

StorageTek T10000 Tape Drive

Systems Assurance Guide



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StorageTek T10000 Tape Drive Systems Assurance Guide

TM0002

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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	Refer to this revision for a list of changes
January 2009	EC	Refer to this revision for a list of changes
April 2009	ED	Refer to this revision for a list of changes
September 2009	EE	Refer to this revision for a list of changes
May 2010	EF	Revised marketing part numbers Changed to the latest FrameMaker template Removed Sun branding.

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Preface

The checklists provided in this guide are part of the systems assurance process and enable 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
- Anyone interested in information about Oracle's StorageTek T10000 tape drive family

Related Documentation

The following list contains the names and order numbers of publications that provide additional information about the StorageTek T10000 tape drive.

Function	Title	Part Number
Installation	<i>T10000 Tape Drive Installation Manual</i>	96173
Hardware	<i>T10000 Tape Drive Service Manual</i>	96175
Safety	Regulatory and Safety Compliance Guides	820-5506-xx 816-7190-12
User	<i>T10000 Tape Drive Operator's Guide</i> <i>Virtual Operator Panel User's Guide</i>	96174 96179
Encryption	<i>Key Management System Administrator's Guide</i> <i>Key Management System 2.0 Systems Assurance Guide</i> <i>T10000A Encrypting Tape Drive Security Policy</i> <i>T10000B Encrypting Tape Drive Security Policy</i>	3161951xx 3161948xx 316055001 316055101

Documentation, Support, and Training

Function	URL
Web Site	■ http://www.oracle.com/index.html
Documentation	■ Customer: ■ http://docs.sun.com ■ Employee: ■ http://docs.sfbay.sun.com/ ■ Partner: ■ https://spe.sun.com/spx/control/Login
Downloads	■ Customer: ■ http://www.sun.com/download/index.jsp ■ Employee: ■ https://dlrequest-zn-dlapps1.sfbay.sun.com/usr/login
Support	■ http://www.sun.com/support/
Training	■ http://www.oracle.com/global/us/education/sun_select_country.html
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Please include the title and part number of your document with your feedback:

StorageTek T10000 Tape Drive Systems Assurance Guide, TM0002.

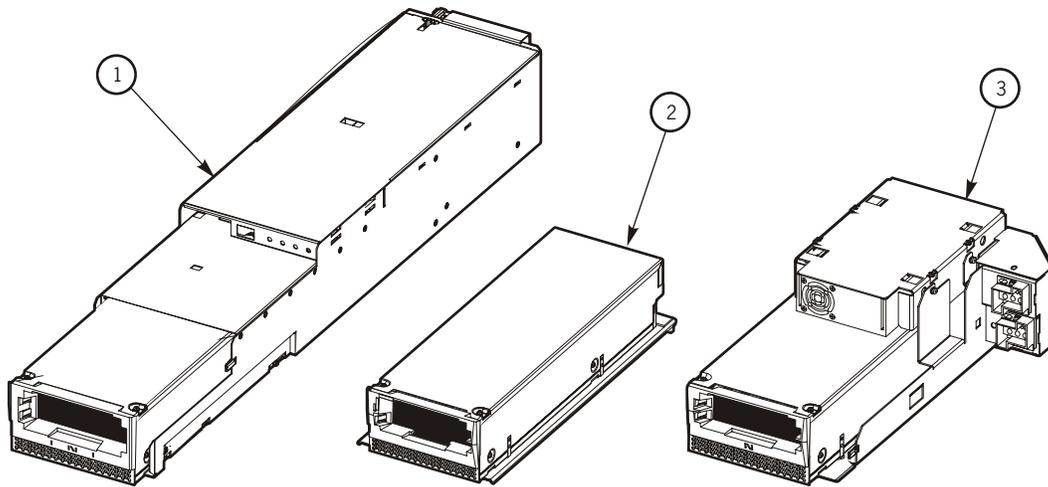
Introduction

The StorageTek T10000 tape drive is a small, modular, high-performance tape drive designed for high-capacity storage of data. Two configurations are supported (library and stand-alone) for a variety of operating system platforms: enterprise mainframes (z/OS and OS/390) or open system platforms (Windows, UNIX, and Linux).

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

FIGURE 1-1 shows examples of the tape drive in three library drive configurations.

FIGURE 1-1 T10000 Tape Drive



T103_221

Illustration call-outs:

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.

The tape drive has built-in encryption that works in conjunction with the Crypto Key Management System (KMS), an appliance that provides a simple, centralized, scalable solution for managing the keys used to encrypt and decrypt data written by the T10000 tape drive.

Description

Size:	The tape drive is 8.89 cm (3.5 in.) high, 14.6 cm (5.75 in.) wide, and 42.55 cm (16.75 in.) deep. FIGURE 1-2 shows a rear view of the T10000 tape drive:
Capacity:	The tape drive 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 StorageTek T10000 tape cartridge uses a single-reel hub for high capacity; the supply reel is inside the cartridge and the take-up reel is inside the drive.
Interface:	The host connections to the tape drive are fiber-optic, such as Fibre Channel and FICON, which provide a high rate of data transfer. The Fibre Channel drive supports 256 concurrent hosts with code level 1.37.114, or higher.

Things to note about the tape drive are:

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

FIGURE 1-2 Tape Drive Rear View

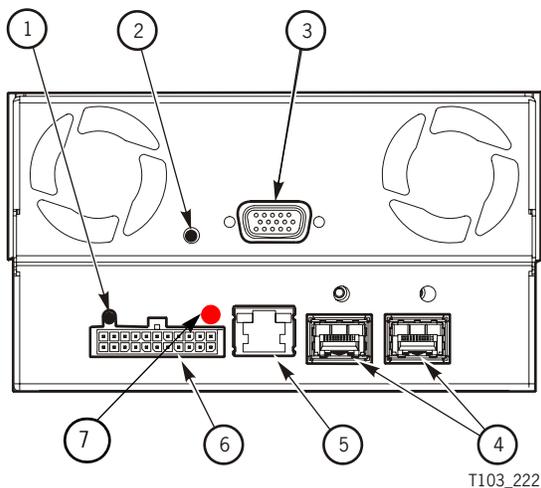


Illustration call-outs:

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
5. RJ-45 receptacle
An Ethernet port that supports a connection for encryption keys, the virtual operator panel (VOP), or the Service Delivery Platform (SDP). 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 (KMS 1.x) or enrolled (KMS 2.0)
Red = encryption enabled

With drive code level 1.40.x07 and KMS 2.1, the T10000A drive complies with FIPS-2 Level 1, and the T10000B drive complies with FIPS-2 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 [“Related Documentation” on page 15](#).

The data path key management (DPKM) subsystem is the third installment of encryption on StorageTek tape drives. DPKM uses the SCSI 4 commands `Security Protocol In` and `Security Protocol Out` to implement host-based key management on StorageTek 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 VOP to enable or disable the DPKM capability of the tape drive.

Maintenance Port Use

All Oracle service calls to tape drives under warranty or maintenance contract require physical access and connection to the rear panel maintenance (Ethernet) port. In the event that a customer has an Ethernet cable physically connected to the drive requiring service, the service representative must disconnect the cable to perform a required service action.

- T10000 non-encryption drives supported by the Service Delivery Platform (SDP) require 100% dedication of the drive’s Ethernet port to the SDP site unit.
- T10000 encryption-enabled drives require 100% dedication of the drive’s Ethernet port to the Encryption Service Network except during service activities by Oracle or Oracle-certified service partners.

Where Encryption and SDP co-exist, the Ethernet port must be concurrently shared by using the Service Network.

Note – Oracle neither supports nor assumes any responsibility for drive functional failures that occur during the unauthorized use of the drive’s maintenance port.

Unauthorized use applies to any use of the drive’s Ethernet port other than the following items:

- Encryption 1.x or 2.x environments
- VOP customer versions or service versions
- Service Delivery Platform (SDP)
- Services Tape Health Check Tool
- StorageTek Diagnostic System (STDS)

Small Form-factor Pluggable Modules

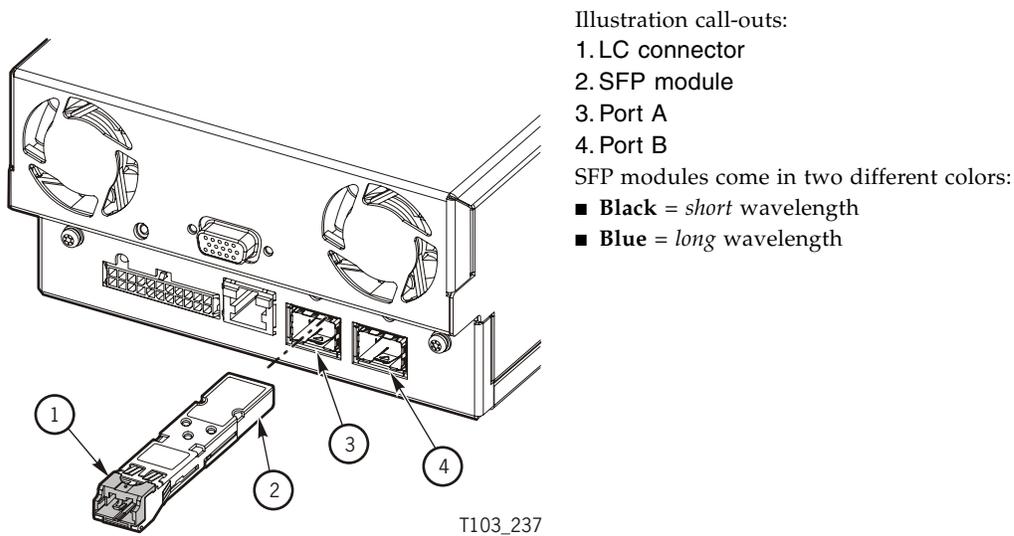
The small form-factor pluggable (SFP) module plugs into the interface port on the tape drive (FIGURE 1-3) and normally on network switches. There are two different types of SFP modules depending on the *wavelength* (mode) and type of cable:

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

The tape drive can be configured as:

- Single-port (short or long wavelength SFP)
- Dual port (short or long wavelength SFP)
- Mixed-port (one short wavelength SFP and one long wavelength SFP)

FIGURE 1-3 SFP Modules



Tip – When planning the network, make sure the SFP module supports the 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 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 or 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)	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: <ul style="list-style-type: none"> ■ General status of the drive ■ Encryption functionality
Ethernet port	Provides a connection that supports items such as encryption keys, the virtual operator panel, or the Service Delivery Platform.
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.
RFID (Radio Frequency Identification) system	Provides an interface to a memory chip in the tape cartridge.

1. An Adaptive Lossless Data Compression technique.

FIGURE 1-4 on page 22 shows key components of the tape drive.

FIGURE 1-5 on page 22 shows elements of the tape path.

FIGURE 1-4 Tape Drive Components (Example only)

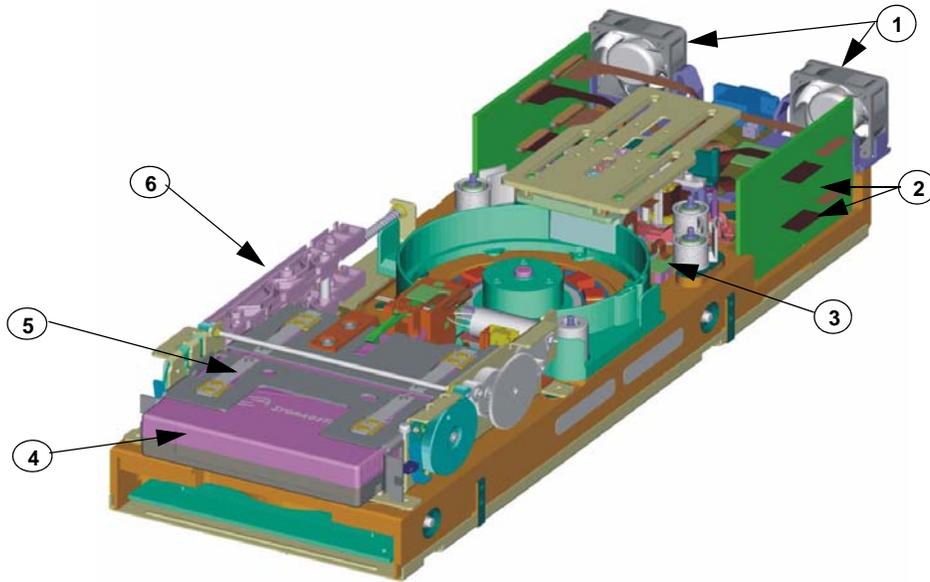


Illustration call-outs:

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

FIGURE 1-5 Tape Path

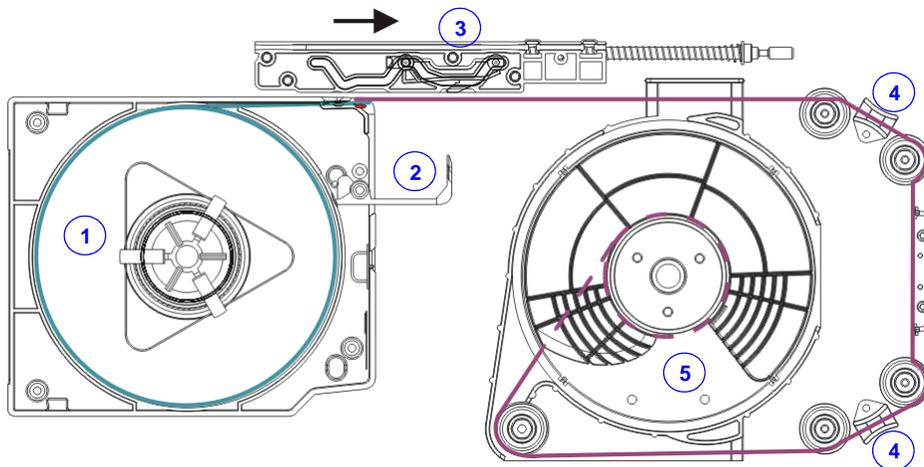


Illustration call-outs:

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

Power Supply Modules

FIGURE 1-6 shows the ways to provide power to the T10000 tape drive depending on the configuration:

- In an SL3000 or SL8500 configuration: the T10000 receives operating voltages from an *internal* DC power module located inside the drive tray.
- In an L-Series library configuration: the T10000 receives operating voltages from an *external* AC power supply module installed above the drive.
- In a 9741E cabinet configuration: the drive receives operating voltages from an *external* AC power supply module mounted inside the cabinet.
- In a rack mount configuration: the drive receives operating voltages from an *external* AC power supply module mounted inside the rack tray (chassis).

FIGURE 1-6 Power Supply Modules

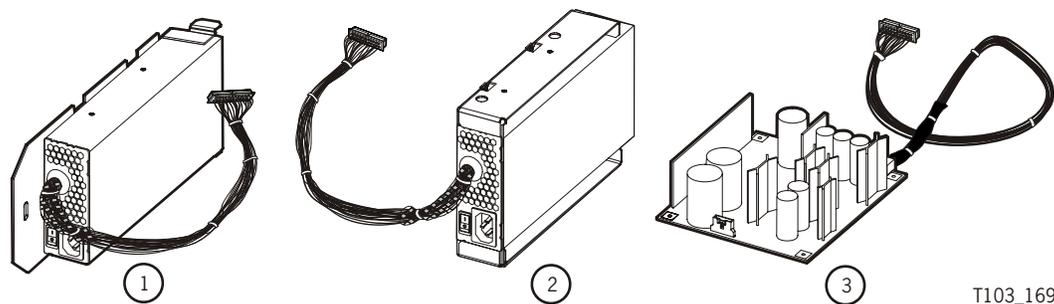


Illustration call-outs:

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)

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 Modules

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

TABLE 1-1 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.)

TABLE 1-1 Power Supply Physical Dimensions (Continued)

Measurement	Specification
Weight	1.4 kg (3.5 lb) 2.38 kg (5.25 lb) L-series libraries

TABLE 1-2 Power Supply Specifications

Characteristics	Specification
Input voltage	88 to 264 VAC
Input frequency	48 to 63 Hz
Power consumption	58 W (drive only) 90 W (drive and power supply)
Power dissipation	420 Btu/hr

Digital Archive Data Protection

With code level 1.44.x06 or higher, the drive supports the Digital Archive Data Protection (DADP) information model through the SB-2 CRC.

The DADP information model provides for *end-to-end* protection of user data while it is being transferred between a sender and the tape drive. Protection information is generated at the initiator on a write operation and may be checked by any object associated with the I_T_L nexus (for example, Host application, Host HBA, Target controller, and Target tape device). Once received, protection information is retained (that is, written to medium, stored in non-volatile memory, or recalculated on read back) by the device server until overwritten. Power loss, hard reset, logical unit reset, and I_T nexus loss will have no effect on the retention of protection information.

Max Capacity

With code level 1.44.x06 or higher, the drive supports the max capacity feature. The default is for this feature to be off.

This feature allows the application to use the full physical capacity of the cartridge (for example, on average an extra 5%). The feature is enabled by issuing a `Mode Select` command (mode page 0X25) as defined in the *StorageTek T10000 Tape Drive Fibre Channel Interface Reference Manual* (part number MT9259).

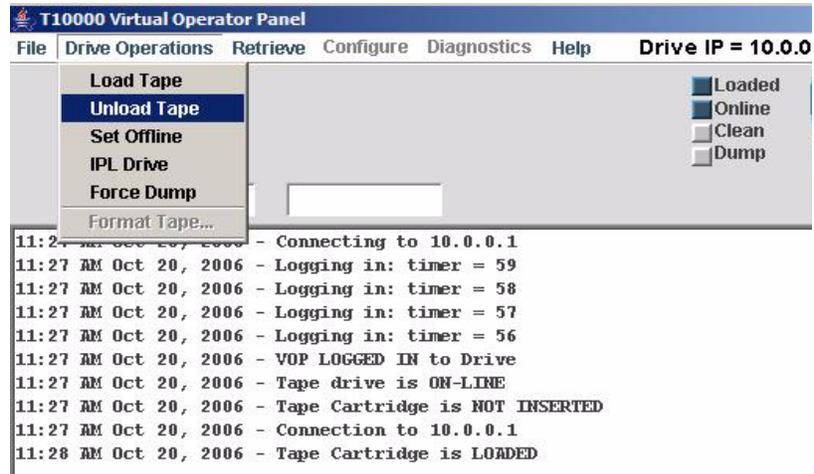
Once enabled, the tape drive allows the application to write data beyond the normal logical end of tape, which is 500 gigabytes for the T10000A and 1 terabyte for the T10000B.

Note – When the feature is activated, Oracle does not guarantee that you can copy the tape cartridge to a different tape cartridge because the exact usable capacity will differ from one cartridge to another. Oracle will guarantee only the copying of a 500 gigabyte or 1 TB native cartridge.

Virtual Operator Panel

FIGURE 1-7 shows an example of the virtual operator panel (VOP) graphical user interface (GUI) for the T10000 tape drive.

FIGURE 1-7 Virtual Operator Panel



- Description:** The virtual operator 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 drive.
Note: VOP version 1.0.13 or higher 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 diagnostic routines (service representative version only)

Specifications

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

TABLE 1-3 Tape Drive Physical Specifications

Measurement	Specification
Width	14.6 cm (5.75 in.) drive, 48.3 cm (19 in.) rackmount tray
Depth	42.55 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)	
Rackmount	18.6 kg (41.0 lb.) single drive, 25 kg (55 lb.) dual drive
SL8500	9.4 kg (20.75 lb)
SL3000	10.1 kg (22.25 lb)
9310 (T10000A only)	6.9 kg (15.25 lb)
L-Series	8.3 kg (18.3 lb)

Environmental Requirements

Note – Although the T10000 will function over the full list of ranges as specified below, you will achieve *optimal reliability* by maintaining the environment within the recommended ranges.

TABLE 1-4 Environmental Specifications

Description	Optimum	Recommended	Ranges
Temperature			
Operating	22°C (72°F)	20° – 25°C (68° – 77°F)	15° to 32°C (59° to 90°F) - dry bulb
Shipping			-40° to 60°C (-40° to 140°F)
Storing			10° to 40°C (50° to 104°F)
Relative Humidity			
Operating	45%	40% – 50%	20% to 80%
Shipping			10% to 95%
Storing			10% to 95%
Wet bulb (non-condensing)			
Operating	29.2°C (84.5°F)		
Storing	35°C (95°F)		

Tip – Industry best practices recommend 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 1-5 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	<i>same as T10000A</i>
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	<i>same as T10000A</i>
High speed rewind	8.0 – 12 m/s	<i>same as T10000A</i>
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	<i>same as T10000A</i>
Data rate	120 MB/s	<i>same as T10000A</i>
Burst transfer rate	up to 330 MB/s	<i>same as T10000A</i>
Emulation Modes	3592 (MVS) and VSM (3490)	<i>same as T10000A</i>
Access times		
Tape load and thread to ready	16.5 sec	<i>same as T10000A</i>
File access, average (includes loading)	62 sec (28 sec for Sport Cartridge)	<i>same as T10000A</i>
Rewind (maximum)	91 sec (23 sec for Sport Cartridge)	<i>same as T10000A</i>
Average rewind	48 sec (13 sec for Sport Cartridge)	<i>same as T10000A</i>
Unload time	23 sec	<i>same as T10000A</i>
Reliability		
Archive life	up to 30 years	<i>same as T10000A</i>
Loads/unloads	greater than 100,000	<i>same as T10000A</i>
Power on @ 100% duty cycle	290,000 hr	<i>same as T10000A</i>
Head life	5 years	<i>same as T10000A</i>
Uncorrected bit error rate	1 x 10 ⁻¹⁹	<i>same as T10000A</i>
Undetected bit error rate	1 x 10 ⁻²³	<i>same as T10000A</i>

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

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.

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

TABLE 1-6 lists some of the connectivity factors to be aware of and provide for.

TABLE 1-6 Connectivity Comparisons

Type	Operating system (examples)	Interface type	Connection scheme	Network creation
Open Systems (servers)	<ul style="list-style-type: none"> ■ Windows: NT, 2000, etc. ■ UNIX: Solaris, HP-UX, etc. ■ Linux 	Fibre Channel	Host bus adapters (HBAs)	Network switches
Enterprise (mainframe)	<ul style="list-style-type: none"> ■ z/OS, z/VM, and OS390 ■ VSE/ESA ■ Linux on z/Series 	FICON	FICON channels	Directors and switches

Both of the 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 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 is qualified for 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.

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.

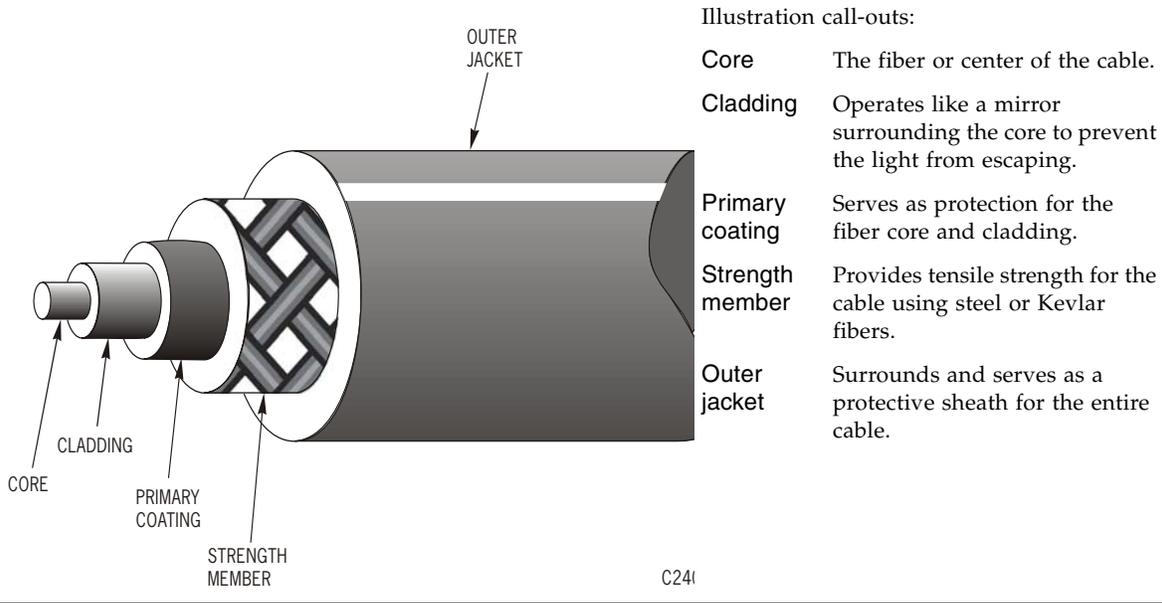
TABLE 1-7 Cable Length Guidelines

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 m – 500 m
				2 Gbps	2 m – 300 m
				4 Gbps	2 m – 150 m
Multimode	LED	62.5/125 (see note below)	Orange	1 Gbps	2 m – 300 m
				2 Gbps	2 m – 150 m
				4 Gbps	2 m – 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.

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

FIGURE 1-8 Fiber Optic Composition



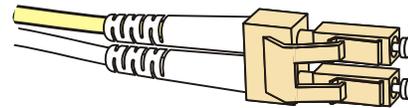
LC Connectors

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 1-9 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 only supports LC connectors.



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Configurations

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

Library Configurations

TABLE 1-8 lists the libraries the T10000 can attach to. See [“Library Installation Requirements”](#) on page 58.

TABLE 1-8 Library Configurations

Library	Description
SL3000	Holds from 200 to 4,500 cartridges with up to 56 T10000A/B tape drives
SL8500	A <i>single</i> SL8500 holds up to 6,640 cartridges with up to 64 T10000A/B tape drives
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)
L1400	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 Note: The 9310 library does not support the T10000B tape drive.

Rack Mount Configurations

A 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 66 for more information.

FIGURE 1-10 Rack Mount Configuration

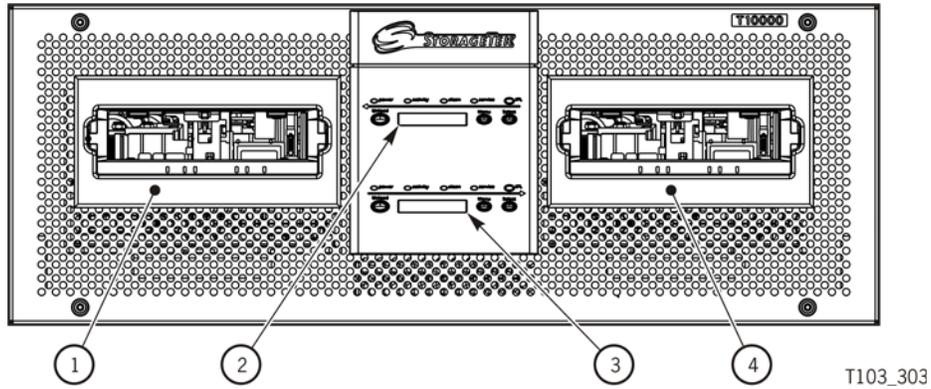


Illustration call-outs:

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

Tape Cartridge



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

FIGURE 1-11 shows an example of the T10000 tape cartridge.

FIGURE 1-11 Tape Cartridge Description

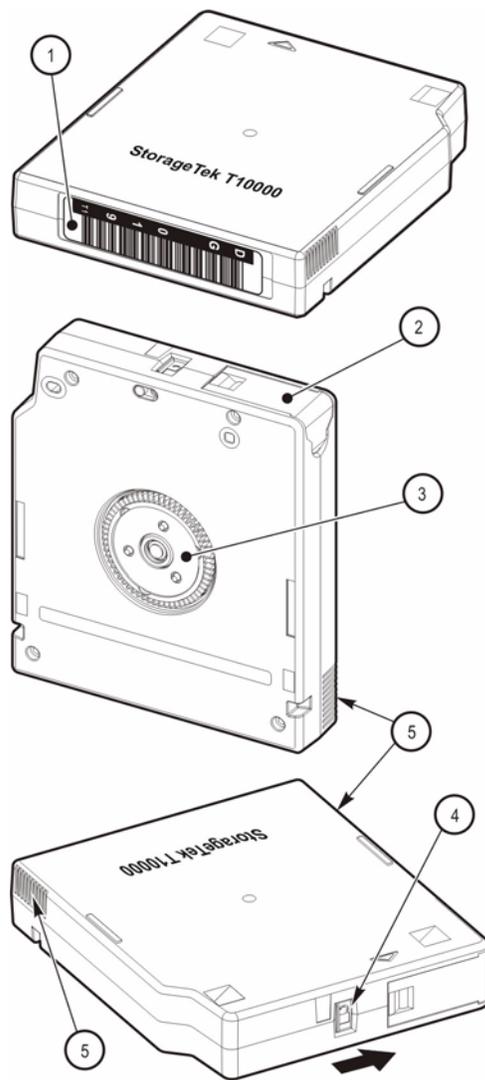


Illustration call-outs:

1. Label area

2. Door

The cartridge type is identified by the door color:

- 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

See [Appendix A, "Tape Cartridges"](#) for:

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

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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)

Comparisons

TABLE 1-9 provides some comparisons between the T10000 tape drive and other drive-types, including StorageTek T-series and Linear Tape-Open.

TABLE 1-9 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

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

The system assurance team members (customer and Oracle) 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, an Oracle representative schedules one or more system assurance planning meetings.

Use this chapter to:

- Track the tasks in [TABLE 2-1 on page 38](#)
- Complete the Team Member Contact sheets on pages [39](#) and [40](#)

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 2-1 System Assurance Team Checklist

Task	Completed?
Introduce the Oracle team to the customer	Yes <input type="checkbox"/> No <input type="checkbox"/>
Describe the T10000 tape drive to the Team Members. See Chapter 1, "Introduction" for topics and information.	Yes <input type="checkbox"/> No <input type="checkbox"/>
Complete the Team Member Contact sheets on pages 39 and 40 .	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review and complete Chapter 3, "Site Survey" . Comments:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Review and complete Chapter 4, "Site Preparation" . Comments:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Complete the Order Worksheets in Chapter 5, "Ordering" . Comments:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the customer want encryption-enabled tape drives? Comments:	Yes <input type="checkbox"/> No <input type="checkbox"/>
Note: In addition to the information in this system assurance guide, refer to the Key Management System guide for information.	
Determine the installation schedule: Date: _____ Day: _____ Time: _____	Yes <input type="checkbox"/> No <input type="checkbox"/>



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: _____

Oracle 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 representatives, installation coordinator, system engineers (SEs), and service representatives.

Site Survey

Use this chapter to record your customer's *current* platforms, applications, and hardware configurations.

The types of information you might need to gather include:

- "System Configuration" on page 42
- "Backup Applications" on page 44
- "Databases" on page 47
- "Hardware Configurations" on page 48
 - "Tape Drives" on page 48
 - "Libraries" on page 49
 - "Cartridge Tapes" on page 49
 - "Network" on page 50
 - "Cables and Connectors" on page 52

Connectivity Matrix

Not sure if your customer's hardware or software of choice supports the 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 Oracle 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 customer's operating systems and configurations.

TABLE 3-1 Questions About the Customer's Operating System

Question	Answer
1. How many and what types of operating systems or platforms does the customer have?	
Open-Systems:	
■ Windows: 2008, 2003, ... 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 the following table to record specific information about the customer's *current* system configuration.

TABLE 3-2 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 customer's backup applications.

TABLE 3-3 Questions About the Customer's Backup and Restore Applications

Question	Answer
1. How are backups performed (manually or automatic)?	
2. How many servers or systems perform backups?	
3. On what days are backups performed?	
4. What types of backups are performed and when?	<ul style="list-style-type: none"> ■ Full ■ Incremental ■ Differential
5. How many hours are available for backups?	<ul style="list-style-type: none"> ■ Full backups: ■ Daily backups:
6. How much data is backed up?	<ul style="list-style-type: none"> ■ 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?	
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?	

TABLE 3-3 Questions About the Customer's Backup and Restore Applications (Continued)

Question	Answer
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?	<ul style="list-style-type: none"> ■ 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, and hardware)?	
30. Specifically for the backup solution, what is the maximum available budget?	

Use TABLE 3-4 through TABLE 3-6 to record specific information about the customer's current applications and software.

TABLE 3-4 Backup and Archive Software

Selection	Type of Backup and Archive Software	Version
<input type="checkbox"/>	Symantec NetBackup	
<input type="checkbox"/>	IBM Tivoli Storage Manager (TSM)	
<input type="checkbox"/>	EMC NetWorker	
<input type="checkbox"/>	CA Arcserve	
<input type="checkbox"/>	HP Data Protector	
<input type="checkbox"/>	Commvault Galaxy	
<input type="checkbox"/>	E-Mail Archive	
<input type="checkbox"/>	ASM NT	
<input type="checkbox"/>	ASM UNIX	
<input type="checkbox"/>	Other (specify)	

TABLE 3-5 Network Management Software

Selection	Type of Backup and Archive Software	Version
<input type="checkbox"/>	VERITAS	
<input type="checkbox"/>	IBM Tivoli NetView	
<input type="checkbox"/>	HP OpenView	
<input type="checkbox"/>	Horizon tape drive monitor	
<input type="checkbox"/>	RMS/GSM	
<input type="checkbox"/>	Other (specify)	

TABLE 3-6 Library Attachment Software

Selection	Type of Backup and Archive Software	Version
<input type="checkbox"/>	ACSLS	Requires ACSLS 7.1 with PUT0502 or higher
<input type="checkbox"/>	ACSLS HA	
<input type="checkbox"/>	Fibre Channel	
<input type="checkbox"/>	Library Station	
<input type="checkbox"/>	Host Software Component (HSC)	
<input type="checkbox"/>	Virtual Storage Manager (VSM)	
<input type="checkbox"/>	Other (specify)	

Databases

TABLE 3-7 Questions About the Customer's Database

Question	Answer
1. How much primary storage exists: Total Capacity:	
2. What type and size of disk drives does the customer have?	<ul style="list-style-type: none"> ■ 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) does the customer have?	
8. What type of databases need backup?	
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 various 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 of the customer’s existing hardware:

- 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 3-8 Existing Tape Drive Types

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

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 3-9 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 customer's media? _____

TABLE 3-10 Existing Cartridge Tapes

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

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 3-11 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 3-12 Ethernet Hubs and Switches

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

TABLE 3-13 Fibre Channel Switch Connections

FC Switch Information	Switch 1	Switch2	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			
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

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

TABLE 3-14 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		
	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

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

- “Site Planning Checklist” on page 53
- “Library Installation Requirements” on page 58
- “Rack Mount Configurations” on page 66
- “Tape Drive Configuration and Planning” on page 67
- “Cables and Connectors” on page 75
- “Service Delivery Platform” on page 76

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 4-1 Site Planning Checklist

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

TABLE 4-1 Site Planning Checklist (Continued)

Question	Completed?	Comments:
Environmental Planning (See “Specifications” on page 26 for T10000-specific information and the <i>Data Center Site Planning Guide</i> P/N 805-5863-13)		
Does the site meet the environmental requirements for: <ul style="list-style-type: none"> ■ Temperature? ■ Humidity? ■ Cooling? 	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the site contain features and materials that guard against electrostatic discharge?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are there special requirements to dispose of or recycle the packing material, pallets, and cardboard?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is space available for spare parts and documentation?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
See “Library Installation Requirements” on page 58 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 <input type="checkbox"/> No <input type="checkbox"/> _____ _____ _____	
Does the library support or require the Dynamic World Wide Name feature?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See “World Wide Name Descriptions” on page 71
Power Requirements		
Does the intended site meet the power requirements for the tape drives?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Have you identified the circuit breakers locations and ratings?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are there any power cable routing concerns to be aware of?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Switches and Directors		
Which topology will be used?	Point-to-point <input type="checkbox"/> Switched <input type="checkbox"/> Cascaded <input type="checkbox"/>	
How many interfaces will be connected to the switch?	_____	
Are additional ports needed?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
What is the port wavelength?	Short (SW) <input type="checkbox"/> Long (LW) <input type="checkbox"/>	Note: Wavelength must match the drive port and fiber optic cable.
Is this a multi-switch fabric network?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are there <i>zoning</i> requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Are existing cables being used? Connector type: _____	Yes <input type="checkbox"/> No <input type="checkbox"/>	Note: The cable connector must be the same type as the drive port.

TABLE 4-1 Site Planning Checklist (Continued)

Question	Completed?	Comments:
Host Bus Adapters		
Does the customer have existing HBAs?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See the Interop Tool at: https://interop.central.sun.com/interop/interop
Are these HBAs approved in the Connectivity Matrix?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Will the customer provide new or additional HBAs?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
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?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Is this driver supported?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Connectivity: Cabling is <i>very important</i> to establish a reliable network for the tape drives. See “ Interface Cables ” on page 87 for more information.		
Have you completed a cable plan?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Have you determined the type and number of cables required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Each tape drive needs an interface cable
■ Fibre Channel	Yes <input type="checkbox"/> No <input type="checkbox"/>	Quantity: _____
■ FICON	Yes <input type="checkbox"/> No <input type="checkbox"/>	Quantity: _____
■ Ethernet:	Yes <input type="checkbox"/> No <input type="checkbox"/>	Quantity: _____
■ Power (if required)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Quantity: _____
Is the customer prepared to supply Ethernet cables for the network?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Can the customer provide the required number of <i>static</i> IP addresses?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Will interface cables be run from outside the computer room?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Cables that run outside a computer room require a flammability rating of CL2 or CL2P.
Will the customer allow use of remote support?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See “ Service Delivery Platform ” on page 76 for more information
See “ Tape Drive Configuration and Planning ” on page 67 for more information.		
Does the customer want data compression enabled?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Off, On, or No.
Does the customer want Data Security Erase (DSE) enabled?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the customer want to use Hard or Soft Arbitrated Loop Physical Address (AL_PA)?	Hard <input type="checkbox"/> Soft <input type="checkbox"/>	See TABLE 4-10 on page 70 . Note: Some libraries do not support drive AL_PA addressing.
Are there any block size requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the customer want to use the VolSafe feature and tape cartridges?	Yes <input type="checkbox"/> No <input type="checkbox"/>	Note: If one drive is configured to support VolSafe, all drives <i>should</i> be configured.

TABLE 4-1 Site Planning Checklist (Continued)

Question	Completed?	Comments:
Are there any Emulation mode requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Media		
The T10000 uses a unique tape cartridge. Does the customer have the correct type and number of cartridge tapes?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See Appendix A, "Tape Cartridges" for information about the media.
■ Are data cartridges required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
■ Are Sport cartridges required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
■ Are cleaning cartridges required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
■ Are VolSafe cartridges required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
■ Are Sport VolSafe cartridges required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
■ Are labels required?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Remote Support		
Will the customer allow remote support?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Have you completed the Service Delivery Platform (SDP) requirements?	Yes <input type="checkbox"/> No <input type="checkbox"/>	See "Service Delivery Platform" on page 76 for more information.
Are phone connections available for modems and telephones?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Does the customer use SNMP?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Data at Rest Encryption Feature		
Is the customer interested in the encryption feature?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Has the customer data been identified or classified into categories?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
What data is considered secret, sensitive, business critical, and <i>non-essential</i> ?		
What data needs to be encrypted?		
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 4-2 lists the minimum level software requirements to support the T10000. However, you should strive to use the latest available software level.

TABLE 4-2 Library Management Software Requirements

Software	Minimum Level	Comments
T10000B		
ACLSLS	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		
ACLSLS	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 StorageTek tape libraries, review the following information and requirements for that library:

- [StorageTek SL3000 Modular Library System](#)
- [“StorageTek SL8500 Modular Library System” on page 59](#)
- [“L-Series—L180 Library” on page 60](#)
- [“L-Series—L700/L700e Libraries” on page 61](#)
- [“L-Series—L1400M Library” on page 62](#)
- [“L-Series—Tape Drive Installation Guidelines” on page 63](#)
- [“9310 Automated Cartridge System” on page 64 \(T10000A\) only](#)
 - [“Drive Cabinets” on page 65](#)

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

StorageTek SL3000 Modular Library System

TABLE 4-3 StorageTek 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



StorageTek SL8500 Modular Library System

TABLE 4-4 StorageTek SL8500 Modular Library System

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* 100,000 tape cartridges with up to 640 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

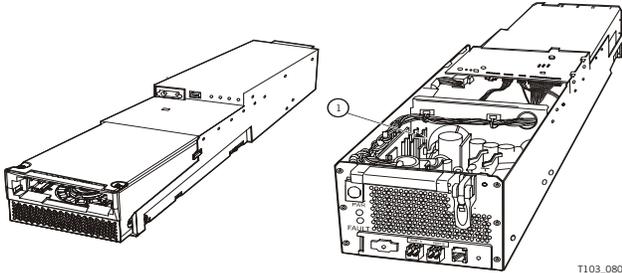
The T10000 requires an SL8500 drive tray

Power Supply

SL8500 DC power module (1) included with drive tray

Weight

9.4 kg (20.75 lb)



T103_080

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)

- T9840x: 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 4-5 L180 Library Requirements

Description

The L180 library can hold from 84 to 174 cartridges with up to **six** 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

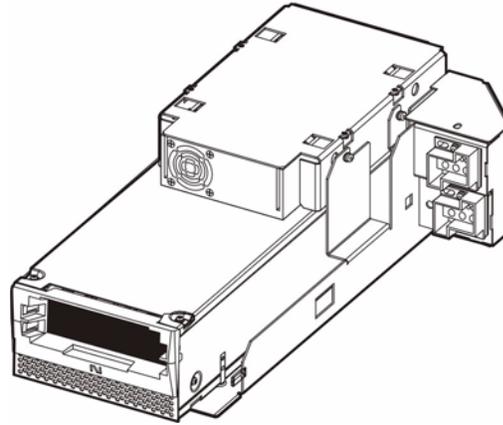
See [“L-Series—Tape Drive Installation Guidelines”](#) on page 63 for more information

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)

- T9840x and T9940x
- LTO Gen 1, 2, 3, and 4
- SDLT 320 and 600
- DLT 8000

Prerequisites

Microcode (minimum)

T10000A	3.11.02 or higher
T10000B	3.17.03

L-Series—L700/L700e Libraries

TABLE 4-6 L700/L700e Library Requirements

Description

The L700 can hold from 216 to 678 cartridges
The L700e holds 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

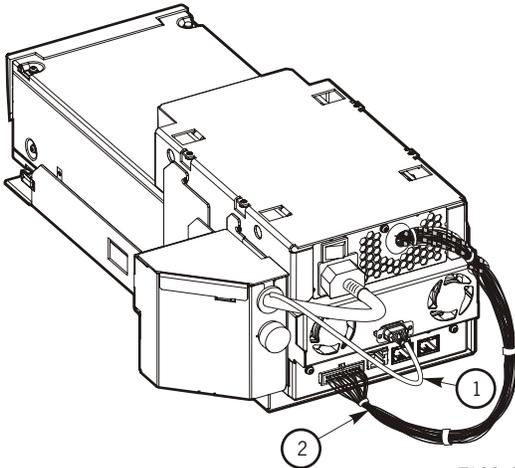
L700 drive tray
See “L-Series—Tape Drive Installation Guidelines” on page 63 for more information

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)

T9840x and T9940x
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 3.11.02 or higher
T10000B 3.17.03

L-Series—L1400M Library

TABLE 4-7 L1400M Library Requirements

Description

The L1400M single frame library holds 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

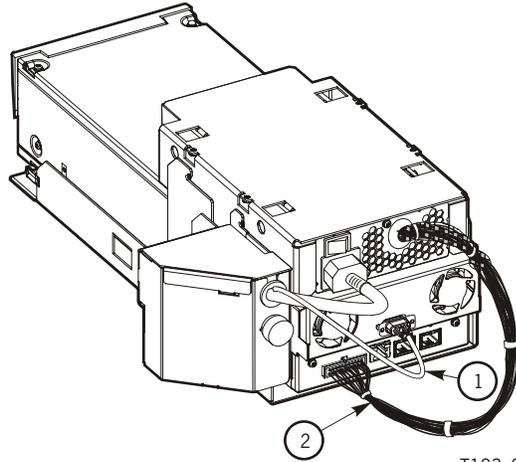
L700 drive tray
See [“L-Series—Tape Drive Installation Guidelines”](#) on page 63 for more information

Power Supply

Requires an external power supply

Weight

8.3 kg (18.3 lb) estimate



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)

- T9840x and T9940x
- LTO Gen 1, 2, 3, and 4
- SDLT 320 and 600
- DLT 8000

Prerequisites

Microcode (minimum)

T10000A	3.11.02 or higher
T10000B	3.17.03

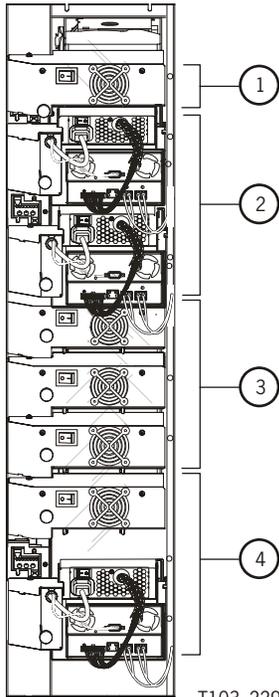
L-Series—Tape Drive Installation Guidelines

L-Series libraries 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 T9840x or T9940x 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 4-1 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 DLT or LTO drives only 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 (call-outs 2, 3, and 4) allow you to install:
 - Two T10000 tape drives (callout 2),
 - Three DLT or LTO drives (callout 3), *or*
 - One T10000 tape drive and one DLT or LTO 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.

T103_229

9310 Automated Cartridge System

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

TABLE 4-8 9310 Automated Cartridge System Requirements

Important: 9310 is the only library that requires upgrades that are at *an additional cost*. The reason for this is because the library went to End-of-Manufacturing status in March of 2005, thus this library required a purchase upgrade to support the T10000A tape drive. However, this upgrade is now End-of-Life due to the 9310 End-of-Service life status on December 31, 2010. Only 9310s previously upgraded for the T10000A can use T10000 drives.

Description

The 9310 library (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 65](#)



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)

- T9840x: ESCON, FICON, and Fibre Channel
- T9940x: ESCON, FICON, and Fibre Channel
- TimberLine: 36-Track (*end-of-life*)

Prerequisites

The Turntable Assembly must be at level 308747807 or higher. Depending on the level, take the following action:

- 308747807 or higher—no new hardware required
- 308747806—CSE must verify minimum gripper #308436417

Microcode (minimum)

- 9310: XSL9310-T10K-HW (*end of life*)
- 9330: XSL9330-T10K (*end of life*)

Configuration note

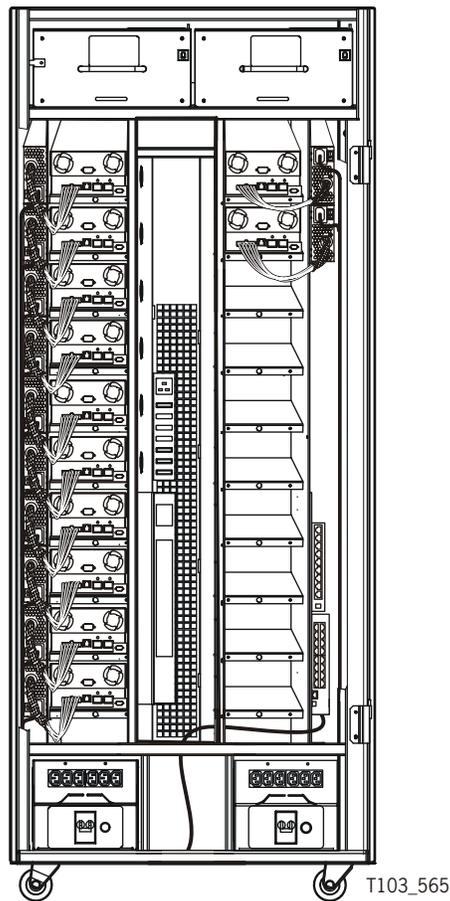
The 9310 library *does not* support tape drive dynamic World Wide Names (dWWN)

Drive Cabinets

Note – Only a 9741E Drive Cabinet is supported with the 9310 library and T10000A tape drives.

FIGURE 4-2 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 4-2 9741E Cabinet



Prerequisites:

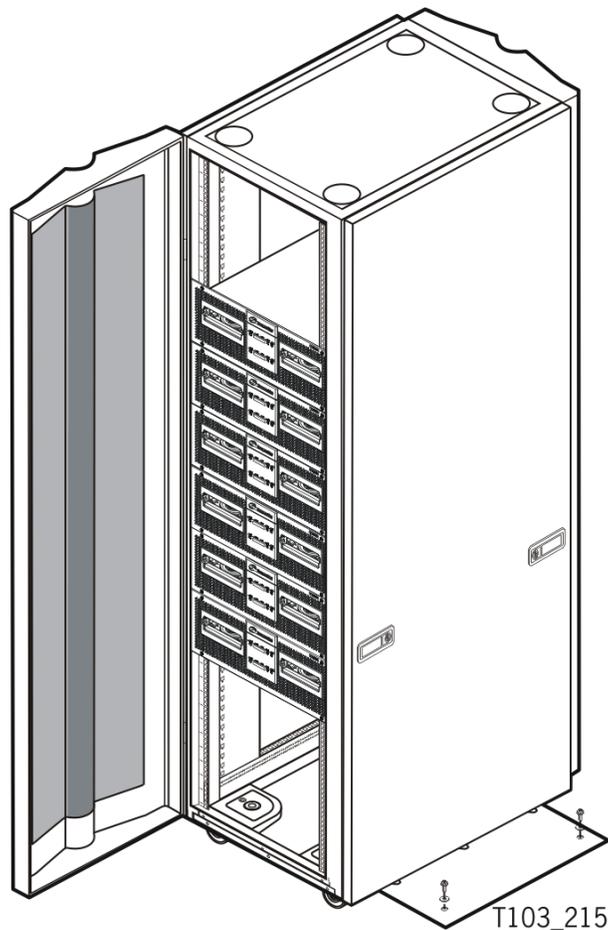
- Order X9741E-T10K-9310 for an additional hardware upgrade.
- Ethernet switch part numbers are 8-port 24100208 and 16-port 24100209.
- Customers with an older 9741-001 cabinet must obtain a 9741E cabinet to support the T10000A tape drive.

Rack Mount Configurations

A 42U rack can hold up to 12 manual-mount drives in six dual-drive units (see [FIGURE 4-3](#)). Each unit provides a control panel that provides a cartridge load/unload slot, several LEDs, several switches, and a 10-character display panel. 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 in the unit, it must be installed on the left (A). The rack units are installed between the U11 and U34 locations as counted from the bottom of the cabinet.

Note – The acceptable spacing between the cabinet front vertical rail and rear vertical rail is from 71 cm (28 in.) to 73 cm (28.75 in.). The horizontal separation between the front or rear set of vertical rails must be at least 43.8 cm (17.25 in.) but not greater than 44.2 cm (17.4 in.).

FIGURE 4-3 Rack Mount Configuration



Tape Drive Configuration and Planning

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

- [FIGURE 4-4](#) and [FIGURE 4-5](#) on page 73 provide examples of the VOP.
- [TABLE 4-9](#) on page 68 provides information about the configuration options. For more information, refer to the installation manual or operator's guides.

FIGURE 4-4 VOP Configuration Settings (Example: Subject to change)

Parameter Definition	Parameter Value	Update
Fibre emulation option:	Standard-FIBRE	<input type="checkbox"/>
Data compression:	<input type="radio"/> No <input checked="" type="radio"/> Yes <input type="radio"/> Off	<input type="checkbox"/>
Data security erase:	<input type="radio"/> No <input checked="" type="radio"/> Yes	<input type="checkbox"/>
Standard Label protect:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
Library address:	ff	<input type="checkbox"/>
Tape completion display:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
Language:	English	<input type="checkbox"/>
World Wide Name(default):	50:01:04:f0:00:b3:97:39	<input type="checkbox"/>
Pa hrd asgn phys addr:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
Pa arbtrtd loop addr:	0	<input type="checkbox"/>
Pa soft asgn phys addr:	<input type="radio"/> Hi <input checked="" type="radio"/> Lo	<input type="checkbox"/>
Pa max recv size:	<input type="radio"/> 2112 <input checked="" type="radio"/> 2048	<input type="checkbox"/>
Pa WWN override(default):	50:01:04:f0:00:b3:97:3a	<input type="checkbox"/>
Pa speed negotiation:	Auto	<input type="checkbox"/>
Pb hrd asgn phys addr:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
Pb arbtrtd loop addr:	1	<input type="checkbox"/>
Pb soft asgn phys addr:	<input type="radio"/> Hi <input checked="" type="radio"/> Lo	<input type="checkbox"/>
Pb max recv size:	<input type="radio"/> 2112 <input checked="" type="radio"/> 2048	<input type="checkbox"/>
Pb WWN override(default):	50:01:04:f0:00:b3:97:3b	<input type="checkbox"/>
Pb speed negotiation:	Auto	<input type="checkbox"/>
Channel interface type:	<input checked="" type="radio"/> Fibre <input type="radio"/> Ficon	<input type="checkbox"/>

Buttons: Load Drive Config, Commit, Cancel

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

TABLE 4-9 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.	<ul style="list-style-type: none"> ■ Standard ■ VSM mode ■ 3592 mode (native FICON)
<p>*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.</p>		
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. <i>This is usually a function that is only enabled for special circumstances and under the direction of StorageTek tape engineering.</i>	Yes or No <i>Important:</i> Set to No.
Data Compression	<ul style="list-style-type: none"> ■ When No, data is not compressed by default. Operating system commands can <i>enable</i> data compression. ■ When Yes, data is compressed by default. The operating system commands can <i>disable</i> data compression. ■ When Off, data is not compressed. The operating system commands <i>cannot enable</i> 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 <i>Important:</i> Set to Yes.
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	<i>Selections include:</i> English, Espanol (Spanish), Francais (French), Italiano (Italian), or Deutsche (German)	English (default)
World Wide Name	World Wide Name (WWN)	See page 71 for more information
World Wide Node Name	A unique 64 bit number that identifies a node.	
World Wide Port Name	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.	

TABLE 4-9 Tape Drive Configuration Planning (Continued)

Configuration Item	Description	Settings
Port Attributes	<ul style="list-style-type: none"> ■ Port A (Pa) and Port B (Pb) selections ■ Hard Assigned Physical Address <ul style="list-style-type: none"> ■ Hard = Permanently assigned ■ Soft = Automatically (<i>and randomly</i>) assigned addresses. ■ <i>arbtrtd loop addr</i> 	<p>Enabled or disabled</p> <p>Yes or No</p> <p>See page 70</p>
	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	Hi or Low
Important: Set to <i>Auto</i>	<ul style="list-style-type: none"> ■ Speed Negotiation 	<i>Auto</i> , 4Gb, 2Gb, 1Gb
Block Size	Sets the maximum frame size that is accepted by the tape drive.	<p>2112</p> <p>2048</p> <p>Note: Code level 1.37.114, or higher.</p>
Network selections See page 71 for more information.	<ul style="list-style-type: none"> ■ 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 <p>Note: Starting with drive code level 1.40.x07, you can set a static IPv6 address.</p> <ul style="list-style-type: none"> ■ Network node name: <i>variable</i> ■ Dynamic Host Configuration Protocol (DHCP) Default: <i>No</i> ■ Location ACS: ■ Location LSM ■ Location panel ■ Location drive 	

Arbitrated Loop Physical Address

TABLE 4-10 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 4-10 Arbitrated Loop Physical Address Values

PA	Index								
xx	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 company ID is 24 bits (50:01:04:f0).

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*.

Note – 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 4-5 Network Configuration (Example: Subject to Change)

Parameter Definition	Parameter Value	Update
IPv4 address:	010.000.000.001	<input type="checkbox"/>
Subnet mask:	255.255.255.000	<input type="checkbox"/>
Gateway:	255.255.255.255	<input type="checkbox"/>
IPv6 static address:		<input type="checkbox"/>
Network node name:	T10000-001000183	<input type="checkbox"/>
Get IP address via DHCP:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
SNMP Enabled:	<input checked="" type="radio"/> No <input type="radio"/> Yes	<input type="checkbox"/>
Location ACS:	0	<input type="checkbox"/>
Location LSM:	0	<input type="checkbox"/>
Location panel:	0	<input type="checkbox"/>
Location drive:	0	<input type="checkbox"/>

Buttons: Load Drive Config, Commit, Cancel

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 web site 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.

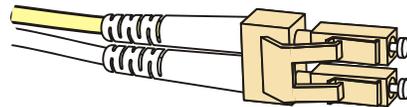
Notes:

1. Maximum total non-repeated channel distance for a 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 4-6 Fiber-optic Connectors (For reference only)

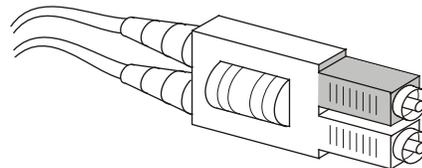
LC connectors are the industry standard for all 2-Gbps and 4-Gbps Fibre Channel devices such as the T10000 tape drives.



T103_048

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 <input type="checkbox"/>	No <input type="checkbox"/>
Has the SDP Systems Assurance Guide been completed?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Has the SDP appliance been ordered?	Yes <input type="checkbox"/>	No <input type="checkbox"/>

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

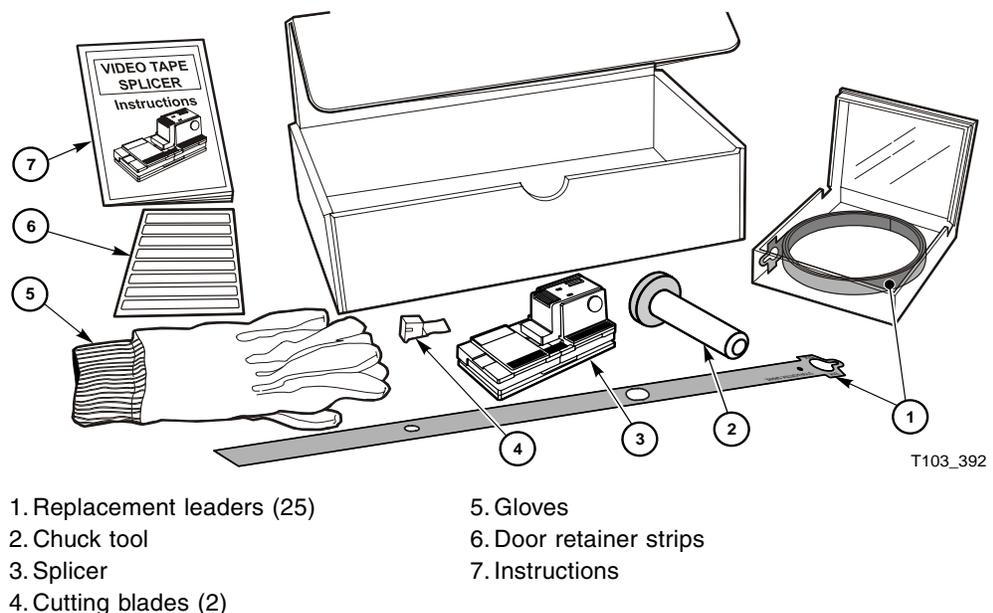
To install a T10000 tape drive requires *one* or *two qualified installers* depending on the attachment, the number of drives, and the configuration.

Tools

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

- Tool kit
- Grounding kit (ESD kit)

FIGURE 4-7 Splicer Kit



Ordering

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

What host interface is used?	<input type="checkbox"/> Fibre Channel <input type="checkbox"/> FICON
Number of interface ports?	<input type="checkbox"/> 1 port <input type="checkbox"/> 2 port
Type of interface transceiver (check both for mixed port)?	<input type="checkbox"/> Long wavelength (LW) ¹ <input type="checkbox"/> Short wavelength (SW) ²
Is the drive installed in a library or a rack?	<input type="checkbox"/> SL8500 <input type="checkbox"/> SL3000 <input type="checkbox"/> L180/L700e/L1400M <input type="checkbox"/> 9310 (T10000A only) <input type="checkbox"/> rack (single drive) ³ <input type="checkbox"/> 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).

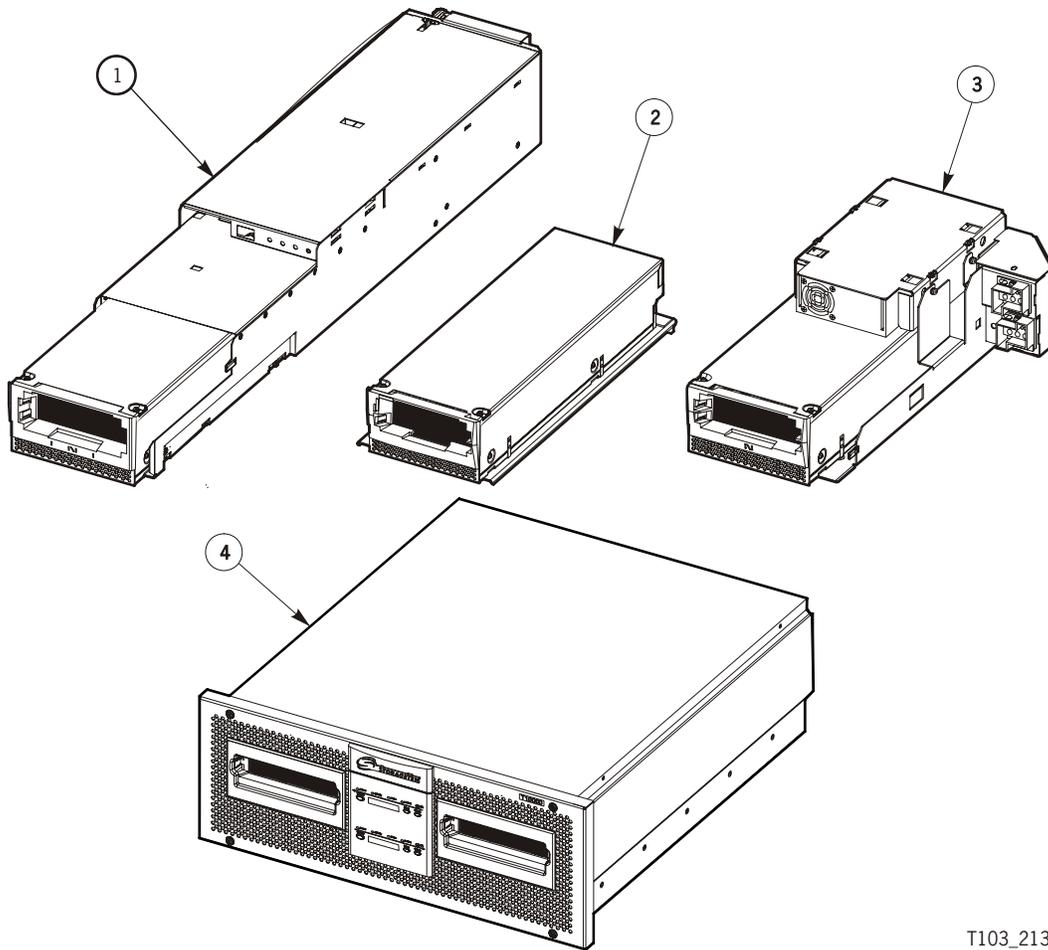
A part number is composed of many of the elements listed in the table above. For example, the part number T10B-4FC-SW-85Z-N is comprised of:

- **T10B** indicates the tape drive model number (T10000B 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** usually indicates that the drive complies with ROHS requirements
- **N** indicates that this part was copied from the Sun price list to the Oracle price list

The following figure shows typical drive configurations. Note that the tape drive is fully enclosed by sheet metal in some 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 5-1 Configuration Models



T103_213

Illustration call-outs:

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

This chapter provides the following information:

- [“Tape Drive Order Numbers” on page 81](#)
- [“Conversion Kits and Upgrades” on page 84](#)
- [“Ordering Media and Cartridge Labels” on page 86](#)
- [“Power Cords” on page 86](#) and [“Ethernet Cables” on page 87](#)
- [“Interface Cables” on page 87](#)

Tape Drive Order Numbers

The T10000B tape drive:

- [Table 5-1](#) lists the new tape drive marketing part numbers

The T10000A tape drive:

- [Table 5-2 on page 82](#) lists the marketing part numbers for *used* 4 Gb drives
- [Table 5-3 on page 82](#) lists the marketing part numbers for *used* 2 Gb drives

TABLE 5-1 T10000B Tape Drive Order Number

Short Description	Order Number
Library Mounted Drive	
L180/L700e/L1400M Library	
L700/1400/180 FIBRE CHANNEL Drive ¹	T10B4FC-L7/14/18-N
L700/1400/180 FICON Drive ¹	T10B4FI-L7/14/18-N
T10K 4 Gbit 1 port Long Wave	XT10K-4GB-LW-Z-N
T10K 4 Gbit 1 port Short Wave	XT10K-4GB-SW-Z-N
T10K 4 Gbit 2 port Long Wavelength	two XT10K-4GB-LW-Z-N
T10K 4 Gbit 2 port Mix Wavelength	XT10K-4GB-LW-Z-N and XT10K-4GB-SW-Z-N
T10K 4 Gbit 2 port Short Wavelength	two XT10K-4GB-SW-Z-N
SL3000 Library	
SL3000 FIBRE CHANNEL Drive 2-port Short Wavelength	T10B-4FC-SW-30Z-N ²
SL3000 FICON Drive 2-port Long Wavelength	T10B-4FI-LW-30Z-N ²
SL8500 Library	
SL8500 FIBRE CHANNEL Drive 2-port Short Wavelength	T10B-4FC-SW-85Z-N ²
SL8500 FICON Drive 2-port Long Wavelength	T10B-4FI-LW-85Z-N ²
Rack Drive	
Rack mount FIBER CHANNEL Short Wavelength 1 Drive	T10B-4FC-SW-RK1Z-N ³
Rack mount FICON Long Wavelength 1 Drive	T10B-4FI-LW-RK1Z-N ³

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).

2. SFP conversion kits are available to obtain SW or LW modules (see [TABLE 5-4 on page 84](#)).

3. A conversion kit is available to obtain a second drive (see [TABLE 5-4 on page 84](#)).

TABLE 5-2 *Used 4 Gb T10000A Tape Drive Order Numbers*

Order Number	Short Description
Library Mounted Drive	
YT10A-4FC-9310Z-N ^{1, 2}	T10K 4 Gbit 9310, 9741E
YT10A-4FC-MW-85Z-N	T10K 4 Gbit, DPMW, SL8500
YT10A-4FC-SW-85Z-N	T10K 4 Gbit, DPSW, SL8500
Rack Drive	
YT10A4FC-SW-RK1-N	T10K 4 Gbit, DPSW, 1 drv, rack

1. Tape drives for the 9310 library require SFP modules, see [TABLE 5-4 on page 84](#).
2. Installation in a 9310 library requires additional hardware upgrades. See [“9310 Automated Cartridge System” on page 64](#) and [“Drive Cabinets” on page 65](#).

TABLE 5-3 *Used 2 Gb T10000A Tape Drive Order Numbers*

Order Number	Short Description
YT10A-2FC-9310-N ^{1, 2}	<i>Used</i> T10KA 2 Gbit FC drv 9310, NON-RoHS
YT10A-2FC-9310Z-N ^{1, 2}	<i>Used</i> T10KA 2 Gbit FC drv 9310
YT10A2FCL7/14/18-N ¹	<i>Used</i> T10KA 2 Gbit FC drv L-Series, NON-RoHS
YT10A-2FC-LW-85-N	<i>Used</i> T10KA 2 Gbit FC drv Long Wave SL8500, NON-RoHS
YT10A-2FC-LW-85Z-N	<i>Used</i> T10KA 2 Gbit FC drv Long Wave SL8500
YT10A-2FC-MW-85-N	<i>Used</i> T10KA 2 Gbit FC drv Mix Wave SL8500, NON-RoHS
YT10A-2FC-MW-85Z-N	<i>Used</i> T10KA 2 Gbit FC drv Mix Wave SL8500
YT10A-2FC-SW-85-N	<i>Used</i> T10KA 2 Gbit FC drv Short Wave SL8500, NON-RoHS
YT10A-2FC-SW-85Z-N	<i>Used</i> T10KA 2 Gbit FC drv Short Wave SL8500
YT10A-2FI-9310-N ^{1, 2}	<i>Used</i> T10KA 2 Gbit FICON drv 9310, NON-RoHS
YT10A-2FI-9310Z-N ^{1, 2}	<i>Used</i> T10KA 2 Gbit FICON drv 9310
YT10A2FIL7/14/18-N ¹	<i>Used</i> T10KA 2 Gbit FICON drv L-Series, NON-RoHS
YT10A-2FI-LSERZ-N ¹	<i>Used</i> T10KA 2 Gbit FICON drv L-Series
YT10A-2FI-LW-85-N	<i>Used</i> T10KA 2 Gbit FICON drv Long Wave SL8500, NON-RoHS
YT10A-2FI-LW-85Z-N	<i>Used</i> T10KA 2 Gbit FICON drv Long Wave SL8500
YT10A-2FI-MW-85-N	<i>Used</i> T10KA 2 Gbit FICON drv Mix Wave SL8500, NON-RoHS
YT10A-2FI-MW-85Z-N	<i>Used</i> T10KA 2 Gbit FICON drv Mix Wave SL8500
YT10A-2FI-SW-85-N	<i>Used</i> T10KA 2 Gbit FICON drv Short Wave SL8500, NON-RoHS
YT10A-2FI-SW-85Z-N	<i>Used</i> T10KA 2 Gbit FICON drv Short Wave SL8500

1. Tape drives for the 9310 and L-Series libraries require SFP modules, see [TABLE 5-4 on page 84](#) 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 64](#) and [“Drive Cabinets” on page 65](#).

TABLE 5-3 *Used 2 Gb T10000A Tape Drive Order Numbers (Continued)*

Order Number	Short Description
Rack Drives	
YT10A-2FC-LW-RK1-N	<i>Used T10KA 2 Gbit FC 1drv Long Wave Rack, NON-RoHS</i>
YT10A2FC-LW-RK1-N	<i>Used T10KA 2 Gbit FC 1drv Long Wave Rack</i>
YT10A-2FC-LW-RK2-N	<i>Used T10KA 2 Gbit FC 2 drv Long Wave Rack, NON-RoHS</i>
YT10A2FC-LW-RK2-N	<i>Used T10KA 2 Gbit FC 2 drv Long Wave Rack</i>
YT10A-2FC-SW-RK1-N	<i>Used T10KA 2 Gbit FC 1drv Short Wave Rack, NON-RoHS</i>
YT10A2FC-SW-RK1Z-N	<i>Used T10KA 2 Gbit FC 1drv Short Wave Rack</i>
YT10A-2FC-SW-RK2-N	<i>Used T10KA 2 Gbit FC 2 drv Short Wave Rack, NON-RoHS</i>
YT10A2FC-SW-RK2-N	<i>Used T10KA 2 Gbit FC 2 drv Short Wave Rack</i>
YT10A-2FI-LW-RK1-N	<i>Used T10KA 2 Gbit FICON 1drv LW Rack, NON-RoHS</i>
YT10A2FI-LW-RK1-N	<i>Used T10KA 2 Gbit FICON 1drv LW Rack</i>
YT10A-2FI-LW-RK2-N	<i>Used T10KA 2 Gbit FICON 2 drv LW Rack, NON-RoHS</i>
YT10A2FI-LW-RK2-N	<i>Used T10KA 2 Gbit FICON 2 drv LW Rack</i>
YT10A-2FI-SW-RK1-N	<i>Used T10KA 2 Gbit FICON 1drv SW Rack, NON-RoHS</i>
YT10A2FI-SW-RK1-N	<i>Used T10KA 2 Gbit FICON 1drv SW Rack</i>
YT10A-2FI-SW-RK2-N	<i>Used T10KA 2 Gbit FICON 2 drv SW Rack, NON-RoHS</i>
YT10A2FI-SW-RK2-N	<i>Used T10KA 2 Gbit FICON 2 drv SW Rack</i>

1. Tape drives for the 9310 and L-Series libraries require SFP modules, see [TABLE 5-4 on page 84](#) 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 64](#) and [“Drive Cabinets” on page 65](#).

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.

SFP Modules

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

- Short wavelength (black module)
- Long wavelength (blue module)



Conversion Kits and Upgrades

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

- [Table 5-4](#) lists the drive port and rack mount kits for the T10000B tape drive.
- [Table 5-5 on page 85](#) provides a quick list of tray kits by library.

Tip – When planning the network, make sure the SFP module supports the specific network type and configuration (HBAs, switches, wavelength, and cable types).

TABLE 5-4 Drive Port and Rack Mount Conversion Kits (New)

Order Number	Descriptions
Port Conversions	
4 Gigabit	
XT10K-4GB-LW-Z-N ^{1, 2, 3, 5}	T10000 4 Gbit LW SFP, cable kit
XT10K-4GB-SW-Z-N ^{1, 2, 4, 5}	T10000 4 Gbit SW SFP, cable kit
2 Gigabit	
X984/T10K-2GB-LW-N ^{1, 2, 3, 5}	T9840/T10K 2 Gbit LW SFP, cable kit
X984/T10K-2GB-SW-N ^{1, 2, 4, 5}	T9840/T10K 2 Gbit SW SFP, cable kit
Rack mount conversions	
XT10B-4-LW-RK1-2-N	T10000B Single LW drive to double LW drive rack mount
XT10B-4-SW-RK1-2-N	T10000B Single SW drive to double SW drive rack mount

1. 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. 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 5-5 T10000 Drive Tray Conversion Kit Summary

Drive Tray Configuration		Marketing Part Number for the New Tray Configuration	
		SL8500	SL3000
T10000B		To	
		SL8500	SL3000
F r o m	L180	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	L700	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	L1400	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	SL3000	T10K-S30/S85CKIT-N	
	SL8500		T10K-S85/S30CKIT-N
T10000A 4Gb		To	
		SL8500	SL3000
F r o m	L180	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	L700	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	L1400	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	L5500	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	9310	T10K-4-SL85-CKIT-N	T10AB-FCFI-SL3-Z-N
	SL3000	T10K-S30/S85CKIT-N	
	SL8500		T10K-S85/S30CKIT-N
T10000A 2Gb		To	
		SL8500	SL3000
F r o m	L180	T10A-LSER/85-KIT-N	T10AB-FCFI-SL3-Z-N
	L700	T10A-LSER/85-KIT-N	T10AB-FCFI-SL3-Z-N
	L1400	T10A-LSER/85-KIT-N	T10AB-FCFI-SL3-Z-N
	L5500	T10A-LSER/85-KIT-N	T10AB-FCFI-SL3-Z-N
	9310	T10A-LSER/85-KIT-N	T10AB-FCFI-SL3-Z-N
	SL8500		T10K-S85/S30CKIT-N

Ordering Media and Cartridge Labels

Ordering tape cartridges is easy.

- Call **1.877.STK.TAPE** to order media from your local 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

See [Appendix A](#) for information about tape cartridges or the tape media area on the corporate web site.

<http://www.oracle.com/us/products/servers-storage/storage/tape-storage/029155.htm>

Power Cords

The following table lists the power cord requirements for the rack mount drive trays.

TABLE 5-6 Power Cords

Order Number	Description	Comments
PWRCORD10187018-Z	StorageTek Cord Set, 3X1MM2, 250Volt/10Amps, BELGIUM, HOLLAND, FRANCE, GERMANY, SWEDEN, NORWAY, FINLAND, Female/IEC320, 2.5 Meter, RoHS-5	Cord, IMM2,Intl Eur,F/C320,2.5M
PWRCORD10187019-Z	StorageTek Cord Set, 3X18AWG, 125Volt/10Amps, USA, CANADA, Female/C13, 7.5FT, RoHS-5	Cord,18AWG,US/CAN,F/C13,7.5FT
PWRCORD10187045-Z	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. The following table lists the available cables.

TABLE 5-7 Ethernet Cables

Select	Order Number	Description	Quantity
<input type="checkbox"/>	CABLE10187033-Z	CAT5E, 8 ft, 24 AWG, shielded	
<input type="checkbox"/>	CABLE10187034-Z	CAT5E, 35 ft, 24 AWG, shielded	
<input type="checkbox"/>	CABLE10187035-Z	CAT5E, 50 in., 24 AWG, shielded	
<input type="checkbox"/>	CABLE10187039-Z	CAT5E, 35 ft, 24AWG, shielded, plenum	
<input type="checkbox"/>	CABLE10187040-Z	CAT5E, 55 ft, 24AWG, shielded, plenum	
<input type="checkbox"/>	CABLE10187041-Z	CAT5E, 100 ft, 24AWG, shielded, plenum	

Interface Cables

The following sections provide information about the different interface cables.

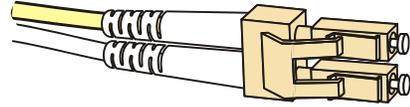
- [“Multimode Fiber-optic Cable Worksheet” on page 88](#)
- [“Single Mode Fiber-optic Cable Worksheet” on page 89](#)
- [“One Gigabit Fiber-optic Cable Worksheet” on page 90](#)

When you order cables, keep in mind:

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

Multimode Fiber-optic Cable Worksheet

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



Note: The tape drive only supports LC connectors.

T103_048

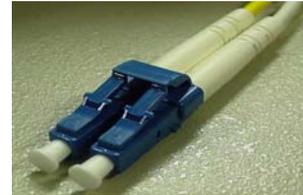
TABLE 5-8 Multimode Fiber-optic Cables (2 or 4 Gb)

Select	Order Number	Description	Quantity
<input type="checkbox"/>	CABLE10800310-Z	LC-LC, 50/125/ duplex, riser, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800311-Z	LC-LC, 50/125/ duplex, riser, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800312-Z	LC-LC, 50/125/ duplex, riser, 100 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800313-Z	LC-LC, 50/125/ duplex, plenum, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800314-Z	LC-LC, 50/125/ duplex, plenum, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800315-Z	LC-LC, 50/125/ duplex, plenum, 100 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800316-Z	LC-LC, 50/125/ duplex, riser, 0.5 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800317-Z	LC-SC, 50/125/ duplex, riser, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800318-Z	LC-SC, 50/125/ duplex, riser, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800319-Z	LC-SC, 50/125/ duplex, riser, 100 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800320-Z	LC-SC, 50/125/ duplex, plenum, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800321-Z	LC-SC, 50/125/ duplex, plenum, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800322-Z	LC-SC, 50/125/ duplex, plenum, 100 meter, RoHS-5	
<input type="checkbox"/>	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 Worksheet

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



Note: The tape drive only supports LC connectors.

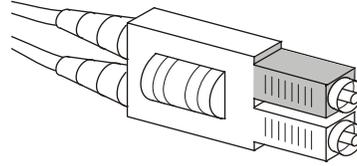
TABLE 5-9 Single Mode Fiber-optic Cables

Select	Order Number	Description	Quantity
<input type="checkbox"/>	CABLE10800330-Z	LC-LC, 9/125/ duplex, plenum, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800331-Z	LC-LC, 9/125/ duplex, riser, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800332-Z	LC-LC, 9/125/ duplex, plenum, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800333-Z	LC-LC, 9/125/ duplex, riser, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800334-Z	LC-SC, 9/125/ duplex, plenum, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800335-Z	LC-SC, 9/125/ duplex, riser, 10 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800336-Z	LC-SC, 9/125/ duplex, plenum, 50 meter, RoHS-5	
<input type="checkbox"/>	CABLE10800337-Z	LC-SC, 9/125/ duplex, riser, 50 meter, RoHS-5	

One Gigabit Fiber-optic Cable Worksheet

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

Note: The T10000 tape drive only supports LC connectors.



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TABLE 5-10 Multimode Fiber-optic Cable (1 Gb)

Select	Order Number	Description	Quantity
<input type="checkbox"/>	CABLE10800294-Z	SC-SC, 5-/125/ Duplex, Plenum, 10 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800295-Z	SC-SC, 5-/125/ Duplex, Plenum, 50 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800296-Z	SC-SC, 5-/125/ Duplex, Plenum, 100 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800297-Z	SC-SC, 5-/125/ Duplex, Riser, 10 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800298-Z	SC-SC, 5-/125/ Duplex, Riser, 50 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800299-Z	SC-SC, 5-/125/ Duplex, Riser, 100 Meter, RoHS-5	
<input type="checkbox"/>	CABLE10800301-Z	SC-SC, 5-/125/ Duplex, Plenum, 0.25 Meter, RoHS-5	

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

Tip – When using cables with SC connectors, you must have an SC to LC adapter. See [“Cables and Connectors” on page 75](#).

Tape Cartridges

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 86 for more information.

This appendix lists and describes the StorageTek T10000 tape cartridges.

FIGURE A-1 Tape Cartridge Types

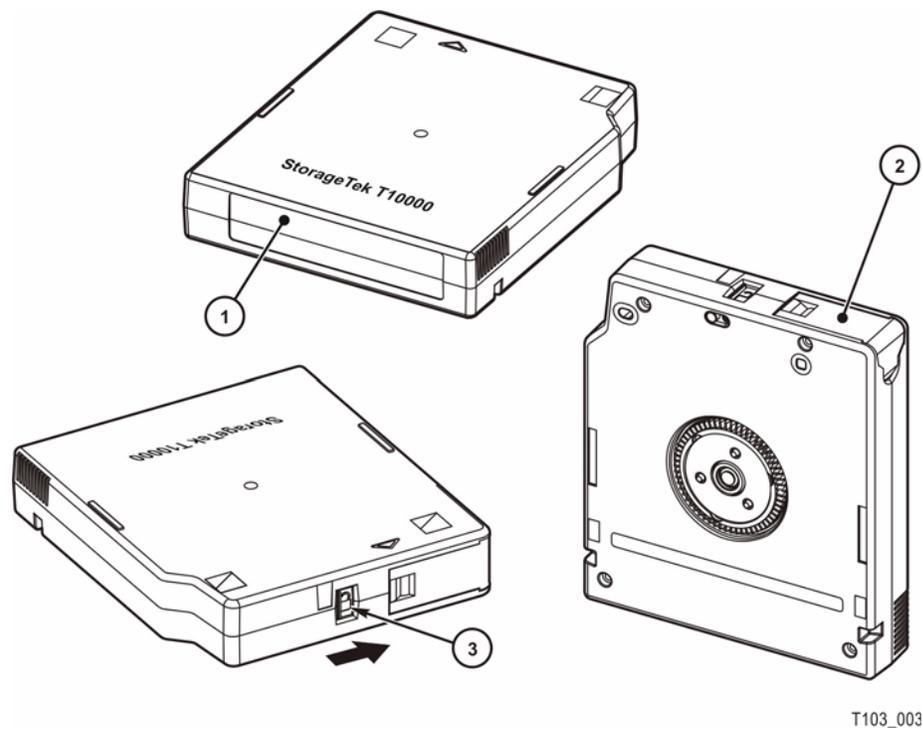


Illustration call-outs:

- 1. Label area
- 2. Door (black = data, red = sport, white = cleaning, and yellow = VolSafe)
- 3. Write protect switch

Disclaimer

Media Usage:

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

- StorageTek-branded media has a warranty.
- 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.

Note – 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.

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.

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.

- T10000 writes data to a VolSafe tape then the drive can append a multitude of data sets onto the cartridge until the cartridge is full. In this way, 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.

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

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."

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.

Note – The drive automatically requests cleaning based upon the number of media passes.

You can use a cleaning cartridge to clean a drive's read/write head up to the rated number of passes. 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.

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](#)” and “[Media Information](#)”.

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.
- 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 an 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 A-1 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)

TABLE A-2 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 (120 GB for the Sport cartridge)
T10000B	1 TB (240 GB for the Sport cartridge)
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) / 267 m (876 ft) Sport
Recordable length (including MIR)	855 m (2,805 ft) / 205 m (672.6 ft) Sport

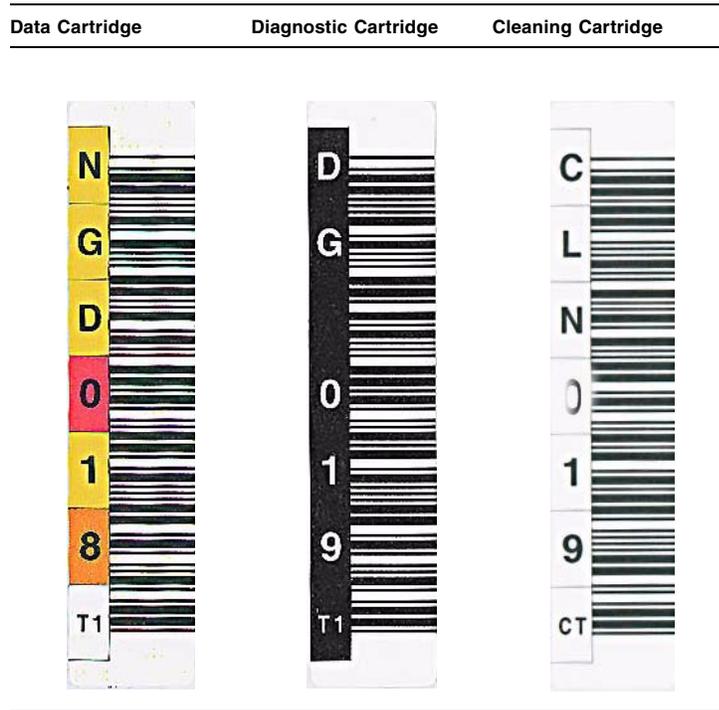


Caution – *Servo track damage*: Bulk-erase will destroy pre-recorded servo tracks. **Do not degauss T10000 tape cartridges.**

Labels

FIGURE A-2 shows examples of three tape cartridge labels.

FIGURE A-2 Label Examples



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 recognize 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 ([FIGURE A-3 on page 100](#)) 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.

The following specifications are recommended:

- 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

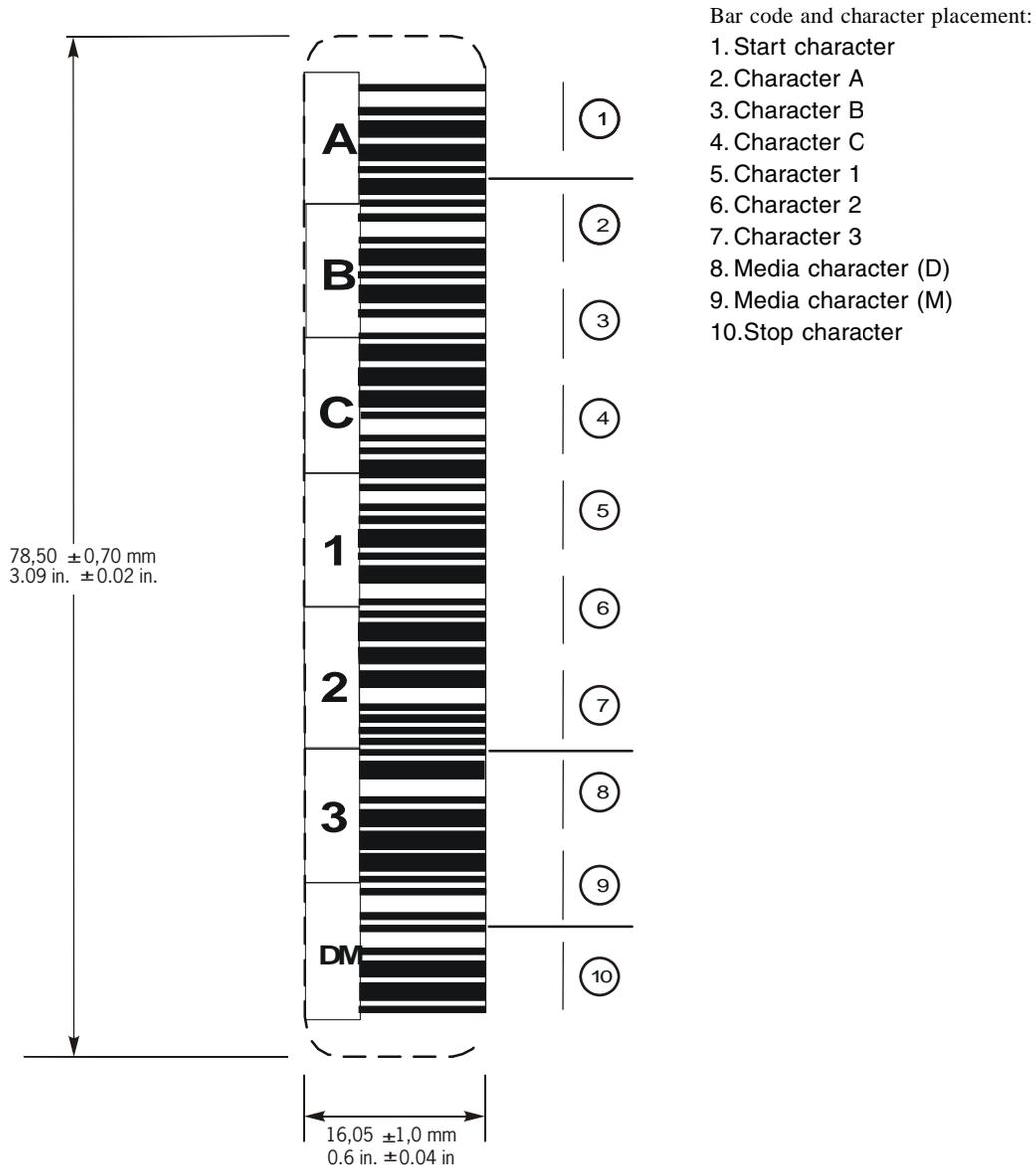
If you are using the cartridges in a StorageTek library, see the *User's Guide* for that library regarding the label requirements.

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.

FIGURE A-3 Cartridge Label Specification



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 terms and abbreviations related to the T10000 tape drive.

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 is initialized and the instant at which the delivery of data is completed. (T)

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

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 (AL_PA) A one-byte value that identifies a port in an arbitrated loop topology.

arbitration Any process by which a user of shared resources 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 collection of contiguous records recorded as a unit. Interblock gaps separate blocks, and each block can contain one or more records.

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

burst In data communication, a sequence of signals counted as one unit in accordance with a specific criterion or measure. (A)

C

capacity Total amount of User Data stored on one data cartridge in 8-bit bytes. *Synonymous with "User Capacity" or "Native Capacity"*. This is the capacity that the user sees after the ECC/Format/ERP and other overhead has been assessed (no compression).

capacity, raw Total amount of data stored on one data cartridge in 8-bit bytes before any ECC/Format/ERP and other overhead has been assessed (no compression).

capacity, user Total amount of data stored on one data cartridge in 8-bit bytes that is sent by the host computer. This is the capacity that the user sees after the ECC/Format/ERP and other overhead has been assessed (no compression).

cartridge A storage device that consists of magnetic tape on a supply reel in a protective housing.

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

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

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

condition One of a set of specified values that a data item can assume. (IBM)

conditioning time The amount of time to prepare a tape cartridge for use in a T10000 Tape Drive.

configuration The manner in which the hardware and software of an information processing system is 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 error rate** The number of errors that occur per a measurable amount of data on a tape.
- 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 StorageTek tape drives.
- data rate** The speed of a data transfer process, usually 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 data cartridge formatted for use as a regular data tape for the system in which it is used.
- data tracks** The regions of recorded tape containing user data formed as discreet longitudinal "tracks" (similar to railroad tracks).
- DHCP** *See* Dynamic Host Configuration Protocol.
- diagnostics** Pertaining to the detection and isolation of errors in programs and faults in equipment.
- DPKM** *See* data path key management.
- drive** A drive controls the movement of the tape and records or reads the data on the tape as desired by the customer.
- DSE** *See* data security erase.
- dump** To copy the contents of all or part of storage to collect error information.
- dynamic host configuration protocol (DHCP)** An IP protocol that a host uses to obtain all necessary configuration information, including an IP address.
- dynamic world wide name (dWWN)** A feature that applies dynamic names to network devices rather than fixed names. When a dWWN-named device is replaced, it is assigned the same WWN as the one it replaced, preventing reconfiguration of the 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)
- encryption** The translation of data into a secret code. Encryption is one of the most effective ways to achieve data security. To read an encrypted file, you must have access to a special key or password that enables you to decipher it.
- end of block (EOB)** A code that marks the end of a block of data. (IBM)

- end of file (EOF)** A coded character recorded on a data medium to indicate the end of the medium. (IBM)
- end-of-file label**
 1. An internal label indicating the end of a file and possibly containing data for file control. (T)
 2. Synonymous with trailer label.
- end-of-tape marker (EOT)** A marker on a magnetic tape to indicate the end of the permissible recording area. (IBM)
- environmental requirement** Any of the physical conditions required for the protection and proper operation of a functional unit; the requirement is usually specified as a nominal value and a tolerance range. For a device, there may be more than one set of environmental requirements; for example, one set for transport, another for storage, and another for operation. (T) (A)
 - EOT** End of tape.
 - erase** To remove data from a data medium, leaving the medium available for recording new data. (I) (A)
 - 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

- fault symptom code (FSC)** A four-character hexadecimal code generated in response to an error to help isolate failures within the device. Some FSCs are for information purposes only.
 - FC** *See* Fibre Channel.
- 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 ultrathin 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.
- Fibre Channel** The National Committee for Information Technology Standards standard that defines an ultrahigh-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.
- fibres connection (FICON)** An ESA/390 and zSeries computer peripheral interface. The I/O interface uses ESA/390 and zSeries FICON protocols (FC-FS and FC-SB-2) over a Fibre Channel serial interface that configures units attached to a FICON-supported Fibre Channel communications fabric.

- 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.
- file-protect** To prevent the erasure or overwriting of data stored on data cartridges. *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 ROM. (T)
- FRU** Field replaceable unit.
- FSC** Fault symptom code.
- FTP** File Transfer Protocol.
-

G

- Gb** Gigabit, equal to 10^9 bits.
- Gbps** Gigabits per second.
- 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)
- 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.
- 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 v4 (IPv4) address** A four-byte value that identifies a device and makes it accessible through a network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be from 0 to 255. For example, 129.80.145.23 could be an IP address.
- internet protocol v6 (IPv6) address** The next generation internet protocol. It provides a much larger address space than IPv4. This is based upon the definition of a 128-bit address - IPv4 used a 32-bit address. The IPv6 address format is eight fields of four hexadecimal characters separated by colons (for example, 2001:0db8:85a3:0000:0000:8a2e:0370:7334)
- IP** See internet protocol.
- IPL** *See* initial program load.
-

L

- laser** *See* light amplification by simulated emission of radiation.
- LC connector** A standard connector for 2-Gbps Fibre Channel data transfer. This type of connector is used on fiber-optic cables.
- library** A robotic system that stores, moves, mounts, and dismounts data 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.
-

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.
- MB** Megabytes or 1,000,000 bytes for disk or tape storage but 1,048,576 (2²⁰) 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

- network** An arrangement of nodes and branches that connects data processing devices to one another through software and hardware links to facilitate information interchange.
- nexus** A connection that exists between an initiator, a target, and a logical unit. This is where one initiator port talks to one target port, addressing one LUN and together they execute a task.

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

Partial Response Maximum Likelihood

(PRML) A method for converting a weak analog signal into a stronger digital signal to provide a higher recording density and contributes to faster data transfer rates.

performance One of two major factors 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-resistant material that, when burned, generates little smoke. Plenum cables are used for installation in air ducts (plenums).

port A specific communications end point within a host. A port is identified by a port number. (IBM) (2) In Fibre Channel, an access point in a device where a link attaches.

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

R

read/write head The data sensing and recording unit of a tape drive. (IBM)

release A distribution of a new product or new function and fixes for an existing product. (IBM)

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

R/W Read/write

S

SCSI Small Computer Serial Interface.

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

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

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

subsystem A system that is part of some larger system.

switch In Fibre Channel technology, a device that connects Fibre Channel devices together in a fabric.

system A combination of functionally interrelated interacting mechanical and electrical elements designed to work as a coherent entity.

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 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 240 bytes.

**transmission control
protocol/internet protocol**

(TCP/IP) 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 measure 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, no data set may 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) A software application that allows a user to monitor and perform some operations on one or more tape drives remotely.

VolSafe VolSafe (volume safe) is a special feature that provides write once, read many (WORM) technology to VolSafe-designated tape cartridges. VolSafe permits new data to only append the tape media, while it prevents erasure or overwrite of previously written data.

VOLSER 1. VOLume SERIAL Number. It is usually six characters long and is both the paper label stuck on the back edge of the cartridge and in the VOLID label that is recorded, particularly by MVS systems, at the beginning of the media.
2. 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.

VOP *See* virtual operator panel.

W

- world wide name (WWN)** A 64-bit integer that identifies a Fibre Channel port.
- world wide node name (WWNN)** A 64-bit network address that identifies the company (in IEEE format) with a vendor specific identifier.
- world wide port name (WWPN)** A 64-bit network address that identifies the port name.
- wrap** A single pass of tape from either BOT to EOT or EOT to BOT with the heads in a fixed transverse location.
- write-enabled** A setting on a data cartridge that allows data to be written on the tape.
- 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-protected** A setting on data cartridges that prevents data from being written on the tape. Reading data is still possible.

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