch and cabling. Installation included.  <b>Note:</b> Each 9741E cabinet may contain up to 20 tape drives and requires the use of a 24-port Ethernet switch.

### Firmware Levels

Library Prerequisites Feature Codes:	The 9310 requires upgrades to support the T10000 tape drive. 93T1—LSM upgrade (firmware and hardware) 93T1—LMU upgrade (firmware only) XT10—Hardware kit upgrade (9741E cabinet)
Library Firmware (minimum)	9311: 4.4.06 9330: TCP/IP - 2.1.02 code 9330: 3270 - 1.9.73 code
Tape Drives: ■ T10000A ■ T10000B ■ T9840D	1.34.208 or higher ( <i>Check on availability</i> ) 1.42.104 or higher
Virtual Operator Panel (VOP)	Version 1.0.11 or higher

# L-Series–L180, L700e, and L1400 Libraries

**TABLE 4-5** L-Series Library Requirements

<p><b>High-level Description:</b>                  L700 and L1400 libraries support two models:</p> <ul style="list-style-type: none"> <li>■ <i>Single frame</i> libraries can hold:                         <ul style="list-style-type: none"> <li>■ From 678 tape cartridges and</li> <li>■ Up to 12 T10000 tape drives.</li> </ul> </li> <li>■ <i>Dual frame</i> libraries holds                         <ul style="list-style-type: none"> <li>■ From 1,344 tape cartridges and</li> <li>■ Up to 24 T10000 tape drives.</li> </ul> </li> </ul> <p><b>Operating System Support:</b>                  Supports open system platforms, such as UNIX, Windows NT, Novell, and Linux.</p> <p><b>Host-to-Library Interface:</b></p> <ul style="list-style-type: none"> <li>■ LVD or HVD SCSI</li> <li>■ Fibre Channel option</li> </ul> <p>The L700e/L1400M libraries have internal rack space for the encryption hardware.</p>	
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Order Number	Description
CRYPTO-2X-L7/14-Z	L180/700/1400 accessory kit. Includes a 16-port switch, and cabling. <b>Note:</b> Depending on the number of tape drives installed, you may need to order an additional switch. Installation included.

Firmware Levels	
Library (minimum) <ul style="list-style-type: none"> <li>■ L700e / L1400</li> <li>■ L180</li> </ul>	3.11.02 or higher  Note: 3.18.xx required for LTO4
Tape Drives: <ul style="list-style-type: none"> <li>■ T10000A</li> <li>■ T10000B</li> <li>■ T9840D</li> <li>■ HP LTO4</li> </ul>	1.34.208 or higher (Check on availability) 1.42.104 or higher H45S Fibre Channel
Virtual Operator Panel (VOP)	Version 1.0.11 or higher Version 1.0.12 or higher for LTO4

# Rack Mount

**TABLE 4-6** Rackmount Requirements

The Sun StorageTek rack can hold up to **12** manual-mount tape drives in 6 trays.

This figure shows the T10000 rack module.

- The top (A) operator panel works with the drive on the left.
- The bottom (B) operator panel works with the drive on the right.

When only one drive is installed, it must be installed on the left.

**Recommendation:**

The customer should purchase a CBNT42U cabinet with this configuration.



Order Number	Description
CRYPTO-2X-RACK-Z	Sun StorageTek rack mount kit. Include 16-port switch and cabling. Installation included.

Firmware Levels	
Tape Drives: <ul style="list-style-type: none"> <li>■ T10000A</li> <li>■ T10000B</li> <li>■ T9840D</li> </ul>	1.34.208 or higher <i>(Check on availability)</i> 1.42.104 or higher
Virtual Operator Panel (VOP)	Version 1.0.11 or higher

# Order Numbers, Descriptions, and Contents

**TABLE 4-7** Order Numbers

Part Name	Part Number	Order Information	Kit Includes
<b>Key Management Appliance:</b>			
Crypto Key Management Appliance 2.0	CRYPTO-KMA-2-Z	Minimum Order two (2) per site. Provides clustering config, High-availability (HA), and auto-mirroring of key database	<ul style="list-style-type: none"> <li>■ KMA</li> <li>■ Pre-loaded Solaris</li> <li>■ Rack mounting hardware</li> <li>■ Client GUI</li> </ul>
<b>Encryption Library Kits</b>			
Crypto SL8500 Library Kit	CRYPTO-2X-SL8500-Z	Minimum of one kit needed per SL8500 library Maximum of 4 per fully populated library.  One required for each rail.	<ul style="list-style-type: none"> <li>■ 24 port ethernet switch cables</li> <li>■ rack mounting hardware</li> </ul> SL8500 rack part numbers: <ul style="list-style-type: none"> <li>■ XSL8500-RACK-Z</li> <li>■ XSL8500-RACK-HW-Z</li> </ul>
Crypto SL500 Base Kit	CRYPTO-2X-SL500B-Z	Uses HP LTO4 encryption capable drives. For use with KMS 2.x.	<ul style="list-style-type: none"> <li>■ 16 port ethernet switch and cables</li> <li>■ rack mounting hardware</li> </ul>
Crypto SL500 Expansion Kit	CRYPTO-2X-SL500X-Z	Uses HP LTO4 encryption capable drives. For use with KMS 2.x. Purchase up to 4 kits per library rack. Cannot install 4 kits and encryption in <b>same</b> rack.	<ul style="list-style-type: none"> <li>■ Additional cables to extend from switch in base kit to each expansion kit</li> <li>■ May require extra rack</li> </ul>
Crypto 9310 Library Kit	CRYPTO-2X-9310-Z	One kit needed per 9310. Includes first connection hardware to a 9741e Drive Cabinet	<ul style="list-style-type: none"> <li>■ 24 port ethernet switch for use in first 9741E cabinet</li> <li>■ 16 port ethernet switch external to cabinet and cables</li> <li>■ rack mounting hardware</li> </ul>
Crypto 9741e Drive Cabinet Kit	CRYPTO-2X-9741E-Z	One kit needed per 9741E cabinet Maximum of 3 per single 9310 silo. (Total of 4 9741e Drive Cabinets)	<ul style="list-style-type: none"> <li>■ 24 port ethernet switch and cables</li> <li>■ rack mounting hardware.</li> </ul>
Crypto L180/700/1400 Library Kit	CRYPTO-2X-L7/14-Z	One kit needed per Lxxx library.	<ul style="list-style-type: none"> <li>■ 16 port ethernet switch, cables, and rack mounting hardware.</li> </ul>

**TABLE 4-7** Order Numbers

Part Name	Part Number	Order Information	Kit Includes
SL3000 uses multiple part numbers depending on the library configuration:			
Crypto SL3000 Library Kits	Multiple Part Numbers	Minimum of one kit needed per SL3000, max (4) per fully populated SL3000.	See SL3000 configurator for PNs and pricing which vary based on library module. These numbers also used with the Service Delivery Platform SDP.
SL3000 Kit 1	XSL3000-ETHRNT1-Z	Switch: supports drives 1-8 in the Base/DEM	If library encryption upgrade, check installation to verify if already installed. Kit (PNs) also used for SDP.
SL3000 Kit 2	XSL3000-ETHRNT2-Z	Cables: supports drives 8-16 in the Base/DEM	If library encryption upgrade, check installation to verify if already installed. Kit (PNs) also used for SDP.
SL3000 Kit 3	XSL3000-ETHRNT3-Z	Switch: supports drives 17-24 in the Base/DEM	If library encryption upgrade, check installation to verify if already installed. Kit (PNs) also used for SDP.
SL3000 Kit 4	XSL3000-ETHRNT4-Z	Cables: supports drives 25-32 in the DEM	If library encryption upgrade, check installation to verify if already installed. Kit (PNs) also used for SDP.

**TABLE 4-7** Order Numbers

Part Name	Part Number	Order Information	Kit Includes
<b>Crypto Accessories</b>			
Rack kit for SL8500	XSL8500-RACK-Z	Sun StorageTek SL8500 Tape Library, Conversion Bill, Rack Component HW Kit.  See upgrade planner for additional detail: <a href="http://sunwebcms.central.sun.com:8001/sunweb/cda/mainAssembly/0,2685,369146_47679,00.html">http://sunwebcms.central.sun.com:8001/sunweb/cda/mainAssembly/0,2685,369146_47679,00.html</a>	<ul style="list-style-type: none"> <li>■ Rack mounting hardware to place switches in SL8500.</li> </ul>
APC for SL8500	XSL8500-AC-SW-Z	Power supply for SL8500	<ul style="list-style-type: none"> <li>■ Optional power supply which may be used with encryption configuration within SL8500 library.</li> </ul>
External, 20U Rack	RACK-20U-Z	One (optional) with 9310, unless customer has external rack already available. May be required for other libraries.	<ul style="list-style-type: none"> <li>■ External, half-high rack for use as needed, primarily with 9310</li> <li>■ Includes no mounting hardware</li> </ul>
Crypto Rack	CRYPTO-2X-RACK-Z	One (optional) for use with rackmount drives.	<ul style="list-style-type: none"> <li>■ Extra 16 port switch</li> <li>■ mounting hardware as needed</li> </ul>
Crypto 16PT ethernet switch	CRYPTO-X-16PT-Z	One or more (optional) for redundancy or replacement.	<ul style="list-style-type: none"> <li>■ Extra 16 port switch</li> <li>■ no mounting hardware</li> <li>■ no cables</li> </ul>
Crypto 24PT ethernet switch	CRYPTO-X-24PT-Z	One or more (optional) for redundancy or replacement.	<ul style="list-style-type: none"> <li>■ Extra 24 port switch</li> <li>■ no mounting hardware</li> <li>■ no cables</li> </ul>
Monitor/Keyboard and rack mount accessory kit, US only PN 315496601.	XCRYPTO-KEYBD-MONZ	One (optional) for use in lieu of customer provided client or workstation.	<ul style="list-style-type: none"> <li>■ Optional monitor and keyboard.</li> </ul>
<b>Drive Enablement Keys</b>			
T10000A drive encryption key, bundled	T10A-4FC-EKEY-B	One required per encryption enabled tape drive. Bundled with T10000A drive at time of sale.	Software license key from <b>Web Site</b> for drive license and encryption enablement.
T10000A drive encryption key, after market	T10A-4FC-EKEY-A	One required per encryption enabled tape drive. After market for T10000A drives previously purchased.	Software license key from <b>Web Site</b> for drive license and encryption enablement.

**TABLE 4-7** Order Numbers

<b>Part Name</b>	<b>Part Number</b>	<b>Order Information</b>	<b>Kit Includes</b>
T10000A drive encryption key, bundled	T10A-2FI-EKEY-B	One required per encryption enabled tape drive. Bundled with T10000A drive at time of sale.	Software license key from <b>Web Site</b> for drive license and encryption enablement.
T10000A drive encryption key, after market	T10A-2FI-EKEY-A	One required per encryption enabled tape drive. After market for T10000A drives previously purchased.	Software license key from <b>Web Site</b> for drive license and encryption enablement.
<b>T10000B</b> drive encryption key, bundled	X-T10B-EKEY-B	T10KB drive feature B	Software license key from <b>Web Site</b> for drive license and encryption enablement.
<b>T10000B</b> drive encryption key, after market	X-T10B-EKEY-A	T10KB drive feature A	Software license key from <b>Web Site</b> for drive license and encryption enablement.
T9840D drive encryption key, bundled	9840D-EKEY-B	One required per encryption enabled tape drive. Bundled with 9840D drive at time of sale.	Software license key from <b>Web Site</b> for drive license and encryption enablement.
T9840D drive encryption key, after market	9840D-EKEY-A	One required per encryption enabled tape drive. After market for T9840D drives previously purchased.	Software license key from <b>Web Site</b> for drive license and encryption enablement.
HP LTO4 drive encryption key, bundled	X-HP-LTO4-EKEY-B	NOT AVAILABLE UNTIL 2Q08 with HP LTO4 encryption capable drives For use with KMS 2.x.	One required per encryption enabled tape drive. Bundled with HP LTO4 drive at time of sale.
HP LTO4 drive encryption key, after market	X-HP-LTO4-EKEY-A	NOT AVAILABLE UNTIL 2Q08 with HP LTO4 encryption capable drives For use with KMS 2.x.	One required per encryption enabled tape drive. After market for HP LTO4 drives previously purchased.

**TABLE 4-7** Order Numbers

Part Name	Part Number	Order Information	Kit Includes
<b>HP LTO4 Drive Upgrade Kits</b>			
Crypto Drive Upgrade for HP LTO4 FC SL500	XHPLTO4E-FCUPL500Z	HP LTO4 FC drive upgrade SL500	<ul style="list-style-type: none"> <li>■ HP LTO4 FC encryption drive upgrade for SL500</li> <li>■ Serial to Ethernet interface card, cabling, drive tray back-plate</li> </ul>
Crypto Drive Upgrade for HP LTO4 FC SL3000 / SL8500	XHPLTO4E-FCUP3085Z	HP LTO4 FC drive upgrade SL3000 /SL8500	
Crypto Drive Upgrade for HP LTO4 SCSI SL500	X-HPLTO4E-SCUP500Z	HP LTO4 SCSI drive upgrade SL500	
<b>Service Delivery Platform (SDP):</b> These numbers also used with the Service Delivery Platform			
Crypto SL3000 Library Kits	Multiple Part Numbers	Minimum of one kit needed per SL3000, max (4) per fully populated SL3000.	See SL3000 configurator for PN's and pricing which vary based on library module. These numbers also used with the Service Delivery Platform (SDP)
SL3000 Kit 1	XSL3000-ETHRNT1-Z	Switch: supports drives 1-8	<b>Kit also used for SDP.</b> If library encryption upgrade, check installation to verify if already installed.
SL3000 Kit 2	XSL3000-ETHRNT2-Z	Cables: supports drives 8-16	
SL3000 Kit 3	XSL3000-ETHRNT3-Z	Switch: supports drives 17-24	
SL3000 Kit 4	XSL3000-ETHRNT4-Z	Cables: supports drives 25-32	
<b>KMS 1.x to KMS 2.0 Upgrade—Check on Availability</b>			
Upgrade <b>From:</b> Version 1.x Key Management Workstation (KMS) <b>To:</b> Version 2.0 Key Management Appliance (KMA)	X-CRYPTO-1XTO2XUPZ	<p>Minimum (2) per each KMS Version 1.x being replaced.</p> <p>Note: The KMS must be at Version 1.2 and above to transfer keys.</p>	<ul style="list-style-type: none"> <li>■ KMA</li> <li>■ pre-loaded Solaris</li> <li>■ rack mounting hardware</li> <li>■ client GUI CD</li> <li>■ PLUS conversion bill and documentation for migration</li> </ul>

**TABLE 4-7** Order Numbers

Part Name	Part Number	Order Information	Kit Includes
<b>Version 1.x Field Replaceable Units (FRUs)</b>			
Spares, Workstation, KMS, Value Add	#3144974-Z	Spares KMS workstation.	<ul style="list-style-type: none"> <li>■ Spares Crypto KMS</li> <li>■ Workstation only</li> </ul>
FRU, Crypto KMS token key	#3144947-Z	Spares KMS Crypto key token	<ul style="list-style-type: none"> <li>■ Spares Crypto Token</li> <li>■ Secure key repository</li> <li>■ Use with Crypto KMS</li> </ul>
FRU, Token Bay, Desktop	#3144987-Z	FRU, Token Bay, Desktop	<ul style="list-style-type: none"> <li>■ Spares Token Bay only</li> <li>■ Desktop for Crypto KMS</li> </ul>
FRU, Token Bay, Rack Mount, Ethernet (front)	#3144988-Z	FRU, Token Bay, Rack Mount, Front	<ul style="list-style-type: none"> <li>■ rack mounted (front Ethernet access) token bay</li> </ul>
FRU Token Bay, Rack Mount, Ethernet (rear)	#3154719-Z	FRU, Token Bay, Rack Mount, Rear	<ul style="list-style-type: none"> <li>■ rack mounted (rear Ethernet access) token bay</li> </ul>
Spares, External Hard Drive	#3144973-Z	100 GB USB hard drive	<ul style="list-style-type: none"> <li>■ Spares, KMS hard drive</li> </ul>
	#3133781-Z	120 GB USB hard drive (Must be at KMS V 1.2)	
<b>Version 2.0 Field Replaceable Units (FRUs)</b>			
FRU Crypto KMA appliance	#3154936-Z	Spares, KMA appliance only	<ul style="list-style-type: none"> <li>■ KMA appliance with pre-loaded Solaris, no hardware</li> </ul>
FRU HP LTO4 Encryption Dione Card	#4199549-Z	FRU, Dione Encryption Card <i>HP LTO4 only</i>	<ul style="list-style-type: none"> <li>■ FRU, Dione encryption card and cable replacement for HP LTO4 encrypting drives</li> </ul>

## 9310 Upgrades

**TABLE 4-8** 9310 Upgrade Ordering Instructions and Part Numbers

Order Number	Description
A T10000 software upgrade is required for each LSM (9310). The majority of customers already have the hardware needed for the T10000, therefore in most cases the firmware upgrade marketing part number should be ordered.	
<input type="checkbox"/> YXSL9310-T10K-FW	9310 Firmware upgrade for T10000
<input type="checkbox"/> YXSL9310-T10K-HW	9310 hardware CB for T10000
<input type="checkbox"/> YXSL9330-T10K	9330 Upgrade for T10000 One per LMU
<input type="checkbox"/> YX9741E-T10K-9310	C/B 9741E T10K Install 9310 One per cabinet

## Professional Services

Professional Services Encryption Implementation Required; one per site.

**TABLE 4-9** Professional Services Ordering Instructions and Part Numbers

Order Number	Description
<b>Important: Professional Services is required for new installations.</b>	
<input type="checkbox"/> WW-PS-INTG-KMS	<b>KMS Integration Service</b> The <b>Key Management System Integration Service</b> provides an integration of the KMS hardware and software into the encryption capable tape back-up and archive solution. <b>Note:</b> This service is required for any new tape encryption installations.
<input type="checkbox"/> WW-PS-ARCH-ENCRYPT	<b>Encrypt Ready Assess</b> The <b>Encryption Readiness Assessment</b> provides services to bring a customer into a state of being prepared to take on a new storage encryption product. The service assists in encryption key management lifecycle, Storage policy Alignment, and encryption roles.

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## Tape Drive Ordering Instructions

See the specific tape drive Systems Assurance Guides for—order numbers, descriptions, and additional information—for the different tape drives and the availability.

**TABLE 4-10** Tape Drive Ordering Instructions

<b>Publication Description</b>	<b>Part Number</b>
T10000 Tape Drive Systems Assurance Guide	StorageTek: TM0002
T9x40 Tape Drive Systems Assurance Guide	StorageTek: MT5003
Service Delivery Platform Systems Assurance Guide	StorageTek: 11042004

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## Library Ordering Instructions

See the specific tape drive and library Systems Assurance Guides for—order numbers, descriptions, and additional information—for the different tape drives and the availability.

**TABLE 4-11** Library Ordering Instructions

<b>Publication Description</b>	<b>Part Number</b>
SL8500 Modular Library Systems Assurance Guide	StorageTek: MT9229
SL3000 Modular Library Systems Assurance Guide	StorageTek: 316194101
SL500 Modular Library Systems Assurance Guide	StorageTek: MT9212
L700/1400 Library Ordering and Configuration Guide	StorageTek: MT9112
L180 Library Ordering and Configuration Guide	StorageTek: MT9112
9310 PowderHorn Library Systems Assurance Guide	StorageTek: ML6500

# HP LTO4 Order Numbers

License Keys

**FIGURE 4-3** License Keys

LTO4 Encryption Key	Marketing Number	Description
Bundled	X-HP-LTO4-EKEY-B	One required per encryption enabled drive. Bundled with the drive at time of sale.
After market	X-HP-LTO4-EKEY-A	One required per encryption enabled drive. After market for drives previously purchased.

Configured End Items

**TABLE 4-12** Configured End Items—Order Numbers

Part Numbers	Description
<b>SL500</b>	
LTO4E-HP4FC-SL500Z	LTO4 HP FC 4Gb SL500 Encryp Dr
LTO4E-HPSC-SL500Z	LTO4 HP SCSI SL500 Encryp Dr
<b>SL8500</b>	
LTO4E-HP4FC-SL85Z	LTO4 HP FC 4Gb SL8500 EncrypDr
<b>SL3000</b>	
LTO4E-HP4FC-SL30Z	LTO4 HP FC 4Gb SL3000 EncrypDr

X-Options (Conversion Bills)

**TABLE 4-13** Conversion Bill Numbers

Part Numbers	Description
<b>SL500</b>	
XHPLTO4E-FCUPL500Z	Crypto drive upgrade for HP LTO4 FC SL500
XHPLTO4E-SCUP500Z	Crypto drive upgrade for HP LTO4 SCSI SL500
<b>SL3000/8500</b>	
XHPLTO4E-FCUP3085Z	Crypto drive upgrade for HP LTO4 FC SL3000/SL8500

Dione Card

**TABLE 4-14** Dione Card Part Number

Part Number	Description
419954901	HP LTO4 Dione Card



## Work Sheets

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The following pages contain work sheets that can help prepare for the installation of a Sun StorageTek encryption solution.

These work sheets include:

- [“Initial Configuration Work Sheet” on page 72](#)
- [“User Roles Work Sheet” on page 73](#)
- [“Tape Drives Work Sheet” on page 74](#)
- [“Drive Enrollment Work Sheet” on page 75](#)

Make copies as necessary.

# Initial Configuration Work Sheet

**TABLE A-1** Initial Configuration Settings—Customer

	First KMA			Second KMA		
	Hostname	IP Address / Netmask	DHCP? <sup>1</sup>	Hostname	IP Address / Netmask	DHCP? <sup>1</sup>
LAN 0 = Management			Yes <input type="checkbox"/> No <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>
LAN 1 = ELOM			Yes <input type="checkbox"/> No <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>
LAN 2 = Service			Yes <input type="checkbox"/> No <input type="checkbox"/>			Yes <input type="checkbox"/> No <input type="checkbox"/>
LAN 3 = Reserved						
KMA Name						
Gateway						
DNS Server	Hostname: IP address:			Hostname: IP address:		
Security Officer	Login: Passphrase:			Login: Passphrase:		
Root account Passphrase						
ELOM Passphrase						
Key Split Credentials						
Autonomous Unlocking <sup>2</sup>						
Keyboard Type						
<b>Note:</b>	<p>1. Addresses assigned using DHCP <b>must be static</b>. The system cannot handle the DHCP server changing the IP addresses once assigned.</p> <p>2. Autonomous Unlocking allows the KMA to enter a fully operational state after a hard or soft reset without requiring the entry of a quorum of passphrases using the KMS Manager. This information should not be written down and should be entered by the person to which they belong. These entries can be changed in the KMS Manager; so it may be desirable to enter something simple during the configuration, then change it later using the KMS GUI immediately after the KMA is configured.</p>					



# Tape Drives Work Sheet

**TABLE A-3** Tape Drive Work Sheet—Service Representative

SDP IP Address:		File Pathname:		Location:
Serial Number / DMOD (Last 8 digits)	Drive Type	Crypto Serial Number (6 hexadecimal characters)	Drive IP Address	Location
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

# Drive Enrollment Work Sheet

**TABLE A-4** Enrollment Data Work Sheet—Customer

KMA Hostname:		KMA Hostname:				
KMA IP Address:		KMA IP Address:				
Drive Address	Drive Type	Drive IP Address	Agent ID	Passphrase	Tokens? (KMS 1.x)	Permanent?
1.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
2.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
3.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
4.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
5.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
6.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
7.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
8.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
9.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
10.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
11.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
12.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
13.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
14.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
15.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
16.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
17.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
18.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
19.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
20.					Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>



# Glossary

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This glossary defines terms and abbreviations used in this publication.

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## A

**Abnormal end of task**

**(abend)** A software or hardware problem that terminates a computer processing task.

**Advanced Encryption**

**Standard (AES)** A FIPS-approved NIST cryptographic standard used to protect electronic data.

**AES** See Advanced Encryption Standard.

**Agent** Various types of encryption agents can be created to interact with the KMS for creating and obtaining keying material. The StorageTek T10000 models A and B, T9840D, and the HP LTO4 tape drives are types of encryption agents when enabled for encrypting.

**Agent API** See Agent Library API.

**Agent Library** The Agent Library is used by an Agent to retrieve key material from a KMS.

**Agent Library API** The API provided by the Agent Library. Agents call this API.

**Audit** See Audit Log.

**Audit Log** The KMS Cluster maintains a log of all auditable event occurring throughout the system. Agents may contribute entries to this log for auditable events.

**Auditor** A user role that can view system audit trails (Audit List events and KMA security parameters).

**Autonomous Lock** When autonomous unlock is enabled a quorum of Security Officers is required to unlock a locked KMA. When disabled, the KMA can be unlocked by any Security Officer.

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## B

- Backup File** The file created during the backup process that contains all the information needed to restore a KMA. Encrypted with a key generated specifically for the backup. The key is contained in the corresponding backup key file.
- Backup Key File** A file generated during the backup process containing the key used to encrypt the backup file. This file is encrypted using the system master key. The master key is extracted from the core security backup file using a quorum of the key split credentials.
- Backup Operator** A user role that is responsible for securing and storing data and keys.
- BOT** Beginning of Tape.

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## C

- CA** See Certificate Authority (CA).
- Certificate** A Certificate is a digitally-signed document that serves to validate the holder's authorization and name. The document consists of a specially formatted block of data that contains the name of the certificate holder (Subject DN), a serial number, validity dates, holder's public key, Issuer's DN, and the digital signature of the Issuer for authentication. The Issuer attests that the holder's name is the one associated with the public key in the document.
- Certificate Authority (CA)** A Certificate Authority registers end-users, issues their certificates, and can also create CAs below them. Within KMS 2.0, the KMAs themselves act as the certificate authority to issue certificates to users, agents, and other KMAs.
- Cluster** A Cluster is a set of Key Management Appliances that are grouped together into a single system to enhance fault tolerance, availability, and scalability.
- Communications key** Adds another layer of encryption and authentication during transmission over a LAN from the token to the drive.
- Compliance Officer** A user role that manages the flow of data through your organization and can define and deploy data contexts (Key Groups) and rules that determine how data is protected and ultimately destroyed (Key Policies).
- Critical Security Parameter** Security-related information (for example, secret and private cryptographic keys, and authentication data such as passwords and PINs) whose disclosure or modification can compromise the security of a cryptographic module.
- Crypto Key Management Station** See Key Management Station.
- Crypto-Accelerator** A Crypto-Accelerator is a hardware device (a card) that can be used to increase the rate of data encryption/decryption, thereby improving system performance in high demand conditions.
- Crypto-active** And encryption-capable tape drive that has had the encryption feature turned on in the drive.

- Crypto-ready** A tape drive that has the ability to turn on device encryption and become encryption-capable.
- Cryptography** The art of protecting information by transforming it (encrypting) into an unreadable format, called cipher text. Only those who possess a special *key* can decipher (decrypt) the message into its original form.
- Cryptoperiods** The length of time in which a key can be used for encryption. It starts when the key is first assigned to the drive. This value corresponds to the “Originator Usage Period” in NIST 800-57.

---

## D

- Data Policy** A data policy defines a set of encryption related parameters, such as the encryption and decryption “crypto-periods” for keys.
- Data Unit** Data units are abstract entities within the KMS that represent storage objects associated with KMS policies and encryption keys. The concrete definition of a data unit is defined by the Encryption Agent that creates it. For tape drives, a data unit is a tape cartridge.
- Device key** Enables the tape drive for encryption. KMS Version 1.x term.

---

## E

- EKT** Enabling key token (device keys). KMS Version 1.x term.
- Enable key** Unique 64 character key used to enable the tape drive. See also PC Key.
- Encryption** The translation of data into a secret code. Encryption is one of the most effective ways to achieve data security. To read an encrypted file, you must have access to a special key or password that enables you to decipher it.

---

## F

- FIPS** Federal Information Processions Standards. The National Institute of Standards and Technology (NIST) is a non-regulatory federal agency within the U.S. Commerce Department’s Technology Administration and Laboratories, which develops and promotes standards and technology, including:
- Computer Security Division and Resource Center (CSRC)
  - Federal Information Processing Standards (FIPS)
  - For more information visit:  
<http://www.nist.gov/>

---

## G

**GUI** Graphical User Interface.

---

## H

**Hash Message  
Authentication Code**

**(HMAC)** In cryptography, a keyed-Hash Message Authentication Code, or HMAC, is a type of message authentication code (MAC) calculated using a cryptographic hash function in combination with a secret key.

---

## I

**Internet Protocol (IP)** A protocol used to route data from its source to its destination in an Internet environment.

**Internet Protocol (IP)  
address** A four-byte value that identifies a device and makes it accessible through a network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be from 0 to 255. For example, 129.80.145.23 could be an IP address.  
Also known as TCP/IP address.

---

## K

**Key** A key in this context is a symmetric data encryption key. Agents can request new key material for encrypting data corresponding to one or more Data Units. A key belongs to a single Key Group so that only Agents associated with the Key Group can access the key. Keys have encryption and decryption cryptoperiods that are dictated by the Key Policy associated with the Key Group of the particular key. The type of key (that is, its length and algorithm) is specified by the Encryption Agent.

- Keys**
  - A random string of bits generated by the key management system, entered from the keyboard, or purchased. Types of keys include:
    - Device keys enable the tape drive encryption feature.
    - Media keys encrypt and decrypt customer data on a tape cartridge.
    - PC Keys enable the tape drive for encryption.
    - [Transmission keys](#):
    - Communication key adds another layer of encryption (authentication) to the media key during transmission over the LAN from the token to the drive.
    - Split keys are unique to each drive and work with the wrap key for protection.
    - Wrap keys encrypt the media key on the LAN and the token.

**Key Group** Key Groups are used for organizing keys and associating them with a Key Policy. Key Groups are also used to enforce access to the key material by the Encryption Agents.

**Key Management Appliance (KMA)**

A SunFire X2100-M2 server preloaded with the KMS 2.0 software. The appliance is a proven, dual-core processor with a Solaris 10 operating system that delivers policy-based key management and key provisioning services.

**Key Management System (KMS)**

A system providing key management. The Sun StorageTek system has a KMS component providing key management on behalf of encryption agents.

**Key Policy**

A Key Policy provides settings for the cryptoperiods to be applied to keys. Each Key Group has a Key Policy, and a Key Policy may apply to zero or more Key Groups. The encryption and decryption cryptoperiods specified on the policy limit the usage of keys and trigger key life cycle events, such as the deactivation or destructions of keys.

Key Policies also control where keys governed by the Key Policy can be exported to other Key Transfer Partners or imported from other Key Transfer Partners.

**Key Transfer File**

A file containing keys and associated data units (if defined) used to move key material from one KMS Cluster to another. Both parties to the transfer must configure a key transfer partner of the other party to the exchange. The key transfer file is signed and encrypted to ensure both privacy of the transferred information as well its integrity.

**Key Transfer Partner**

The Key Transfer Partner is the recipient of keys being exported from one KMS to another.

**KMA**

See Key Management Appliance.

**KMS**

See Key Management System.

**KMS Cluster**

A set of one or more interconnected KMAs. All the KMAs in a KMS Cluster should have identical information. This will not be the case only when a KMS is down, or when a newly created piece of information has not yet propagated through all KMAs in the KMS Cluster. An action taken on any KMA in the KMS Cluster will eventually propagate to all KMAs in the KMS Cluster.

---

## M

**Media key** Encrypts and decrypts customer data on a tape cartridge.

---

## N

**network** An arrangement of nodes and branches that connects data processing devices to one another through software and hardware links to facilitate information interchange.

**NIST** National Institute of Standards and Technology.

---

## O

**OKT** Operational key token (media keys). KMS Version 1.x term.

**Operator** A user role responsible for managing the day-to-day operations of the system.

---

## P

**PC Key** Enables the tape drive to read and write in encrypted mode.

---

## R

**Read key** This is a media key that is used when reading data from a tape.

**Rijndael algorithm** An algorithm selected by the U.S. National Institute of Standards and Technology (NIST) for the Advanced Encryption Standard (AES). Pronounced "rain-dahl," the algorithm was designed by two Belgian cryptologists, Vincent Rijmen and Joan Daemen, whose surnames are reflected in the cipher's name.

**RSA** In cryptography, **RSA** is an algorithm for public-key cryptography created by Ron Rivest, Adi Shamir, and Leonard Adleman at MIT. The letters **RSA** are the initials of their surnames.

---

## S

### Secure Hash Algorithms

**(SHA)** Secure Hash Algorithms are cryptographic hash functions designed by the National Security Agency (NSA) and published by the NIST as a U.S. Federal Information Processing Standard.

**Security Officer** A user role that manages security settings, users, sites, and Transfer Partners.

**Security Policy** A rigorous statement of the sensitivity of organizational data, various subjects that can potentially access that data, and the rules under which that access is managed and controlled.

**Shamir's Secret Sharing** An algorithm in cryptography where a secret is divided into parts, giving each participant its own unique part, where some of the parts or all of them are needed in order to reconstruct the secret. Counting on all participants to combine together the secret might be impractical, and therefore a quorum or threshold scheme is used.

**Site** A site is an attribute of each KMS and Encryption Agent that indicates network proximity, or locality. When Encryption Agents connect to the KMS cluster there is a bias towards establishing communication with KMAs in the same site as the Encryption Agent.

**System Dump** A user-invoked operation that results in all the relevant data being collected into a single file and then that file being downloaded to the machine from which the user invoked this operation. Once the download is complete, this file is deleted from the KMA.

---

## T

**T10000 tape drive** The T10000 tape drive is a small, modular, high-performance tape drive designed for high-capacity storage of data—up to 500 gigabytes (GB) of uncompressed data.

**T9840D tape drive** The T9840D tape drive is a small, modular, is a small, high-performance, access-centric tape drive that has an average access time of just 8 seconds.

This drive obtains its high-performance by using a unique *dual-hub* cartridge design with midpoint load technology. This enables fast access and reduces latency by positioning the read/write head in the middle of the tape.

**Token** KMS Version 1.x term.  
Tokens are handheld, intelligent devices that connect to a token bay with an Ethernet connection. The two roles of the tokens are:

- Enabling key token
- Operational key token

**Token bay** KMS Version 1.x term.  
A chassis that houses the physical tokens and provides power and connectivity for one or two tokens through the rear blind-mating connector. The token bay is compatible with a standard 19-inch rack—a 1U form factor. The token bay comes in two styles: desktop and rack-mount.

**Transport Layer Security (TLS)** A cryptographic protocol that provide secure communications on the Internet for such things as web browsing, e-mail, Internet faxing, instant messaging and other data transfers.

---

## U

**UID** A string that serves as a unique identifier for a KMS entity, e.g. an encryption agent or user.

**Ultra Tape Drive Encryption Agent** Ultra 2.0 compliant encrypting tape drives utilize Ultra Tape Drive Encryption Agent software for key management. These drives acquire key material from the KMS to be used with tape volumes. Each write from BOT results in the use of fresh key material being used for encryption of data on the volume. Consequently, the definition of a data unit maps to a tape volume where the external ID of the data unit is the volume serial number.

**UTC** Coordinated Universal Time.

---

## V

**Volume Serial Number** A six-, seven-, or eight-character alpha-numeric label that identifies a tape volume.

---

## W

**Wrap key** Encrypts the media keys on the LAN and on the token.

**Write key** This is a media key that is used when writing data to a tape.

---

## Z

**Zeroize** To erase electronically stored data, cryptographic keys, and Critical Security Parameters by altering or deleting the contents of the data storage to prevent recovery of the data.

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