T10000 Tape Drive

Systems Assurance Guide

Part Number: TM0002
Revision: ED

T10000 Tape Drive

Systems Assurance Guide

Sun Microsystems, Inc.
www.sun.com

Part No. TM0002
Revision: ED
April 2009

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Revision: ED • TM0002

Summary of Changes

Date	Revision	Description
February 2006	A	Initial release
May 2006	B	Refer to this revision for a list of changes
September 2006	C	Refer to this revision for a list of changes
April 2008	D	Refer to this revision for a list of changes
June 2008	E	Refer to this revision for a list of changes
September 2008	EA	Refer to this revision for a list of changes
December 2008	EB	Added information on: • New SFP cable kits • Airborne contamination specification (Chapter 1)
January 2009	EC	• Added information regarding the drive supporting IPv6 with code level 1.40.x07, or higher. • Removed cartridge part number tables in Chapter 5. • Removed the encryption key table in Chapter 5 and referenced the encryption System Assurance Guide for the specific number. • Miscellaneous phrasing and page layout changes.
April 2009	ED	• Added information on data path key management (DPKM)

Contents

List of Figures

List of Tables

Preface

The T10000 Tape Drive *Systems Assurance Guide* contains checklists that are part of the systems assurance process and for the exchange of information to ensure that no aspects of the sale, order, or installation processes are overlooked.

The intended readers of this document are:

- Account Executives
- System Engineers
- Installation Coordinators
- Technical Specialists and Professional Services personnel
- Customer Service Representatives
- Marketing and Sales personnel, plus
- Anyone interested in information about the T10000 tape drive family

Organization

Chapter	Use this chapter to:
Chapter 1, Introduction	Understand the T10000 tape drive family.
Chapter 2, System Assurance	Explain the system assurance process and exchange information to ensure the accuracy of the sale, order, and installation.
Chapter 3, Site Survey	Record the different platforms, applications, and hardware configurations the customer *currently* has. This information can help identify the solution and fit for a T10000x tape drive.
Chapter 4, Site Preparation	Prepare for the installation by reviewing the information and completing the checklists: site planning checklist (*if not previously done*), library installation requirements, rack mount requirements, and the tape drive configuration checklist
Chapter 5, Ordering	Help order the models, cables, and tape cartridges for a T10000x tape drive.
Appendix A, “Tape Cartridges”	Obtain information about the tape cartridge.
Glossary	Learn the terms and abbreviations in this guide.
Index	Locate items and topics in this guide.

Publications

The following table lists the support documentation for the T10000 tape drive that is available online in portable document format (PDF).

Publication Description		Intended Audience	Part Number
Installation Manual Describes how to install the T10000 tape drive in library and rack mount configurations.		• Technical specialists • Service representatives	96173
Service Manual Contains removal and replacement procedures.			96175
Operator's Guide Contains information that can be useful to user's, operators, and system administrators.		• Operators • System administrators • Service representatives	96174
Virtual Operator Panel User Guides Contains useful information about the VOP.			96179 96180
Fibre Channel Reference Manual		• Software Vendors (ISVs) • Technical specialists	MT9259
Systems Assurance Guide Provides an overview about the T10000 tape drive and contains site preparation checklists, feature codes, conversion bills, media, and part numbers for the tape drive.		• System engineers • Account executives • Professional services • Technical specialists • Service representatives • Marketing and sales representatives	TM0002
Encryption	*Key Management System 2.0: Systems Assurance Guide*		316194803
	Key Management System Installation and Service Manual	• Technical specialists • Service representatives • Operators • System administrators	3161949xx
	Key Management System: Administrator Guide	• Operators • System administrators	3161951xx
	T10000A Encrypting Tape Drive Security Policy	• Service representatives • Crypto officer	316055001
	T10000B Encrypting Tape Drive Security Policy		316055101

You can find most of the documentation listed in the previous table online at the following URL: http://docs.sun.com/app/docs/prod/tape.storage#hic.

Publications regarding Sun Microsystems tape device software products:

Sun Microsystems Software Products

A list of Sun Microsystems tape device software products can be found online at:

http://docs.sun.com/app/docs/prod/tape.device#hic

Documentation, Support, and Training

Sun Function	URL
Documentation	http://www.sun.com/documentation/
Support	http://www.sun.com/support/
Training	http://www.sun.com/training/

Introduction

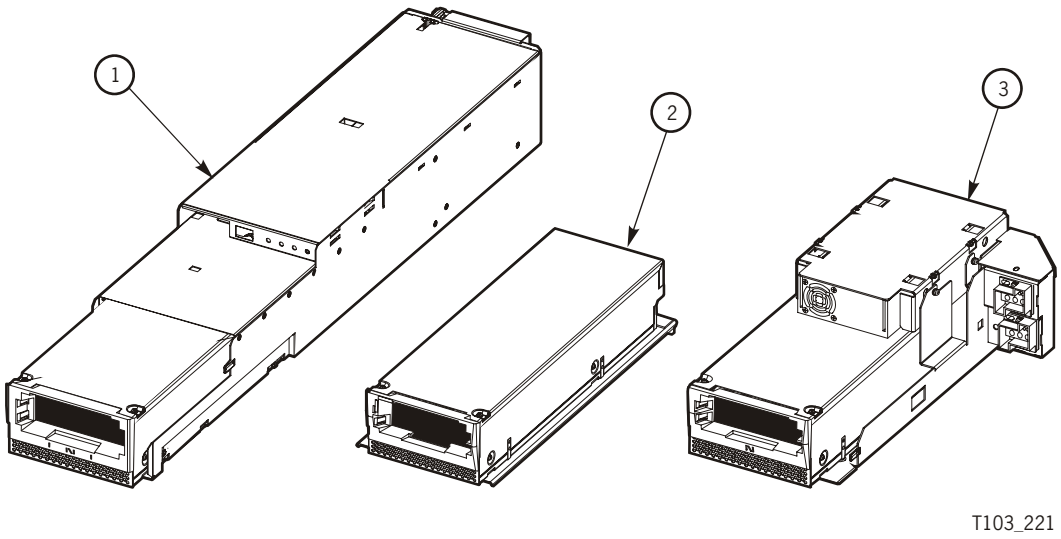
1

Use this chapter to introduce yourself and your customer to the Sun StorageTek T10000A and T10000B tape drives.

Note: The tape drives are also called the T10000, tape drive, or just drive throughout this guide.

The T10000 tape drive is a small, modular, high-performance tape drive designed for high-capacity storage of data. Figure 1 shows examples of the T10000 in three library drive configurations:

Figure 1. T10000 Tape Drive



1. SL8500 library drive tray
2. 9310 library and 9741E Drive Cabinet tray (T10000A only)
3. L180, L700, L700e, and L1400M library drive tray

Note: The T10000 is not intended for installation in the L5500 library.

Description

Size: The 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 T10000A tape drive to record and store up to 500 gigabytes (GB) or the T10000B tape drive to record and store up to 1 terabyte (TB) of uncompressed data.

Media: The unique 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.

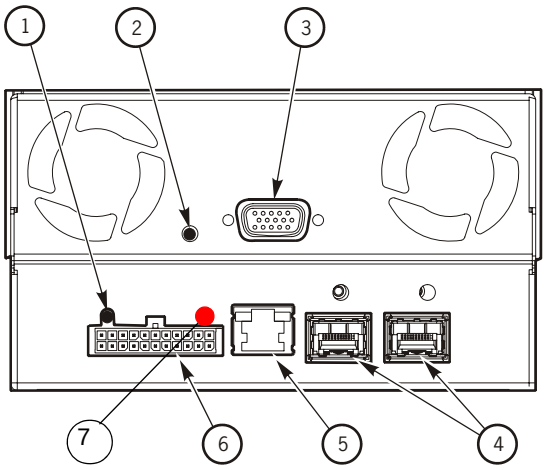
Interface: The host connections to the T10000 are fiber-optic to provide a high rate of data transfer, such as Fibre Channel and FICON. The Fibre Channel drive supports 256 concurrent hosts with code level 1.37.114, or higher.

Configurations: The T10000 supports two configurations: library and stand-alone, for a variety of operating system platforms:

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

Figure 2 shows a rear view of the T10000 tape drive:

Figure 2. Rear View

Rear Panel	Descriptions
	1. Tape drive activity indicator 2. Reset switch 3. Tape transport interface (TTI) A serial port for library communications 4. Interface ports (2) Two small form-factor pluggable (SFP) modules with fiber-optic LC connectors See “Small Form-factor Pluggable Modules” on page 3 for more information. 5. RJ-45 receptacle An Ethernet port that provides a connection for the virtual operator panel (VOP), Service Delivery Platform (SDP), or encryption keys. Starting with drive code level 1.40.x07, you can use IPv6 addressing. 6. Power connector DC voltages from an external power supply module or drive tray connections 7. Encryption LED Green = encryption disabled Amber = needs media keys Red = encryption enabled

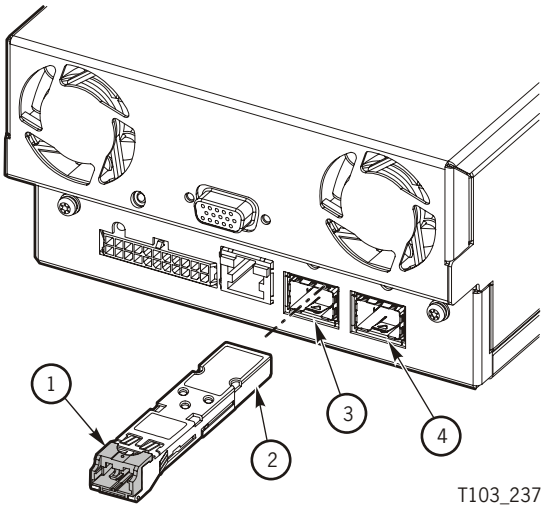
Small Form-factor Pluggable Modules

The small form-factor pluggable (SFP) modules plug into the interface port on the tape drive and normally on network switches. There are two different types of SFP modules depending on the *wavelength* (mode) and type of cable:

- 50-micron multimode cables for use with a short wavelength SFP module.
- 9-micron single mode cables for use with a long wavelength SFP module.

The tape drive can be configured with a single-port (short or long wavelength SFP), dual ports (short or long wavelength SFP), or mixed-port (one short wavelength SFP and one long wavelength SFP).

Figure 3. SFP Modules



1. LC connector
2. SFP module
3. Port A
4. Port B

SFP modules come in two different colors:

- **Black** = *short* wavelength
- **Blue** = *long* wavelength

Important:
When planning the network, make sure the SFP module supports that specific network type and configuration including HBAs, switches, wavelength, and cable types.

Tape Drive Components

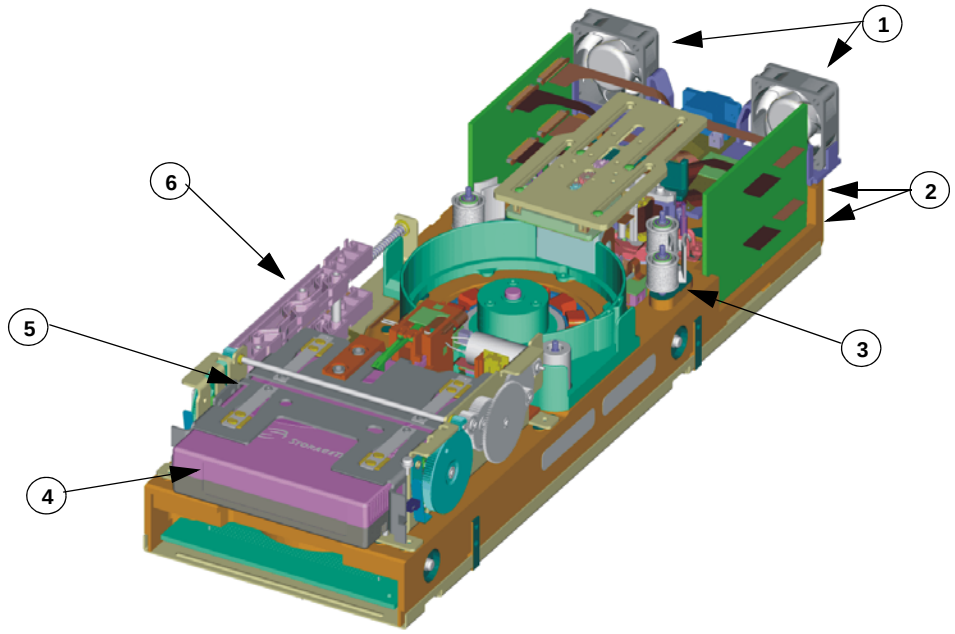
The tape drive contains the following electrical and mechanical components:

Component	Description
Control processor	Controls all drive functions and contains the embedded firmware.
PCI bus	Provides a peripheral component interconnection (PCI).
ADC technology [1]	Performs data compression and decompression.
Specialized buffers	Hold the data in a form written on tape and read back to the host.
Read/Write circuitry (Read/Write heads)	Uses PRML[2] complemented by magneto-resistive (MR) head technologies that provide *32* channels (two 16-channel heads) to write data to the tape and read it back. Dual head technology increases data integrity, promotes longer media life, and achieves high transfer rates.
Encryption circuitry	When enabled, encrypts and decrypts data.
Head Cleaner	Removes loose debris from the head during a cartridge unload.
Data Buffer	The T10000 drive has a 256 MB data buffer.
Variable speed servo system	A variable speed servo system allows the tape drive to run at discrete speeds and tension. Tape speed can vary between 2.0 and 4.95 m/s (3.74 m/s for the T10000B) during read/write operations with varying higher speeds, up to 12 m/s, during locates or rewinds.
Loader	Loads the cartridge and engages it with the cartridge motor.
Threader	Threads tape through the tape path to the take up reel during a load and returns the tape to the cartridge during an unload.
Tape path	Guides the tape past the read/write heads.
Control and status indicators (LED) [3]	An operator panel provides a human interface with the tape drive for rack mount configurations. Two tri-color light emitting diodes on the rear of the tape drive indicate: • General status of the drive • Encryption functionality.
Ethernet port	Provides a connection that supports the virtual operator panel, Service Delivery Platform, and encryption keys.
Remote maintenance capabilities	Supports connections to the Service Delivery Platform (SDP), which provides monitor and alert capabilities for the tape drive.
TTI interface	Transfers commands and status between the drive and the library over the TTI serial interface.
A Radio Frequency Identification (RFID) system	Provides an interface to a memory chip in the tape cartridge.

1. An Adaptive Lossless Data Compression technique.
2. Partial Response, Maximum Likelihood, a method for converting a weak analog signal into a stronger digital signal to provide a higher recording density and also contributes to faster data transfer rates.
3. Human interface and operator panel functions are now provided by the Virtual Operator Panel (VOP).

Figure 4 shows key components of the tape drive.

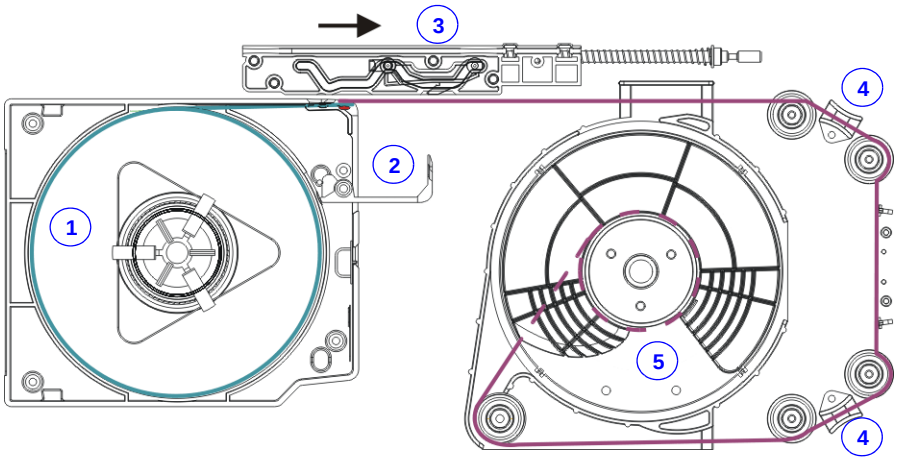
Figure 4. Tape Drive Components (Example only)



1. Cooling fans (2)
2. Read/Write and Logic cards
3. Tape path roller/guides (see Figure 5)
4. Tape cartridge
5. Loader (elevator)
6. Tape leader buckler

Figure 5 shows elements of the tape path.

Figure 5. Tape Path



1. Tape cartridge and loader (elevator)
2. Tape cartridge door
3. Buckler
4. Tape path rollers and guides
5. Take-up reel, motor, and hub assembly

Things to note about the tape drive are:

- The same drive is capable of either encryption or non-encryption, *not both*
- A physical indicator that indicates when encryption is enabled
- The Ethernet port is used to obtain encryption keys

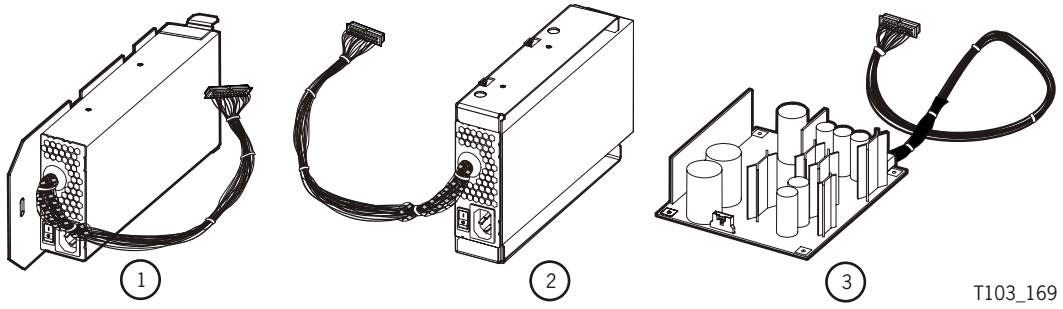
With drive code level 1.40.x07 and KMS 2.1, the T10000A drive complies with FIPS Level 1, and the T10000B drive complies with FIPS Level 2. Level 1 has production-grade requirements (the lowest level). Level 2 has requirements for physical tamper evidence and role-based authentication. Refer to the appropriate security policy listed in “Publications” on page xiv.

The data path key management (DPKM) subsystem is the third installment of the Sun Microsystems implementation of encryption on Sun tape drives. DPKM uses the SCSI 4 commands `Security Protocol In` and `Security Protocol Out` to implement host-based key management on Sun encrypting tape drives. Encryption keys are delivered to the tape drive over the Fibre Channel interface (non-FIPS compliant). DPKM provides the ability to toggle the encryption state on/off on a per cartridge basis which allows the user to have a mix of encrypted/non-encrypted files on each tape cartridge. DPKM support is available with drive code level 1.41.x10 or higher. You use the Virtual Operator Panel to enable or disable the DPKM capability of the tape drive.

Power Supply Modules

Figure 6 shows the ways to provide power to the T10000 tape drive depending on the configuration:

Figure 6. Power Supply Modules



1. AC Power supply for the 9741E drive cabinet (T10000A only)
2. AC Power supply (L-Series libraries and rack chassis)
3. DC Power supply (SL8500 and SL3000 libraries)

- In a 9741E cabinet configuration: the drive receives operating voltages from an *external* AC power supply module mounted inside the cabinet.
- In an L-Series library configuration: the T10000 receives operating voltages from an *external* AC power supply module installed above the drive.

- In a rack mount configuration: the drive receives operating voltages from an *external* AC power supply module mounted inside the rack tray (chassis).
- In an SL3000 or SL8500 configuration: the T10000 receives operating voltages from an *internal* DC power module located inside the drive tray.

Table 1. Power Supply Input Voltage and Frequency

Characteristics	External Power Module	DC Power Module
Input voltage	88 to 264 VAC	48 VDC supplied from the SL3000 or SL8500 power system
Input frequency	48 to 63 Hz	

All versions of the power supply are field replaceable units (FRUs) with no other servicing requirements. If the power module fails, replace it with another module.

Note: Even though the power supplies look similar and have the same dimensions as other T-Series tape drive power supplies, *the T10000 power supplies are unique to the T10000 tape drive*.

External Power Supply Module

The external power supply is used in the 9741E cabinet, the L-series libraries, or the rack mount chassis.

Table 2. Power Supply Physical Dimensions

Measurement	Specification
Width	14.7 cm (5.77 in.)
Depth	20.4 cm (8.04 in.)
Height	4.7 cm (1.83 in.)
Weight:	1.4 kg (3.5 lb) 2.38 kg (5.25 lb) L-Series libraries

Table 3. Power Specifications

Characteristics	Specification
Power consumption	58 W (drive only) 90 W (drive and power supply)
Power dissipation	420 Btu/hr

Virtual Operator Panel

Description: Figure 7 shows an example of the virtual operator panel (VOP) graphical user interface (GUI) for the T10000 tape drive. This panel allows operators and service representatives to monitor and perform tasks on a single tape drive.

Software: You can install the VOP software on a variety of platforms, such as Windows, Solaris, and Linux.

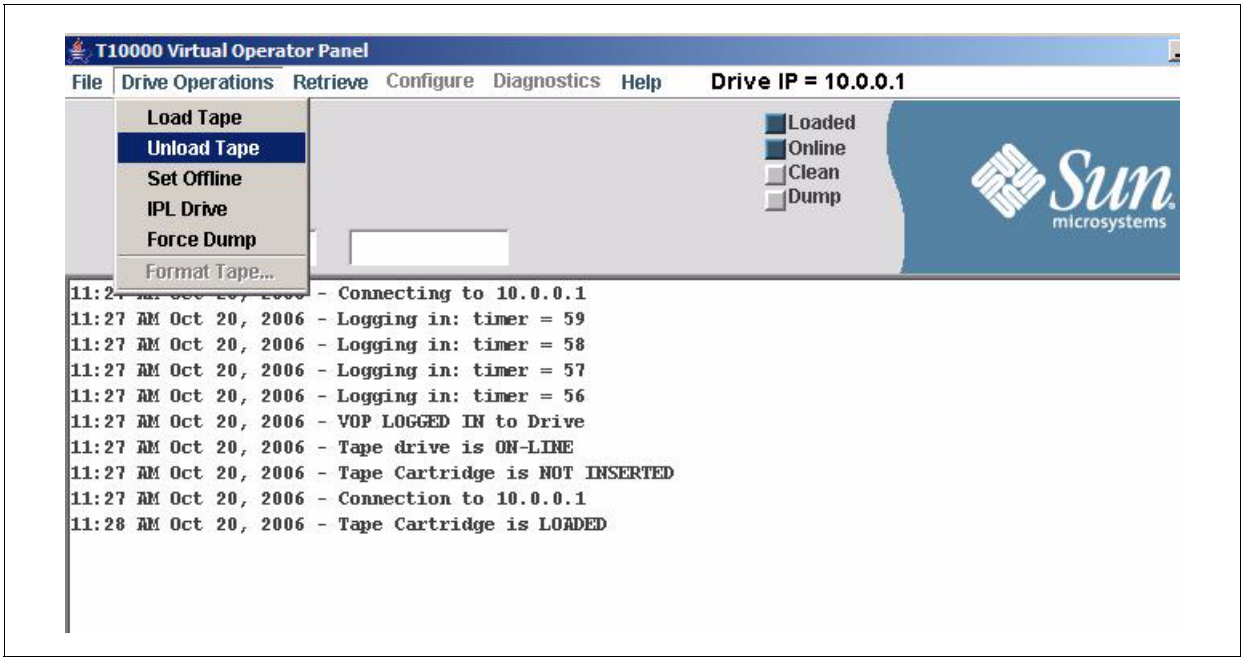
Connection: The VOP uses a standard RJ-45 Ethernet connection to the tape drives.

Note: VOP version 1.0.13 in conjunction with the appropriate drive code level supports the use of an IPv6 address.

Uses: You can use VOP to:

- Perform drive operations
- Retrieve error information
- Configure the tape drive
  - License and enroll a drive for encryption in a KMS solution
  - Data path key management (DPKM)
- Run diagnostics (service representative version only)

Figure 7. Virtual Operator Panel



Specifications

This section lists the physical, environmental, and performance specifications for the T10000 tape drive.

Table 4. Tape Drive Physical Specifications

Measurement	Specification
Width	14.6 cm (5.75 in.) drive, 48.3 cm (19 in.) rackmount tray
Depth	42.5 cm (16.75 in.) drive, 64 cm (25 in.) rackmount tray
Height	8.25 cm (3.25 in.) drive, 17.8 cm (7 in.) rackmount tray
Weight (with drive tray)	
SL8500 SL3000 9310 (T10000A only) L-Series Rackmount	9.4 kg (20.75 lb) 10.1 kg (22.25 lb) 6.9 kg (15.25 lb) 8.3 kg (18.3 lb) 18.6 kg (41.0 lb.) single drive, 25 kg (55 lb.) dual drive

Environmental Requirements

Note: Although the T10000 will function over the full list of ranges as specified below, *optimal reliability* will be achieved if you maintain the environment between the recommended ranges.

Table 5. Environmental Specifications

Description	Optimum	Recommended	Ranges
Temperature			
- Operating - Shipping - Storing	22°C (72°F)	20° – 25°C (68° – 77°F)	5° to 32°C (59° to 90°F) [1] -40° to 60°C (-40° to 140°F) 10° to 40°C (50° to 104°F)
Relative Humidity			
- Operating - Shipping - Storing	45%	40% – 50%	20% to 80% 10% to 95% 10% to 95%
Wet bulb (non-condensing)			
- Operating - Storing	29.2°C (84.5°F) 35°C (95°F)		

1. Dry bulb

Important: Industry best practices recommends computer rooms maintain a relative humidity of 40% to 50% for best performance.

Airborne Contamination

Tape drives and media are subject to damage from airborne particulates (0.3 microns and smaller). The operating environment should strive to adhere to the requirements of a Class 100,000 clean room and the ISO 14644-1 Class 8 or 9 environment. See the *Sun Microsystems Data Center Site Planning Guide* for additional information regarding gasses and other contaminants.

http://dlc.sun.com/pdf/805-5863-13/805-5863-13.pdf

Performance

Table 6. Tape Drive Performance Specifications

Characteristic	Specification	
	T10000A	**T10000B**
Capacity and Performance		
Capacity, native	500 GB (5 x 10^{11} bytes)	1 TB (1 x 10^{12} bytes)
Capacity (Sport Cartridge)	120 GB	240 GB
Data buffer size	256 MB	*same as T10000A*
Tape speeds:		
Read and write	2.0 and 4.95 m/s	2.0 and 3.74 m/s [1]
File search and locates	8.0 - 12 m/s	*same as T10000A*
High speed rewind	8.0 - 12 m/s	*same as T10000A*
Interfaces		
Types	2 Gb/4 Gb Fibre Channel and FICON	4 Gb Fibre Channel and FICON
Specifications	N, NL ports, FC-AL_2, FCP_2, FC-tape	*same as T10000A*
Data rate	120 MB/s	*same as T10000A*
Burst transfer rate	up to 330 MB/s	*same as T10000A*
Emulation Modes	3592 (MVS) and VSM (3490)	*same as T10000A*
Access times		
Tape load and thread to ready	16.5 s	*same as T10000A*
File access, average (includes loading)	62 s	*same as T10000A*
Rewind (maximum)	91 s (23 s for Sport Cartridge)	*same as T10000A*
Average rewind	48 s (13 s for Sport Cartridge)	*same as T10000A*
Unload time	23 s	*same as T10000A*
Reliability		
Archive life	up to 30 years	*same as T10000A*
Loads/unloads	15,000	*same as T10000A*
Power on @ 100% duty cycle	290,000 hr	*same as T10000A*
Head life	5 years	*same as T10000A*
Uncorrected bit error rate	1 x 10^{-19}	*same as T10000A*
Undetected bit error rate	1 x 10^{-23}	*same as T10000A*

1. Legacy cartridge read speeds 2.0 and 4.95 m/s.

Cables and Connectors

Specific types of cables and connectors are required to interface with the T10000 tape drive.

Cable Guidelines

Note: Exceeding these lengths could: introduce problems, exceed error thresholds, and inhibit performance.

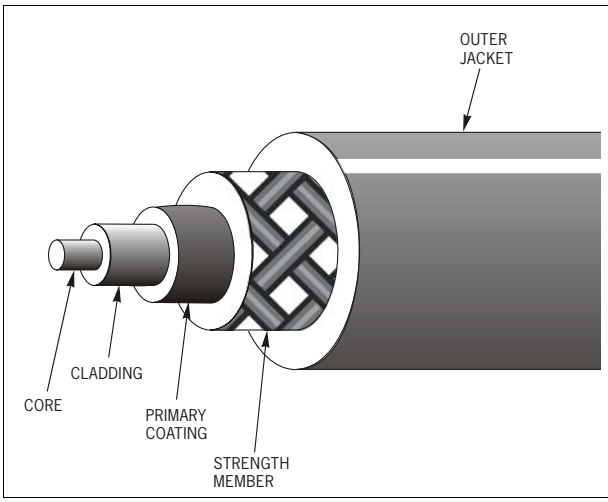
Figure 8. Cable Length Guidelines

Mode	Transmission	Core/Cladding	Color	Interface Speed	Distance
Single mode	Laser	9/125	Yellow	1, 2, or 4 Gbps	2 m – 10 km
Multimode	LED	50/125	Orange	1 Gbps	2 – 500 m
				2 Gbps	2 – 300 m
				4 Gbps	2 – 150 m
Multimode	LED	62.5/125 (See note below)		1 Gbps	2 – 300 m
				2 Gbps	2 – 150 m
				4 Gbps	2 – 75 m

Important:
Multimode cables with a measurement of 62.5/125 are *not recommended.* If you encounter them at existing installations, replace them with multimode 50/125 interface cables.

Composition:
Although fibre-optic cables can vary in composition, this figure shows a basic design for a fiber-optic interface cable.

Figure 9. Fiber Optic Composition



Core: The fiber or center of the cable. Originally, all fibers were made of glass and required more stringent handling precautions. Now with new technologies plastic is being used more than glass.

Cladding: Operates like a mirror surrounding the core which keeps the light from escaping.

Primary coating: Serves as protection for the fiber core and cladding.

Strength member: Provides tensile strength for the cable using steel or Kevlar fibers.

Outer jacket: Surrounds and serves as a protective sheath for the entire cable.

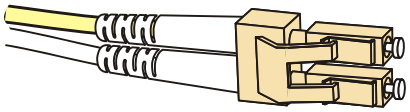
LC Connectors

LC connectors are used on fiber-optic cables and connect to the SFP modules in the tape drive interface ports and with network switches and directors.

Figure 10. LC Connectors

These connectors are a duplex, RJ-style connector body with a latch that makes them easy to engage and disengage.

Note: The tape drive supports LC connectors only.



Configurations

The T10000 tape drives are available in configurations for Sun StorageTek libraries or for rack mounting.

Library Configurations

Table 7 lists the libraries the T10000 can attach to. See “Library Installation Requirements” on page 42.

Table 7. Library Configurations

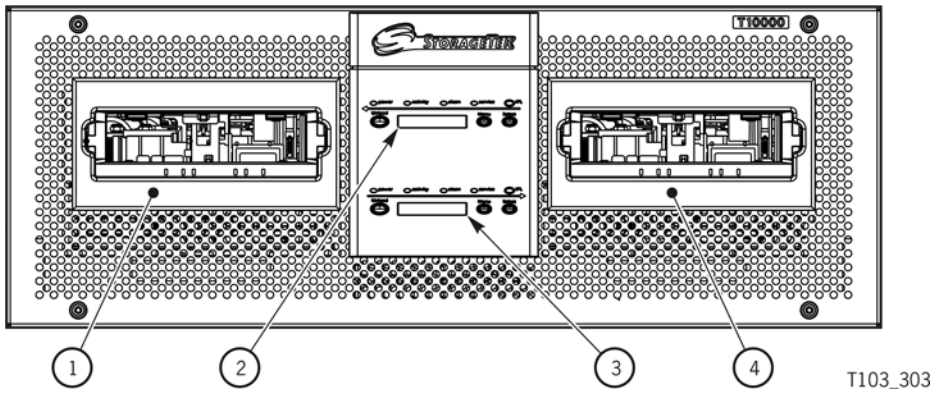
Library	Description
L180	Holds from 84 to 174 cartridges with up to *6* T10000A/B tape drives
L700	Holds from 216 to 678 cartridges with up to *12* T10000A/B tape drives
L700e	Holds from 300 to 1,344 cartridges with up to *24* T10000A/B tape drives when two libraries are connected with a pass-thru port (PTP)
L1400M	Holds from 300 to 1,344 cartridges with up to *24* T10000 tape drives
9310[1]	A single 9310 holds up to 6,000 cartridges with up to *80 T10000A* tape drives on four drive walls with the 9741E drive cabinet
SL3000	Holds from 200 to 4,500 cartridges with up to *56* T10000A/B tape drives
SL8500	A *single* SL8500 holds up to 6,640 cartridges with up to *64* T10000A/B tape drives

1. The 9310 library does not support the T10000B tape drive.

Rack Mount Configurations

A Sun StorageTek rack can hold either 6 manual-mount drives with *one* drive per tray (chassis), 12 manual-mount drives with *two* drives per tray, or a combination of *both* single-drive and dual-drive trays. See “Rack Mount Configurations” on page 50 for more information.

Figure 11. Rack Mount Configuration



1. Drive A (left)
2. Operator panel A (top center)
3. Operator panel B (bottom center)
4. Drive B (right)

Connectivity

The T10000 tape drive supports fiber-optic based host interfaces only—no small computer system interface (SCSI) connections are available. These interfaces include:

- Fibre Channel for open systems platforms
- FICON (IBM’s Fibre Connection) for enterprise mainframes

Note: The drive supports 256 concurrent hosts with code level 1.37.114 or higher.

Both of these interfaces conform to: the American National Standards Institute (ANSI), International Organization for Standardization (ISO), and the InterNational Committee for Information Technology Standards (INCITS–pronounced Insights).

The T10000 tape drive supports connection of both ports in accordance with ANSI Fibre Channel specifications. Refer to the InterNational Committee on Information Technology Standards [INCITS] documents:

- SCSI Primary Commands -3, Section 5.6
- Fibre Channel Protocol -3

Note: The drive will support two hosts, provided that they honor the “reserve/release” or the “persistent reserve/release” specifications.

It is not recommended that a T10000 tape drive be connected to the same host bus port with another tape or a disk subsystem. The stress on the host bus adapter, due to the bandwidth needs, creates unacceptable error recovery issues between both solutions.

Table 8 lists some of the connectivity factors to be aware of and provide for.

Table 8. Connectivity Comparisons

Connection Type for	Open Systems (servers)	Enterprise (mainframes)
Operating systems (*examples*)	• Windows: NT, 2000, etc. • UNIX: Solaris, HP-UX, etc. • Linux	• z/OS, z/VM, and OS/390 • VSE/ESA • Linux on z/Series
Interface type	Fibre Channel	FICON
Connection scheme	Host bus adapters (HBAs)	FICON channels
Network creation	Network switches	Directors and switches

Both of these platforms—Open Systems and Enterprise—require specific cables and connectors as the interface to the T10000 tape drive.

Interop Tool

The Interop Tool is a Web-based tool designed with connectivity information on all supported products regardless of whether they are StorageTek branded or third-party branded. The configurations listed on this Web site are reflective of the most up-to-date information reported from various sources, including internal Sun StorageTek testing labs as well as our technology partners.

Important:
Make sure to visit the Interoperability Web site at:

https://interop.central.sun.com/interop/interop

This site allows searching a connectivity matrix by application, interface, operating system, network component, and product to see what has been qualified in support of the T10000 tape drives.

Network Considerations

Planning is foremost when building a storage area network (SAN). Here is a list of items to consider when designing and connecting to a network:

- Create a logical plan for connections.
- Use dual Fabrics and dual HBAs to attach servers.
- Separate vendor’s and device types into zones.
- Use WWN zoning for flexibility and use Port zoning for security.

- Keep zone configurations the same on every switch in a single Fabric.
- Use unique names for aliases in a zone.
- Standardize vendors for switches and HBAs when possible.
- Use the same firmware and driver levels on similar devices.
- Use at least two links between switches for redundancy.
- Leave room for growth.
- Document and label everything; provide drawings when possible.
- Keep in mind that while large Fabrics are possible; it is best to limit the size and use multiple smaller Fabrics to reduce errors and confusion.

Binding

Some operating systems do not guarantee that devices will always have the same target ID or path after a reboot. This can cause problems for applications that expect tape drives to have the same ID as before the reboot.

Binding is a method that matches the World Wide Name (WWN) of a component (such as a tape drive, port, switch, or fabric) to a specific target ID in a Fibre Channel network. This capability is useful in environments that share devices.

Types of binding:

- Persistent binding secures an individual drive to a host bus adapter.
- Port binding secures individual ports on a switch to a node.
- Switch binding secures individual switches in a fabric.
- Fabric binding secures the entire fabric in a network.

Zoning

Zoning is a method of grouping different ports and devices that connect to a switch and/or director. Zones:

- Enable or disable communications between devices and systems.
- Limit the access to confidential data on specific systems (security).
- Control the number of data paths between systems and devices.
- Separate different operating system types (such as Windows and UNIX).
- Restrict traffic from being re-directed.

Note: Zoning is highly recommended in mixed environments with different devices connected to the same switch and/or director.

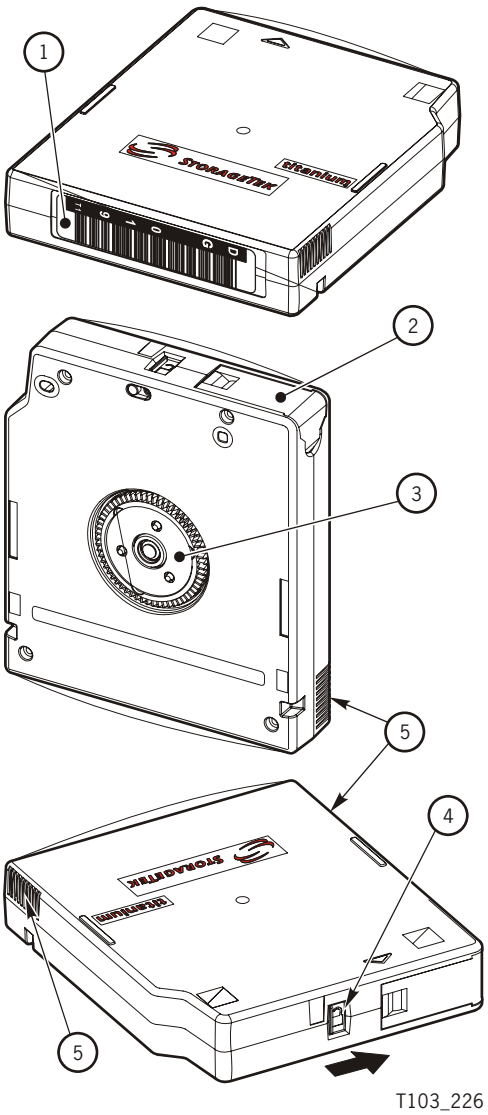
Tape Cartridge

Caution: *Servo track damage:* Bulk-erase will destroy pre-recorded servo tracks. **Do not degauss T10000 tape cartridges.**

Figure 12 shows an example of the T10000 tape cartridge. The T10000 supports five types of cartridges:

- Data, standard (*500* Gbytes T10000A, *1* Tbyte T10000B)
- Data, sport (*120* Gbytes T10000A, *240* Gbytes T10000B)
- VolSafe, capacity (*500* Gbytes T10000A, *1* Tbyte T10000B)
- VolSafe, sport (*120* Gbytes T10000A, *240* Gbytes T10000B)
- Cleaning (50 uses)

Figure 12. Tape Cartridge Description



Callouts:

1. Label area
2. Door color identifies the type of cartridge:
   - Black = Standard (data)
   - Yellow = VolSafe (capacity and security)
   - Red = Sport (data and VolSafe - less capacity than the standard cartridge)
   - White = Cleaning
3. Hub
4. Write protect switch
5. Finger grips

Radio Frequency Identification
Included inside the cartridge is a Radio Frequency Identification (RFID) memory chip that stores information about the cartridge and its performance over time. The Radio Frequency Identification technology is composed of a:

- Memory chip in the cartridge
- Module in the drive to retrieve information from the chip

Notes:

See Appendix A, “Tape Cartridges” for:

- More information about the tape cartridges
- Examples of labels
- Specifications

Comparisons

Table 9 provides some comparisons between the T10000 tape drive and other drive-types, including StorageTek T-Series and Linear Tape-Open.

Table 9. Tape Drive Comparisons

Comparison	T10000	T9940B	T9840D	LTO4
Capacity (native)	500 GB (*T10000A*) 1 TB (*T10000B*)	200 GB	75 GB	800 GB
Media Length (recordable)	855 m (2,805 ft)	650 m (2,133 ft)	251 m (823 ft)	783 m (2,569 ft)
Tracks	768 (*T10000A*) 1,152 (*T10000B*)	576	576	896
Data Rate	120 MB/s	30 MB/s	30 MB/s	40-120 MB/s
Access Time (average)	62 s	59 s	8 s	62 s
Read/Write Speed	2.0 or 4.95 m/s (*T10000A*) 2.0 or 3.74 m/s (*T10000B*)	3.4 m/s	3.4 m/s	6.2 m/s
Rewind Time (maximum)	91 s	90 s	16 s	124 s

System Assurance

2

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 T10000 tape drive are overlooked. This process promotes an error-free installation and contributes to the overall customer satisfaction.

The system assurance team members (customer and Sun) 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 one or more system assurance planning meetings.

Use this chapter to:

- Track the tasks in Table 10 on page 20
- Complete the Team Member Contact sheets on page 21 and 22.

System Assurance Planning Meetings

The purpose of the system assurance planning meetings are to:

- Introduce the customer to the T10000 tape drive
- Explain the system assurance process and establish the team
- Identify and define the customer requirements
- Identify the proposed configurations
- Complete the sales order
- Identify any additional items needed (such as cables and tape cartridges)
- Prepare for the installation and implementation
- Schedule and track the entire process

Table 10. System Assurance Task Checklist

Task	Completed?
Introduce the Sun team to the customer.	Yes ❑ No ❑
Describe the T10000 tape drive to the Team Members. See Chapter 1, Introduction for topics and information.	Yes ❑ No ❑
Complete the Team Member Contact sheets on page 21 and 22.	Yes ❑ No ❑
Review and complete Chapter 3, “Site Survey”. *Comments:*	Yes ❑ No ❑
Review and complete Chapter 4, “Site Preparation”. *Comments:*	Yes ❑ No ❑
Complete the Order Work Sheets in Chapter 5, “Ordering”. *Comments:*	Yes ❑ No ❑
Does the customer want encryption-enabled tape drives? *Comments:* **Note:** In addition to the information in this systems assurance guide, refer to the Key Management Station guide for information.	Yes ❑ No ❑
Determine the installation schedule: **Date:**_____ **Day:**_____ **Time:**_____	Yes ❑ No ❑

Customer Team Member Contact Sheet

Complete the following with 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: _____

Sun StorageTek Team Member Contact Sheet

Complete the following with information for the 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: _____

Note: Representatives may include: marketing and sales representative, installation coordinator, systems engineers (SEs), and service representatives.

Site Survey

3

Use this chapter to record the different platforms, applications, and hardware configurations your customer *currently* has.

The different types of information you might need to gather include:

Connectivity Matrix

Not sure if your customer's hardware or software of choice supports the Sun StorageTek T10000 tape drive?

Make sure you visit the Interop Tool Web site at:

https://interop.central.sun.com/interop/interop

The Interop Tool is a Web-based tool designed for connectivity information on all supported products regardless of whether they are StorageTek branded or third-party branded.

The configurations listed on this Web site are reflective of the most up-to-date information reported from various sources, including internal testing labs as well as our technology partners.

This site allows you to search a connectivity matrix by application, interface, operating system, network component, and product to see what has been qualified in support of the T10000 tape drives.

System Configuration

The following two pages provide space where you can record information about the customers operating systems and configurations.

Table 11. Questions About the Customers Operating Systems

Question	Answer
1. How many and what types of operating systems or platforms does the customer have? Open-Systems: • Windows: 2000, NT... Server make and model: Quantity: • UNIX: Solaris, AIX, HP-UX... Server make and model: Quantity: • Linux... Server make and model: Quantity: Mainframe: • MVS Make and model: Quantity: • VM Make and model: Quantity: Other (Specify): Make and model: Quantity:	
2. Are there plans for: • New purchases? • Future upgrades? • If so, what?	
3. How many systems/servers are used as: • Backup servers? • File servers? • Print servers? • Exchange servers?	

Use Table 12 to record specific information about the customer's *current* system configuration.

Table 12. System Configuration

System _____	Processor _____	Processor _____
Vendor make and model		
Operating system type		
Version number and patch level		
Number of channels		
IP address		
HBA vendor and model		
HBA firmware versions		
Switch and port numbers		
Switch make and model		
Ports		

System _____	Processor _____	Processor _____
Vendor make and model		
Operating system type		
Version number and patch level		
Number of channels		
IP address		
HBA vendor and model		
HBA firmware versions		
Switch and port numbers		
Switch make and model		
Ports		

Backup Applications

The following three pages provide space where you can record information about the customers backup applications.

Table 13. Questions About the Customers Backup and Restore Applications

Question	Answer
1. How are backups performed, manually or automatically? 2. How many servers or systems perform backups?	
3. On what days are backups performed? 4. What types of backups are performed and when? • Full: • Incremental: • Differential: 5. How many hours are available for backups? • Full backups: • Daily Backups:	
6. How much data is backed up? • Per day: • Per week: • Per month: 7. How much data changes daily (%)?	
8. Are backup windows being met? 9. How long does a backup actually take? 10. How long should a backup take? 11. Is a different backup schedule needed?	
12. How long does the customer keep the different levels of backed up data? 13. How many copies are made (including the original)? 14. How many copies are archived?	
15. How often are restores necessary? 16. Why are restores necessary? 17. What are the restore requirements? 18. What are the restore objectives?	

Table 13. Questions About the Customers Backup and Restore Applications (Continued)

Question	Answer
19. What types of tape drives and libraries are being used? 20. Are the backup applications able to stream to the tape drives at full speed? 21. What are the sustained data transfer rates? 22. What are the typical data block sizes?	
23. What types of data are being backed up? (databases, mail servers, image files, text files, audio, video,...)	
24. What types of network topology are being used? - Storage area network (SAN) - Wide area network (WAN) - Local area network (LAN) - Ethernet (TCP/IP) - Token Ring - FDDI - Other	
25. Are there plans to upgrade the network? If yes, describe.	
26. What interface-types are planned? Fibre Channel, FICON, Ethernet, iSCSI, other	
27. Are there any changes anticipated for the operating system and/or platforms? If yes, describe.	
28. What is the most important aspect for the customer regarding a backup solution? 29. What is the overall time frame for the entire project (backup, servers, network, software, hardware)?	
30. Specifically for the backup solution, what is the maximum available budget?	

Use Table 14 through Table 16 to record specific information about the customer's *current* applications and software.

Table 14. Backup and Archive Software

Selection	Type of Backup and Archive Software	Version
❑	VERITAS NetBackup	
❑	IBM Tivoli Storage Manager (TSM)	
❑	Legato NetWorker	
❑	CA Brightstor	
❑	HP Omniback	
❑	Commvault Galaxy	
❑	E-Mail Archive	
❑	ASM NT	
❑	ASM UNIX	
❑	Other (specify)	

Table 15. Network Management Software

Selection	Type of Management Software	Version
❑	VERITAS	
❑	IBM Tivoli NetView	
❑	HP OpenView	
❑	Horizon tape drive Monitor	
❑	RMS/GSM	
❑	Other (specify)	

Table 16. Library Attachment Software

Selection	Type of Attachment Software	Version
❑	ACSLS	*Requires ACSLS 7.1 with PUT0502 or higher*
❑	ACSLS HA	
❑	Fibre Channel	
❑	Library Station	
❑	Host Software Component (HSC)	
❑	Virtual Storage Manager (VSM)	
❑	Other (specify)	

Databases

Table 17. Questions About the Customers Database

Question	Answer
1. How much primary storage exists? Total capacity:	
2. What type and size of disk drives does the customer have? Make: Model: Capacity: Quantity:	
Make: Model: Capacity: Quantity:	
3. What is the RAID configuration? 4. What type of failover product and version is the customer using?	
5. Does all primary storage require backup? If not, how much does? 6. Are additional storage devices needed?	
7. What database management systems (DBMS's) does the customer have? 8. What types of databases need backups? 9. What is the size of the smallest database? 10. What is the size of the largest database? 11. How often does the customer backup each database?	
12. What type of data is the customer backing up? 13. How valuable is the data in each database? 14. Do the different databases have different backup requirements?	
15. How is the customer currently protecting the databases (tape backup, mirroring, snapshot)? 16. If mirroring, how many mirrors? 17. Is mirroring installed because failover is required?	

Hardware Configurations

The remainder of this chapter provides space to record any existing hardware the customer has:

- Does the customer have any existing libraries? ❑ Yes ❑ No
- Does the customer have any existing tape drives? ❑ Yes ❑ No
- Does the customer have an existing network? ❑ Yes ❑ No
- Are migration services required? ❑ Yes ❑ No

Tape Drives

- Does the customer have existing StorageTek tape drives? ❑ Yes ❑ No
- What types of drives are they? _____

- Does the customer have any other types of tape drives? ❑ Yes ❑ No
- What types of drives are they? _____

Note: If the customer has and uses other types of tape drives, media migration services might be required.

Does the customer need to migrate from one tape drive technology to another?	❑ Yes ❑ No
Does the customer need help relocating cartridge tapes, tape drives, and racks?	❑ Yes ❑ No

Table 18. Existing Tape Drive Types

Tape Drive Type	Yes	No	Vendor
3480-type devices (18 track)	❑	❑	
3490-type devices (36 track)	❑	❑	
3590-type devices (cartridge)			
DLT 7000 or 8000	❑	❑	
SDLT 220 or 320	❑	❑	
SDLT 600	❑	❑	
DLT-S4	❑	❑	
LTO Generation 1	❑	❑	
LTO Generation 2	❑	❑	
LTO Generation 3	❑	❑	
LTO Generation 4	❑	❑	
T9840x	❑	❑	
T9940x	❑	❑	
T10000x	❑	❑	
Other	❑	❑	

Libraries

- Does the customer have any existing StorageTek libraries? ❑ Yes ❑ No
- If so, what are the model numbers? _____
- Does the customer have any other types of libraries? ❑ Yes ❑ No
- If so, what are the make and model numbers? _____

Table 19. Existing Libraries

Libraries	Description	Quantity
Manufacturer		
Make and model		
Cartridge capacity		
Manufacturer		
Make and model		
Cartridge capacity		

Cartridge Tapes

Approximately,

- How many cartridge tapes does the customer have? _____
- What is the media capacity the customer owns? _____
- What is the percentage (%) full for the customers media? _____

Table 20. Existing Cartridge Tapes

Cartridge Tapes	Description	Quantity
Data Cartridge Type		
Manufacturer		
Data Cartridge Type		
Manufacturer		
Cleaning Cartridge Type		
Manufacturer		
Cleaning Cartridge Type		
Manufacturer		

Does the customer need help to migrate old data or technology to new data and the T10000 tape drive?	❑ Yes ❑ No
Does the customer need help relocating cartridge tapes to a library or other location?	❑ Yes ❑ No

Network

- Does the customer have an existing network? ❑ Yes ❑ No
- What type is it? _____
- Are additional network devices required? ❑ Yes ❑ No
- What are they? _____
- Does the customer use *zones* in the network? ❑ Yes ❑ No
- Are there frequent reconfigurations of the network? ❑ Yes ❑ No
- Are there multiple floors involved with this network? ❑ Yes ❑ No
- Are there inter-connections of hubs and switches? ❑ Yes ❑ No
- Are there remote connections to hubs and switches? ❑ Yes ❑ No
- Is this a campus network? ❑ Yes ❑ No
- Are trunk cables used? ❑ Yes ❑ No
- Are patch panels used? ❑ Yes ❑ No

Table 21. Fibre Channel Switches

Information	Switch 1	Switch 2	Switch 3
Manufacturer			
Make and model			
Software version			
Speed			
Number of ports			
Port types			
Module types (SFP?)			
Number of open ports			
IP addresses			
IP addresses			

Table 22. Ethernet Hubs and Switches

Information	Hub/Switch 1	Hub/Switch 2	Hub/Switch 3
Manufacturer			
Make and model			
Number of ports			
Software version			
Speed			
Duplex			
Number of open ports			
IP addresses			
IP addresses			

Table 23. Fibre Channel Switch Connections

FC Switch Information	Switch 1	Switch 2	Switch 3
Vendor			
Model number			
Port 0 connection and status			
Port 1 connection and status			
Port 2 connection and status			
Port 3 connection and status			
Port 4 connection and status			
Port 5 connection and status			

Table 23. Fibre Channel Switch Connections

FC Switch Information	Switch 1	Switch 2	Switch 3
Port 6 connection and status			
Port 7 connection and status			
Port 8 connection and status			
Port 9 connection and status			
Port 10 connection and status			
Port 11 connection and status			
Port 12 connection and status			
Port 13 connection and status			
Port 14 connection and status			
Port 15 connection and status			
Port 16 connection and status			
Port 17 connection and status			
Port 18 connection and status			
Port 19 connection and status			
Port 20 connection and status			
Port 21 connection and status			
Port 22 connection and status			
Port 23 connection and status			
Port 24 connection and status			
Port 25 connection and status			
Port 26 connection and status			
Port 27 connection and status			
Port 28 connection and status			
Port 29 connection and status			
Port 30 connection and status			
Port 31 connection and status			

Cables and Connectors

Note: Plan for 1–2 m (3–7 ft) of slack cable for limited movement and routing.

Table 24. Cables and Connectors

Type	Connector	Length	Quantity
9 micron fiber-optic	LC-to-LC		
	LC-to-SC		
Other (specify)			
50 micron fiber-optic	LC-to-LC		
(Preferred)	LC-to-SC		
	LC-to-ST		
Other (specify)			
62.5 micron fiber-optic[1]	SC-to-SC		
Other (specify)			
Ethernet (CAT5E)	RS-232		
Other (specify)			

1. Multimode cables with a measurement of 62.5/125 are *not recommended.* If you encounter them at existing installations, replace them with multimode 50/125 interface cables.

Note: The T10000 tape drives use only LC-style connectors.
If the customer has and uses other types of cables and connectors, a new cable plan should be created.

Site Preparation

4

Use this chapter to prepare for the installation by reviewing the information and completing the checklists:

Site Planning Checklist

Use the following checklist to ensure that the customer is ready to receive the tape drives and to ensure that you are ready to start the installation.

Table 25. Site Planning Checklist

Question	Completed?	Comments:
Delivery and Handling		
Does the customer have a delivery dock? If *no*, where will the equipment be delivered?	Yes ❑ No ❑	
If a delivery dock *is* available, what are the hours of operation?	_____	
Are there street or alley limitations that might hinder delivery?	Yes ❑ No ❑	
Will people be available to handle the delivery of the equipment?	Yes ❑ No ❑	
Is the delivery location close to the computer room where the tape drive will be installed?	Yes ❑ No ❑	
Is an elevator available to move the equipment to the appropriate floors?	Yes ❑ No ❑	
Is there a staging area where the tape drives can be placed close to the installation site? Note: Allow the tape drives to acclimate, unpacked, and close to the installation site before installing them.	Yes ❑ No ❑	

Table 25. Site Planning Checklist (Continued)

Question	Completed?	Comments:
Environmental Planning (See "Specifications" on page 9 for T10000-specific information and the *Sun Microsystems Data Center Site Planning Guide* P/N 805-5863-13)		
Does the site meet the environmental requirements for: • Temperature? • Humidity? • Cooling?	Yes ❑ No ❑	
Does the site contain features and materials that guard against electrostatic discharge?	Yes ❑ No ❑	
Are there special requirements to dispose of or recycle the packing material, pallets, and cardboard?	Yes ❑ No ❑	
Is space available for spare parts and documentation?	Yes ❑ No ❑	
See "Library Installation Requirements" on page 42 for information about the supported libraries		
Are the tape drives being installed in a library? Models? How many tape drives? How many tape cartridges?	Yes ❑ No ❑ _____ _____	
Does the library support or require the Dynamic World Wide Name feature?	Yes ❑ No ❑	See "World Wide Name Descriptions" on page 55
Power Requirements		
Does the intended site meet the power requirements for the tape drives?	Yes ❑ No ❑	
Have you identified the circuit breakers locations and ratings?	Yes ❑ No ❑	
Are there any power cable routing concerns to be aware of?	Yes ❑ No ❑	
Switches and Directors		
Which topology will be used?	Point-to-point ❑ Switched ❑ Cascaded ❑	
How many interfaces will be connected to the switch?	_____	
Are additional ports needed?	Yes ❑ No ❑	
What is the port wavelength?	Short (SW) ❑ Long (LW) ❑	**Note:** Wavelength must match the drive port and fiber optic cable.
Is this a multi-switch fabric network?	Yes ❑ No ❑	

Table 25. Site Planning Checklist (Continued)

Question	Completed?	Comments:
Are there *zoning* requirements?	Yes ❑ No ❑	
Are existing cables being used? Connector type: _____	Yes ❑ No ❑	**Note:** The cable connector must be the same type as the drive port.
Host Bus Adapters		
Does the customer have existing HBAs? Are these HBAs approved in the Connectivity Matrix?	Yes ❑ No ❑ Yes ❑ No ❑	See the Interop Tool at: https://interop.central.sun.com/interop/interop
Will the customer provide new or additional HBAs?	Yes ❑ No ❑	
What is the vendor for the HBA? What is the level of device driver of the HBA the T10000 tape drives are attaching to? Is this the latest driver? Is this driver supported?	_____ _____ Yes ❑ No ❑ Yes ❑ No ❑	
Connectivity: Cabling is *very important* to establish a reliable network for the tape drives. See "Interface Cables" on page 76 for more information.		
Have you completed a cable plan?	Yes ❑ No ❑	
Have you determined the type and number of cables required? • Fibre Channel • FICON • Ethernet: • Power (if required)	Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑	Each tape drive needs an interface cable Quantity: _____ Quantity: _____ Quantity: _____ Quantity: _____
Is the customer prepared to supply Ethernet cables for the network?	Yes ❑ No ❑	
Can the customer provide the required number of "static" IP addresses?	Yes ❑ No ❑	
Will interface cables be run from outside the computer room?	Yes ❑ No ❑	Cables that run outside a computer room require a flammability rating of CL2 or CL2P.
Will the customer allow Sun StorageTek to use remote support?	Yes ❑ No ❑	See "Service Delivery Platform" on page 60 for more information
See "Tape Drive Configuration and Planning" on page 51 for more information		
Does the customer want data compression enabled?	Yes ❑ No ❑	Off, On, or No.
Does the customer want Data Security Erase (DSE) enabled?	Yes ❑ No ❑	

Table 25. Site Planning Checklist (Continued)

Question	Completed?	Comments:
Does the customer want to use Hard or Soft Arbitrated Loop Physical Address (AL_PA)?	Hard ❑ Soft ❑	See Table 33 on page 54 **Note:** Some libraries do not support drive AL_PA addressing).
Are there any block size requirements?	Yes ❑ No ❑	
Does the customer want to use the VolSafe feature and tape cartridges?	Yes ❑ No ❑	**Note:** If one drive is configured to support VolSafe, all drives *should be* configured.
Are there any Emulation mode requirements?	Yes ❑ No ❑	

Media

The T10000 uses a unique tape cartridge. Does the customer have the correct type and number of cartridge tapes?	Yes ❑ No ❑	See Appendix A, “Tape Cartridges” for information about the media
• Are data cartridges required?	Yes ❑ No ❑	
• Are Sport cartridges required?	Yes ❑ No ❑	
• Are cleaning cartridges required?	Yes ❑ No ❑	
• Are VolSafe cartridges required?	Yes ❑ No ❑	
• Are Sport VolSafe cartridges required?	Yes ❑ No ❑	
• Are labels required?	Yes ❑ No ❑	

Remote Support

Will the customer allow remote support?	Yes ❑ No ❑	
Have you completed the Service Delivery Platform (SDP) requirements?	Yes ❑ No ❑	See “Service Delivery Platform” on page 60 for more information
Are phone connections available for modems and telephones?	Yes ❑ No ❑	
Does the customer use SNMP?	Yes ❑ No ❑	

Data at Rest Encryption Feature

Is the customer interested in the encryption feature?	Yes ❑ No ❑	
Has the customer data been identified—or classified—into categories? What data is considered secret, sensitive, business critical, and **non-essential**? What data needs to be encrypted?	Yes ❑ No ❑	
Refer to the Crypto Key Management Station (1.x) or Crypto Key Management System (2.x) Systems Assurance Guide for more information		

Library Management Software Requirements

Table 26 lists the minimum level software requirements to support the T10000. However, you should strive to use the latest available software level.

Table 26. Library Management Software Requirements

Software	Minimum Level	Comments
T10000B		
ACSLS	7.2	PUT0702
NCS/VTCS	NCS/VTCS 6.2	PTF L1H14EP - HSC 6.2 (MVS)
		PTF L1A00OT - SMC 6.2
		PTF L1H142C - VTCS 6.2
		PTF L1C109N - MVS/CSC 6.2
		PTF L1H14EO - HSC 6.2 (VM)
	NCS/VTCS 6.1	PTF L1H14EN - HSC 6.1 (MVS)
		PTF L1A00OS - SMC 6.1
		PTF L1H1429 - VTCS 6.1
		PTF L1C109M - MVS/CSC 6.1
		PTF L1H14EM - HSC 6.1 (VM)
VTSS	VSM4/5	D02.03.00.00 and later releases
T10000A		
ACSLS	7.1	PUT0601 or PUT0502
NCS/VTCS	NCS/VTCS 6.0	PTF L1H12E3 - HSC 6.0 (MVS)
		PTF L1A00D7 - SMC 6.0
		PTF L1H12E1 - VTCS 6.0
		PTF L1S1054 - LibraryStation 6.0
		PTF L1C1074 - MVS/CSC 6.0
		PTF L1H12E2 - HSC 6.0 (VM)
	NCS/VTCS 6.1	PTF L1H12FC - HSC 6.1 (MVS)
		PTF L1A00DV - SMC 6.1
		PTF L1H12FA - VTCS 6.1
		PTF L1S1059 - LibraryStation 6.1
		PTF L1C1075 - MVS/CSC 6.1
		PTF L1H12FB - HSC 6.1 (VM)

Library Installation Requirements

If you are installing the T10000 tape drive in one of Sun StorageTek tape libraries, review the following information and requirements for that library:

- SL3000 Modular Library System
- “SL8500 Modular Library System” on page 43
- “L-Series—L180 Library” on page 44
- “L-Series—L700/L700e Libraries” on page 45
- “L-Series—L1400M Library” on page 46
- “L-Series—Tape Drive Installation Guidelines” on page 47
- “9310 Automated Cartridge System” on page 48 (T10000A only)
- “Drive Cabinets” on page 49

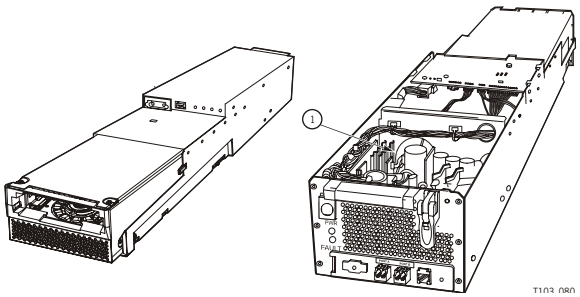
Important:
All of the libraries will require a T10000 drive tray—that is specific for each library—and the appropriate firmware in order to support the T10000.

SL3000 Modular Library System

Description The SL3000 library can store from 200 to 4,500 tape cartridges, and can hold up to **56** tape drives.	
Operating Systems	Supports all major operating systems (enterprise and open systems).
Library-to-Host Interface	Single Ethernet (TCP/IP) 1x, dual TCP/IP (optional feature) 2x, or Fibre Channel 1x
Mounting	The T10000 requires an SL3000 drive tray.
Library-to-Tape Drive Interface	Tape transport interface (TTI) through the HBO and HBD cards in the SL3000 library
***Other* Supported Tape Drives** (mixed media)	• T9840C/D: ESCON, Fibre Channel, FICON • LTO3/4: Fibre Channel (HP and IBM only
Microcode	FRS_2.00

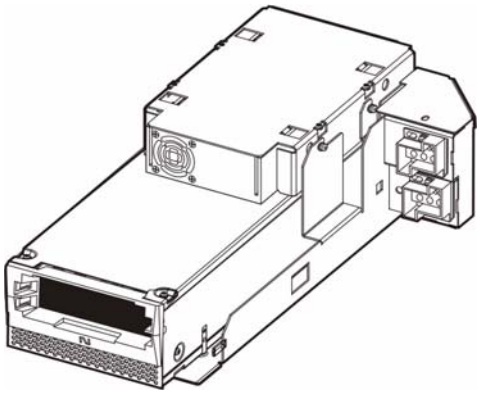
SL8500 Modular Library System

Table 27. SL8500 Modular Library System Requirements

Description One SL8500 library can store from 1,448 to 10,000 tape cartridges Each library can hold up to **64** tape drives A *library complex* consists of two or more libraries and can store *up to* 70,000 tape cartridges with up to 448 tape drives **Operating Systems** Supports all major operating systems (enterprise and open systems).	
Library-to-Host Interface	Single Ethernet (TCP/IP), Dual TCP/IP (2x), or Multi-host TCP/IP (4x)
Mounting The T10000 requires an SL8500 drive tray **Power Supply** SL8500 DC power module (1) included with drive tray **Weight** 9.4 kg (20.75 lb)	 SL8500 drive tray
Library-to-Tape Drive Interface	Tape transport interface (TTI) through the HBO and HBD cards in the SL8500 library
***Other* Supported Tape Drives** (mixed media)	• T9840*x*: ESCON, Fibre Channel, FICON • T9940B: ESCON, Fibre Channel, FICON • LTO2: Fibre Channel (HP and IBM only) • LTO3: Fibre Channel (HP and IBM only) • LTO4: Fibre Channel (HP and IBM only) • SDLT 600: Fibre Channel • DLT-S4: Fibre Channel
Prerequisites	
Microcode T10000A T10000B	*2.52.a (minimum)* FRS_3.00 or higher 3.98

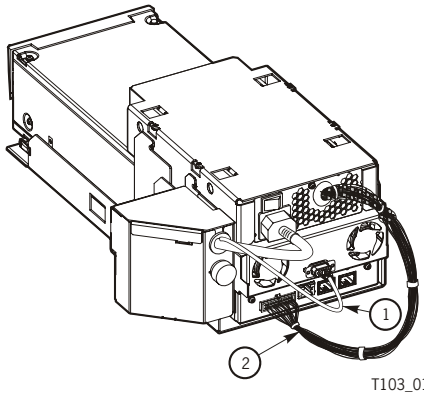
L-Series—L180 Library

Table 28. L180 Library Requirements

Description The L180 library can hold from 84 to 174 cartridges with up to **6** T10000 tape drives **Operating Systems** Supports UNIX, Windows NT, Novell, and Linux platforms **Library-to-Host Interface** LVD or HVD SCSI Fibre Channel option	
Mounting L180 drive tray See "L-Series—Tape Drive Installation Guidelines" on page 47 for more information **Power Supply** Requires an external power supply shown on top of the drive (drive tray) **Weight** 8.3 kg (18.3 lb)	
Library-to-Tape Drive Interface	When a drive is correctly seated in a drive slot, the power and TTI (tape transport interface) connections are complete; you do *not* have to install a separate TTI cable.
Other Supported Tape Drives (mixed media)	• T9840*x* and T9940*x* • LTO Gen 1, 2, 3, and 4 • SDLT 320 and 600 • DLT 8000
Prerequisites	
Microcode (minimum) T10000A T10000B	 3.11.02 or higher 3.17.03

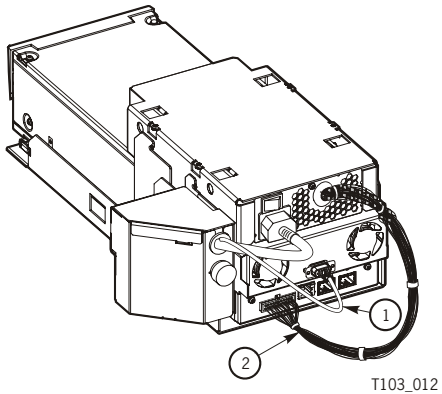
L-Series—L700/L700e Libraries

Table 29. L700e Library Requirements

Description The L700 can hold from 216 to 678 cartridges The L700e can hold from 300 to 1,344 cartridges Up to **12** tape drives per frame (2 drive columns) Up to **24** tape drives when two libraries are connected with a PTP (4 drive columns) **Operating Systems** Designed for the large, distributed open systems implementations, including: UNIX, Windows NT, Novell, Linux platforms	
Library-to-Host Interface LVD or HVD SCSI Fibre Channel option **Mounting** L700 drive tray See "L-Series—Tape Drive Installation Guidelines" on page 47 for more information **Power Supply** Requires an external power supply **Weight** 8.3 kg (18.3 lb)	 T103_012
Library-to-Tape Drive Interface	When a drive is correctly seated in a drive slot, the power and TTI (tape transport interface) connections are complete; you do *not* have to install a separate TTI cable.
Other Supported Tape Drives (mixed media)	• T9840*x* and T9940*x* • LTO Gen 1, 2, 3, and 4 • SDLT 320 and 600 • DLT 8000
Library-to-Host Interface	LVD or HVD SCSI Fibre Channel option
Prerequisites	
Microcode (minimum) T10000A T10000B	 3.11.02 or higher 3.17.03

L-Series—L1400M Library

Table 30. L1400M Library Requirements

Description The L1400M single frame library can hold up to 678 cartridges storing up to 135.6 TB of data. The L1400M dual frame holds up to 1,344 cartridges and up to 268.8 TB of data. Up to **12** T10000 drives (single frame) Up to **24** T10000 drives (dual frame) **Operating Systems** Designed for the large, distributed open systems implementations, including: UNIX, Windows NT, Novell, Linux platforms **Library-to-Host Interface** LVD or HVD SCSI Fibre Channel option	
Mounting L700 drive tray See "L-Series—Tape Drive Installation Guidelines" on page 47 for more information **Power Supply** Requires an external power supply **Weight** 8.3 kg (18.3 lb) estimate	
Library-to-Tape Drive Interface	When a drive is correctly seated in a drive slot, the power and TTI (tape transport interface) connections are complete; you do *not* have to install a separate TTI cable.
Other Supported Tape Drives (mixed media)	• T9840*x* and T9940*x* • LTO Gen 1, 2, 3, and 4 • SDLT 320 and 600 • DLT 8000
Prerequisites	
Microcode (minimum) T10000A T10000B	 3.11.02 or higher 3.17.03

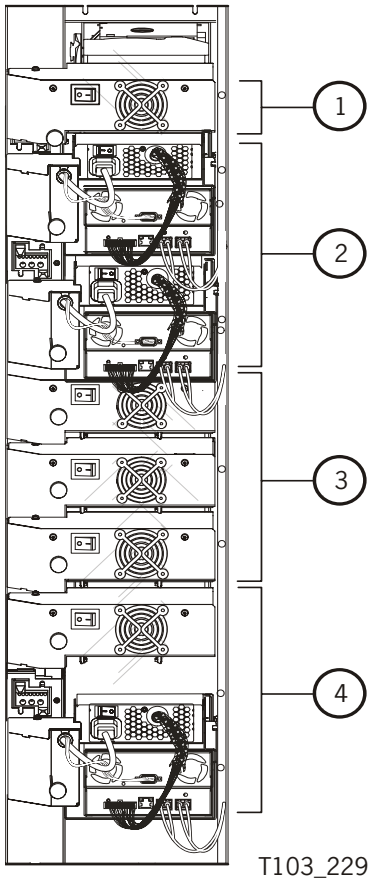
L-Series—Tape Drive Installation Guidelines

Any Cartridge Any Slot™ technology allows the L-Series libraries to handle multiple tape drive technologies with multiple cartridge types.

These libraries have internal drive columns that can hold up to:

- 6 T10000 tape drives (with room for one DLT/LTO drive)
- 6 T9840*x* or T9940*x* Tape Drives (with room for one DLT/LTO drive)
- 10 Digital Linear Tape (DLT or Super DLT) drives
- 10 Linear Tape-Open (LTO) drives
- A combination of T10000, T9x40, LTO, and DLT/SDLT drives

Figure 13. L-Series Tape Drive Installation Guidelines



This figure shows the drive configuration guidelines:

- There are ten slots available in a drive column where you can install from *one* to *six* T-Series tape drives in an L-Series library.
  - The L180 has one drive column
  - The L700e and L1400M can have one, two, three, or four drive columns depending on the configuration
- The slot at the top of the column (callout 1) is for a non-StorageTek drive only (such as an LTO or SDLT) because these drives do not have or require the external power supply.
- The other slots, shown by brackets in groups of three drive slots each (callouts 2, 3, and 4) allow you to install:
  - Two T10000 tape drives (callout 2),
  - Three non-StorageTek drives (callout 3), *or*
  - One T10000 tape drive and one non-StorageTek drive (callout 4)

Note: In size, two T10000 drives fit in the same space as three DLT or LTO drives *or* one T10000 and one DLT or LTO drive.

9310 Automated Cartridge System

Note: The T10000B tape drive is not supported by the 9310 library.

Table 31. 9310 Automated Cartridge System Requirements

Important: The 9310 is the only library that requires upgrades that are at *an additional cost*. The reason for this is because the 9310 went to End-of-Manufacturing status in March of 2005, thus this library requires a purchase upgrade to support the T10000A tape drive.

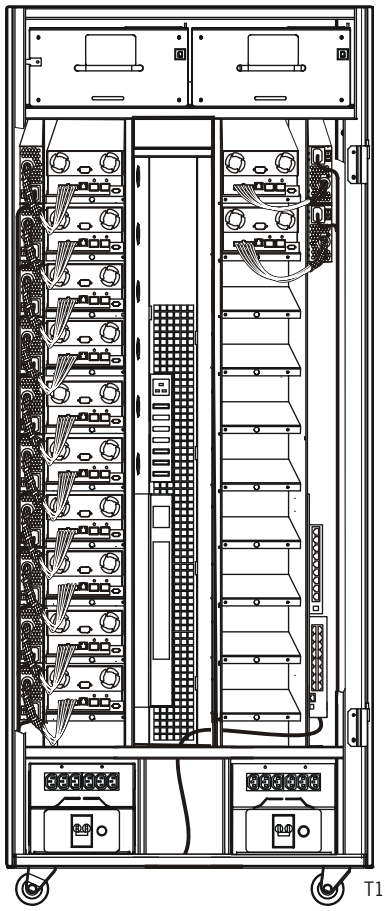
Description The 9310 (called PowderHorn) can store from 2,000 up to 6,000 tape cartridges. Up to four drive cabinets per LSM with up to **20** drives per cabinet (80 drives total) *Automated Cartridge Systems:* ACSLS, 24 LSMs (144,000 cartridges) NCS/HSC, 16 LSMs (96,000 cartridges) **Operating Systems** Supports all major operating systems (enterprise and open systems). **Mounting** requires “Drive Cabinets” on page 49	
Library-to-Host Interface	TCP/IP 3270 interface (end-of-life)
Power Supply	External power supply for each tape drive.
Weight	Drive frame: 138 kg (304 lb) Drive tray: 6.9 kg (15.25 lb)
Library-to-Tape Drive Interface	Tape transport interface (TTI) cable. A cable must be installed to *each* tape drive
Other Supported Tape Drives (mixed media)	• T9840*x*: ESCON, FICON, and Fibre Channel • T9940*x*: ESCON, FICON, and Fibre Channel • TimberLine: 36-Track (*end-of-life*)
Prerequisites The Turntable Assembly must be at level 308747**807**or higher. Depending on the level, take the following action:	• 308747807or higher—no new hardware required • 308747806—CSE must verify minimum gripper #308436417 • 308747805 or lower— Order two XSL9310-T10K-HW
Microcode (minimum)	• 9310: order XSL9310-T10K-HW • 9330: order XSL9330-T10K
Configuration note	The 9310 library *does not* support tape drive dynamic World Wide Names (dWWN)

Drive Cabinets

Important:
Only a 9741E Drive Cabinet will be supported with the 9310 library and T10000A tape drives.

Figure 14 shows an example of a 9741E Drive Cabinet (rear view) that attaches to the outer wall of a 9310 library. This cabinet can hold up to 10 drives with a standard LSM drive wall or up to 20 drives with an optional wall.

Figure 14. 9741E Cabinet



Prerequisites:

- Order X9741E-T10K-9310 for an additional hardware upgrade.
- Ethernet switch part numbers are 8-port 24100208 and 16-port 24100209.
- Customers with an older 9741-001 cabinet must obtain a 9741E cabinet to support the T10000A tape drive.

Rack Mount Configurations

A Sun StorageTek rack (SL-RACK-42-Z) can hold up to 12 manual-mount drives. Figure 15 and Figure 16 shows examples of the rack modules.

Figure 15. Rack Mount Configurations

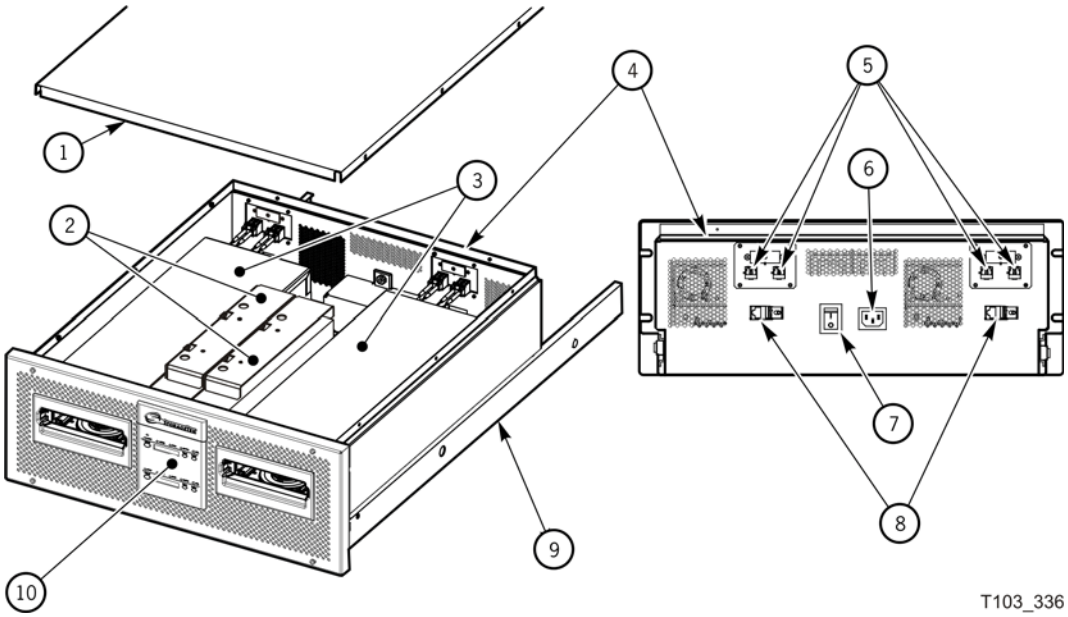
This figure shows the rack module.

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.

Figure 16. Rack Mount Callouts



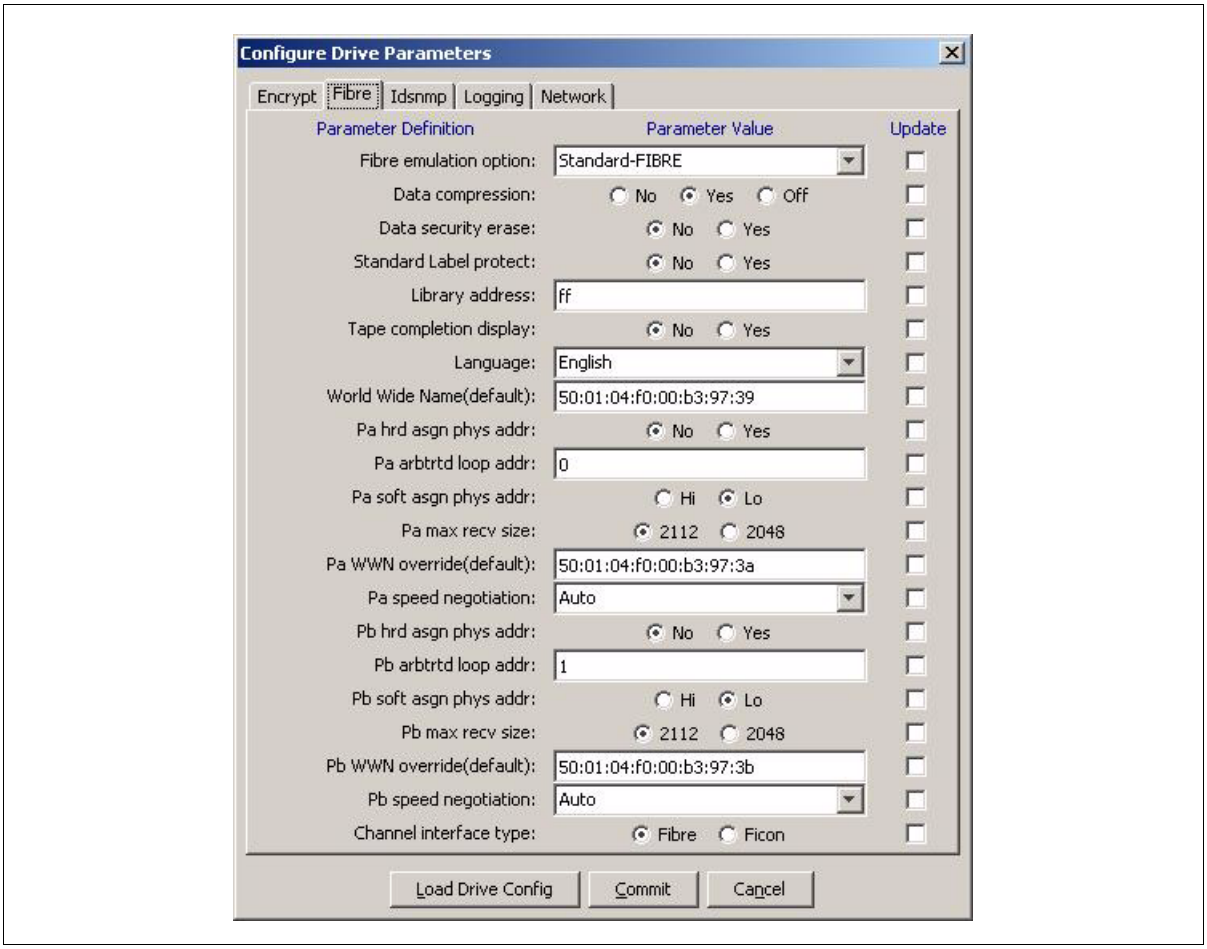
1. Top cover
2. Power supplies (2)
3. Tape drives (2)
4. Rear panel
5. Interface ports (2 each)
6. Power cord
7. Power switch
8. Ethernet or service ports (2)
9. Rail assemblies (one on each side)
10. Operator panel (2)

Tape Drive Configuration and Planning

The following section provides information to help plan the configuration for the tape drives.

- Figure 17 and Figure 18 on page 57 provide examples of the VOP.
- Table 32 on page 52 provides information about the configuration options. For more information, refer to the installation manual or operator's guides.

Figure 17. VOP Configuration Settings (Example: Subject to change)



Select **Fibre** or **Ficon** as the Channel interface type then complete the remainder of the configuration.

Table 32. Tape Drive Configuration Planning

Configuration Item	Description	Settings
Emulation option *	An emulation mode refers to the ability of a program or device to imitate another program or device. Selection depends on the operating system, device drivers, and the interface type.	• Standard • VSM mode • 3592 mode (native FICON)
***Important:** In emulation mode, the T10000 tape drive uses the same channel commands, the same density codes, and returns the same inquiry data as the other—emulated—device. When emulating a device (such as an IBM 3590), you must still use a compatible T10000 tape cartridge, you can not use an IBM 3590 tape cartridge in a T10000 tape drive.		
Short tape	Enables and disables the tape drive's ability to use the short tape mode—a special test mode that can quickly access wraps on the tape. *This is usually a function that is only enabled for special circumstances and under the direction of Sun StorageTek tape engineering*.	Yes or No *Important: Set to No.*
Data Compression	• When **No**, data is not compressed by default. Operating system commands can *enable* data compression. • When **Yes**, data is compressed by default. The operating system commands can *disable* data compression. • When **Off**, data is not compressed. The operating system commands *cannot enable* data compression.	No, Yes, Off
Data Security Erase (DSE)	Yes = a random binary pattern overwrites existing data, similar to an Erase command. No = writes a mark on the tape that prevents access to old data on that tape.	Yes or No
Library address	Entries are library dependant. This is the library address for the tape drive on the tape transport interface (TTI). For drives and libraries that do not use this serial interface, the entry may be left blank or set to "ff".	
Language	*Selections include:* English, Espanol (Spanish), Francais (French), Italiano (Italian), or Deutsche (German)	*English (default)*

Table 32. Tape Drive Configuration Planning

Configuration Item	Description	Settings
World Wide Name World Wide Node Name World Wide Port Name	**World Wide Name** (WWN) A unique 64 bit number that identifies a node. **World Wide Node Name** (WWNN) The 64-bit identifier assigned to each Fibre Channel node **World Wide Port Name** (WWPN) The 64-bit identifier assigned to each Fibre Channel port. Ports may use several different naming authorities such as Network Address Authority (NAA) to distinguish between the various authorities that identify the WWPN.	See page 55 for more information
Port Attributes **Important:** Set to *Auto*	• Port A (Pa) and Port B (Pb) selections • Hard Assigned Physical Address - Hard = Permanently assigned - Soft = Automatically (*and randomly*) assigned addresses. • *arbtrtd loop addr* Arbitrated Loop Physical Address (AL_PA). During the loop initialization process, each device on an arbitrated loop gets an AL_PA. This address remains with that device as long as it is connected and powered on. When the device is removed or powered off, it may be assigned a different AL_PA when powered on again. • Soft Assigned Physical Address • Speed Negotiation	Enabled or disabled Yes or No See page 54 Hi or Low *Auto*, 4Gb, 2Gb, 1Gb
Block Size	Sets the maximum frame size that is accepted by the tape drive.	2112 2048 **Note:** Code level 1.37.114, or higher.
Network selections See page 56 for more information.	• IP Address (high and low) Default: 010.000.000.001 • Subnet Mask (or Net Mask) Default: 255.255.255.000 • Gateway (high and low) Default: 255.255.255.255 **Note:** Starting with drive code level 1.40.x07, you can set a static IPv6 address. • Network node name: *variable* • Dynamic Host Configuration Protocol (DHCP) Default: *No* • Location ACS: • Location LSM • Location panel • Location drive	

Arbitrated Loop Physical Address

Table 33 shows the Arbitrated Loop Physical Address (AL_PA) by system (PA) address and index (decimal index) for the hard physical address configuration. Valid index entries are 000–125.

Note: The SL8500 and SL3000 libraries do not support ALPA addresses.

Table 33. Arbitrated Loop Physical Address

PA xx	Index ddd	PA xx	Index ddd	PA xx	Index ddd	PA xx	Index ddd	PA xx	Index ddd
01	125	34	100	63	075	90	050	BC	025
02	124	35	099	65	074	97	049	C3	024
04	123	36	098	66	073	98	048	C5	023
08	122	39	097	67	072	9B	047	C6	022
0F	121	3A	096	69	071	9D	046	C7	021
10	120	3C	095	6A	070	9E	045	C9	020
17	119	43	094	6B	069	9F	044	CA	019
18	118	45	093	6C	068	A3	043	CB	018
1B	117	46	092	6D	067	A5	042	CC	017
1D	116	47	091	6E	066	A6	041	CD	016
1E	115	49	090	71	065	A7	040	CE	015
1F	114	4A	089	72	064	A9	039	D1	014
23	113	4B	088	73	063	AA	038	D2	013
25	112	4C	087	74	062	AB	037	D3	012
26	111	4D	086	75	061	AC	036	D4	011
27	110	4E	085	76	060	AD	035	D5	010
29	109	51	084	79	059	AE	034	D6	009
2A	108	52	083	7A	058	B1	033	D9	008
2B	107	53	082	7C	057	B2	032	DA	007
2C	106	54	081	80	056	B3	031	DC	006
2D	105	55	080	81	055	B4	030	E0	005
2E	104	55	079	82	054	B5	029	E1	004
31	103	59	078	84	053	B6	028	E2	003
32	102	5A	077	88	052	B9	027	E4	002
33	101	5C	076	8F	051	BA	026	E8	001
								EF	000

World Wide Name Descriptions

Each connection (node or port) in a Fibre Channel environment must have a unique ID called the World Wide Name (WWN). The WWN is a 64-bit address that identifies each individual device with company and vendor information.

When a device logs in to a Fibre Channel network, the WWN is validated for access by comparing Port Name, Node Name, and Port ID. All three of these identifiers must match or this indicates the configuration has changed and the port is blocked from access.

The format of the World Wide Name is an IEEE registered format for Name Address Authority (NAA), company ID, and vendor specific identifier for a total of 64 bits for login validation.

The Sun StorageTek company ID is 24 bits (50:01:04:f0).

Sun StorageTek libraries and tape drives have a feature called *dynamic* World Wide Name (dWWN) that allows you to swap or replace tape drives without bringing down the entire operating system to update a configuration file because of a new WWN.

World Wide Name (WWN)
A unique 64 bit number that identifies a node (device) or node port. Most networking technologies use an identifier convention such as the Ethernet Media Access Control Identifier, or MAC address.

World Wide Node Name (WWNN)
The 64-bit identifier assigned to each Fibre Channel node

World Wide Port Name (WWPN)
The 64-bit identifier assigned to each Fibre Channel port. Fibre Channel ports can use several naming authorities. Fibre Channel specifies a Network Address Authority (NAA) to distinguish between the various authorities that identify the WWPN.

Network Selections

The following describes the selections to address the T10000 on a network.

TCP/IP

Transmission Control Protocol/Internet Protocol (TCP/IP) are a set of communication protocols that support peer-to-peer connectivity on networks.

TCP is one of the main protocols in networks that establish connections for the different devices or nodes. TCP guarantees the delivery of data and that the data packets are delivered in the same order in which they were sent.

IP specifies the format of packets and the addressing scheme.

DHCP

Short for dynamic host configuration protocol, DHCP assigns dynamic IP addresses to devices on a network. With dynamic addressing enabled, a device can have a *different* IP address every time it connects to the network.

Having different IP addresses or changing addresses is not always advisable for tape drives. Some applications expect static addresses for devices such as libraries and tape drives. For this reason, the DHCP default is set to *no*.

Important: If using the Service delivery Platform, DHCP must be set to *yes*.

IP Address

Provides an address for the physical device on a network.

The format of an IPv4 address is a 32-bit number written as four groups separated by periods. Each group can be from zero to 255. For example, 169**.**254**.**18**.**234.

- Within these four groups are two identifiers, the network address and the host address. The first two groups (169.254) identify the network address, the second two groups (18.234) identify the host.
- Within an isolated network, you can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses to avoid duplicates. Contact the customer’s systems administrator for a list of IP addresses.

The format of an IPv6 address is a 128-bit value written as eight groups of four hexadecimal characters separated by colons. An example address follows: 2001:0db8:85a3:0000:0000:8a2e:0370:7334.

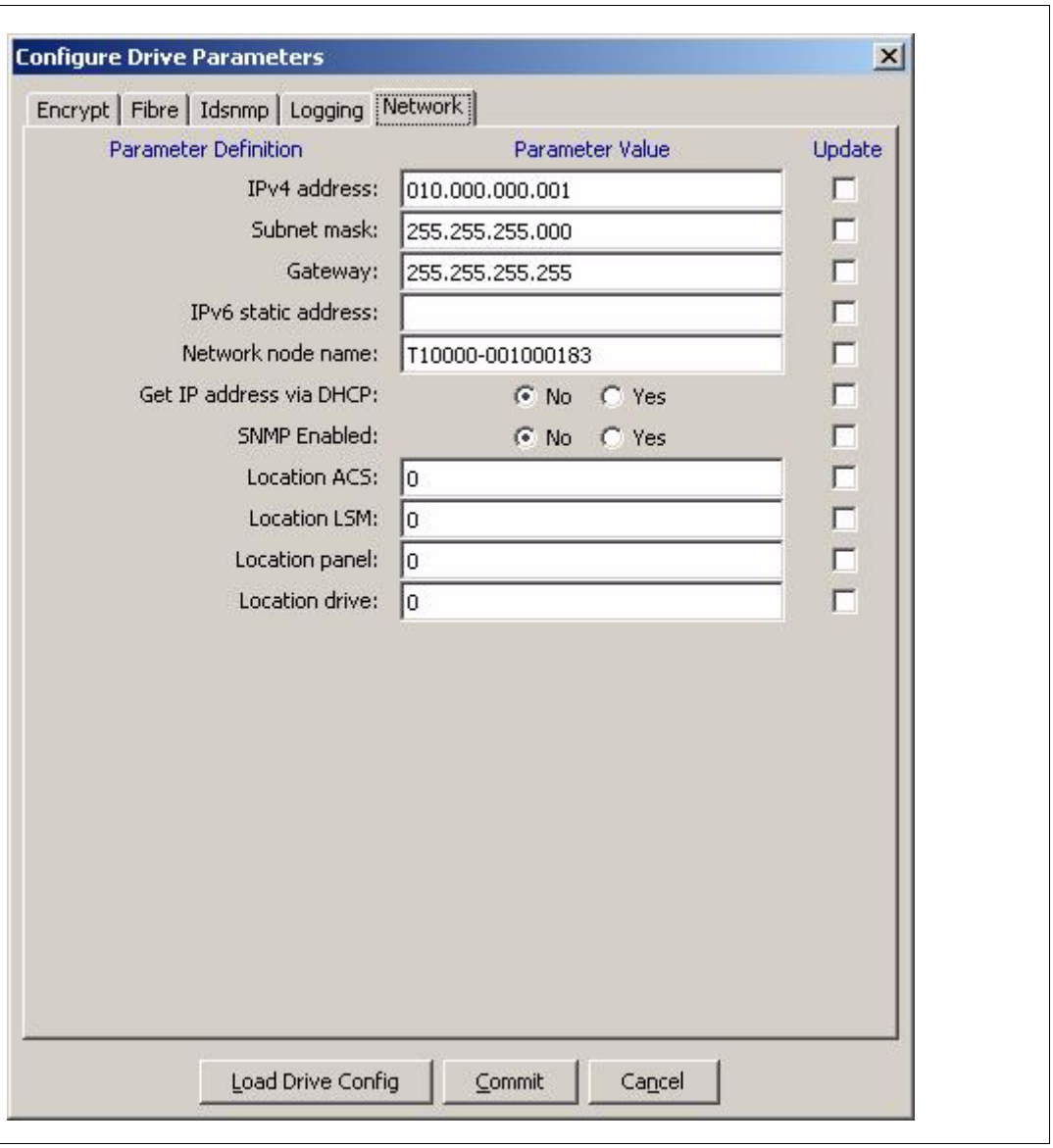
Gateway

A gateway is a device (or node) that connects one network to another.

Subnet Mask

Subnetting enables the network administrator to further divide the host portion of the IP address into two or more subnets. Contact the customers systems administrator for information about their subnets.

Figure 18. Network Configuration (Example: Subject to change)



Note: The *Get IP address via DHCP* parameter is used for IPv4 addressing only.

Initial Drive Settings

There are no default settings as such for the T10000. Before being shipped, manufacturing erases the configuration sector after internal testing.

The following registers are set to these initial settings:

- IP address: 10.0.0.1
- IP Mask: 255.255.255.0
- IP Gateway: 255.255.255.255
- IP NodeName: T10000-<last 9 digits of Serial Number>
- DHCP: OFF
- SNMP Alerts: All turned OFF
- Library Locator: ACS: 0 LSM: 0 Panel: 0 Drive: 0
- SNMP Managers: None Specified
- Drive Statistics: All zeroed
- Permanent Errors: All zeroed, pointers initialized
- Temporary Errors: All zeroed, pointers initialized

FICON Configurations

Fibre Connection (FICON) is a proprietary IBM channel. The benefits of a FICON channel include greater bandwidth, more logical paths, more devices per channel, and greater distance.

- A total of 256 logical paths are possible. On dual-port tape drives, the 256 total logical paths can be unevenly split between Port A and Port B.
- Approximately *six* T-Series FICON tape drives, concurrently reading and writing large (64 KB) blocks, can be attached to a single channel.
- Approximately 16 T-Series FICON tape drives, concurrently reading and writing small (16 KB) blocks, can be attached to a single channel.

Hardware Configuration Definition

Once you have installed FICON drives, you need to set the Hardware Configuration Definition (HCD) for each drive.

Go to the White Papers section of the SE Tools website at:
http://xmen.east.sun.com/setools/aaaNotForCD/Papers/T10000_hcd_config.pdf

Port Configuration

The T10000 FICON tape drives can be configured with a single-port, short or long wave; dual port, short or long wave; or mixed-port (one short wave and one long wave), using standard Fibre Channel infrastructure and cables.

- Use multimode cables when connecting to short wave ports. Multimode cables have an orange jacket with a rating of 50/125 cable.

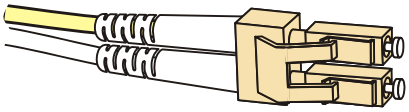
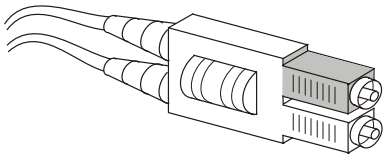
- Use single mode cables when connecting to long wave ports. Single mode cables have a yellow jacket with a rating of 9/125 cable.

Notes:

1. Maximum total non-repeated channel distance for an short wave 850 nm small form-factor pluggable (SFP) using a 50 micron multimode cable on a 100 MB/s channel is 500 m (1640 ft.).
2. Maximum total non-repeated channel distance for an 850 nm SFP using a 50 micron multimode cable on a 200 MB/s channel is 300 m (984 ft.).
3. Maximum total non-repeated channel distance for an 850 nm SFP using a 50 micron multimode cable on a 400 MB/s channel is 150 m (492 ft.).
4. Maximum total non-repeated channel distance for a long wave 1310 nm SFP using a single mode cable is 10 km (6.21 mi).
5. Single mode cable maximum distances can be extended through an amplifier-repeater unit up to 20 km (12.4 mi) for a 100 MB/s channel or to 12 km (7.46 mi) for a 200 MB/s channel.

Cables and Connectors

Figure 19. Fiber-optic Connectors (For reference only)

LC connectors are the industry standard for all 2-Gbps and 4-Gbps Fibre Channel devices such as the T10000 tape drives.	
SC connectors are the standard for 1-Gbps Fibre Channel devices. **Note:** When using multimode cables with SC connectors, you will need to use an SC to LC adapter (PN 312105301) RoHS compliant (315447901).	

What are the fiber optic cabling requirements? Here are some considerations to help determine what is needed:

- Are there existing fiber optic cables at the customer site?
  Should you consider reusing these cables rather than installing new ones?
- Are these cables the correct type to use?
  - Are Mode Conditioning Patch (MCP) cables required?
  - Is there a link distance constraint?
- Are the cable connectors the correct type to use?
  - If the customer is upgrading their system to support LC connectors and SFP modules, no other modifications are required.
  - If the customer intends on using the existing SC cabling in their environment, they need adaptors to LC connectors.

Note: The part number is 312105301.
RoHS compliant part number is 315447901.

- Are kits, adapters (LC to SC), or mode conditioning patch (MCP) cables included in the cable plan for a storage area network?
  - When connecting a single mode port to a multimode MCP, cables are required at both ends of the multimode fiber optic cable.
- Are cascaded directors or inter-switch links (ISLs) being used to extend distances?

Remote Support

Service representatives are available to assist you and the customer with hardware and software problem resolution. During the initial order and installation planning, make sure that you inform the customer about local and remote support options.

Service Delivery Platform

The Service Delivery Platform (SDP) is a remote support solution that consists of a smart appliance placed at the customer site that connects to the library and any StorageTek T-series tape drives.

If the customer wants remote support as part of the T10000 drive installation, you complete the SDP Systems Assurance Guide. This document is located online at:

https://csa-wiki.east.sun.com/display/SDP/Internal+SDP+Documents#InternalSDPDocuments-SDPSAG

Ask your local logistics personnel to order the parts.

Does the customer want remote support?	**Yes** ❑	**No** ❑
Has the SDP Systems Assurance Guide been completed?	**Yes** ❑	**No** ❑
Has the SDP appliance been ordered?	**Yes** ❑	**No** ❑

Preparing for Drive Installation and Service

Site preparation is important to ensure that no aspects of the installation and implementation are overlooked and to promote an error-free installation. Considerations that you and the customer must make before the equipment arrives includes:

- Unpacking and acclimating the tape drives before installing them.
- Providing enough space to route cables and work comfortably.
- Disposing of the shipping cartons and packaging material.

Personnel

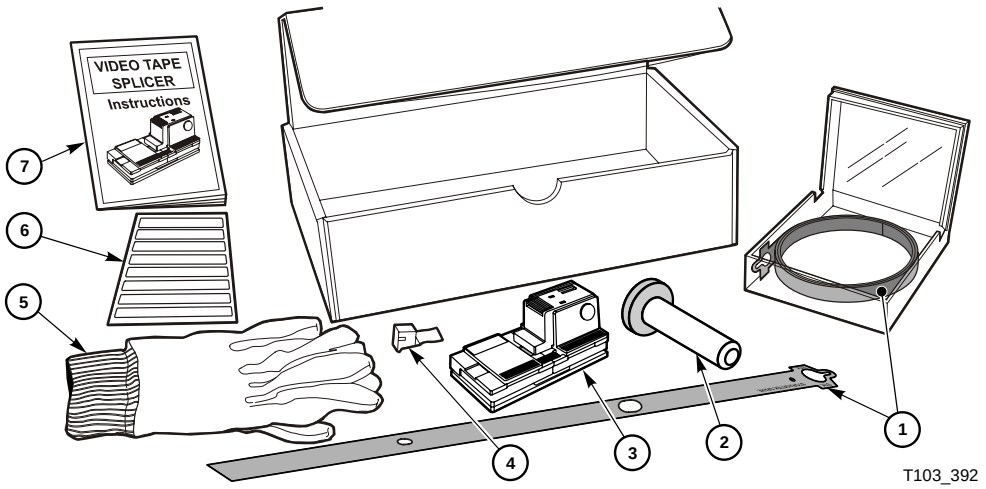
To install a T10000 tape drive requires *one* or *two qualified installers* depending on the attachment, the number of drives, and the configuration.

Tools

The tools to install the tape drive—both standard and special tools include:

- Tool kit
- Grounding kit (ESD kit)

Figure 20. Splicer Kit



1. Replacement leaders (25)
2. Chuck tool
3. Splicer
4. Cutting blades (2)
5. Gloves
6. Door retainer strips
7. Instructions

A job aid (part number ICDK-2665) is available that provides instructions and video clips for various tasks associated with a tape cartridge and the splicer kit.

Ordering

5

Use this chapter to help order tape drives, cables, and a T10000A or T10000B drive. If you have answers to the following questions, the task of locating the pertinent part number becomes easier.

What host interface is used?	❑ Fibre Channel ❑ FICON
Number of interface ports	❑ 1 port ❑ 2 port
Type of interface transceiver (check both for mixed port)	❑ Long wavelength (LW)[1] ❑ Short wavelength (SW)[2]
Is the drive installed in a library or a rack	❑ SL8500 ❑ SL3000 ❑ L180/L700e/L1400M ❑ 9310 (T10000A only) ❑ rack (single drive)[3] ❑ rack (two drives)[3]

1. Long wavelength ports require single-mode (9 micron fiber) cables.
2. Short wavelength ports require multimode cables.
3. Transceivers in a rack drive must be the same type (all LW or all SW).

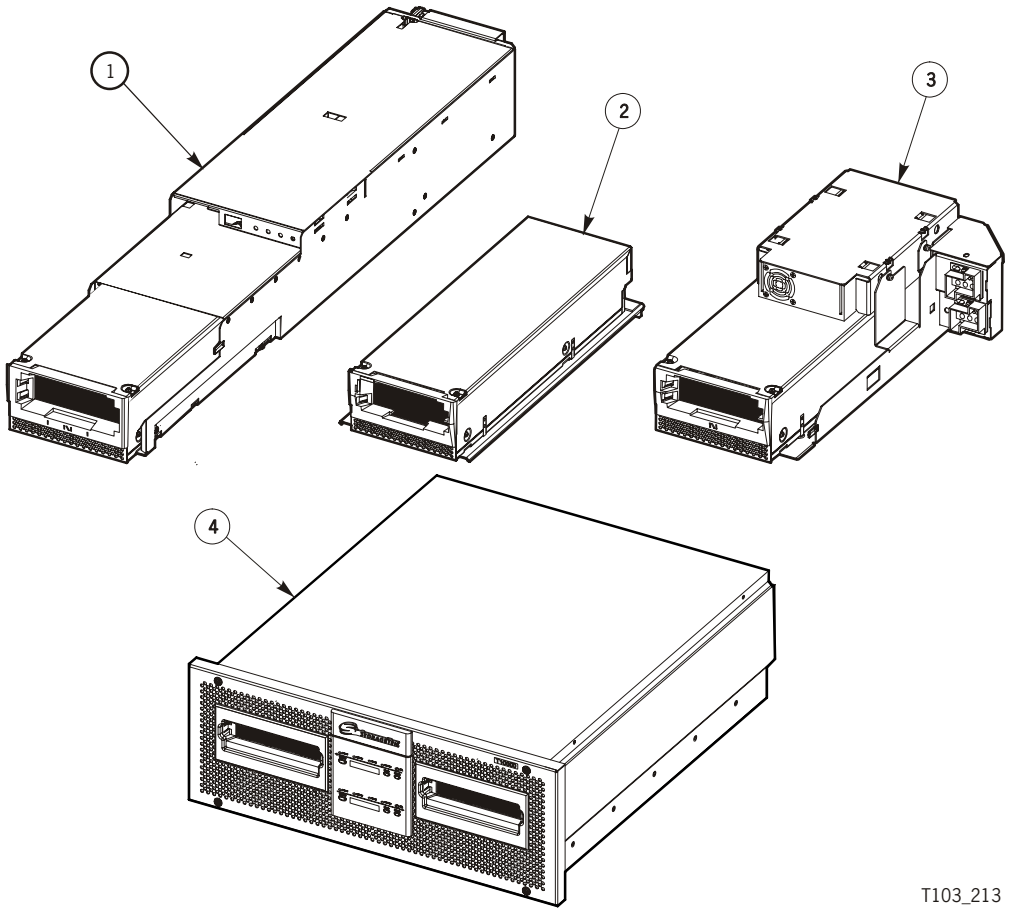
A part number is composed of many of the elements listed in the table above. For example, the part number T10A-4FC-SW-85Z is comprised of:

- **T10A** indicates the tape drive model number (T10000A in this example)
- **4** indicates that the drive is capable of 4 Gbit data transfer rates
- **FC** indicates a Fibre Channel interface
- **SW** indicates the drive interface transceivers use short wavelength
- **85** indicates the library model (SL8500)
- **Z** indicates that the drive complies with ROHS requirements

The following figure shows typical drive configurations. Note that the tape drive is fully enclosed by sheet metal in the SL8500 (also in the SL3000 which is not shown) and rack mount configurations.

Note: The 9310 and L-series configurations do not ship from the plant with the interface transceivers installed. You must order a conversion bill to obtain the transceiver, and the service representative will install them.

Figure 21. Configuration Models



1. SL8500 library drive tray
2. 9310 library drive tray (T10000A only)
3. L-Series drive tray
4. Rack mount

This chapter provides the following information:

- “Tape Drive Order Numbers” on page 65
- “Ordering Media and Cartridge Labels” on page 74
- “Power Cords”, “Ethernet Cables”, and “Interface Cables” on page 76
- “Conversion Kits and Upgrades” on page 71

Tape Drive Order Numbers

T10000B tape drive:

- Table 34 lists the new tape drive marketing part numbers

T10000A tape drive:

- Table 35 on page 67 lists the 4 Gb marketing part numbers
- Table 36 on page 68 lists the marketing part numbers for *used* 4 Gb drives
- Table 37 on page 69 lists the marketing part numbers for *used* 2 Gb drives

Table 34. T10000B Tape Drive Order Numbers

Short Description		Order Number
Library Mounted Drive		
L180/L700e/L1400M Library [1]		
L700/1400/180 FIBRE CHANNEL Drive		T10B-4FC-L7/14/18Z
L700/1400/180 FICON Drive		T10B-4FI-L7/14/18Z
	T10K 4 Gbit 1 port Long Wave	XT10K-4GB-LW-Z
	T10K 4 Gbit 1 port Short Wave	XT10K-4GB-SW-Z
	T10K 4 Gbit 2 port Long Wavelength	two XT10K-4GB-LW-Z
	T10K 4 Gbit 2 port Mix Wavelength	XT10K-4GB-LW-Z and XT10K-4GB-SW-Z
	T10K 4 Gbit 2 port Short Wavelength	two XT10K-4GB-SW-Z
SL3000 Library		
SL3000 FIBRE CHANNEL Drive Long Wavelength		T10B-4FC-LW-30Z
SL3000 FIBRE CHANNEL Drive Mix Wavelength		T10B-4FC-MW-30Z
SL3000 FIBRE CHANNEL Drive Short Wavelength		T10B-4FC-SW-30Z
SL3000 FICON Drive Long Wavelength		T10B-4FI-LW-30Z
SL3000 FICON Drive Mix Wavelength		T10B-4FI-MW-30Z
SL3000 FICON Drive Short Wavelength		T10B-4FI-SW-30Z
SL8500 Library		
SL8500 FIBRE CHANNEL Drive Long Wavelength		T10B-4FC-LW-85Z
SL8500 FIBRE CHANNEL Drive Mix Wavelength		T10B-4FC-MW-85Z
SL8500 FIBRE CHANNEL Drive Short Wavelength		T10B-4FC-SW-85Z
SL8500 FICON Drive Long Wavelength		T10B-4FI-LW-85Z

1. Interface transceivers (SFP modules) do not ship with the tape drive for the L-series libraries. A complete order consists of a tape drive number and a port conversion kit (a number beginning with an X).

Table 34. T10000B Tape Drive Order Numbers (Continued)

Short Description	Order Number
SL8500 FICON Drive Mix Wavelength	T10B-4FI-MW-85Z
SL8500 FICON Drive Short Wavelength	T10B-4FI-SW-85Z
Rack Drive	
Rack mount FIBRE CHANNEL Long Wavelength 1 Drive	T10B-4FC-LW-RK1Z
Rack mount FIBRE CHANNEL Long Wavelength 2 Drives	T10B-4FC-LW-RK2Z
Rack mount FIBRE CHANNEL Short Wavelength 1 Drive	T10B-4FC-SW-RK1Z
Rack mount FIBRE CHANNEL Short Wavelength 2 Drives	T10B-4FC-SW-RK2Z
Rack mount FICON Long Wavelength 1 Drive	T10B-4FI-LW-RK1Z
Rack mount FICON Long Wavelength 2 Drives	T10B-4FI-LW-RK2Z
Rack mount FICON Short Wavelength 1 Drive	T10B-4FI-SW-RK1Z
Rack mount FICON Short Wavelength 2 Drives	T10B-4FI-SW-RK2Z

1. Interface transceivers (SFP modules) do not ship with the tape drive for the L-series libraries. A complete order consists of a tape drive number and a port conversion kit (a number beginning with an X).

Table 35. 4 Gbit RoHS Compatible T10000A Tape Drive Order Numbers

Short Description		Order Number
Library Mounted Drive		
9310 Library [1, 2]		
T10KA 4 Gbit FC drive 9310		T10A-4FC-93Z
	T10KA 4 Gbit 2 port Long Wavelength	two XT10K-4GB-LW-Z
	T10KA 4 Gbit 2 port Mix Wavelength	XT10K-4GB-LW-Z and XT10K-4GB-SW-Z
	T10KA 4 Gbit 2 port Short Wavelength	two XT10K-4GB-SW-Z
L180/L700e/L1400M Library[1]		
L700/1400/180 FIBRE CHANNEL Drive		T10A-4FC-LXXZ
	T10KA 4 Gbit 2 port Long Wavelength	two XT10K-4GB-LW-Z
	T10KA 4 Gbit 2 port Mix Wavelength	XT10K-4GB-LW-Z and XT10K-4GB-SW-Z
	T10KA 4 Gbit 2 port Short Wavelength	two XT10K-4GB-SW-Z
SL3000 Library		
SL3000 FIBRE CHANNEL Drive Long Wavelength		T10A-4FC-LW-30Z
SL3000 FIBRE CHANNEL Drive Mix Wavelength		T10A-4FC-MW-30Z
SL3000 FIBRE CHANNEL Drive Short Wavelength		T10A-4FC-SW-30Z
SL8500 Library		
SL8500 FIBRE CHANNEL Drive Long Wavelength		T10A-4FC-LW-85Z
SL8500 FIBRE CHANNEL Drive Mix Wavelength		T10A-4FC-MW-85Z
SL8500 FIBRE CHANNEL Drive Short Wavelength		T10A-4FC-SW-85Z
Rack Drive		
Rack mount FIBRE CHANNEL Short Wavelength 1 Drive		T10A-4FC-SW-RK1Z
Rack mount FIBRE CHANNEL Short Wavelength 2 Drives		T10A-4FC-SW-RK2Z
Rack mount FIBRE CHANNEL Long Wavelength 1 Drive		T10A-4FC-LW-RK1Z
Rack mount FIBRE CHANNEL Long Wavelength 2 Drives		T10A-4FC-LW-RK2Z

1. Interface transceivers (SFP modules) do not ship with the tape drive for the 9310 or L-series libraries. A complete order consists of a tape drive number and a port conversion kit (a number beginning with an X).
2. Installation in a 9310 library requires additional hardware upgrades. See “9310 Automated Cartridge System” on page 48 and “Drive Cabinets” on page 49.

Table 36. *Used* 4 Gb T10000A Tape Drive Order Numbers

Sun Order Number	Short Description
Library Mounted Drive	
YT10A-4FC-9310Z [1, 2]	T10K 4 Gbit 9310, 9741E
YT10A-4FC-LW-85Z	T10K 4 Gbit, DPLW, SL8500
YT10A-4FC-MW-85Z	T10K 4 Gbit, DPMW, SL8500
YT10A-4FC-SW-85Z	T10K 4 Gbit, DPSW, SL8500
Rack Drives	
YT10A-4FC-LW-RK1Z	T10K 4 Gbit, DPLW, 1 drv, rack
YT10A-4FC-LW-RK2Z	T10K 4 Gbit, DPLW, 2 drv, rack
YT10A-4FC-SW-RK1Z	T10K 4 Gbit, DPSW, 1 drv, rack
YT10A-4FC-SW-RK2Z	T10K 4 Gbit, DPSW, 2 drv, rack

1. Tape drives for the 9310 library require SFP modules, see Table 39 on page 72.
2. Installation in a 9310 library requires additional hardware upgrades. See “9310 Automated Cartridge System” on page 48 and “Drive Cabinets” on page 49.

Table 37. *Used* 2 Gb T10000A Tape Drive Order Numbers

Sun Order Number	Short Description
YT10A-2FC-9310 [1, 2]	*Used* T10KA 2 Gbit FC drv 9310, *NON-ROHS*
YT10A-2FC-9310Z [1, 2]	*Used* T10KA 2 Gbit FC drv 9310
YT10A-2FC-L7/14/18 [1]	*Used* T10KA 2 Gbit FC drv L-series, *NON-ROHS*
YT10A-2FC-LSERZ [1]	*Used* T10KA 2 Gbit FC drv L-series
YT10A-2FC-LW-85	*Used* T10KA 2 Gbit FC drv Long Wave SL8500, *Non-ROHS*
YT10A-2FC-LW-85Z	*Used* T10KA 2 Gbit FC drv Long Wave SL8500
YT10A-2FC-MW-85	*Used* T10KA 2 Gbit FC drv Mix Wave SL8500, *Non-ROHS*
YT10A-2FC-MW-85Z	*Used* T10KA 2 Gbit FC drv Mix Wave SL8500
YT10A-2FC-SW-85	*Used* T10KA 2 Gbit FC drv Short Wave SL8500, *Non-ROHS*
YT10A-2FC-SW-85Z	*Used* T10KA 2 Gbit FC drv Short Wave SL8500
YT10A-2FI-9310 [1, 2]	*Used* T10KA 2 Gbit FICON drv 9310, *NON-ROHS*
YT10A-2FI-9310Z [1, 2]	*Used* T10KA 2 Gbit FICON drv 9310
YT10A-2FI-L7/14/18 [1]	*Used* T10KA 2 Gbit FICON drv L7/14/18, *NON-ROHS*
YT10A-2FI-LSERZ [1]	*Used* T10KA 2 Gbit FICON drv L7/14/18
YT10A-2FI-LW-85	*Used* T10KA 2 Gbit FICON Long Wave SL8500, *Non-ROHS*
YT10A-2FI-LW-85Z	*Used* T10KA 2 Gbit FICON Long Wave SL8500
YT10A-2FI-MW-85	*Used* T10KA 2 Gbit FICON Mix Wave SL8500, *Non-ROHS*
YT10A-2FI-MW-85Z	*Used* T10KA 2 Gbit FICON Mix Wave SL8500
YT10A-2FI-SW-85	*Used* T10KA 2 Gbit FICON Short Wave SL8500, *Non-ROHS*
YT10A-2FI-SW-85Z	*Used* T10KA 2 Gbit FICON Short Wave SL8500
YT10A-2FI-C-9310Z [1, 2]	*Used* T10KA 2 Gbit FICON Encryption-capable drv 9310
YT10A-2FI-C-LW-85Z	*Used* T10KA 2 Gbit FICON Encryption-capable drv LW SL8500
YT10A-2FI-C-MW-85Z	*Used* 2 Gbit FICON Encryption-capable drv MW SL8500
YT10A-2FI-C-SW-85Z	*Used* 2 Gbit FICON Encryption-capable drv SW SL8500

1. Tape drives for the 9310 and L-series libraries require SFP modules, see Table 39 on page 72 and those parts that begin with X98/T10K.
2. Installation in a 9310 library requires additional hardware upgrades. See “9310 Automated Cartridge System” on page 48 and “Drive Cabinets” on page 49.

Table 37. *Used* 2 Gb T10000A Tape Drive Order Numbers (Continued)

Sun Order Number	Short Description
Rack Drives	
YT10A-2FC-LW-RK1	*Used* T10KA 2 Gbit FC 1 drv Long Wave Rack, *Non-ROHS*
YT10A-2FC-LW-RK1Z	*Used* T10KA 2 Gbit FC 1 drv Long Wave Rack
YT10A-2FC-LW-RK2	*Used* T10KA 2 Gbit FC 2 drv Long Wave Rack, *Non-ROHS*
YT10A-2FC-LW-RK2Z	*Used* T10KA 2 Gbit FC 2 drv Long Wave Rack
YT10A-2FC-SW-RK1	*Used* T10KA 2 Gbit FC 1 drv Short Wave Rack, *Non-ROHS*
YT10A-2FC-SW-RK1Z	*Used* T10KA 2 Gbit FC 1 drv Long Wave Rack
YT10A-2FC-SW-RK2	*Used* T10KA 2 Gbit FC 2 drv Short Wave Rack, *Non-ROHS*
YT10A-2FC-SW-RK2Z	*Used* T10KA 2 Gbit FC 2 drv Short Wave Rack
YT10A-2FI-LW-RK1	*Used* T10KA 2 Gbit FICON 1 drv LW Rack, *Non-ROHS*
YT10A-2FI-LW-RK1Z	*Used* T10KA 2 Gbit FICON 1 drv LW Rack
YT10A-2FI-LW-RK2	*Used* T10KA 2 Gbit FICON 2 drv LW Rack, *Non-ROHS*
YT10A-2FI-LW-RK2Z	*Used* T10KA 2 Gbit FICON 2drv LW Rack
YT10A-2FI-SW-RK1	*Used* T10KA 2 Gbit FICON 1 drv SW Rack, *Non-ROHS*
YT10A-2FI-SW-RK1Z	*Used* T10KA 2 Gbit FICON 1 drv SW Rack
YT10A-2FI-SW-RK2	*Used* T10KA 2 Gbit FICON 2 drv SW Rack, *Non-ROHS*
YT10A-2FI-SW-RK2Z	*Used* T10KA 2 Gbit FICON 2 drv SW Rack
YT10A-2FI-C-LWRK1Z	*Used* T10KA 2 Gbit FICON Encryption 1 drv LW Rack
YT10A-2FI-C-LWRK2Z	*Used* T10KA 2 Gbit FICON Crypt 2 drv Long Wave Rack
YT10A-2FI-C-SWRK1Z	*Used* T10KA 2 Gbit FICON Crypt 1 drv Short Wave Rack
YT10A-2FI-C-SWRK2Z	*Used* T10KA 2 Gbit FICON Crypt 2drv Short Wave Rack

1. Tape drives for the 9310 and L-series libraries require SFP modules, see Table 39 on page 72 and those parts that begin with X98/T10K.
2. Installation in a 9310 library requires additional hardware upgrades. See “9310 Automated Cartridge System” on page 48 and “Drive Cabinets” on page 49.

Encryption Features

The encryption feature provides a key to license a drive and enable encryption.

Note: One required per encryption-enabled tape drive.

Refer to the Ordering chapter in the encryption System Assurance Guide to locate the appropriate license key.

Conversion Kits and Upgrades

Conversion kits or upgrade kits are available and can be installed at the customer's site.

- Table 38 lists the drive port and rack mount kits available for the T10000B tape drive
- Table 39 on page 72 lists the kits available for the T10000A tape drive
- Table 40 on page 73 provides a quick list of tray kits by library

Important:
When planning the network, make sure the SFP module supports that specific network type and configuration including HBAs, switches, wavelength, and cable types.

Table 38. T10000B Drive Port and Rack Mount Conversion Kits [New}

Order Number	Description
Port Conversions	
XT10K-4GB-LW-Z [1, 2, 3, 5, 6]	T10000 4 Gbit Long Wave 1 port
XT10K-4GB-SW-Z [1, 2, 4, 5, 6]	T10000 4 Gbit Short Wave 1 port
Rack mount conversions	
XT10B-4-LW-RK1-2Z	Single LW drive to double LW drive rack mount
XT10B-4-SW-RK1-2Z	Single SW drive to double SW drive rack mount

1. Drives have two ports, but you can choose to use only one port.
2. You must order a kit for each drive port - a mixed port drive requires one SW kit and one LW kit.
3. To upgrade from 1 LW to 2 LW, from MW to 2 LW, or from 2 SW to MW.
4. To upgrade from 1 SW to 2 SW, from MW to 2 SW, or from 2 LW to MW.
5. Interface kit to convert from Fibre Channel to FICON or from FICON to Fibre Channel.
6. Drives for L-series libraries do not ship with SFP modules. You must order at least one SFP kit for each drive.

Important:
When planning the network, make sure the SFP module supports that specific network type and configuration including HBAs, switches, wavelength, and cable types.

Table 39. T10000A Port Conversion Kits

Order Number	Description
4 Gigabit Port	
XT10K-4GB-LWZ [1, 2, 3, 5, 6]	T10K 4 Gbit LW SFP, cable kit
XT10K-4GB-SWZ [1, 2, 4, 5, 6]	T10K 4 Gbit SW SFP, cable kit
YXT10A-4-2LW-CKITZ	*Used* T10KA 4 Gbit 2 port Long Wave Conversion Kit
YXT10A-4-2MW-CKITZ	*Used* T10KA 4 Gbit 2 port Mix Wave Conversion Kit
YXT10A-4-2SW-CKITZ	*Used* T10KA 4 Gbit 2 port Short Wave Conversion Kit
2 Gigabit Port	
X98/T10K-2GB-LWZ [1, 2, 3, 5, 6]	T9840/T10K 2Gbit LW SFP, cable kit
X98/T10K-2GB-SWZ [1, 2, 4, 5, 6]	T9840/T10K 2Gbit SW SFP, cable kit
Used 2 Gigabit Port Kits	
YT10A-2-2LW-CKITZ	*Used* T10KA 2 port Long Wave Conversion Kit
YT10A-2-2MW-CKITZ	*Used* T10KA 2 port Mixed Wave Conversion Kit
YT10A-2-2SW-CKITZ	*Used* T10KA 2 port Short Wave Conversion Kit
YXT10A-1LW-CKIT	*Used* T10KA 1 port Long Wave Conversion Kit, *NON-ROHS*
YXT10A-2LW-CKIT	*Used* T10KA 2 port Long Wave Conversion Kit, *NON-ROHS*
YXT10A-2MW-CKIT	*Used* T10KA 2 port Mixed Wave Conversion Kit, *NON-ROHS*
YXT10A-2SW-CKIT	*Used* T10KA 2 port Short Wave Conversion Kit, *NON-ROHS*

1. Drives have two ports, but you can choose to use only one port.
2. You must order a kit for each drive port - a mixed port drive requires one SW kit and one LW kit.
3. To upgrade from 1 LW to 2 LW, from MW to 2 LW, or from 2 SW to MW.
4. To upgrade from 1 SW to 2 SW, from MW to 2 SW, or from 2 LW to MW.
5. Interface kit to convert from Fibre Channel to FICON or from FICON to Fibre Channel.
6. Drives for L-series libraries do not ship with SFP modules. You must order at least one SFP kit for each drive.

Use the following table to locate kit numbers when moving a drive from one library to a different library.

Table 40. T10000 Drive Tray Conversion Kit Summary

Drive Tray Configuration		Marketing Part Number for the New Tray Configuration		
T10000B		**To**		
		SL8500	**SL3000**	
From	L180	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	L700	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	L1400	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	SL3000	T10K-S30/S85-CKITZ		
	SL8500		T10K-S85/S30-CKITZ	
T10000A 4Gb		**To**		
		SL8500	**SL3000**	**9310**
From	L180	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	L700	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	L1400	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	L5500	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	9310	T10K-4-SL85-CKITZ	T10AB-FCFI-SL3-Z	
	SL3000	T10K-S30/S85-CKITZ		
	SL8500		T10K-S85/S30-CKITZ	XT10A-SL85-9310Z
T10000A 2Gb		**To**		
		SL8500	**SL3000**	**9310**
From	L180	T10A-LSER/85-KITZ	T10AB-FCFI-SL3-Z	
	L700	T10A-LSER/85-KITZ	T10AB-FCFI-SL3-Z	
	L1400	T10A-LSER/85-KITZ	T10AB-FCFI-SL3-Z	
	L5500	T10A-LSER/85-KITZ	T10AB-FCFI-SL3-Z	
	9310	T10A-LSER/85-KITZ	T10AB-FCFI-SL3-Z	
	SL8500		T10K-S85/S30-CKITZ	XT10A-SL85-9310Z

Ordering Media and Cartridge Labels

Sun makes ordering tape cartridges easy.

- Call **1.877.STK.TAPE** to order media from your local Sun reseller or to obtain media pre-sales support.
- E-mail addresses for local support questions:
  us.mediaorders@sun.com
  EMEA.mediaorders@sun.com
  LA.mediaorders@sun.com
- Label kits:

  Label kits are available in either 60 or 200 piece quantities. The 60 piece kit has 60 data and 6 cleaning cartridge labels. The 200 piece kit has 200 data and 20 cleaning cartridge labels. The end-user will affix the labels to the cartridges. The label ranges are sequentially numbered, non-repeating and cannot be customized.

You can use a cleaning cartridge to clean a drive's read/write head up to 50 times. An attempt to use a cleaning cartridge beyond that results in the tape drive rejecting the cartridge and posting an error message to the host.

Note: It is recommended that you clean the T10000B tape drive every ten full file operations due to its higher linear density and capacity. This is three times more frequent than with the T10000A tape drive.

If you are not sure what you need or what some terms mean refer to *Sun StorageTek Tape Media A Variety of Storage Options* for more details. Select the Tape Media Catalog link on the T10000 media web page:

http://www.sun.com/storagetek/tape_storage/tape_media/t10000/

See Appendix A for more information about the specific tape cartridge.

Tape Media Policies

There are three media policies:

- *Usage* policy: The tape storage media (tape cartridge) used in a tape drive and/or automated tape system can have a significant impact on the overall performance of the tape drive and/or automated tape system. The following is Sun's policy regarding tape storage media:
  - Sun warrants tape storage media that is Sun StorageTek branded.
  - The customer can be billed for any service provided by Sun resulting from or related to problems caused by non-Sun StorageTek branded tape storage media.

- *Endorsement* policy: Sun does not certify, recommend or endorse 3rd party brand tape media. Sun only recommends Sun StorageTek brand media for use in Sun StorageTek libraries and tape drives.
- *Cancellation* policy: Purchase Orders for tape media entered into Sun's Order Management system (either 'standalone' or included with Sun hardware, software or services) are non-cancelable, non-returnable, and cannot be reworked.

  Note: The customer is liable for the media portion of the purchase order regardless if the hardware, software or services portion of the purchase order is canceled.

Power Cords

Table 41 lists the power cord requirements for the rack mount drive trays.

Table 41. Power Cords

Order Number	Description	Comments
PWRCORD10187018-Z	Sun StorageTek Cord Set, 3X1MM2, 250Volt/10Amps, BELGIUM, HOLLAND, FRANCE, GERMANY, SWEDEN, NORWAY, FINLAND, Female/IEC320, 2.5 Meter, RoHS-5	Cord,1MM2,Intl Eur,F/C320,2.5M
PWRCORD10187019-Z	Sun StorageTek Cord Set, 3X18AWG, 125Volt/10Amps, USA, CANADA, Female/C13, 7.5FT, RoHS-5	Cord,18AWG,US/CAN, F/C13,7.5FT
PWRCORD10187045-Z	Sun StorageTek Power Cord,IEC320,3,SVT,18AWG, RoHS-5	Cord,PWR,IEC320,3,SVT, 18AWG

Ethernet Cables

The tape drive uses Ethernet cables for virtual operator panel and maintenance port connections. Table 42 lists the available cables.

Table 42. Ethernet Cables

Select	Order Number	Description	Qty
❑	CABLE10187033-Z	CAT5E, 8 ft, 24 AWG, Shielded	
❑	CABLE10187034-Z	CAT5E, 35 ft, 24 AWG, Shielded	
❑	CABLE10187035-Z	CAT-5E, 50 IN, 24 AWG, Shielded	
❑	CABLE10187039-Z	CAT5E, 35 ft, 24AWG, Shielded, Plenum	
❑	CABLE10187040-Z	CAT5E, 55 ft, 24AWG, Shielded, Plenum	
❑	CABLE10187041-Z	CAT5E, 100 ft, 24AWG, Shielded, Plenum	

Interface Cables

The following sections provide information about the different interface cables. When you order cables, keep in mind:

- **Riser cables** materials are not classified according to flammability.
- **Plenum cables** meet UL standards for flammability.

Multimode Fiber-optic Cable Work Sheet

The following multimode (50-micron) fiber-optic cables connect Fibre Channel devices and FICON devices. These cables are orange with LC connectors at the drive end.

Note: The tape drive supports LC connectors only.

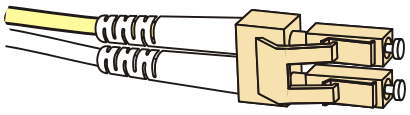


Table 43. Multimode Fiber-optic Cables (2 Gb)

Select	Order Number	Description	Qty
❑	CABLE10800310-Z	LC-LC, 50/125, Duplex, Riser, 10 Meter, RoHS-5	
❑	CABLE10800311-Z	LC-LC, 50/125, Duplex, Riser, 50 Meter, RoHS-5	
❑	CABLE10800312-Z	LC-LC, 50/125, Duplex, Riser, 100 Meter, RoHS-5	
❑	CABLE10800313-Z	LC-LC, 50/125, Duplex, Plenum, 10 Meter, RoHS-5	

Note: Rows highlighted with a yellow background might not appear in the price list.

Table 43. Multimode Fiber-optic Cables (2 Gb)

Select	Order Number	Description	Qty
❑	CABLE10800314-Z	LC-LC, 50/125, Duplex, Plenum, 50 Meter, RoHS-5	
❑	CABLE10800315-Z	LC-LC, 50/125, Duplex, Plenum, 100 Meter, RoHS-5	
❑	CABLE10800316-Z	LC-LC, 50/125, Duplex, Riser, 0.5 Meter, RoHS-5	
❑	CABLE10800317-Z	LC-SC, 50/125, Duplex, Riser, 10 Meter, RoHS-5	
❑	CABLE10800318-Z	LC-SC, 50/125, Duplex, Riser, 50 Meter, RoHS-5	
❑	CABLE10800319-Z	LC-SC, 50/125, Duplex, Riser, 100 Meter, RoHS-5	
❑	CABLE10800320-Z	LC-SC, 50/125, Duplex, Plenum, 10 Meter, RoHS-5	
❑	CABLE10800321-Z	LC-SC, 50/125, Duplex, Plenum, 50 Meter, RoHS-5	
❑	CABLE10800322-Z	LC-SC, 50/125, Duplex, Plenum, 100 Meter, RoHS-5	
❑	CABLE10800323-Z	LC-ST, 50/125, Duplex, Plenum, 10 Meter, RoHS-5	
Note: Rows highlighted with a yellow background might not appear in the price list.			

Single Mode Fiber-optic Cable Work Sheet

The following single mode (9-micron) fiber optic cables are applicable for FICON devices configured with a long wave SFP. These cables are yellow and have an LC connector at the drive end.

Note: The tape drive supports LC connectors only.

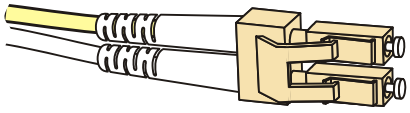


Table 44. Single Mode Fiber-optic Cables

Select	Order Number	Description	Qty
❑	CABLE10800330-Z	LC-LC, 9/125, Duplex, Plenum, 10 Meter, RoHS-5	
❑	CABLE10800331-Z	LC-LC, 9/125, Duplex, Riser, 10 Meter, RoHS-5	
❑	CABLE10800332-Z	LC-LC, 9/125, Duplex, Plenum, 50 Meter, RoHS-5	
❑	CABLE10800333-Z	LC-LC, 9/125, Duplex, Riser, 50 Meter, RoHS-5	
❑	CABLE10800334-Z	LC-SC, 9/125, Duplex, Plenum, 10 Meter, RoHS-5	
❑	CABLE10800335-Z	LC-SC, 9/125, Duplex, Riser, 10 Meter, RoHS-5	
❑	CABLE10800336-Z	LC-SC, 9/125, Duplex, Plenum, 50 Meter, RoHS-5	
❑	CABLE10800337-Z	LC-SC, 9/125, Duplex, Riser, 50 Meter, RoHS-5	

SFP Modules

You insert small form-factor pluggable (SFP) modules into the interface port on the tape drive. SPFs come in two wavelengths.

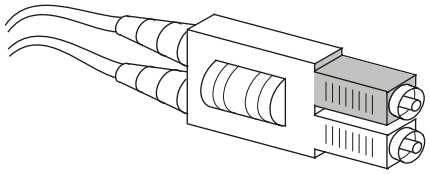
- Short wavelength (black module): #3144180
  RoHS (#3154344-Z)
  #3154645-Z (4 Gbit)
- Long wavelength (blue module): 3144732xx(STK part number)
  RoHS (#3154345-Z)
  #3154646-Z (4 Gbit)

One Gigabit Fiber-optic Cable Order Work Sheet

Figure 22. SC Duplex Connector

SC connectors are the standard for 1 Gbps Fibre Channel devices such as the T9840A Tape Drive. You might see these connectors when replacing a T9x40 tape drive with a T10000 tape drive.

These cables are orange and have SC connectors at both ends.



Note: The tape drive supports LC connectors only.

Table 45. Multimode Fiber-optic Cable (1Gb)

Select	Order Number	Description	Qty
❑	CABLE10800294-Z	SC-SC, 50/125, Duplex, Plenum, 10 Meter, RoHS-5	
❑	CABLE10800295-Z	SC-SC, 50/125, Duplex, Plenum, 50 Meter, RoHS-5	
❑	CABLE10800296-Z	SC-SC, 50/125, Duplex, Plenum, 100 Meter, RoHS-5	
❑	CABLE10800297-Z	SC-SC, 50/125, Duplex, Riser, 10 Meter, RoHS-5	
❑	CABLE10800298-Z	SC-SC, 50/125, Duplex, Riser, 50 Meter, RoHS-5	
❑	CABLE10800299-Z	SC-SC, 50/125, Duplex, Riser, 100 Meter, RoHS-5	
❑	CABLE10800301-Z	SC-SC, 50/125, Duplex, Plenum, 0.25 Meter, RoHS-5	

Note: The part number in a row highlighted with a yellow background might not appear in the price list.

Note: When using cables with SC connectors, you will need to use an SC to LC adapter. See “Cables and Connectors” on page 59.

Warranties

The initial warranty period for the T10000 tape drive is:

- 12 months
- Monday through Friday 8:00 a.m. to 5:00 p.m. Mountain time

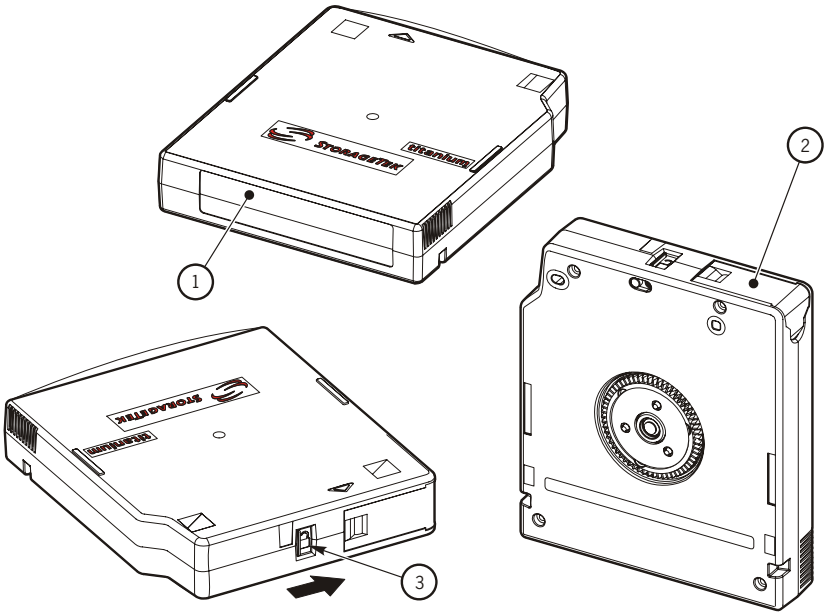
Tape Cartridges

A

Tape cartridges are not shipped as part of the T10000 tape drive; you must order them separately from qualified vendors. See “Ordering Media and Cartridge Labels” on page 74 for more information.

This appendix lists and describes the cartridge tapes used in the T10000.

Figure 23. Tape Cartridge Types



1. Label area
2. Door
   - Black = data
   - Red = sport
   - White = cleaning
   - Yellow = VolSafe
3. Write protect switch

Disclaimer

Media Usage:
The storage media (tape cartridges) used in a library and/or tape drive can have a *significant* impact on the overall performance. The following is a policy regarding tape storage media:

- Sun StorageTek warrants tape storage media that is branded StorageTek.
- The customer is responsible for all expenses and costs related to the repair or replacement of hardware damaged by non-StorageTek branded tape storage media.

Tape Cartridges

Optimized for high capacity, these cartridges use a single reel hub to maximize performance. The basic types of cartridges are:

- Standard
- Sport
- VolSafe (standard or sport)‘
- Cleaning

Standard Cartridges

Standard cartridges are the common read/write data cartridges. You can identify a standard cartridge by the **black** access door.

- Each *standard* data cartridge has a native capacity of:
  - 500 GB (T10000A)
  - 1 TB (T10000B)
- The tapes are under warranty for 6,500 tape passes on the media. The tape drive issues a warning message when that number is exceeded.
- The cartridges are under warranty for 15,000 mounts[1].

Sport Cartridges

Sport cartridges are a smaller version of the standard data cartridges. You can identify a sport cartridge by the **red** access door.

- Each *sport* data cartridge has a native capacity of:
  - 120 GB (T10000A)
  - 240 GB (T10000B)
- The tapes are under warranty for 6,500 tape passes on the media. The tape drive issues a warning message when that number is exceeded.
- The cartridges are under warranty for 15,000 mounts[1].

VolSafe Cartridges

VolSafe is an extension of the write protect function. Use VolSafe cartridges for write-once, read-many (WORM) applications. You cannot erase them without destroying the tape itself.

You can identify a VolSafe cartridge by the **yellow** access door.

1. A mount is defined as the tape drive threading the tape onto the take-up reel and moving to the load point. Just inserting the cartridge into the tape drive does not constitute a mount.

- The T10000 writes data to a VolSafe tape then it can append a multitude of data sets onto the cartridge until it is full. In this respect, VolSafe enables permanent archival of data on the tape without the possibility of data loss.
- VolSafe cartridges come in both standard and sport capacities.
- The tapes are under warranty for 6,500 tape passes on the media. The tape drive issues a warning message when that number is exceeded.
- The cartridges are under warranty for 15,000 mounts[1].

VolSafe and WORM technologies are ideal for data storage, protection, and archive for a variety of applications such as the Sarbanes-Oxley Act[2].

Note: VolSafe cartridges written on a T10000B drive can not be reclaimed on a T10000A drive.

Cleaning Cartridges

As the name implies, cleaning cartridges to clean a tape drive's read/write head and tape path up to 50 times.

An attempt to use a cleaning cartridge beyond that results in the tape drive rejecting the cartridge and posting an error message to the host.

Note: It is recommended that you clean the T10000B tape drive every ten full file operations due to its higher linear density and capacity. This is three times more frequent than with the T10000A tape drive.

You can identify these cartridges by a **white** leader access door.

Additional Components

Two additional components of T10000 tape cartridges are the:

Radio Frequency Identification

The T10000 drive RFID circuitry reads the information in the RFID chip located in the cartridge when a tape is loaded. This information helps determine the type of tape and the state of the media information region (MIR).

- When the tape is loaded, the MIR is marked as invalid—or, subject to change—then updated with new information when it is unloaded.

---

2. The Sarbanes-Oxley Act was signed into law on July 30, 2002. This act introduced highly significant legislative changes to financial practice and corporate governance regulation. It introduced stringent new rules with the stated objective: "*to protect investors by improving the accuracy and reliability of corporate disclosures made pursuant to the securities laws*."

- When the tape is released from the drive, the RFID chip is refreshed by the drive with the current MIR information, statistics, and status.

Media Information

The T10000A/B tape drives use information recorded on each tape cartridge to reduce access times and manage the useful life of the cartridge. This information is recorded in the cartridge's radio frequency identification (RFID) chip and at the beginning of tape in an area known as the media information region (MIR). The information stored in the RFID is a proper subset of the information stored in the MIR. The media information falls into two categories: statistical counters and data pointers.

Statistical Counters

Statistical counters reflect the usage of the cartridge and includes read/write activity, error activity, cumulative mounts, and other information about its use.

Data Pointers

The data pointer information is basically a directory (map) used to locate the customer (logical) data on the physical tape media. Since customer data is compressed and written in drive controlled blocks on the tape, a map is needed to efficiently locate the data after it is written. This map provides an index between customer data and the physical block on the tape media. Once data is written the drive accesses this map to optimize access to the customer data.

To locate/space to customer data, the logical object that identifies the block is translated to the physical location on the tape media and the drive determines the quickest method to read the block. If the block is some physical distance from the current location, a calculation results in a high-speed locate to the block location and is followed by a normal speed read.

The existence of the media information is usually transparent to the customer unless it has a problem. This can occur if the information update fails during a dismount. The impact of an invalid media information occurs in several areas. Since it enables high speed positioning, an invalid media information forces all operations to a slow speed mode. This has no impact on a sequential read from the beginning of the tape. However, any operation using locate defaults to a sequential slow speed read to the requested block, which can result in longer processing time.

An invalid media information might be suspected if you observe poor performance on a specific tape cartridge.

The following sections describe how media information is processed and some potential implications of problems with the information.

Normal Processing

Every time a tape cartridge is loaded, the media information is read from the tape media and saved in drive-resident memory. After being loaded in drive memory, a read-invalid state is written in the tape-resident RFID. The tape-resident media information is marked open, read-invalid because it does not reflect results of activity in the current mount session. All subsequent media information accesses during the current mount session are saved in the drive-resident information. If no writes are performed to the cartridge, the RFID remains in the read-invalid state meaning the MIR directory information is still completely valid. Once a write takes place the RFID is marked write-invalid meaning the MIR directory information on tape is invalid.

The T10000A and B use the drive-resident copy of the information to access customer data pointers for read-only functions. Statistical counters are continuously updated in the memory-resident information with any drive activity.

When the cartridge is unloaded, as part of the unload routine, the drive-resident information is written to the cartridge's RFID and the tape-resident MIR with the closed state indication set.

Cross-Density Cartridge Processing

In an environment with both T10000A and T10000B drives, a mandatory T10000A firmware update provides the capability for the T10000A drive to read the RFID of a T10000B formatted cartridge; the drive can never read its MIR because of the different tape formats. If the drive is reclaiming the cartridge, the only available operation, the cartridge's statistical data from previous usage is included in the current usage when the media information is rewritten.

A T10000B drive can read both the RFID and the MIR of a T10000A cartridge. If the T10000B is only reading the cartridge, the memory-resident statistical counters are updated to reflect any read operations. Because the T10000B drive cannot rewrite the tape-resident T10000A MIR when the cartridge is unloaded only the RFID is updated. If the T10000B drive is reclaiming the cartridge, the cartridge's statistical data from previous usage is included in the current usage when the media information is rewritten.

Note: When the T10000A&B drive identifies the data cartridge as a non readable-density data format, it displays 3215 on the Virtual Operator Panel (VOP) or the physical operator panel of the rack mount drive.

Invalid Media Information Conditions

There are four media invalid conditions for the T10000A/B drives:

- If the cartridge's RFID is unreadable, the drive will refuse to mount the cartridge with a FSC of 403B. The cartridge must be returned to engineering to recover the customer data.

- If the cartridge's RFID can be partially read, the drive will mount the cartridge as read-only.
- If the RFID and MIR are out-of-sync, none of the block information, coarse-grained in the RFID or fine-grained in the MIR, can be trusted. The cartridge is usable but since none of the block information is trusted it's rebuilt as the drive sequentially reads all of the data up to the desired customer data.

  Note: This scenario can cause the drive to spend an hour or more rebuilding the block information, potentially causing the application running on the host to time-out.

- If the MIR is corrupted or unreadable, the fine-grained block location information on the cartridge cannot be used; the tape can be used with the coarse-grained block information on the RFID but with lower performance.

The T10000A/B drive posts a 4031/4032 informational FSC whenever a cartridge with an invalid MIR is loaded.

Once a tape cartridge has an invalid media information, some action is required to correct it. Invalid media information can be corrected in several ways:

- Run the media correction utility through the VOP.
- The drive itself will recover the media information as it processes host commands, but very slowly.

Tape Cartridge Specifications

Table 46. Tape Cartridge Specifications

Characteristic	Specification
Physical Specifications	
Height	2.45 cm (0.964 in.)
Length	12.5 cm (4.921 in.)
Depth (width)	10.9 cm (4.290 in.)
Weight	264 g (9.31 oz)
Margin:	± 0.0254 cm (± 0.010 in.)
Cartridge physical data	
Cartridge life	Warranted: 15,000 load/unload cycles
Wind tension	85 to 94 g (3 to 3.35 oz)
Pack tape (hub) diameter	10.1 cm (3.985 in.)
Tape media data	
Drive compatibility	T10000A/B tape drive
Capacity, native (uncompressed)	
T10000A	500 GB
T10000B	1 TB
Tracks	
T10000A	768 tracks / 32 channels / 24 wraps
T10000B	1152 tracks / 32 channels / 36 wraps
Track-following servo	Factory pre-recorded
Formulation	Advanced metal particle (AMP)
Physical thickness	6.5 microns (µm)
Physical length	917 m (3,009 ft)
Recordable length (including MIR)	855 m (2,805 ft)
Caution: *Servo track damage:* Bulk-erase will destroy pre-recorded servo tracks. **Do not degauss T10000 tape cartridges.**	

Table 47. Tape Cartridge Environmental Requirements

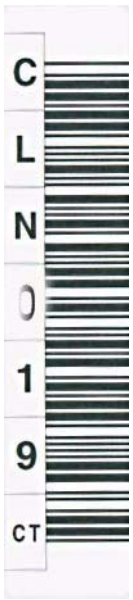
Measurement	Operating[1] (Tape Path)	Storage		Shipping[2] < 10 Days
		<Four Weeks	Archival	
Temperature	10° to 45°C (50° to 113°F)	10° to 32°C (50° to 90°F)	15° to 26°C (59° to 79°F)	-23° to 49°C (-9° to 120°F)
Relative Humidity, Non-Condensing	20% to 80%	5% to 80%	15% to 50%	5% to 80%
Wet Bulb (maximum)	26°C (79°F) with no condensation			

1. The conditioning time before use is 24 hours.
2. The shipping environment must not exceed the limit of the storage environment, archive or non-archive, for longer than 10 days (maximum).

Labels

Figure 24 shows examples of three tape cartridge labels.

Figure 24. Label Examples

Data Cartridge	Diagnostic Cartridge	Cleaning Cartridge
		

Data Cartridge Labels

Data cartridge labels consist of eight characters and the associated barcode. These characters may consist of letters A–Z and numbers 0–9. No special characters (&$%@# and so on) may be used. The first six characters in the label are the customer volume ID or volume serial number (VOLSER). The last two characters (T1) are the media ID usually with a white background.

Note: VolSafe cartridge labels are the same as data cartridge labels except that the background color of the media ID is usually yellow.

Diagnostic Cartridge Labels

These labels must start with DG <space> so a library can recognized them as diagnostic cartridges. The label is “DG xxxT1” where “DG<space>” are the first three characters, “xxx” can be 000 to 999 and “T1” indicates the media ID.

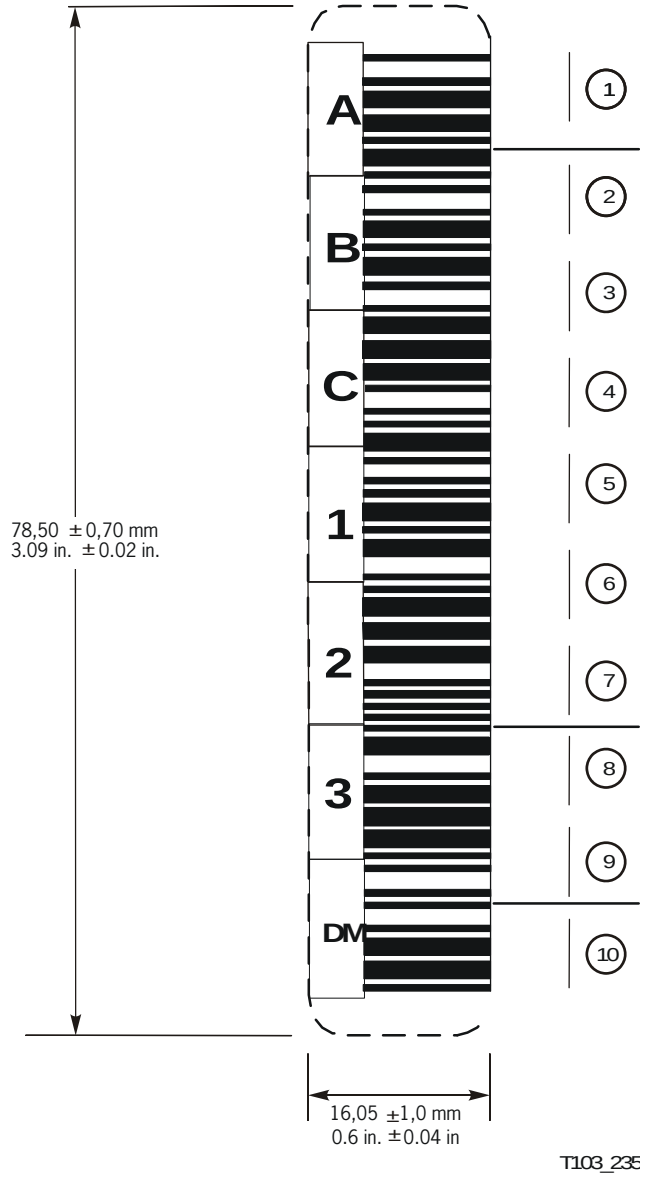
Cleaning Cartridge Labels

The cleaning label is “CLNxxx CT” where xxx is 00 to 99 to identify each individual cleaning tape. The CT media identifier lets the library know it is a cleaning label.

Label Specification

The label specification indicates where the *bar code* lines need to be placed. The visual characters are for operators and are not used by the libraries. These visual characters do not need to line up with the bar code.

Figure 25. Cartridge Label Specification



Bar Code and Character Placement:

1. Start character
2. Character A
3. Character B
4. Character C
5. Character 1
6. Character 2
7. Character 3
8. Media character (D)
9. Media character (M)
10. Stop character

Sun recommends the following specifications:

- AIM Uniform Symbology Specification USS-39
- ANSI MH10.8M-1993 ANSI Code 39 Barcode Specification
- ANSI NCITS 314-199X SCSI 3 Medium Changer Commands (SMC)

Tape Cartridge Care

T10000 cartridges require care to ensure proper operation and longevity.

New Cartridges

Unpack new tape cartridges in the area in which they will be used and allow them to acclimate for a period of at least 24 hours.

Handling

Caution: *Tape and cartridge damage*: Tape cartridges are easily damaged and you must handle them carefully. Follow these tape cartridge handling guidelines:

- Do not open a tape cartridge or touch the tape.
- Do not carry tape cartridges loosely in a container.
- Do not expose the tape or cartridge to direct sunlight or moisture.
- Do not expose a recorded tape cartridge to magnetic fields.
- Maintain clean operating, working, and storage environments.

Labels

If you are using the cartridges in a Sun StorageTek library, see the *User's Guide* for that library regarding the label requirements.

If you are using cartridges in rack mount tape drives, the cartridges may be labeled on the rear of the cartridge as desired.

Cleaning

Wipe all dust, dirt, and moisture from the cartridge case with a lint-free cloth.

Storing

Always store tape cartridges in an environment within the specified range of temperature and humidity. Follow these recommendations when you store cartridges:

- Do not take tape cartridges out of their protective wrapping until you need them. Use the tear string, not a sharp instrument, to remove wrapping.
- Store tape cartridges in a dirt-free environment that, if possible, duplicates the conditions of the data processing center.
- Before you use tape cartridges that have been in tape storage, acclimate them to the operating environment for at least 72 hours.

Shipping

Caution: *Tape and cartridge damage*: Tape cartridges are easily damaged. Proper packaging is required for shipping.

If you must ship cartridges, especially if they are for remote system backup, remote database duplication, or disaster recovery, follow these guidelines:

- **Save the original factory packaging** when you receive new tape cartridges. Use this packaging material, or the equivalent, to package tape cartridges for shipment.
- Wrap the tape cartridges in plastic to block moisture and contamination from entering the tape cartridges.
- Pack the tape cartridges on edge, with the leader door on *top*. If you pack the tape cartridges flat, shipping vibration causes the clutches in the tape cartridges to disengage and slip.
- Pad the tape cartridges on all six (6) sides.
- If you are using factory packaging to ship fewer tape cartridges than the packaging originally held, or if you are using other packaging, fill voids in the packaging with foam padding equivalent to the original contents.
- Label the outside of the shipping carton clearly with text or accepted symbols that indicate:
  - Do not expose to magnetic fields
  - Do not expose to moisture
  - This end up
  - Fragile

Glossary

This glossary defines abbreviations and new or special terms used in this publication.

Some of the definitions are taken from other glossaries. The letters in the parentheses that follow some definitions indicate the source of the definition:

(**A**) *The American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI).

(**E**) The ANSI/Electronic Industries Association (EIA) Standard-440-A, *Fiber Optic Terminology*.

(*I*) *The Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and International Electro-technical Commission (ISO/IEC/JTC1/SC1).

(**IBM**) *The IBM Dictionary of Computing*, copyright 1994 by IBM.

(**T**) Draft international standards committee drafts, and working papers being developed by the ISO/IEC/JTC1/SC1.

A

access time The time interval between the instant at which a call for data initializes and the instant at which the delivery of data completes.

adapter Any hardware that joins different connector types.

address A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination. (**A**)

AL_PA *See* Arbitrated Loop Physical Address.

alphanumeric A system of notation that uses alphabetic letters, numbers, and special characters.

Arbitrated Loop A Fibre Channel interconnect topology in which all parts are connected in a common loop. Before transmitting data, devices must participate in arbitration to gain control of the loop.

Arbitrated Loop Physical Address A one-byte value that identifies a port in an arbitrated loop topology.

arbitration Any process by which a user of shared resource negotiates with other users for the right to use the resource. A port connected to a shared bus must win arbitration before it transmits data on the bus.

B

beginning-of-tape (BOT) The location on a tape where written data begins.

block A string of data elements recorded or transmitted as a unit. The elements may be characters, words, or physical records.

buffer A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another.

burst In data communication, a sequence of signals that counts as one unit in

accordance with a specific criterion or measure.

C

cartridge A container that holds magnetic tape on a supply reel and that is inserted into a drive for read and write operations.

cascading The process of connecting two or more Fibre Channel switches together to increase the number of ports or to extend distances.

channel A functional unit, controlled by the processor (or host), that handles the transfer of data between processor storage and local peripheral equipment.

cleaning cartridge A cartridge tape that contains special material to clean the tape path in a transport or drive.

compress To save storage space by eliminating gaps, empty fields, redundancy, or unnecessary data to shorten the length of records or files. (**IBM**)

configuration The manner in which the hardware and software of an information processing system are organized and interconnected. (**T**)

connector An electrical or optical part that joins two or more other parts.

coupler Fiber-optic hardware that joins optical fiber connectors of the same type.

D

data path key management (DPKM) The use of the SCSI 4 commands *Security Protocol In* and *Security Protocol Out* to implement host-based key management encryption on Sun tape drives.

data rate The speed of a data transfer process, normally expressed in bits per second or bytes per second. (**IBM**)

Data Security Erase (DSE) A random binary pattern, over-writing existing data, from the point of an Erase command, to the end-of-tape.

data tape A cartridge tape formatted for use as a regular data tape for the system in which it is used.

DHCP *See* Dynamic Host Configuration Protocol.

diagnostics Pertaining to the detection and isolation of errors in programs and faults in equipment. (**IBM**)

drive *See* tape drive.

drive bay A partitioned section of the tape drive array assembly that holds one tape drive tray assembly.

drive tray The mechanical structure that houses a tape drive, fan assembly, power and logic cards, cables, and connectors for data and logic cables.

DSE *See* data security erase.

Dynamic Host Configuration Protocol (DHCP) A network protocol that enables a server to automatically assign an IP address to devices on a network. DHCP assigns a number dynamically from a defined range of numbers for a given network.

E

emulation The use of programming techniques and special machine features to permit a computing system to execute programs written for another system. (**IBM**)

Enterprise Systems Connection (ESCON) A set of IBM products and services that provide a dynamically-connected environment within an enterprise.

error A discrepancy between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition. (**I**) (**A**)

F

F_Port A port in a fabric to which an N_Port or NL_Port attaches.

fabric The Fibre Channel topology similar to a telephone switch in that the initiator of a call to the receiving port simply provides the receiver with the port address, and the fabric routes the transmission to the correct port. A fabric differs from a point-to-point or arbitrated loop topology in that it provides for interconnections between ports without having a point-to-point connection. The fabric also serves as a media-type converter.

fault symptom code (FSC) A four-character hexadecimal code generated in response to an error to help isolate failures within the device.

fiber optics The branch of optical technology concerned with the transmission of radiant power through fibers made of transparent materials such as glass, fused silica, and plastic. (**E**)

fiber-optic cable A cable made of ultra-thin glass or silica fibers which can transmit data using pulses of laser light. Fiber-optic cables have several advantages over copper cables: they have much less signal loss; they allow information to be transmitted at higher speeds and over longer distances; they are not affected by external electrical noise; and they are better for transmissions which require security.

fiber-optic connector One of several types of devices used to join pairs of optical fibers together. Some types are: ST connectors, SMA connectors, MIC connectors, and SC connectors.

Fibre Channel (FC) The National Committee for Information Technology Standards standard that defines an ultra high-speed, content independent, multilevel data transmission interface that supports multiple protocols simultaneously. Fibre Channel supports connectivity to millions of devices over copper and/or fiber-optic physical media and provides the best characteristics of both networks and channels over diverse topologies.

Fibre Connection (FICON) An IBM z/Series and ESA/390 computer peripheral interface that uses a Fibre Channel protocol.

FICON *See* Fibre Connection.

FICON channel A channel having a Fibre Channel connection (FICON) channel-to-control-unit I/O interface that uses optical cables as a transmission medium. May operate in either FC or FCV mode.

FICON Director Similar to a Fibre Channel switch.

field replaceable unit (FRU) An assembly that is replaced in its entirety when any one of its components fails.

file-protect To prevent the erasure or overwriting of data stored on cartridge tape. *See also* write-protect switch.

firmware An ordered set of instructions and data stored in a way that is functionally independent of main storage; for example, microprograms stored in a ROM. (**T**) *See also* microcode.

fixed Synonym for resident.

FL_Port A special type of fabric port that an arbitrated loop uses to connect N_Ports and NL_Ports into a fabric, thus making a public loop.

G

GB *See* gigabyte.

Gb Gigabit, equal to 10^9 bits.

gateway A node on a network that serves as an entrance to another network.

Gigabit Interface Converter (GBIC) An adapter that allows a Fibre Channel hub or switch to use either fiber-copper or fiber-optic cabling.

gigabyte (GB) One billion (10^9) bytes. When referring to disk and tape capacity, one GB equals 1,000,000,000 bytes.

When referring to memory capacity, one GB equals 1,073,741,824 in decimal notation or 2^{30} bytes.

H

hardware All or part of the physical components of an information processing system, such as computers or peripheral devices. (**T**) (**A**)

HBA *See* host bus adaptor

host The primary computer on a network, with which other computers interact.

host bus adapter (HBA) A circuit installed in a multi-platform host or device that interfaces between the device and the bus.

host interface Interface between a network and host computer. (**T**)

hub A Fibre Channel Arbitrated Loop switching device that allows multiple servers and targets, such as storage systems, to connect at a central point. A single hub configuration appears as a single loop.

I

indicator A device that provides a visual or other indication of the existence of a defined state. (**T**)

initial program load (IPL) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at initial program load execution. Devices running firmware usually reload the functional firmware from a diskette or disk drive at initial program load execution.

initialization The operations required for setting a device to a starting state, before the use of a data medium, or before implementation of a process. (**T**)

input/output (I/O) Pertaining to a device, process, or channel involved in data input, data output, or both. (**IBM**)

interface Hardware, software, or both, that links systems, programs, or devices. (**IBM**)

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

Internet Protocol (IP) v4 address A four-byte value that identifies a device and makes it accessible through a network. The format of an IPv4 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.

Internet Protocol (IP) v6 address The next generation Internet protocol. It provides a much larger address space than IPv4. This is based on the definition of a 128-bit address - IPv4 used a 32-bit address. The format of an IPv6 address is eight fields of four hexadecimal characters separated by colons (for example: 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

I/O *See* input /output.

IPL See Initial Program Load.

L

laser *See* light amplification by simulated emission of radiation.

library A robotic system that stores, moves, mounts, and dismounts tape cartridges that are used in data read or write operations.

light amplification by simulated emission

of radiation (LASER) Laser devices generate coherent radiation in the visible, ultraviolet, and infrared portions of the electromagnetic spectrum. Regarding Fibre Channel, lasers can transmit either short waves or long waves, depending on the composition of the arbitrated loop or fabric.

link A physical connection (electrical or optical) between two nodes of a network.

logical path A relationship between a channel and control unit that designates the physical path to be used for device-level communication between each entity, defined by a link address assigned to each entity.

L_Port A multifunctional port, including an NL_Port, FL_Port, or GL_Port that resides either in a fabric or arbitrated loop and that is capable of performing arbitrated loop functions and protocols.

M

magnetic tape A tape with a magnetizable layer on which data can be stored. (**T**)

magnetic tape drive A mechanism for moving magnetic tape and controlling its movement.

mainframe A large computer with the ability to support hundreds or thousands of users simultaneously.

manual operation Processing of data in a system by direct manual techniques.

megabyte (MB) One million (10^6) bytes when referring to disk or tape capacity, but 1,048,576 (2^{20}) bytes of memory capacity.

menu A list of options displayed to the user by a data processing system, from which the user can select an action to be initiated. (**T**)

microcode A code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable. (**IBM**)

multimode A graded-index or step-index optical fiber that allows more than one bound mode to propagate. (**E**) Contrast with single mode.

multimode fiber An optical fiber designed to carry multiple signals, distinguished by frequency or phase, at the same time.

N

NearLine A registered trademark of Sun StorageTek, this term is used in association with StorageTek's family of tape-library information storage and retrieval products.

net mask See subnet mask.

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

NL_Port A port attached to a node for use in the point-to-point arbitrated loop and fabric topologies of Fibre Channel. The NL_Port is configured as a private and/or a public loop.

node A device that contains a minimum of one N_Port and/or NL_Port.

N_Port A port that connects a node to a fabric or to another node.

O

offline Neither controlled by, nor communicating with, a computer. (**IBM**)

online Pertaining to the operation of a functional unit when under the direct control of the computer. (**T**)

open systems A system whose characteristics comply with standards made available throughout the industry and that can connect to other systems complying with the same standards.

operating system Software that controls the execution of programs and that provides services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominantly software, partial hardware implementations are possible.

operator control panel A functional unit that contains switches used to control all or part of a computer and possibly the indicators giving information about its functioning. (**T**)

P

performance One of two major factors, together with facility, on which the total productivity of a system depends. Performance is largely determined by a combination of throughput, response time, and availability. (**IBM**)

plenum cable A cable made of fire-retardant material that, when burned, generates little smoke. Plenum cables are used for installation in air ducts (plenums).

point-to-point A topology in which exactly two ports communicate. In Fibre Channel, the two ports are N_Ports.

port (1) A specific communications end point within a host. A port is identified by a port number. (2) In Fibre Channel, it is an access point in a device where a link attaches. Examples of this port are N_Port, NL_Port, F_Port, and FL_Port.

port address (1) In an ESCON Director, an address used to specify port connectivity parameters and to assign link address for attached channels and control units. (2) In a FICON Director or Fibre Channel switch, it is the middle 8 bits of the full 24-bit FC port address. This field is also referred to as the “area field” in the 24-bit FC port address.

private loop A Fibre Channel arbitrated loop with no fabric attachment.

Private NL_Port An NL_Port that does not attempt a Fabric Login.

protocol A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication.

public loop A Fibre Channel arbitrated loop with an attachment to a fabric.

Public NL_Port An NL_Port that attempts a Fabric Login.

R

radio frequency identification (RFID) A chip that is physically located in the tape cartridge and contains information about the cartridge and its performance over time.

The Radio Frequency Identification technology is composed of a:

- Memory chip in the cartridge
- Module in the drive to retrieve information about the tape

random access memory (RAM) A storage device into which data is entered and from which data is retrieved in a nonsequential manner.

read/write head The data sensing and recording unit of a diskette magazine drive or tape drive.

rewind To move tape from the take-up hub to the supply hub.

S

SC connector A standard connector for high-speed data transfer. This type of connector is used on fiber-optic cable.

serial transmission A transmission in which bits are sent in a stream in a single fiber.

Service Delivery Platform (SDP) The Service Delivery Platform (SDP) is a support

tool that provides remote support for the equipment that it attaches.

single mode An optical fiber in which only the lowest-order bound mode can propagate at the wavelength of interest. (**E**)

small form-factor plug (SFP) Technology with a 2- or 4-gigabit transfer speed over smaller connectors, cables, and transceivers for larger bandwidth capability.

software (S/W) All or part of the programs, procedures, rules, and associated documentation of a data processing system. Software is an intellectual creation that is independent of the medium on which it is recorded.

state The condition of a device, such as online or offline.

StorageTek Diagnostic System (STDS) A tool that enables a service engineer to connect to the maintenance port of Sun StorageTek products to perform maintenance functions.

submenu A menu related to and reached from a main menu. (**IBM**)

subnet mask A 32-bit, or 4-byte number, in dotted decimal format (typically written as four numbers separated by periods, such as 255.255.255.0) that is applied to an IP address to identify the network and node address of a host or router interface.

switch (1) A device or programming technique for making a selection; for example, a toggle, a conditional jump. (A) (2) In Fibre Channel technology, a device that connects Fibre Channel devices together in a fabric.

T

tape *See* magnetic tape.

tape cartridge A container holding magnetic tape that can be processed without separating the tape from the container.

tape drive A device for moving magnetic tape and controlling its movement. (**T**)

TB *See* terabyte.

TCP/IP *See* Transmission Control Protocol/ Internet Protocol.

Terabyte (TB) A unit of measure equal to one trillion (10^{12}) bytes of disk or tape storage capacity.
When referring to memory capacity, one TB equals 1,099,511,627,776 in decimal notation or 2^{40} bytes.

topology A method or scheme for connecting ports for communicating in Fibre Channel. FC topologies include point-to-point, arbitrated loop, and fabric.

Transmission Control Protocol/Internet Protocol A set of communication protocols that support peer-to-peer connectivity functions for both local and wide area networks. (**IBM**)

U

U A standard unit of measurement of vertical space inside a rack mount cabinet equal to 44.5 mm (1.75 in.).

V

vary offline To change the status of a device from online to offline. When a device is offline, a data set cannot be opened on that device. (**IBM**)

vary online To restore a device to a state where it is available for use by the system. (**IBM**)

virtual operator panel (VOP) Allows one or more operators and service representatives to monitor and perform tasks on multiple T10000 tape drives from a central location.

VolSafe A feature that provides write once, read many (WORM) technology to VolSafe-designated tape cartridges. VolSafe only permits new data to be appended to data currently on tape. Once written, the data cannot be overwritten.

volume serial number (VOLSER) An alphanumeric label that the host software uses to identify a volume. It attaches to the spine of a cartridge and is both human- and machine-readable.

W

wide transfer A SCSI bus that supports 16 data-bus signals and transmits data over a 68-pin, SCSI-3 P-cable.

worldwide name (WWN) A 64-bit integer that identifies a Fibre Channel port.

worldwide node name (WWNN) A 64-bit network address that identifies the company (in IEEE format) with a vendor specific identifier.

worldwide port name (WWPN) A 64-bit network address that identifies the port name.

write once read many (WORM) A storage classification for media that can be written only once but read many times.

write operation An output operation that sends a processed record to an output device or output file. (**IBM**)

write-enabled A setting on a cartridge tape that allows data to be written on the tape.

write-protection The restriction of writing into a data set, file or storage area of a user or program not authorized to do so.

Index

Numerics

A

B

C

D

E

F

G

H

I

K

L

M

N

O

P

R

S

T

U

V

W

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