

# StorageTek T9x40 Tape Drive

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## Systems Assurance Guide



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## Preface

This book provides pre-sales and planning information for Oracle's StorageTek T9840D tape drive. It also provides information about the various cartridges, cartridge labels, and older models of the T9x40 tape drive family.

The term *T9x40* is used in this publication to generically reflect all drive models. Whenever model differentiation is appropriate, the specific model nomenclature is indicated.

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## Product Overview

This chapter provides an overview of T9x40 tape drives.

### Descriptions

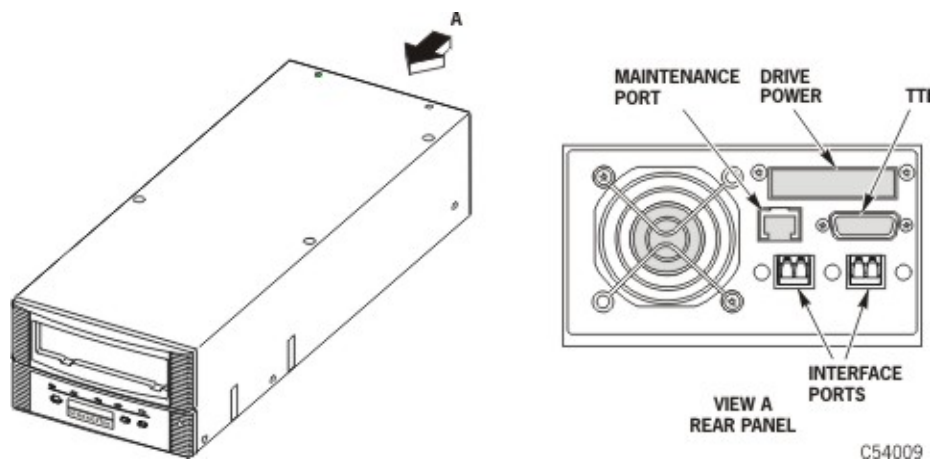
The T9x40 tape drives are small, modular, high-performance drives designed for the enterprise and client-server environments. There are four generations of T9840 access-centric drives and two generations of T9940 high-capacity drives.

### T9840 Tape Drive

The T9840 tape drives (FIGURE 1-1) provide applications with high data throughput and fast recall. T9840 tape drives read/write dual-reel cartridges (see “9840 Cartridge Description” on page 24, for more information about 9840 cartridges). The dual-reel cartridge loads to midpoint, which eliminates tape threading time and minimizes first-file access time (see TABLE A-2 on page 63).

- T9840A/B tape drives read/write 20-GigaByte (GB) dual-reel cartridges.
- The T9840C tape drive is an enhanced version for 40-GB recording, using partial response maximum likelihood (PRML) format.

FIGURE 1-1 T9840B/C/D Tape Drive



- The T9840D encryption-capable drive provides 75-GB recording when using block sizes between 32 KB and 256 KB. With drive code level 1.44.x04 and Key Management System (2.1) or Oracle Key Manager, the drive complies with FIPS Level 1. Level 1 is the lowest classification and has production-grade requirements.

The T9840B/C/D rear panel has a Maintenance Port (standard RJ45 receptacle) for Service Delivery Platform (SDP) and service representative interface.

The T9840D maintenance port supports the use of the Virtual Operator Panel to perform drive operations, retrieve error information, and configure the tape drive. VOP version 1.0.13, or higher, in conjunction with the appropriate drive code level supports the use of an IPv6 address.

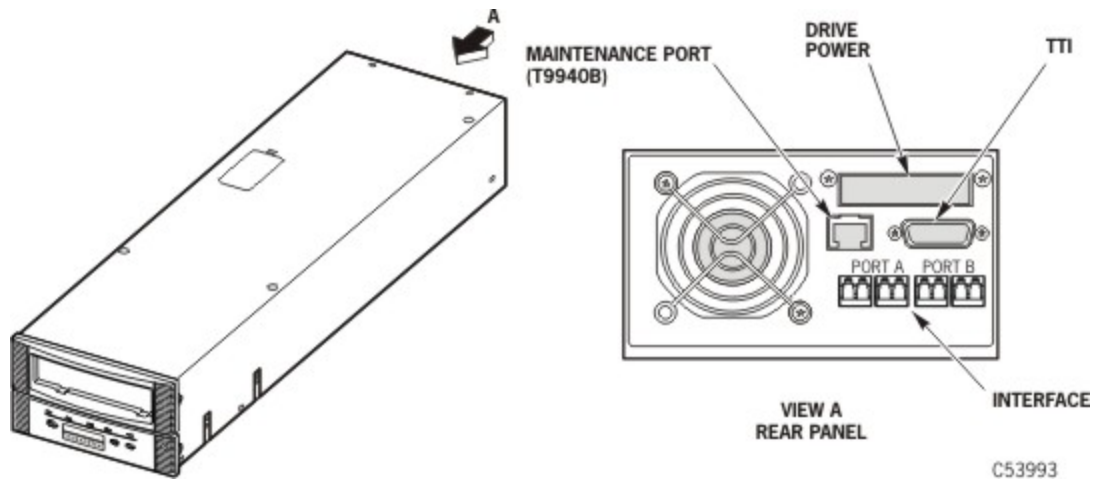
T9840 tape drives are also capable of reading/writing specially designated, write-only (VolSafe) cartridges, which provide a non-erasable, non-rewritable storage solution for important data. See “T9x40 VolSafe” on page 15 for additional information.

## T9940 Tape Drive

The T9940 tape drives (FIGURE 1-2) are capacity-centric for data-intensive applications. The T9940A tape drive reads/writes 60-GB, single-reel cartridges (see “9940 Cartridge Description” on page 26, for more information about 9940 cartridges). The T9940B tape drive is an enhanced version for 200-GB recording, using PRML format, better performance (see TABLE A-2 on page 63), and better serviceability. Like the T9840B/C/D tape drives, the T9940B tape drive rear panel has a RJ45 Maintenance Port that uses TCP/IP for SDP and/or CSE interface.

The T9940 tape drive is approximately 140 mm (5.5 in.) longer than the T9840 tape drive. The increased length is due to the tape path mechanism being inside the tape drive. The increased length also requires additional mounting space available for installation.

FIGURE 1-2 T9940B Tape Drive



T9940B tape drives are also capable of reading/writing specially designated, write-only (VolSafe) cartridges, which provide a non-erasable, non-rewritable storage solution for important data. See [“T9x40 VolSafe” on page 15](#) for additional information.

## T9x40 VolSafe

T9x40 VolSafe capability is a combination of hardware (VolSafe enabled tape drives), microcode, and special media (VolSafe cartridges). This combination provides write-once, read-many (WORM) functionality to safeguard selected data files. Once written to a VolSafe cartridge, data cannot be over-written or erased. New data can be added (appended) to a density-compatible VolSafe cartridge until the cartridge is full.

VolSafe cartridges have a magnetic signature in the Media Information Region (MIR), distinct machine readable features, and are visually identified by colored labels and write-protect switches. See [“9840 Cartridge Description” on page 24](#) or [“9940 Cartridge Description” on page 26](#) for more information on VolSafe cartridge identification features.

### Write

To write to a VolSafe cartridge, a T9x40 tape drive must have compatible data density with the specific VolSafe cartridge, and the drive must be VolSafe-enabled. For instance:

- T9840A/B drives write to 20-GB 9840 VolSafe cartridges only (yellow identification).
- T9840C drives write to 40-GB 9840C VolSafe cartridges only (green identification).
- T9840D drives write to 75-GB 9840D VolSafe cartridges only (purple identification).

**Note** – See [“9840 Cartridge Description” on page 24](#), for VolSafe cartridge identification

- T9940B tape drives write to 200-GB 9940B VolSafe cartridges only (see [“9940 Cartridge Description” on page 26](#), for VolSafe cartridge identification).

The specific tape drive’s VolSafe configuration setting must also be enabled (indicated by Ready A, when a compatible VolSafe cartridge is loaded).

### Read

To read VolSafe cartridges, a T9x40 tape drive only needs to be density-compatible, the tape drive VolSafe configuration setting need not be enabled. The tape drive recognizes VolSafe cartridges as file-protected (Ready F), regardless of the write-protect switch position. For instance, the T9840C tape drive reads 40-GB 9840C VolSafe cartridges and 20-GB 9840 VolSafe cartridges, but T9840A/B tape drives only read 20-GB 9840 VolSafe cartridges.

## Drive - VolSafe Cartridge Compatibility

A 20-GB 9840 VolSafe cartridge, loaded in a T9840C or T9840D tape drive is recognized as file-protected (Ready F), regardless of the cartridge write-protect switch position, and whether the tape drive is VolSafe enabled or not. Therefore, a T9840C or T9840D tape drive reads a 20-GB 9840 VolSafe cartridge, but cannot write to it, even if the tape drive is VolSafe enabled.

Attempts to load a 40-GB 9840C VolSafe cartridge into a T9840A/B tape drive, a 75-GB 9840D VolSafe cartridge into a T9840A/B/C tape drive, or a 200-GB 9940B VolSafe cartridge into a T9940A tape drive results in a load error condition.

TABLE 1-1 correlates T9x40 tape drives to VolSafe cartridge compatibility.

**TABLE 1-1** T9x40 Tape Drive - VolSafe Cartridge Compatibility Matrix

Drive	VolSafe Cartridge			
	9840 (20 GB)	9840C (40 GB)	9840D (75 GB)	9940B (200 GB)
T9840A	Read/Write	Load Error	Load Error	N/A
T9840B	Read/Write	Load Error	Load Error	N/A
T9840C	Read Only	Read/Write	Load Error	N/A
T9840D	Read Only	Read Only	Read/Write	N/A
T9940A <sup>1</sup>	N/A	N/A	N/A	Load Error
T9940B	N/A	N/A	N/A	Read/Write

1. T9940A tape drive is not VolSafe compatible.

## Configurations

**Note** – See Chapter 5, “Information for Ordering” for specific marketing part number availability.

### T9840 Configurations

The **T9840A tape drive** is used in the following configurations:

- Desktop, with a choice of: 1) manual load or 2) cartridge scratch loader (CSL)
- Rack mount, with a choice of: 1) manual load or 2) CSL
- Library attached, see “Library-attached T9x40” on page 17

The **T9840B tape drive** is used in the following configurations:

- Desktop, manual load
- Rack mount, manual load
- Library-attached, see “Library-attached T9x40” on page 17

The **T9840C tape drive** is used in the following configurations:

- Rack mount, manual load



- Library attached, see “Library-attached T9x40” on page 17

The **T9840D tape drive** is used in the following configurations:

- Rack mount, manual load
- Library attached, see “Library-attached T9x40” on page 17

## T9940 Configurations

The **T9940A tape drive** is used in the following configurations:

- Rack mount, manual load, shipboard.
- Library attached, see “Library-attached T9x40” on page 17.

The **T9940B tape drive** is used in the following configurations:

- Rack mount, manual load, shipboard.
- Library attached, see “Library-attached T9x40” on page 17.

## Configuration Details

This section provides a list of available configurations for the various drive models. Library configurations are listed first, followed by rack mount, and finally desktop.

### Library-attached T9x40

The *T9840* tape drive is attached to trays for the following StorageTek libraries:

- 9310 (PowderHorn): Up to 80 tape drives in four 20-drive walls
- 9360 (WolfCreek) (T9840A only): Up to 20 tape drives [**end of support**]
- 9710 (TimberWolf) (T9840A/B only): Up to 10 drives [**end of support**]
- 9738 (TimberWolf) (T9840A only): Up to 3 drives [**end of support**]
- 9740 (TimberWolf) [T9840D is not supported]: Up to 10 tape drives
- L180 Tape Library: Up to 6 tape drives
- L700/L1400 Tape Library: Up to 12 tape drives
- L5510 LSM (L5500 ACS) [T9840D is not supported]: Up to 77 tape drives in four 20-drive walls
- StorageTek SL3000 modular library system (T9840C/D only): Up to 56 tape drives
- StorageTek SL8500 modular library system: Up to 64 tape drives in a single module or up to 640 tape drives in a 10 module library complex

FIGURE 1-3 shows some common configurations of the T9840 tape drive.

**FIGURE 1-3** T9840 Tape Drive Common Configurations

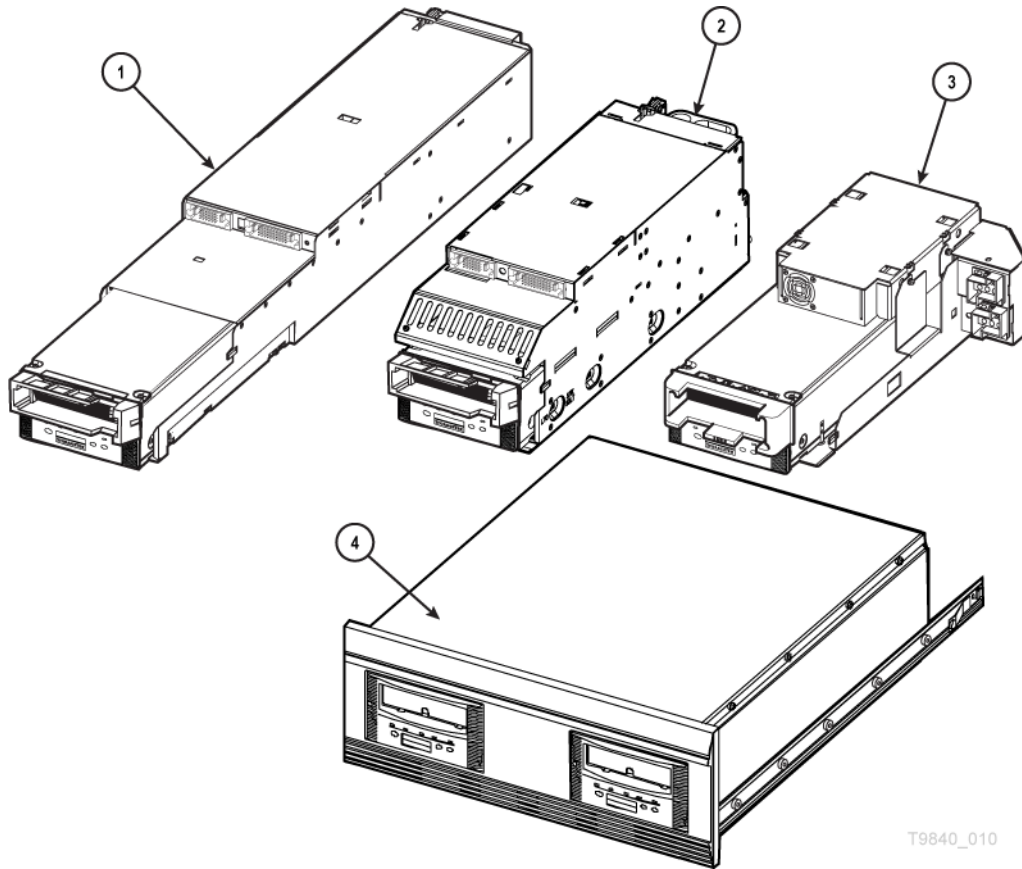


Illustration call-outs:

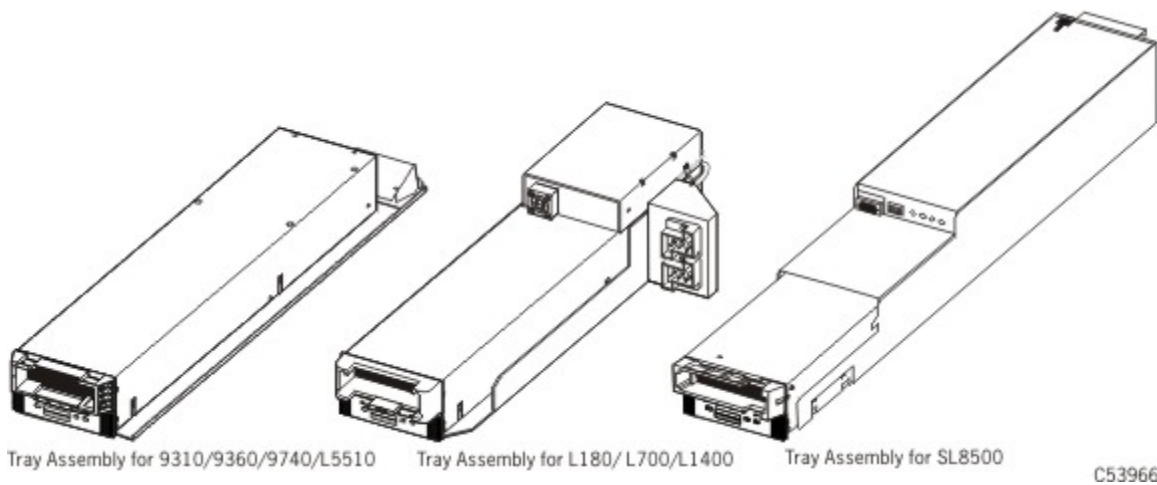
1. SL8500 Drive Tray
2. SL3000 Drive Tray
3. L170/L700/L1400 Drive Tray
4. Rackmount

The *T9940* tape drive is attached to trays for the following StorageTek libraries:

- 9310 (PowderHorn): Up to 80 tape drives in four 20-drive walls
- 9360 (WolfCreek) (T9940A only): Up to 20 tape drives [**end of support**]
- 9740 (TimberWolf): Up to 10 tape drives
- L180 Tape Library (T9940B only when using an expansion door): Up to 6 drives
- L700/L1400 Tape Library: Up to 12 tape drives
- L5510 LSM (L5500 ACS): Up to 77 tape drives in four 20-drive walls
- StorageTek SL8500 modular library system (T9940B only): Up to 64 tape drives in a single module or up to 640 drives in a 10 module library complex

FIGURE 1-4 shows the T9940 tape drive on library trays.

**FIGURE 1-4** T9940 Tape Drive, Library attached



**Notes:**

1. Ordering information for the StorageTek libraries that accept the T9x40 tape drive, including drive cabinet and minimum software requirements, is provided in the system assurance guide for the appropriate library.
2. In the L5500 ACS, the total number of mixed drives, including the Linear Tape Open (LTO) Ultrium tape drives attached to one L5510 LSM is 80 tape drives. The PLM unit, required for LTO drives, blocks three T9x40 power supply slots; therefore, in a mixed 20-drive cabinet, a maximum of 17 tape drive slots are available for T9x40 tape drives.

Additional drive cabinets would also be limited to a maximum 17 slots for T9x40 tape drives, when a PLM is present. However, if the serial TTI (Tape Transport Interface) cable was installed in place of the PLM unit, a second cabinet could have all 20 tape drive slots available for T9x40 tape drives.

While an L5510 LSM could theoretically have up to 77 tape drive slots available for T9x40 tape drives, it will most likely be less. For instance, if four drive cabinets were attached, each with a PLM unit installed, there would be a maximum of 68 drive slots (4 X 17) available for T9x40 tape drives.

The total number of drive cabinets and total mix of T9x40 and LTO tape drives is determined by the site parameters for each library installation.

## Desktop T9840

The desktop configuration of T9840A/B tape drives consist of one manual-load drive and one power supply in a desktop chassis. The T9840A drive can also be contained in a Cartridge Scratch Loader (CSL) desktop chassis.

The operator loads a data cartridge by manually inserting it into the drive loading slot; and, unloads a data cartridge by pressing the Unload switch, then manually removing it from the drive loading slot.

With the T9840A desktop CSL chassis, the operator stacks up to seven data cartridges in the CSL mechanism; the mechanism then loads and unloads the cartridges sequentially. Also, operators can manually load/unload a single data cartridge through the loading slot.

## Rack Mount

The rack mount T9840 drive tray chassis mounts into a 483-mm (19-in.) rack cabinet. The chassis consists of single/dual manual-load tape drives. The T9840A drive can also be configured in a rack mount CSL chassis. Each tray can hold:

- One manual-load drive in position A (T9840A/B/C/D)
- Two manual-load drives, side-by-side, positions A and B (T9840A/B/C/D)
- One CSL chassis (one T9840A drive only)

The rack mount configuration of the T9940 tape drive consists of two manual-load tape drives mounted on a shock absorbing platform in a rack mount tray.

### **Rack Cabinets**

The rack mount configurations of the T9x40 tape drives are designed to fit into a standard 483-mm (19-in.) rack cabinet. If the customer supplies the rack cabinet, make sure that the cabinet is at least 780 mm (30.75 inches) deep. You can mount:

- Up to six T9840 drive trays in any combination of one drive, two drive, or CSL configurations in a single rack cabinet.
- Up to four T9940 rack mount drive trays in single rack cabinet.

T9940 rack mount trays in combination with T9840 and T10000 rack mount trays within the same rack cabinet. Therefore, the tray totals are limited to the following combinations:

**Note** – The total vertical space cannot exceed 24U (106.7 cm / 42.0 inches).

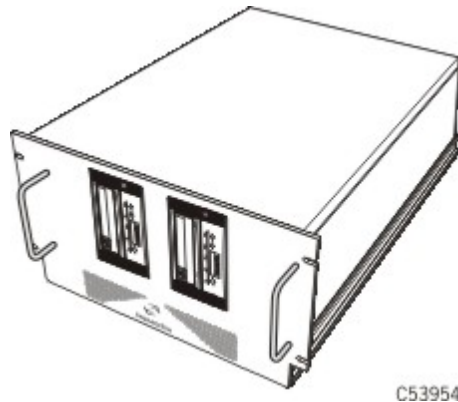
- One T9940 tray and from one to four T9840 or T10000 trays

**Note** – Each T9940 drive tray is 6U (266.7 mm / 10.5 inches). Each T9840 or T10000 drive tray is 4U (177.8 mm / 7.0 inches).

- Two T9940 trays and from one to three T9840 or T10000 trays
- Three T9940 trays and one T9840 or T10000 tray

To supply power to rack mount drive trays in a rack cabinet, you must order one internal AC power cord per drive tray to connect to a power strip mounted in the cabinet.

FIGURE 1-5 shows the T9940 Rack Mount configuration.

**FIGURE 1-5** T9940 Tape Drive, Rack Mount**Power Cords**

The power cord options for the desktop and rack mount T9x40 tape drive are:

- Desktop or rack mount 120 VAC operation in the U.S. and Canada with a 120 VAC three-prong standard plug
- Desktop 250 VAC operation outside the U.S. and Canada with a continental European standard plug
- Rack Mount 250 VAC operation in the U.S. and Canada with either a Hubbell or a Russellstoll plug

**Device Emulation Modes Supported (T9840D)**

- Fibre Channel:
  - T9840D native mode
  - 3490E11 and 3590E11 (AS400 attachments)
  - T9840C (testing only)
- FICON: 3490E11 and 3590H10
- ESCON: 3490E11 and 3590H10

**Interfaces**

The following interface types are available on T9x40 tape drives:

**ESCON**

The ESCON-configured T9x40 tape drives have one ESCON Duplex interface port to connect a 62.5-micron (mm) ESCON Duplex cable.

- The drive emulates a single-port 3490E or 3590 tape drive.
- 128 logical paths.

**Note** – Maximum total non-repeated channel distance for an ESCON tape drive, using a 62.5 micron multimode cable is 3 km (1.86 mile).

## FC

The FC-configured T9x40 tape drives have dual fiber-optic ports to allow for point-to-point, arbitrated-loop (including redundant-loop) and fabric topology.

- T9x40A tape drives use short wavelength transceivers with SC type ports and operate on a 1-Gb channel.
- The T9840B tape drive uses short wavelength transceivers with LC type ports and operate on a 2-Gb channel.
- The T9840C/D and T9940B tape drives use small form-factor pluggable (SFP) transceivers with LC type ports and operate on a 2-Gb channel. The drives support the use of short or long wavelength SFP modules.

See “[Fibre Channel and FICON Cable Facts](#)” on page 23 for information on types of fiber-optic cable and maximum cable lengths.

The FC interface for the T9x40 uses Ultra-SCSI protocol. The FC T9x40 tape drives connect to other devices with the following equipment:

- A hub that connects FC devices to each other in a loop
- A switch that connects FC devices to each other in a fabric

The drive supports connection of both ports, in accordance with ANSI Fibre Channel specifications (ref. InterNational Committee on Information Technology Standards [INCITS] documents: SCSI Primary Commands -3, Section 5.6, and Fibre Channel Protocol -3).

**Note** – The drive will support two hosts, providing that both hosts honor the “reserve/release” and/or the “persistent reserve/release” specifications.

## FICON

Fibre Connection (FICON) is a proprietary channel for IBM processors. T9x40 FICON tape drives can be configured with:

- A single-port, short or long wave transceiver
- Dual-port, short or long wave transceivers; or
- Dual-port, mixed wave (one short wave and one long wave transceiver)

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 T9x40 FICON tape drives, concurrently reading/writing large (64-KB) blocks, can be attached to a single channel.

- Approximately sixteen T9x40 FICON tape drives, concurrently reading/writing small (16-KB) blocks, can be attached to a single channel.

T9x40 FICON drives use small form-factor pluggable (SFP) transceivers.

The drive supports connection of both ports, in accordance with ANSI Fibre Channel specifications (ref. InterNational Committee on Information Technology Standards [INCITS] documents: SCSI Primary Commands -3, Section 5.6, and Fibre Channel Protocol -3).

**Note** – The drive will support two hosts, providing that both hosts honor the “reserve/release” and/or the “persistent reserve/release” specifications.

## Hardware Configuration Definition

Once you have installed FICON drives, you need to set the hardware configuration definition (HCD) for each drive. Go to the White Papers section of the SE Tools website at:

[http://my.oracle.com/site/pd/sss/products/tape/support-tools/WHITE\\_Content/index.html](http://my.oracle.com/site/pd/sss/products/tape/support-tools/WHITE_Content/index.html)

Select the appropriate drive article for HCD information and guidelines.

## Fibre Channel and FICON Cable Facts

T9x40 Fibre Channel and FICON tape drives use Fibre Channel cables.

Use multimode cables when connecting to short wave ports. Multimode cables have an orange jacket, and the fiber within the cable is 50 microns in diameter.

Use single mode cables when connecting to long wave ports. Single mode cables have a yellow jacket, a blue LC connector, and the fiber within the cable is 9 microns in diameter.

### Notes:

1. Maximum total non-repeated channel distance for a short wave 850 nm transceiver 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 a short wave 850 nm transceiver 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 a long wave 1310 nm transceiver using a single mode cable is 10 km (6.21 mi).
4. Single mode cable maximum distances can be extended through an amplifier-repeater unit (RPQ) 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.

## SCSI

The SCSI-configured T9840A/B and T9940A tape drives have two connectors to attach 68-conductor SCSI P-cables. SCSI enables devices to be connected either directly, in a daisy-chain configuration, or in a combination of direct and daisy-chain configurations. Two connectors facilitate daisy-chaining tape drives. The following SCSI equipment may also be required:

- A terminator that connects to the last device in a SCSI daisy chain
- A bridge that connects SCSI devices to an FC network

A maximum of two daisy-chained devices are possible, with the total SCSI cable length of no more than 25 meters (82 feet).

**Note** – SCSI interface T9x40 Tape Drives are only available as used equipment.

SCSI on the T9x40 is either differential, wide ultra, or a lesser implementation. The T9x40 tape drive does not supply terminator power; therefore, the host bus adaptor (HBA) card must supply SCSI terminator power.

## Tape Cartridges and Labels

The following pages describe the 9x40 data cartridges, VolSafe cartridges, cleaning cartridges, and bar-coded volume serial number (VOLSER) labels. See [“Information for Ordering” on page 45](#) to order cartridges and/or labels.

**Note** – Maximum block size is 256 Kilobytes.

## 9840 Cartridge Description

The T9840 tape drives use a cartridge ([FIGURE 1-6 on page 25](#)) that is the same physical size as a 3490 or 9940 data cartridge; however, they are not interchangeable. Three types of cartridges are available: data, VolSafe and cleaning (100 uses maximum).

The media identification labels for 9840 cartridges have unique letters:

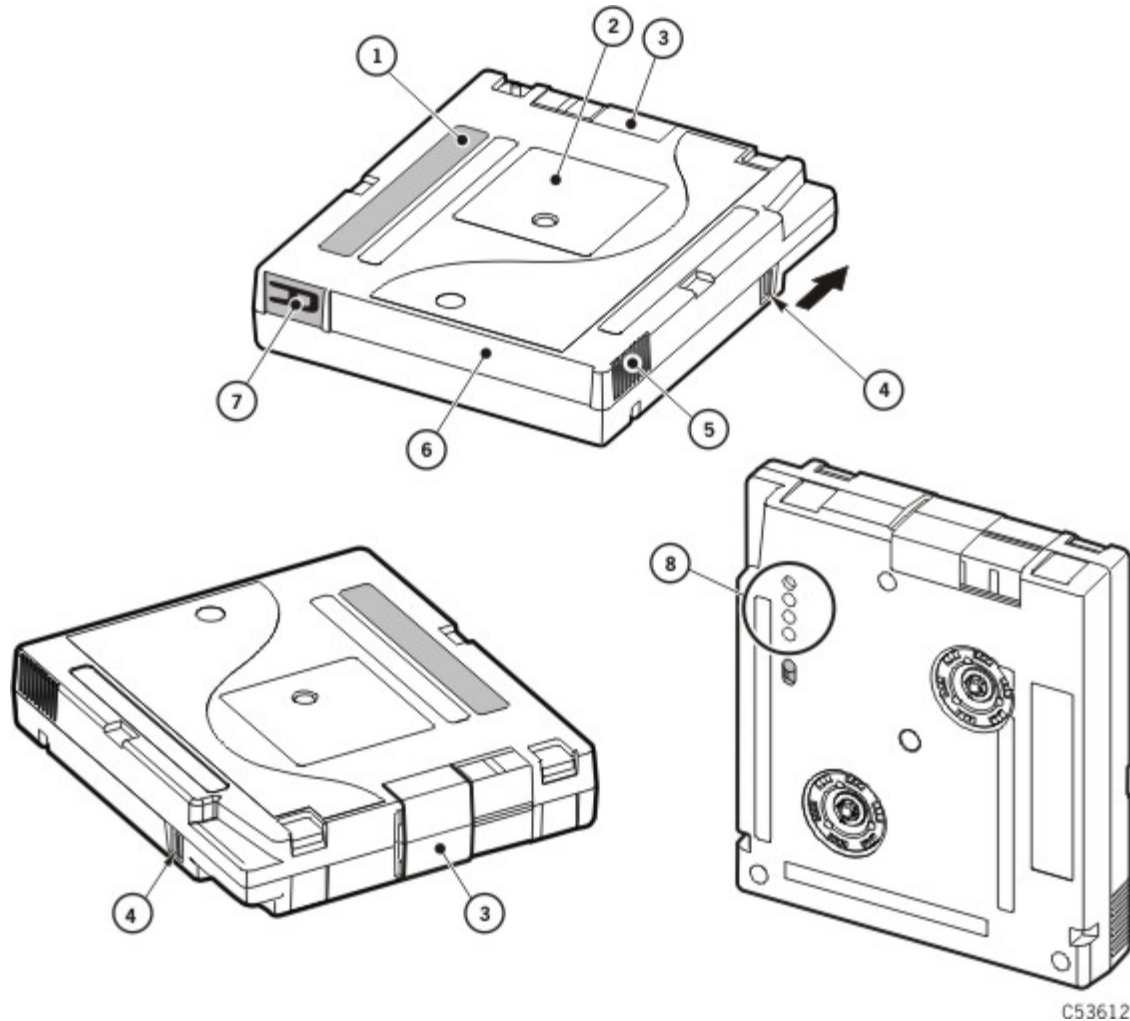
- R 9840 standard data and VolSafe data cartridges
- U 9840 cleaning cartridge (use with T9840A/B/C drives)
- Y 9840D cleaning cartridge (use with T9840D only)

### Data Cartridge

The 9840 data cartridges achieve fast access by having both the supply and takeup reels in the cartridge and by facilitating midpoint loading. The standard data cartridge has an uncompressed capacity of:

- 20 GB when written by T9840A/B tape drives
- 40 GB when written by a T9840C tape drive
- 75 GB when written by a T9840D tape drive



**FIGURE 1-6** 9840 Cartridge


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**Illustration call-outs (8)**

1. Manufacturer Label Area
  2. Customer Label Area
  3. Access Door
  4. Write-protect Switch (black on a standard data cartridge, yellow on a 9840 VolSafe cartridge, green on a 9840C VolSafe cartridge, purple on a 9840D VolSafe cartridge, and white on a cleaning cartridge)
  5. Finger Grip
  6. VOLSER Label Area
  7. Media ID (human & barcode identifiable: R = standard data or VolSafe data cartridges, U = T9840 A/B/C cleaning cartridge, and Y=T9840D cleaning cartridge)
  8. Media ID (machine readable sensor area - first position recessed on a 9840 VolSafe data cartridge, second and fourth positions recessed on a 9840C VolSafe data cartridge, third and fourth positions recessed on a 9840D VolSafe data cartridge, the first three positions recessed on a U-labeled cleaning cartridge, and the second and third positions recessed on the Y-labeled cleaning cartridge)
-

## VolSafe Cartridge

Three variations of the VolSafe data cartridge are available for append-only use:

- 20-GB 9840 VolSafe cartridge, with yellow identifying features
- 40-GB 9840C VolSafe cartridge, with green identifying features
- 75-GB 9840D VolSafe cartridge, with purple identifying features

**Note** – The different VolSafe cartridges are NOT interchangeable (see “Drive - VolSafe Cartridge Compatibility” on page 16).

## Cartridge Reclaim

**Native reclaim:** the ability of a drive to reclaim a cartridge it has previously written.

**Forward reclaim:** the ability of a drive to reclaim a cartridge previously written by a legacy drive. Note that the T9840D is able to reclaim a standard data cartridge previously written by a T9840A, T9840B, or T9840C tape drive.

**Backward reclaim:** the ability of a drive to reclaim a cartridge written by a non-legacy drive. Note that the T9840A and T9840B drives cannot distinguish between T9840C and T9840D formats.

A cartridge written by a T9840D drive that is loaded on a legacy drive that has been given the instruction to write from BOT will be allowed to write on the cartridge provided the write-protect switch allows it and the cartridge is not a VolSafe cartridge.

**Note** – VolSafe cartridges cannot be forward or backward reclaimed.

A VolSafe cartridge containing 25 blocks, or less, that are all tape marks or 80-byte records will be capable of being native reclaimed.

## 9940 Cartridge Description

The T9940 tape drives use a data cartridge (FIGURE 1-7) that is the same physical size as a 9840 and 3490 tape cartridge; however, they are not interchangeable. The 9940 data cartridge has a single reel (supply reel) inside the cartridge.

The 9940 data cartridge has a capacity of 60 GB, uncompressed when written by a T9940A tape drive, or 200 GB when written by a T9940B tape drive. A VolSafe (append only) variation of the data cartridge is available. 9940 cleaning cartridges are also available.

The media identification labels for 9940 cartridges have unique letters:

- P 9940 standard and VolSafe data cartridges
- W 9940 cleaning cartridge

The Media ID sensor area (6 in FIGURE 1-7) is machine-readable by a distinct pattern for each cartridge type. The sensor area is also color coded for visual identification.

## Mixed-Media Management

Extra media management measures must be taken whenever T9x40 tape drives and data cartridges of mixed data density, or mixed Emulation images co-exist in the same library system.

The extra measures essentially involve creation and management of separate media pools/sub-pools for formatted/written 9x40 data cartridges. Guidelines for creation and maintenance of media pools/sub-pools are located in ACSLS, HSC, and independent software vendor (ISV) documentation sets.

**FIGURE 1-7** 9940 Cartridge

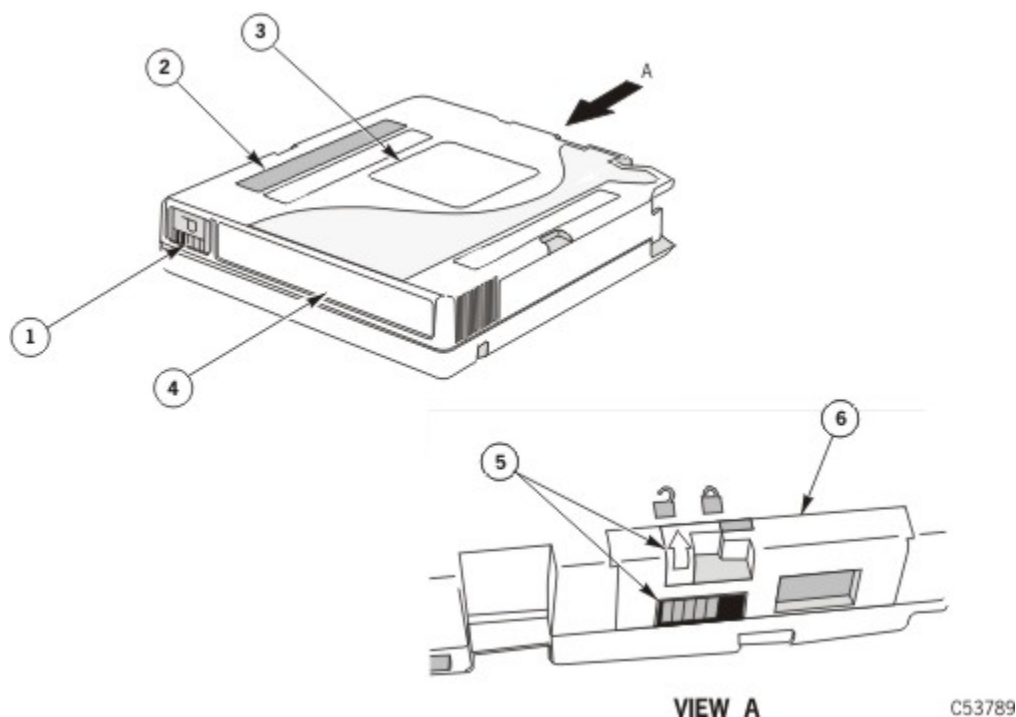


Illustration call-outs (6):

1. Media ID (human & barcode identifiable, yellow background on a VolSafe cartridge, P = standard data or VolSafe data cartridge, W= cleaning cartridge)
2. Manufacturer Label Area (yellow background on a VolSafe cartridge)
3. Customer Label Area
4. VOLSER Label Area
5. Write-protect Switch
6. Media ID, machine readable sensor area (black on a standard data cartridge, yellow on a VolSafe cartridge, or white on a cleaning cartridge)

## Mixed Data Density

Since all T9840 tape drive models use the same 9840 data cartridge, and both T9940 tape drive models use the same 9940 data cartridge, extra media management measures must be taken because low density tape drives (T9840A/B and T9940A) cannot read data from a data cartridge written in the high-density format by T9840C,

T9840D, and T9940B tape drives. The low density tape drives must also have an appropriate drive firmware level, as listed below, to even identify a high-density data cartridge:

- T9840A
  - R1.33.103 or higher to identify a cartridge written by a T9840C drive
  - R1.41.104 or higher to identify a cartridge written by a T9840D drive
- T9840B
  - R1.33.303 or higher to identify a cartridge written by a T9840C drive
  - R1.41.304 or higher to identify a cartridge written by a T9840D drive
- T9840C: R1.41.504 or higher to identify a cartridge written by a T9940D drive
- T9940A: R1.32.215 or higher to identify a cartridge written by a T9940B drive

**Caution – Data Loss.** A low-density tape drive, without the appropriate firmware level, would consider a high-density format cartridge blank and available for scratch or would overwrite data if a write command is issued with the tape positioned at block zero. Use media pools/sub-pools and the appropriate drive firmware level.

The high-density tape drives can read data from a cartridge written by low-density format tape drives. However, the high-density tape drive cannot append data to a low-density data cartridge. An attempt to append a low-density data cartridge on a high-density tape drive will fail, with sense byte data indicating an error, similar to that of a file-protected data cartridge.

**Note –** For additional information about mixed-media management, refer to Cross-Density MIR Processing in the *T9840 Tape Drive User's Reference Manual* and the *T9940 Tape Drive Operator's Guide*.

**TABLE 1-2** Data Cartridge Read, Write Append Matrix

Data Cartridge	Read With				Mid- or End-Volume Append With			
	T9840D	T9840C	T9840B	T9840A	T9840D	T9840C	T9840B	T9840A
Written by T9840D	Yes	No	No	No	Yes	No	No	No
Written by T9840C	Yes	Yes	No	No	No	Yes	No	No
Written by T9840B	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Written by T9840A	Yes	Yes	Yes	Yes	No	No	Yes	Yes

## Mixed Emulation Image

Extra media management measures must also be taken when a mix of T9x40 tape drives with 3490 and 3590 Emulation images co-exist in the same library system.

- Data cartridges written by T9x40 tape drives running with 3590 Emulation image are not readable by T9x40 tape drives running with 3490 Emulation image.
- Data cartridges written by T9x40 tape drives running with 3490 Emulation image are readable by T9x40 tape drives running with 3590 Emulation image, but cannot be written by the 3590 Emulation image tape drive.

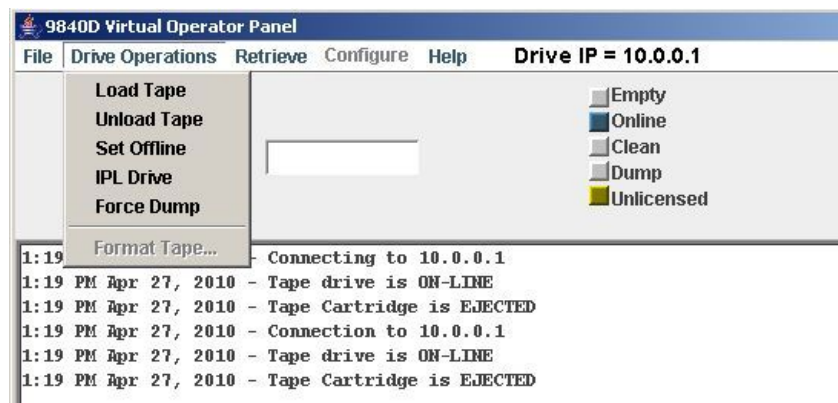
Guidelines for creation and maintenance of media pools/sub-pools are located in HSC and independent software vender (ISV) documentation sets.

## Virtual Operator Panel

FIGURE 1-8 shows an example of the virtual operator panel (VOP) graphical user interface (GUI) for the T9840D tape drive. The VOP enables operators and service representatives to monitor and perform tasks on a single 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.

FIGURE 1-8 Virtual Operator Panel





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## System Assurance

The system assurance process is the exchange of information among team members to assure that no aspects of the sale, order, installation, and implementation for the StorageTek T9x40 tape drive are overlooked. The system assurance team members ensure that all aspects of the process are planned carefully and performed efficiently to promote an error-free installation and contribute to overall customer satisfaction.

This process begins when the customer accepts the sales proposal.

### System Assurance Planning Meetings

The purpose of the system assurance planning meetings is to:

- Introduce the customer to the T10000 tape drive
- Explain the system assurance process and establish a 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 Task Checklist

<b>Task</b>	<b>Completed?</b>
Introduce the Oracle team to the customer.	Yes ___ No ___
Describe the tape drive to the team members.	Yes ___ No ___
Complete the team member contact sheets in this chapter.	Yes ___ No ___
Review <a href="#">Chapter 3, “Library Firmware/Host Software”</a> and complete the checklists.	Yes ___ No ___
Review <a href="#">Chapter 4, “Preinstallation Checklists”</a> and complete the checklists.	Yes ___ No ___
Does the customer want encryption-enabled tape drives? Note: Refer to the Key Management Station guide for information.	Yes ___ No ___
Order the tape drive, cables, and cartridges (see <a href="#">Chapter 5, “Information for Ordering”</a> ).	Yes ___ No ___
Determine the installation schedule:	Yes ___ No ___
Date: _____ Time: _____	



# Customer Team Member Contact Sheet

Complete the following with information about 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:** \_\_\_\_\_

## Client Processor Teams

List names and telephone numbers of the following client processor team personnel:

### CPU Hardware Vendor Contacts

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

### CPU Software Vendor Contacts

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

Name: \_\_\_\_\_ Vendor: \_\_\_\_\_

Office: \_\_\_\_\_ Fax: \_\_\_\_\_ e-mail: \_\_\_\_\_

# Oracle Team Member Contact Sheet

Complete the following with information about the team members. (Members may include: marketing and sales representatives, installation coordinator, systems engineers (SEs), and service representatives.)

**Name:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Telephone Number:** \_\_\_\_\_

**FAX Number:** \_\_\_\_\_

**Cell Phone / Pager:** \_\_\_\_\_

**E-mail Address:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Telephone Number:** \_\_\_\_\_

**FAX Number:** \_\_\_\_\_

**Cell Phone / Pager:** \_\_\_\_\_

**E-mail Address:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Telephone Number:** \_\_\_\_\_

**FAX Number:** \_\_\_\_\_

**Cell Phone / Pager:** \_\_\_\_\_

**E-mail Address:** \_\_\_\_\_

**Name:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Telephone Number:** \_\_\_\_\_

**FAX Number:** \_\_\_\_\_

**Cell Phone / Pager:** \_\_\_\_\_

**E-mail Address:** \_\_\_\_\_



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## Library Firmware/Host Software

When you are adding new/used T9x40 tape drive models to existing libraries, you must verify that library firmware level and host software release levels support the new drive models.

### Library Firmware

For library configurations, determine the customer's existing library firmware level, and compare it with the currently available library firmware:

Update library firmware as required to support incoming drive models.

### Host Software Configuration

The T9x40 tape drives operate with MVS, UNIX, or Windows NT platforms. Certification with these platforms and host-based applications is an ongoing process. For up-to-date information about platforms and applications, see the Tape Device Software area at the following URL:

<http://www.oracle.com/us/products/servers-storage/storage/tape-storage/index.html>

### T9x40-Supported Software

Depending upon the host platform and the type of interface, T9x40 tape drives are subject to one the following software application groups:

- Nearline Control Solutions (NCS), which includes:
- Host Software Component (HSC)

**Note** – In HSC, implementation of VolSafe requires definition of esoteric names and cartridge tape subpools. Refer to the *VolSafe Software Information Guide* Release 2.0.

- Multiple Virtual Storage/Client System Component (MVS/CSC)
- LibraryStation

Use [TABLE 3-1 on page 38](#) to record the customer's current NCS software configuration against obtained requirements.

- Automated Cartridge System Library Software (ACSLS)  
Use [TABLE 3-2 on page 39](#) to record the customer’s current ACSLS software configuration against obtained requirements.
- Removable Media Library Software (RMLS)  
Use [TABLE 3-3 on page 39](#) to record the customer’s current RMLS/CSC software configuration against obtained requirements.

## Software Configuration Worksheets

Record the customer’s NCS software configuration in [TABLE 3-1](#).

**TABLE 3-1** NCS Software Configuration Worksheet

Item	Processor 1		Processor 2	
	Existing	Required	Existing	Required
Operating system and version or release level				
DFP maintenance level				
Backup/recovery software				
Archival/migration software				
Additional information				

Record the customer's ACSLS software configuration in [TABLE 3-2](#).

**TABLE 3-2** ACSLS Software Configuration Worksheet

Item	Processor 1		Processor 2	
	Existing	Required	Existing	Required
Operating system vendor				
Driver software				
Backup/restore software				
Archival/migration software				
Performance monitoring software				
Data compression software				
Additional information				

Record the customer's RMLS software configuration in [TABLE 3-3](#).

**TABLE 3-3** RMLS Software Configuration Worksheet

Item	Processor 1		Processor 2	
	Existing	Required	Existing	Required
Operating system vendor				
Driver software				
Backup/restore software				
Archival/migration software				
Performance monitoring software				
Data compression software				
Additional information				





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## Preinstallation Checklists

This chapter provides checklists that the system assurance team should complete before the delivery and installation of the equipment.

### Predelivery Checklist

TABLE 4-1 lists issues that should be addressed and resolved before equipment delivery. Circle “Yes” or “No” for each item. For unresolved issues, assign an action and a due date to a system assurance team member.

**TABLE 4-1** Predelivery Checklist

Item Description	Yes/No	Action Required/Due Date/ Person Responsible
<i>Site Preparation</i>		
Floor plans completed	Yes/No	
Clearance adequate	Yes/No	
Cooling adequate	Yes/No	
Cleanliness acceptable <sup>1</sup>	Yes/No	
Power requirements met	Yes/No	
Cable lengths determined	Yes/No	
Cable routing established	Yes/No	
Future expansion considered	Yes/No	
Dock facilities scheduled	Yes/No	
<i>Hardware Procurement</i>		
Options or features ordered	Yes/No	
Power cables ordered	Yes/No	
Interface cables ordered	Yes/No	
Interface adapters ordered	Yes/No	
Tapes and labels ordered	Yes/No	

1. See “Airborne Contamination” on page 65 for additional information.

**TABLE 4-1** Predelivery Checklist (Continued)

<b>Item Description</b>	<b>Yes/No</b>	<b>Action Required/Due Date/ Person Responsible</b>
<i>Software Procurement</i>		
Software prerequisites met	Yes/No	
<i>Software Installation</i>		
Scheduled	Yes/No	
Completed	Yes/No	
<i>JCL Changes</i>		
Scheduled	Yes/No	
Completed	Yes/No	
<i>I/O Generation Changes</i>		
Scheduled	Yes/No	
Completed	Yes/No	
<i>Mixed-media Subpools</i>		
Scheduled	Yes/No	
Completed	Yes/No	
<i>Hardware Installation</i>		
Delivery schedule completed	Yes/No	
Dock hours scheduled	Yes/No	
Pre-staging area set	Yes/No	
Installation team identified	Yes/No	
Site access arranged	Yes/No	
Installation hours defined	Yes/No	
1. See <a href="#">“Airborne Contamination”</a> on page 65 for additional information.		

# Delivery and Handling Information

TABLE 4-2 provides a place to record delivery information.

**TABLE 4-2** Delivery and Handling Information

Yes	No	Considerations/Conditions
<input type="checkbox"/>	<input type="checkbox"/>	Is a receiving dock available? If yes, what is the maximum truck length allowed? 12 m / 40 ft____ 14 m / 45 ft____ 15 m / 48 ft____ other____ If yes, what is the maximum truck height? _____ If yes, what is the dock height in inches? _____
<input type="checkbox"/>	<input type="checkbox"/>	Are there any physical impediments to dock use? If yes, list here: _____ _____ _____
<input type="checkbox"/>	<input type="checkbox"/>	Are there any street or alley limitations to dock use? If yes, list here: _____ _____ _____
<input type="checkbox"/>	<input type="checkbox"/>	Are there any days or times when dock hours are controlled or the dock is unavailable? If yes, list here: _____ _____ _____
<input type="checkbox"/>	<input type="checkbox"/>	Will any stairs need to be negotiated? If yes, list here: _____ _____ _____
<input type="checkbox"/>	<input type="checkbox"/>	Will an elevator be used? What are the approved hours for elevator use? _____
<input type="checkbox"/>	<input type="checkbox"/>	Is protective floor covering required? If yes, who will provide the necessary materials and labor? _____ _____
<input type="checkbox"/>	<input type="checkbox"/>	Are transport aids available (cart, hand truck, dolly)? _____ _____

## Access and Administrative Issues

The worksheet in [TABLE 4-3](#) identifies access restrictions to the computer room and addresses other administrative issues.

**TABLE 4-3** Access and Administrative Issues

Yes	No	Considerations/Conditions
<input type="checkbox"/>	<input type="checkbox"/>	<p>Are there physical or statutory limitations of access to the area in which this customer delivery site is located?</p> <p>If yes, list the limited hours here:</p> <p>_____</p> <p>_____</p>
<input type="checkbox"/>	<input type="checkbox"/>	<p>Are there local codes that specify equipment clearances?</p> <p>If yes, list here:</p> <p>_____</p> <p>_____</p>
<input type="checkbox"/>	<input type="checkbox"/>	<p>What ID badges are required to gain access to the customer facility if an outside installer is used?</p> <p>List a point of contact to acquire the required ID badges or to get on appropriate access lists.</p> <p>_____</p> <p>_____</p>
<input type="checkbox"/>	<input type="checkbox"/>	<p>Are there any union or local regulations that would prevent an outside installer from performing any activities?</p> <p>If yes, explain here:</p> <p>_____</p> <p>_____</p>
<input type="checkbox"/>	<input type="checkbox"/>	<p>Does the carrier need to belong to a union?</p> <p>If yes, which union?</p> <p>_____</p>
<input type="checkbox"/>	<input type="checkbox"/>	<p>Is there a secure area where test equipment, spare parts and documentation can be stored? If yes, note the location.</p> <p>_____</p> <p>_____</p>

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## Information for Ordering

Use this chapter to help order cables, tape drive conversion kits, an encryption key, and media for the T9x40 tape drive.

- [“Cable Order Numbers” on page 52](#)
- [“Conversion Bills/Kits” on page 57](#)

Use conversion bills to obtain the necessary parts to:

- Add a second drive to a rack chassis.
- Change the type of SFP module in the drive.
- Transfer a drive from one library model to a different library model.
- [“Encryption Feature” on page 59](#)
- [“Ordering Media and Labels” on page 60](#)

### Tape Drive Order Numbers for Libraries

Tape drive order numbers are provided as reference information only:

- [“T9840 Library Attached Tape Drives”](#)
- [“T9940 Library Attached Tape Drives” on page 48](#)
- [“Desktop and Rack Mount Tape Drive” on page 50](#)

### T9840 Library Attached Tape Drives

- [TABLE 5-1, “T9840D Library Configuration \(Used\) Marketing PNs” on page 46](#)
- [TABLE 5-2, “T9840C \(Used\) ROHS Compliant Marketing PNs” on page 47](#)
- [TABLE 5-3, “T9840C \(Used\) Non-ROHS Marketing PNs” on page 47](#)
- [TABLE 5-4, “T9840B \(Used\) Non-ROHS Marketing PNs” on page 48](#)

**TABLE 5-1** T9840D Library Configuration (Used) Marketing PNs

Description	Marketing PN
T9840D, FICON, 9310 <sup>1</sup> , 9741 <sup>2</sup> , and 9741E drive cabinets	9840D-FI-9310Z-N <sup>5</sup>
Single port long wave	X984/T10K-2GB-LW-N
Single port short wave	X984/T10K-2GB-SW-N
Dual port long wave	(2x) X984/T10K-2GB-LW-N
Dual port mixed wave	X984/T10K-2GB-LW-N and X984/T10K-2GB-SW-N
Dual port short wave	(2x) X984/T10K-2GB-SW-N
T9840D, Fibre Channel, 9310 <sup>1</sup> , 9741 <sup>2</sup> and 9741E drive cabinets	9840D-FC-9310Z-N <sup>5</sup>
<b>Note</b> – You must also order an SFP conversion kit. See the X984/T10K numbers listed above for the FICON drive.	
<b>L180/700e/1400M Library</b>	
T9840D, FICON, L180/L700/L1400 <sup>1</sup>	9840D-FI-L1400Z-N <sup>5</sup>
T9840D, Fibre Channel, L700/L1400 <sup>1</sup>	9840D-FC-L1400Z-N
<b>Note</b> – You must order an SFP conversion kit for FICON or Fibre Channel drives. See the X984/T10K numbers in the 9310 section above for the T9840D, FICON drive.	
<b>SL3000 Library</b>	
T9840D FICON dual-port long-wave <sup>4</sup> , SL3000	9840D-FI-S30-2PL-N <sup>5</sup>
T9840D, Fibre Channel dual-port short-wave <sup>3</sup> , SL3000	9840D-FC-S30-2PS-N <sup>5</sup>
<b>SL8500 Library</b>	
T9840D, FICON dual-port long-wave <sup>4</sup> , SL8500	9840D-FIDPLW-85Z-N <sup>5</sup>
T9840D, Fibre Channel dual-port short-wave <sup>3</sup>	9840D-FCDPSW-85Z-N <sup>5</sup>
<ol style="list-style-type: none"> <li>Interface transceivers (SFP modules) do not ship with the tape drive for the identified library. A complete order consists of a tape drive number plus a port conversion kit (a number beginning with an X).</li> <li>9741 cabinet with the louvered rear door requires EMI pad (FB 101201) to operate FC/FICON drives.</li> <li>Short wave (SW) ports require 50/125 micron cables.</li> <li>Long wave (LW) ports require 9/125 micron cables.</li> <li>Port conversion kits are available to change the drive to SW, LW, or mixed port wavelength (MW). See <a href="#">“T9x40 Common Conversion Bills (ROHS Compliant) - No Longer Available”</a> on page 59.</li> </ol>	

**TABLE 5-2** T9840C (Used) ROHS Compliant Marketing PNs

Description	Marketing PN
Library Attached:	
ESCON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-ES-9310Z-N
ESCON, L180/L700/L1400	Y9840C-ES-L700Z-N
ESCON, SL8500	Y9840C-ES-SL85Z-N
Fibre Channel, 2Gb, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-FC-9310Z-N
Fibre Channel, 2Gb, L180/L700/L1400	Y9840C-FC-L700Z-N
Fibre Channel, 2Gb, SL8500	Y9840C-FC-SL85Z-N
FICON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-FI-9310Z-N
FICON, L180/L700/L1400	Y9840C-FI-L700Z-N
FICON, SL8500, SPSW (single-port short-wave <sup>2</sup> )	Y9840C-FIS85-1PS-N
FICON, SL8500, DPSW (dual-port short-wave <sup>2</sup> )	Y9840C-FIS85-2PS-N
FICON, SL8500, SPLW (single-port long-wave <sup>3</sup> )	Y9840C-FIS85-1PL-N
FICON, SL8500, DPLW (dual-port long-wave <sup>3</sup> )	Y9840C-FIS85-2PL-N
FICON, SL8500, DPMW (dual-port mixed-wave <sup>2,3</sup> )	Y9840C-FIS85-2PM-N
<b>Notes:</b>	
1. 9741 cabinet with louvered rear door requires EMI pad (FB 101201) to operate FC/FICON drives.	
2. Short wave ports require 50/125 micron cables.	
3. Long wave ports require 9/125 micron cables.	

**TABLE 5-3** T9840C (Used) *Non-ROHS* Marketing PNs

Description	Marketing PN
Library Attached:	
ESCON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-ES-9310-N
ESCON, L180/L700/L1400	Y9840C-ES-L700-N
ESCON, SL8500	Y9840C-ES-SL85-N
Fibre Channel, 2Gb, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-FC-9310-N
Fibre Channel, 2Gb, L180/L700/L1400	Y9840C-FC-L700-N
Fibre Channel, 2Gb, SL8500	Y9840C-FC-SL85-N
FICON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840C-FI-9310-N
FICON, L180/L700/L1400	Y9840C-FI-L700-N
FICON, SL8500, SPSW (single-port short-wave <sup>2</sup> )	Y9840CFI-S85-1PS-N
FICON, SL8500, DPSW (dual-port short-wave <sup>2</sup> )	Y9840CFI-S85-2PS-N
FICON, SL8500, SPLW (single-port long-wave <sup>3</sup> )	Y9840CFI-S85-1PL-N
FICON, SL8500, DPLW (dual-port long-wave <sup>3</sup> )	Y9840CFI-S85-2PL-N

**TABLE 5-3** T9840C (Used) *Non-ROHS* Marketing PNs (Continued)

Description	Marketing PN
FICON, SL8500, DPMW (dual-port mixed-wave <sup>2,3</sup> )	Y9840CFI-S85-2PM-N

**Notes:**

- 9741 cabinet with louvered rear door requires EMI pad (FB 101201) to operate FC/FICON drives.
- Short wave ports require 50/125 micron cables.
- Long wave ports require 9/125 micron cables.

**TABLE 5-4** T9840B (Used) *Non-ROHS* Marketing PNs

Description	Marketing PN
ESCON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840B-ES-9741X-N
ESCON, L180/L700/L1400	Y9840B-ES-L700-N
ESCON, SL8500	Y9840B-ES-SL8500-N
Fibre Channel, 2Gb, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840B-FC-9741X-N
Fibre Channel, 2Gb, SL8500	Y9840B-FC-SL8500-N
FICON, 9310/9740/L5500, 9741 <sup>1</sup> and 9741E drive cabinets	Y9840B-FI-9741X-N
FICON, L180/L700/L1400	Y9840B-FI-L700-N
FICON, SL8500, DPLW (dual-port long-wave <sup>2</sup> )	Y9840B-FI-S85-2PL-N

**Notes:**

- 9741 cabinet with louvered rear door requires EMI pad (FB 101201) to operate FC/FICON drives.
- Long wave ports require 9/125 micron cables.

## T9940 Library Attached Tape Drives

- [TABLE 5-5, “T9940B \(Used\) ROHS Compliant Marketing PNs” on page 48](#)
- [TABLE 5-6, “T9940B \(Used\) Non-ROHS Marketing PNs” on page 49](#)
- [TABLE 5-7, “T9940A \(Used\) Non-ROHS Marketing PNs” on page 50](#)

**TABLE 5-5** T9940B (Used) ROHS Compliant Marketing PNs

Description	Marketing PN
Library Attached:	
ESCON, 9310/9740 <sup>3</sup> /L5500, 9741 and 9741E drive cabinets <sup>5</sup>	Y9940B-ES-9310Z-N
ESCON, L180 <sup>4</sup> /L700/L1400 <sup>5</sup>	Y9940B-ES-L700Z-N
ESCON, SL8500	Y9940B-ES-SL85Z-N
Fibre Channel, 2Gb, 9310/97403/L5500, 9741 and 9741E drive cabinets	Y9940B-FC-9310Z-N
Fibre Channel, 2Gb, L1804/L700/L1400	Y9940B-FC-L700Z-N
Fibre Channel, 2Gb, SL8500	Y9940B-FC-SL85Z-N
FICON, 9310/9740 <sup>3</sup> /L5500, 9741 and 9741E drive cabinets <sup>5</sup>	Y9940B-FI-9310Z-N
Single port long wave	X98/T10K-2GB-LW-N



**TABLE 5-5** T9940B (Used) ROHS Compliant Marketing PNs (Continued)

Description	Marketing PN
Single port short wave	X98/T10K-2GB-SW-N
Dual port long wave	(2x) X98/T10K-2GB-LW-N
Dual port mixed	X98/T10K-2GB-LW-N and X98/T10K-2GB-SW-N
Dual port short wave	(2x) X98/T10K-2GB-SW-N
FICON, L180 <sup>4</sup> /L700/L1400 <sup>5</sup>	Y9940B-FI-L700Z-N
FICON, SL8500, SPSW (single-port short-wave <sup>1</sup> )	Y9940B-FI1PS-S85-N
FICON, SL8500, DPSW (dual-port short-wave <sup>1</sup> )	Y9940B-FI2PS-S85-N
FICON, SL8500, SPLW (single-port long-wave <sup>2</sup> )	Y9940B-FI1PL-S85-N
FICON, SL8500, DPLW (dual-port long-wave <sup>2</sup> )	Y9940B-FI2PL-S85-N
FICON, SL8500, DPMW (dual-port mixed-wave <sup>1,2</sup> )	Y9940B-FI2PM-S85-N

**Notes:**

1. Short wave ports require 50/125 micron fiber optic cables.
2. Long wave ports require 9/125 micron fiber optic cables.
3. 9740 library requires serial (RS-423/RS-232) control path to operate T9940B drives.
4. L180 library drive bay requires an expanded rear door to accept T9940B drives.
5. You must also order an SFP kit - see the X98/T10K numbers listed under FICON for the 9310.

**TABLE 5-6** T9940B (Used) *Non-ROHS* Marketing PNs

Description	Marketing PN
Library Attached:	
ESCON, 9310/9740 <sup>3</sup> /L5500, 9741 and 9741E drive cabinets	Y9940B-ES-9310-N
ESCON, L180 <sup>4</sup> /L700/L1400	Y9940B-ES-L700-N
ESCON, SL8500	Y9940B-ES-SL85-N
Fibre Channel, 2Gb, 9310/9740 <sup>3</sup> /L5500, 9741 and 9741E drive cabinets	Y9940B-FC-9310-N
Fibre Channel, 2Gb, L180 <sup>4</sup> /L700/L1400	Y9940B-FC-L700-N
Fibre Channel, 2Gb, SL8500	Y9940B-FC-SL85-N
FICON, 9310/97403/L5500 <sup>5</sup> , 9741 and 9741E drive cabinets	Y9940B-FI-9310-N
FICON, L1804/L700/L1400 <sup>5</sup>	Y9940B-FI-L700-N
FICON, SL8500, SPSW (single-port short-wave <sup>1</sup> )	Y9940BFI-1PS-S85-N
FICON, SL8500, DPSW (dual-port short-wave <sup>1</sup> )	Y9940BFI-2PS-S85-N
FICON, SL8500, SPLW (single-port long-wave <sup>2</sup> )	Y9940BFI-1PL-S85-N
FICON, SL8500, DPLW (dual-port long-wave <sup>2</sup> )	Y9940BFI-2PL-S85-N
FICON, SL8500, DPMW (dual-port mixed-wave <sup>1,2</sup> )	Y9940BFI-2PM-S85-N

**TABLE 5-6** T9940B (Used) *Non-ROHS* Marketing PNs (Continued)

Description	Marketing PN
<b>Notes:</b>	
1. Short wave ports require 50/125 micron fiber optic cables.	
2. Long wave ports require 9/125 micron fiber optic cables.	
3. 9740 library requires serial (RS-423/RS-232) control path to operate T9940B drives.	
4. L180 library drive bay requires an expanded rear door to accept T9940B drives.	
5. You must also order an SFP kit. See the Y9x40 numbers listed in <a href="#">TABLE 5-5 on page 48</a> .	

**TABLE 5-7** T9940A (Used) *Non-ROHS* Marketing PNs

Description	Marketing PN
Library Attached:	
ESCON, 9310, 9741E drive cabinet	Y9940A-ES-9741E-N
Fibre Channel, 1Gb, 9741E drive cabinet	Y9940A-FC-9741E-N

## Desktop and Rack Mount Tape Drive

Use this section to determine the order numbers for the purchase of T9840 or T9940 desktop and rack mount drives:

- [“T9840 Rack Mount and Desktop Drives”](#)
- [“T9940 Rack Mount Drives” on page 51](#)

## T9840 Rack Mount and Desktop Drives

**Note** – Conversion kits are available to add a second drive ([“T9840D Rackmount Conversion Bills \(No Longer Available\)” on page 58](#)) or to change the port type ([“T9x40 Common Conversion Bills \(ROHS Compliant\) - No Longer Available” on page 59](#)). Both drive ports must be either short wavelength (SW) or long wavelength (LW).

**TABLE 5-8** T9840 Non-library Drives - No Longer Available (Sheet 1 of 2)

Description	Marketing Part Number
<b>Rack Mount: T9840D (Used)</b>	
FICON, single drive, DPLW (dual-port long-wave <sup>1</sup> )	9840D-FIDPLW1RKZ-N
Fibre Channel, single drive, DPSW (dual-port short-wave <sup>2</sup> )	9840D-FCDPSW1RKZ-N
Rack Mount: T9840C (Used) ROHS Compliant	
ESCON, single drive	Y9840C-ES-RK1Z-N
ESCON, dual drive	Y9840C-ES-RK2Z-N

**Notes:**

1. Long wave ports require 9/125 micron fiber optic cables.
2. Short wave ports require 50/125 micron fiber optic cables.

**TABLE 5-8** T9840 Non-library Drives - No Longer Available (Sheet 2 of 2)

Description	Marketing Part Number
Fibre Channel, 2Gb, single drive	Y9840C-FC-RK1Z-N
Fibre Channel, 2Gb, dual drive	Y9840C-FC-RK2Z-N
FICON, single drive, DPLW (dual-port long-wave <sup>1</sup> )	Y9840C-FIRK1-2PL-N
FICON, dual drive, DPLW (dual-port long-wave <sup>1</sup> )	Y9840C-FIRK2-2PL-N
FICON, single drive, DPSW (dual-port short-wave <sup>2</sup> )	Y9840C-FIRK1-2PS-N
FICON, dual drive, DPSW (dual-port short-wave <sup>2</sup> )	Y9840C-FIRK2-2PS-N
<b>Rack Mount: T9840C (Used) Non-ROHS</b>	
ESCON, single drive	Y9840C-ES-RK1-N
ESCON, dual drive	Y9840C-ES-RK2-N
Fibre Channel, 2Gb, single drive	Y9840C-FC-RK1-N
Fibre Channel, 2Gb, dual drive	Y9840C-FC-RK2-N
FICON, single drive, DPSW (dual-port short-wave <sup>2</sup> )	Y9840CFI-RK1-2PS-N
FICON, dual drive, DPSW (dual-port short-wave <sup>2</sup> )	Y9840CFI-RK2-2PS-N
FICON, single drive, DPLW (dual-port long-wave <sup>1</sup> )	Y9840CFI-RK1-2PL-N
FICON, dual drive, DPLW (dual-port long-wave <sup>1</sup> )	Y9840CFI-RK2-2PL-N
<b>Desktop: T9840B (Used) Non-ROHS</b>	
Fibre Channel, 2Gb	Y9840B-FC-DESK-N
<b>Rack Mount: T9840B (Used) Non-ROHS</b>	
ESCON, single drive	Y9840B-ES-RK-1DR-N
ESCON, dual drive	Y9840B-ES-RK-2DR-N
Fibre Channel, 2Gb, single drive	Y9840B-FC-RK-1DR-N
Fibre Channel, 2Gb, dual drive	Y9840B-FC-RK-2DR-N
<b>Notes:</b>	
1. Long wave ports require 9/125 micron fiber optic cables.	
2. Short wave ports require 50/125 micron fiber optic cables.	

## T9940 Rack Mount Drives

**TABLE 5-9** T9940 Non-library Drives (No Longer Available)

Description	Marketing Part Number
Rack Mount: T9940B (No Longer Available) ROHS Compliant	
Fibre Channel, 2Gb, dual drive, shipboard ruggedized	Y9940B-FC-RK-SHZ-N
Rack Mount: T9940B (No Longer Available) Non-ROHS	
Fibre Channel, 2Gb, dual drive, shipboard ruggedized	Y9940B-FC-RK-SH-N

## Cable Order Numbers

If you have answers to the following questions, the task of ordering cables becomes much easier:

---

What host interface is used?	<input type="checkbox"/> FICON <input type="checkbox"/> ESCON <input type="checkbox"/> Fibre Channel <input type="checkbox"/> SCSI (used equipment only)
If FICON or Fibre Channel, how many drive ports will be connected to the host?	<input type="checkbox"/> 1 port <input type="checkbox"/> 2 port <sup>1</sup>
If FICON or Fibre Channel, what type of interface transceiver is being used?	<input type="checkbox"/> Long wavelength <sup>2</sup> <input type="checkbox"/> Short wavelength <sup>3</sup>
If FICON or Fibre Channel, what type of cable is required?	<input type="checkbox"/> Single mode <input type="checkbox"/> Multimode <sup>4</sup>
What type of connector is present on the FICON or Fibre Channel tape drive?	<input type="checkbox"/> LC <input type="checkbox"/> SC (T9840A or T9940A)
What type of connector is present on the non-tape drive end of the cable?	<input type="checkbox"/> ESCON duplex <input type="checkbox"/> ST <input type="checkbox"/> MT-RJ <input type="checkbox"/> LC <input type="checkbox"/> SC
What length of cable is required?	

---

### Notes:

1. A separate cable is required for each tape drive port.
  2. Long wavelength ports require single-mode (9 micron fiber) FC/FICON cables.
  3. Short wavelength ports require multimode FC/FICON cables.
  4. Drives using a short wavelength transceiver that are mounted in an SL8500 drive tray or a rack chassis require the use of a 50 micron multimode FC/FICON cable.
- 

Order numbers are listed for the following cable types:

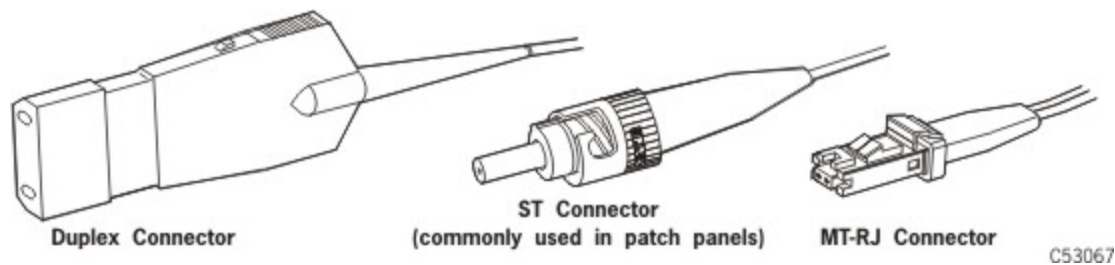
- [“ESCON Cable Order Numbers”](#)
- [“Single Mode FC/FICON \(LC, long wave\) Cables” on page 55](#)
- [“Multimode FC/FICON \(LC, short wave\) Cables” on page 56](#)
- [“Multimode FC Cables \(Type SC, 1-Gb\)” on page 56 \(T9840A or T9940A\)](#)

## ESCON Cable Order Numbers

The following ESCON fiber optic cables connect T9x40 ESCON drives to the first component in the interface infrastructure. The 62.5/125 Micron cables are orange in color, and have a Duplex connector at the drive end. The other end could have a Duplex, ST, or MT-RJ connector (see [FIGURE 5-1](#)).

You must include their length in maximum channel distance calculations.

**Note** – Maximum total non-repeated distance for an ESCON T9x40 tape drive over 62.5-micron multimode cables is 3.00 km (1.86 mile).

**FIGURE 5-1** ESCON Cable Connectors

Description (Sheet 1 of 2)	Marketing PN <sup>1</sup>	Quantity
<b>Duplex to Duplex, 62.5/125 Micron:</b>		
<input type="checkbox"/> 13 m (42 ft) Duplex, Plenum	CABLE10800285-Z	_____
<input type="checkbox"/> 31 m (100 ft) Duplex, Plenum	CABLE10800286-Z	_____
<input type="checkbox"/> 61 m (200 ft Duplex, Plenum	CABLE10800287-Z	_____
<input type="checkbox"/> 107 m (350 ft) Duplex, Plenum	CABLE10800288-Z	_____
<input type="checkbox"/> 13 m (42 ft) Duplex, Riser	CABLE10800289-Z	_____
<input type="checkbox"/> 31 m (100 ft) Duplex, Riser	CABLE10800290-Z	_____
<input type="checkbox"/> 61 m (200 ft Duplex, Riser	CABLE10800291-Z	_____
<input type="checkbox"/> 107 m (350 ft) Duplex, Riser	CABLE10800292-Z	_____
<b>Duplex to MT-RJ, 62.5/125 Micron:</b>		
<input type="checkbox"/> 13 m (42 ft) Duplex - MT-RJ, Plenum	CABLE10800327-Z	_____
<input type="checkbox"/> 31 m (100 ft) Duplex - MT-RJ, Plenum	CABLE10800328-Z	_____
<input type="checkbox"/> 61 m (200 ft Duplex - MT-RJ, Plenum	CABLE10800329-Z	_____
<input type="checkbox"/> 13 m (42 ft) Duplex - MT-RJ, Riser	CABLE10800324-Z	_____
<input type="checkbox"/> 31 m (100 ft) Duplex - MT-RJ, Riser	CABLE10800325-Z	_____
<input type="checkbox"/> 61 m (200 ft Duplex - MT-RJ, Riser	CABLE10800326-Z	_____
<b>Duplex to ST, 62.5/125 Micron:</b>		
<input type="checkbox"/> 3 m (10 ft) Duplex, Plenum	CABLE10800081	_____
<input type="checkbox"/> 7 m (22 ft) Duplex, Plenum	CABLE10800082	_____
<input type="checkbox"/> 13 m (42 ft) Duplex, Plenum	CABLE10800083	_____
<input type="checkbox"/> 22 m (72 ft Duplex, Plenum	CABLE10800084	_____

1. Suffix "-Z" indicates ROHS-compliant component.

	Description (Sheet 2 of 2)	Marketing PN <sup>1</sup>	Quantity
<input type="checkbox"/>	31 m (100 ft) Duplex, Plenum	CABLE10800085 CABLE10800293-Z	_____
<input type="checkbox"/>	46 m (150 ft) Duplex, Plenum	CABLE10800086	_____
<input type="checkbox"/>	61 m (200 ft) Duplex, Plenum	CABLE10800087	_____
<input type="checkbox"/>	77 m (250 ft) Duplex, Plenum	CABLE10800088	_____
<input type="checkbox"/>	92 m (300 ft) Duplex, Plenum	CABLE10800089	_____
<input type="checkbox"/>	107 m (350 ft) Duplex, Plenum	CABLE10800090	_____
<input type="checkbox"/>	122 m (400 ft) Duplex, Plenum	CABLE10800091	_____
<input type="checkbox"/>	3 m (10 ft) Duplex, Riser	CABLE10800070	_____
<input type="checkbox"/>	7 m (22 ft) Duplex, Riser	CABLE10800071	_____
<input type="checkbox"/>	13 m (42 ft) Duplex, Riser	CABLE10800072	_____
<input type="checkbox"/>	22 m (72 ft) Duplex, Riser	CABLE10800073	_____
<input type="checkbox"/>	31 m (100 ft) Duplex, Riser	CABLE10800074	_____
<input type="checkbox"/>	46 m (150 ft) Duplex, Riser	CABLE10800075	_____
<input type="checkbox"/>	61 m (200 ft) Duplex, Riser	CABLE10800076	_____
<input type="checkbox"/>	77 m (250 ft) Duplex, Riser	CABLE10800077	_____
<input type="checkbox"/>	92 m (300 ft) Duplex, Riser	CABLE10800078	_____
<input type="checkbox"/>	107 m (350 ft) Duplex, Riser	CABLE10800079	_____
<input type="checkbox"/>	122 m (400 ft) Duplex, Riser	CABLE10800080	_____
1. Suffix "-Z" indicates ROHS-compliant component.			

## Single Mode FC/FICON (LC, long wave) Cables

Single mode fiber optic cables are used with T9x40B/C/D FICON drives configured with a long-wave SFP module. The cables are yellow in color with blue LC connectors at the drive end. You must include their length in maximum channel distance calculations.

- Maximum total non-repeated distance for a 1310 nm, 9 micron (long-wave) single mode cable is 10 km (6.21 mi).
- Single Mode cable maximum distances can be extended through an RPQ 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.

**TABLE 5-10** 9/125 Micron Cable Part Numbers

Description	Marketing PN <sup>1</sup>	Quantity
<b>LC to LC, 9/125 Micron:</b>		
<input type="checkbox"/> 3 m (9.8 ft) Duplex, Riser	CABLE.10800302-Z	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Riser	CABLE10800331-Z	_____
<input type="checkbox"/> 22 m (72.1 ft) Duplex, Riser	CABLE10800184	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Riser	CABLE10800333-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Riser	CABLE10800306-Z	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Plenum	CABLE10800330-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Plenum	CABLE10800332-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Plenum	CABLE10800305-Z	_____
<b>LC to SC, 9/125 Micron:</b>		
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Riser	CABLE10800335-Z	_____
<input type="checkbox"/> 22 m (72.1 ft) Duplex, Riser	CABLE10800347-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Riser	CABLE10800337-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Riser	CABLE10800304-Z	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Plenum	CABLE10800334-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Plenum	CABLE10800336-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Plenum	CABLE10800303-Z	_____

1. Suffix "-Z" indicates ROHS-compliant component.

## Multimode FC/FICON (LC, short wave) Cables

The following multimode fiber optic cables are applicable to T9x40B/C/D FC or FICON drives configured with short-wavelength SFP modules. The cable connects the drive to the first component in the interface infrastructure. These cables are orange in color, and have LC connectors at the drive end.

Total non-repeated distance for a 850 nm, 50 micron (short-wave) multimode cable is:

- 300 m (984 ft) *maximum* on a 200 MB/s (2 Gb) channel
- 500 m (1640 ft) *maximum* on a 100 MB/s (1 Gb) channel

You must include their length in maximum channel distance calculations.

**TABLE 5-11** 50/125 Micron (LC Connector) Cable Part Numbers

Description	Marketing PN <sup>1</sup>	Quantity
<b>LC to LC, 50/125 Micron - OM4:</b>		
<input type="checkbox"/> 50 m (32.8 ft) Duplex, Riser	7106952	_____
<input type="checkbox"/> 50 m (32.8 ft) Duplex, Plenum	7106954	_____
<b>LC to LC, 50/125 Micron - OM2:</b>		
<input type="checkbox"/> 3 m (9.8 ft) Duplex, Riser	CABLE10800340-Z-N	_____
<input type="checkbox"/> 5 m (16.4 ft) Duplex, Riser	CABLE10800341-Z-N	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Riser	CABLE10800310-Z-N	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Plenum	CABLE10800313-Z-N	_____
<b>LC to SC, 50/125 Micron - OM2:</b>		
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Riser	CABLE10800317-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Riser	CABLE10800318-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Riser	CABLE10800319-Z	_____
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Plenum	CABLE10800320-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Plenum	CABLE10800321-Z	_____
<input type="checkbox"/> 100 m (328 ft) Duplex, Plenum	CABLE10800322-Z	_____

## Multimode FC Cables (Type SC, 1-Gb)

The following multimode fiber optic cables connect T9x40A FC drives to the first component in the interface infrastructure. The cables are orange in color, and have SC connectors at both ends. Total non-repeated distance for a 850 nm, 50 micron (short-wave) multimode cable is 500 m (1640 ft) maximum on a 100 MB/s (1 Gb) channel

You must include their length in maximum channel distance calculations.



Description	Marketing PN <sup>1</sup>	Quantity
<b>SC to SC, 50/125 Micron:</b>		
<input type="checkbox"/> 10 m (32.8 ft) Duplex, Plenum	CABLE10800294-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Plenum	CABLE10800295-Z	_____
<input type="checkbox"/> 10 m (6.6 ft) Duplex, Riser	CABLE10800297-Z	_____
<input type="checkbox"/> 50 m (164 ft) Duplex, Riser	CABLE10800298-Z	_____

1. Suffix “-Z” indicates ROHS-compliant component.

## Conversion Bills/Kits

Conversion bills (CBs) provide instructions and applicable material that allow the:

- Addition of a second drive to a rack chassis
- Transfer of drives from one library type to a different library type
- Modification of the number or type of interface transceiver
- Transfer of drives from one library drive cabinet type to a different library drive cabinet type

Several tables list the conversion bill part numbers:

- [TABLE 5-12](#) lists the T9840 drive tray conversion kits with an LOD card for SL3000 and SL8500 libraries
- [TABLE 5-13](#) lists T9840D rackmount conversions
- [TABLE 5-14 on page 58](#) lists T9840 conversion kits with an HBD card
- [TABLE 5-15 on page 59](#) lists ROHS compliant CBs available for T9840 conversions
- [TABLE 5-16 on page 59](#) lists CBs available for T9940 conversions

**TABLE 5-12** T9840 Drive Tray Conversion Kits (LOD Card)

Drive Model	From:	To:	Marketing PN
T9840D	9310, L5500, L1400, L700, L180, 9740, and SL3000	SL8500	7110129
T9840D	9310, L5500, L1400, L700, L180, 9740, and SL8500	SL3000	7110134

**Note** – If the drive is not being converted from an existing SL3000 or SL8500 drive tray, you must also order Marketing PN 7110139 (T9840 bezel and a 132 W DC power supply) with the conversion kit number listed in the Marketing PN column of the table.

**TABLE 5-13** T9840D Rackmount Conversion Bills (No Longer Available)

Interface	Description	Marketing P/N
<b>T9840D</b>		
Fibre Channel or FICON	T9840D, LW, RACKMT, 1X to 2X	X9840D-LW1-2RACK-N
	T9840D, SW, RACKMT, 1X to 2X	X9840D-SW1-2RACK-N
<b>Note</b> – Both drives in the rack chassis must have the same interface.		

**TABLE 5-14** T9840 Drive Tray Conversion Kits - HBD Card (No Longer Available)

Drive Interface	Drive Model	From:	To:	Marketing PN
ESCON	T9840B	L180/L700/L1400, L5500, 9740, 9310	SL8500	9840B-LEGSL3SL85-N
	T9840C	L180/L700/L1400, L5500, 9740, 9310	SL8500	9840C-LEGSL3SL85-N
	T9840D	L180/L700/L1400, L5500, 9310	SL8500	9840D-LEGSL3SL85-N
	T9840C/D	L180/L700/L1400, 9740 <sup>1</sup> , 9310, L5500	SL3000 <sup>2</sup>	9840CD-ES-SL3-Z-N
Fibre Channel or FICON	T9840B	L180/L700/L1400, L5500, 9740, 9310	SL8500	9840B-LEGSL3SL85-N
	T9840C	L180/L700/L1400, L5500, 9740, 9310, SL3000	SL8500	9840C-LEGSL3SL85-N
	T9840D	L180/L700/L1400, L5500, 9310, SL3000	SL8500	9840D-LEGSL3SL85-N
	T9840C/D	L180/L700/L1400, L5500, 9310	SL3000 <sup>2</sup>	9840CD-FCFI-SL3-N
	T9840C/D	SL8500	SL3000 <sup>2</sup>	9840C/D-S85/S30Z-N

**Notes:**

1. 9740 library does not apply to the T9840D tape drive.
2. The SL3000 library provides support for T9840C and T9840D tape drives.

The conversion bills in [TABLE 5-15](#) are used with many of the T9x40 tape drive models and library configurations. Drive part numbers for the 9310 library and L180/L700/L1400 do not include the SFP module. You must order a port conversion bill and the drive part number.

**TABLE 5-15** T9x40 Common Conversion Bills (ROHS Compliant) - No Longer Available

Description	Marketing PN
<b>SFP Modules <sup>1</sup> (transceivers) for T9840C or T9840D</b>	
T9840/T10K 2 Gbit, 1 SFP, SW, cable kit	X984/T10K-2GB -SW-N
T9840/T10K 2 Gbit, 1 SFP, LW, cable kit	X984/T10K-2GB -LW-N
1. T9840C Fibre Channel drives use fixed transceivers (SFF) T9840C FICON drives use pluggable transceivers (SFP) T9840D Fibre Channel/FICON drives use pluggable transceivers (SFP) T9940B Fibre Channel drives use fixed transceivers (SFF) T9940B FICON drives use pluggable transceivers (SFP).	

**TABLE 5-16** T9940 Conversion Bills (No Longer Available)

Interface	Description	From:	To:	Marketing PN
ESCON	T9940B, ESCON, L700/9741/E - SL8500	L180/L700/L1400, L5500, 9740, 9310	SL8500	9940B-ES-SL85-Z-N
	T9940B, 9310 - L700/L1400	L5500, 9740, 9310	L180/L700/L1400	9940B-9310-L700-N
Fibre Channel <sup>1</sup>	T9940B, FC, L5500 - SL8500	L180/L700/L1400, L5500, 9740, 9310	SL8500	9940B-FC-L55-S85-N
	T9940B, 9310 - L700/L1400	L5500, 9740, 9310	L180/L700/L1400	9940B-9310-L700-N
FICON <sup>2</sup>	T9940B FICON, SPLW - SL8500	L180/L700/L1400, L5500, 9740, 9310	SL8500	9940B-FI-LW-SL85-N <sup>3, 5</sup>
	T9940B FICON, SPSW - SL8500	L180/L700/L1400, L5500, 9740, 9310	SL8500	9940B-FI-SW-SL85-N <sup>4, 5</sup>
	T9940B, 9310 - L700/L1400	L5500, 9740, 9310	L180/L700/L1400	9940B-9310-L700-N

**Notes:**

1. T9940B Fibre Channel drives use fixed transceivers (SFF).
2. T9940B FICON drives use pluggable transceivers (SFP modules).
3. Single port long wavelength.
4. Single port short wavelength.
5. For dual port configurations, order the appropriate SFP module, see [TABLE 5-15 on page 59](#).

## Encryption Feature

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

**Note** – One required per encryption-enable tape drive.

Encryption activation after drive installation (9840D-EKEY-A-N).

## Ordering Media and Labels

To order:

- Call **1.877.STK.TAPE** to order media from your local reseller or to obtain media pre-sales support.
- E-mail address for local support questions: **tapemediaorders\_ww@oracle.com**

See the tape media area on the corporate web site for additional information.

<http://www.oracle.com/us/products/servers-storage/storage/tape-storage/029157.htm>

**Note** – The different VolSafe cartridges are not interchangeable. Make sure to specify the required proper density 9840 VolSafe cartridge when ordering (see [TABLE 1-1 on page 16](#) for additional information).

**TABLE 5-17** VolSafe Cartridge Summary

Drive Model	Identification Color	Description
T9840A/B	Yellow	20-GB 9840 VolSafe cartridges can be read and written with T9840A/B drives.
T9840C	Green	40-GB 9840C VolSafe cartridges can be read and written with a T9840C drive.  The T9840C can only read a T9840A/B VolSafe.
T9840D	Purple	75-GB 9840D VolSafe cartridges can be read and written with a T9840D drives  The T9840D can only read a T9840A/B VolSafe cartridge or a T9840C VolSafe cartridge.
T9940B	Yellow	200-GB 9940 VolSafe cartridges are required for use with T9940B drives <sup>1</sup> .  <b>Note</b> – The T9940A tape drive is not VolSafe capable.

**Note** – The T9840D requires that you use a unique cleaning cartridge designated with a Y media ID label. The T9840A/B/C drives use a different cleaning cartridge designated with a U media ID label.

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## Specifications

This appendix provides specifications for “T9840” and “T9940” on page 70.

### T9840

The following information is provided for T9840 tape drives:

- Power specifications
- Performance specifications
- Environmental requirements
- Physical specifications
- Library attachments

## Power Specifications

TABLE A-1 on page 62 lists the power specifications for the T9840 Tape Drive.

**TABLE A-1** T9840 Tape Drive Power Specifications

Characteristic	Value
Input voltage	88 to 264 VAC
Input frequency	48 to 63 Hz
Power consumption	<p><b>T9840D:</b></p> <p>Write:</p> <p style="padding-left: 40px;">Fibre Channel/FICON 62W ESCON 55W</p> <p>Read:</p> <p style="padding-left: 40px;">Fibre Channel/FICON 58W ESCON not specified</p> <p>Idle tape loaded:</p> <p style="padding-left: 40px;">Fibre Channel 44W FICON 43W ESCON 37W</p> <p>Idle no tape loaded:</p> <p style="padding-left: 40px;">Fibre Channel/FICON 36W ESCON 29W</p> <p>Rewind:</p> <p style="padding-left: 40px;">Fibre Channel/FICON 56W ESCON 48W</p> <p>Load/unload peak 70W</p> <p><b>T9840C:</b></p> <p style="padding-left: 40px;">Write 65 W Idle tape loaded 45 W Idle no tape loaded 38 W</p>
Power dissipation	280 Btu/hr
Power factor	0.95 minimum



## Performance Specification

This section describes tape drive and data cartridge performance specifications.

### Tape Drive

TABLE A-2 on page 63 lists the performance specifications of the T9840 tape drive.

**TABLE A-2** T9840 Tape Drive Performance Specifications

Characteristic	Value			
	T9840A	T9840B	T9840C	T9840D
<b>Capacity and Performance</b>				
Capacity, native	20 GB	20 GB	40 GB <sup>1</sup>	75 GB <sup>1</sup>
				
Data buffer size	8 MB	32 MB	64 MB	64 MB
Tape speed, read/write	2 m/s	4 m/s	3.295 m/s	3.4 m/s
Maximum block size	256K	256K	256K	256K
Performance, native (head-to-tape)				
(uncompressed)	10 MB/s	19 MB/s	30 MB/s	30 MB/s
(compressed, maximum)	35 MB/s	60 MB/s	60 MB/s	60 MB/s <sup>2</sup>
Burst (FC & FICON)	100 MB/s	200 MB/s	200 MB/s	200 MB/s
Burst (ESCON)	17 MB/s	17 MB/s	17 MB/s	17 MB/s
<b>Interface data</b>				
Fibre Channel	1 Gb	2 Gb	2 Gb	2 Gb
Ultra-SCSI HVD	40 MB/s	40 MB/s	NA	NA
ESCON	17 MB/s	17 MB/s	17 MB/s	17 MB/s
FICON	NA	2 Gb	2 Gb	2 Gb
<b>Access times</b>				
Tape load and thread to ready	7 sec	7 sec	6.5 sec	8.5 sec
File access, first (average)	8 sec	8 sec	8 sec	8 sec
Rewind (maximum/average)	16/8 sec	16/8 sec	16/8 sec	16/8 sec
Unload	8 sec	8 sec	11.5 sec	12.5 sec
<b>Reliability</b>				
Mean time between failure (MBTF)				
Power on @ 100% duty cycle	290,000 hr	290,000 hr	290,000 hr	290,000 hr
Tape load @ 10/day (100K loads)	240,000 hr	240,000 hr	240,000 hr	240,000 hr
Tape path motion (TPM)	216,000 hr	216,000 hr	216,000 hr	216,000 hr
@ 70% duty cycle				
Head life @ 70% TPM duty cycle	5 years	5 years	5 years	5 years
Uncorrected bit error rate	1 x 10 <sup>-18</sup>	1 x 10 <sup>-18</sup>	1 x 10 <sup>-18</sup>	1 x 10 <sup>-18</sup>
Undetected bit error rate	1 x 10 <sup>-33</sup>	1 x 10 <sup>-33</sup>	1 x 10 <sup>-33</sup>	1 x 10 <sup>-33</sup>


**Notes:**

- VR2 is a trademark of Overland Storage. VR2 technology is used to achieve T9840C/D capacity and performance.
- Fibre Channel (FC) write and 55 MB/s FICON write

## Data Cartridge

TABLE A-3 lists the physical and performance specifications of the 9840 data cartridge.

**TABLE A-3** 9840 Data Cartridge Performance Specifications

Characteristic	Value
<b>Cartridge physical data</b>	
Drive compatibility	T9840A, T9840B, T9840C and T9840D
Form factor	1/2 in. cartridge, 3490/3490E
Width	109 cm (4.29 in.)
Length	125 cm (4.92 in.)
Height	2.54 cm (1.00 in.)
Weight	262 g (9.17 oz)
Drop strength	1.00 m (39.4 in.)
<b>Tape media data</b>	
Capacity, native (uncompressed)	20 GB - T9840A/B 40 GB <sup>1</sup> - T9840C 75 GB <sup>1</sup> - T9840D
	
Tracks	288 (T9840A/B/C), 576 (T9840D)
Track-following servo	Factory pre-recorded
	<b>Caution</b> – Bulk-erase will destroy pre-recorded servo tracks. DO NOT DEGAUSS 9840 CARTRIDGES.
Formulation	Advanced metal particle (AMP)
Physical thickness	9 microns (mm)
Physical length	271 m (889 ft)
Recordable length (including MIR)	251 m (823 ft)
<b>Reliability</b>	
Archival life	15 - 30 years
Short-length durability	80,000 write/read passes minimum
Long-life durability	361 full file writes
Load/unloads	10,000 minimum
Uncorrected bit error rate	$1 \times 10^{-18}$
Permanent errors	Zero

1. VR2 is a trademark of Overland Storage. VR2 technology is used to achieve T9840C/D capacity.



## Environmental Requirements

This section describes environmental requirements for the drive, power supply, and cartridges for T9840 tape drives.

### Airborne Contamination

Tape drives and media are subject to damage from airborne particulates. The operating environment must adhere to the ISO 14644-1 Class 8 requirements. See [Appendix B, "Controlling Contaminants"](#).

### Tape Drive and Power Supply

[TABLE A-4](#) lists the environmental requirements for the tape drive and the power supply for T9840 tape drives.

**TABLE A-4** T9840 Environmental Requirements

Characteristic	Value
<b>Temperature</b>	
Operating	15° to 32°C (59° to 90°F)
Storage	10° to 40°C (50° to 104°F)
Shipping	-40° to 60°C (-40° to 140°F)
<b>Relative Humidity, Non-Condensing</b>	
Operating	20% to 80%
Storage	10% to 95%
Shipping	10% to 95%
<b>Wet Bulb Maximum</b>	
Operating	26°C (79°F)
Storage	26°C (79°F)
Storage	26°C (79°F)
<b>Altitude</b>	
Operating	0 to 3.05 km (0 to 10,000 ft)
	<b>Note</b> – Except in China markets where regulations may limit installations to a maximum altitude of 2 km (6,562 ft).
Storage	0 to 3.05 km (0 to 10,000 ft)
Shipping	0 to 15.24 km (0 to 50,000 ft)
<b>Air Flow Requirement (Operating Heat Output)</b>	
Drive and power supply operating	73.2 Calories/hr (290.2 Btu/hr)

## Data Cartridges

TABLE A-5 lists the environmental requirements for 9840 data cartridges.

**TABLE A-5** 9840 Data Cartridge Environmental Requirements

Characteristic	Value
<b>Temperature</b>	
Operating <sup>1</sup>	15° to 32°C (59° to 90°F)
Storage (up to four weeks)	5° to 32°C (41° to 90°F)
Storage (archive)	15° to 26°C (59° to 77°F)
Shipping (unrecorded) <sup>2</sup>	-23° to 49°C (-10° to 120°F)
Shipping (recorded) <sup>2</sup>	4° to 40°C (40° to 104°F)
<b>Relative Humidity, Non-Condensing</b>	
Operating <sup>1</sup>	20% to 80%
Storage (up to four weeks)	5% to 80%
Storage (archive)	40% to 60%
Shipping (unrecorded) <sup>2</sup>	5% to 80%
Shipping (recorded) <sup>2</sup>	5% to 80%
<b>Wet Bulb Maximum</b>	
Operating <sup>1</sup>	26°C (79°F)
Storage (non-archive)	26°C (79°F)
Storage (archive)	26°C (79°F)
Shipping (unrecorded) <sup>2</sup>	26°C (79°F)
Shipping (recorded) <sup>2</sup>	26°C (79°F)
<b>Notes:</b>	
1. The conditioning time before use is 24 hours (48 hours preferred).	
2. The shipping environment must not exceed the limit of the storage environment, archive or non-archive, for longer than 10 days.	

## Physical Specifications

This section lists the physical specifications for T9840 tape drives in three configurations— library-attached, desktop, and rack-mount.

### Library-attached Configuration

The T9840 tape drive fits inside these StorageTek libraries or cabinets:

- 9741/9741E drive cabinet that attaches to 9310, 9740, and L5500 libraries
- 9710 libraries (T9840A/B only) [end of support 12/31/2007]
- 9738 libraries (T9840A only) [end of support 12/31/2007]
- L180 and L700x/L1400x libraries

- SL3000 modular library system
- SL8500 modular library system

Refer to the appropriate library System Assurance Guide for the physical dimensions and weights of the library and frame.

TABLE A-6 lists the weights of the library tape drives and accessories, including trays, power supplies, and cables.

**TABLE A-6** T9840 Tape Drive Library-attached Weights

Library	Drive and Accessory Weights
9310/9740/L5500	7.7 kg (17 lb)
9710(T9840A/B only)	10.4 kg (23 lb)
9738 (T9840A only)	7.5 kg (16.5 lb)
L180/L700x/L1400x	7.4 kg (16.3 lb)
SL3000	9.53 kg (21 lb)
SL8500	8.85 kg (19.5 lb)

## Desktop Configuration

The T9840 desktop configuration is a single enclosed assembly. TABLE A-7 lists the physical specifications for a desktop installation.

**TABLE A-7** T9840 Tape Drive Desktop Physical Specifications

Characteristic	Value
Dimensions and weight of manual-load drive (T9840A/B)	230 mm (9.1 in.) wide
	160 mm (6.5 in.) high
	483 mm (19 in.) deep plus 76 mm (3 in.) for cables
	9.3 kg (20.5 lb)
Dimensions and weight of CSL drive (T9840A only)	483 mm (19 in.) wide
	197 mm (7.7 in.) high
	630 mm (24.8 in.) deep plus 76 mm (3 in.) for cables
	23 kg (50 lb)

## Rack Mount Configuration

TABLE A-8 lists the physical specifications for the T9840 rack mount configuration.

**TABLE A-8** T9840 Tape Drive Rack Mount Physical Specifications

Characteristic	Value
<b>Dimensions:</b>	
Width:	
Face plate	483 mm (19.0 in.)
Chassis	446 mm (17.56 in.)
Height	178 mm (7.0 in.)
Depth	641 mm (25.25 in.)
	Includes 102 mm (4.0 in.) cable bend radius allowance at chassis rear
<b>Weight:</b>	
Single-drive tray	14.5 kg (32 lb)
Dual-drive tray	20.4 kg (45 lb)
CSL tray	18.0 kg (39 lb)

## Library Attachments

TABLE A-9 lists the libraries to which T9840 tape drives can attach. To order the correct accessories to install the T9840 tape drives in a library environment, refer to the system assurance guide for the library.

**TABLE A-9** T9840 Tape Drive Library Attachments

Library	Cartridges (Maximum)	Drives (Maximum)	Guide
9310 PowderHorn	6,000 (approximate)	80	<i>Nearline Enterprise 9310/4410/9360 LSM System Assurance Guide</i>
9710 TimberWolf <sup>1</sup>	588	10	<i>9710 Library Storage Module System Assurance Guide</i>
9738 TimberWolf <sup>2</sup>	30	3	<i>TimberWolf 9738 Library System Assurance Guide</i>
9740 TimberWolf <sup>3,4</sup>	494	10	<i>TimberWolf 9740 Library Storage Module System Assurance Guide</i>
L180	180 (approximate)	6	<i>L180/L700x/L1400x Tape Libraries Ordering and Configuration Guide</i>
L700x/L1400x	700 (approximate)	12	<i>L180/L700x/L1400x Tape Libraries Ordering and Configuration Guide</i>
L5500 <sup>3</sup>	Maximum 2000/3500 <sup>5</sup>	80 <sup>6</sup>	<i>L5500 Automated Cartridge System System Assurance Guide</i>
SL3000	4,500	56 <sup>7</sup>	<i>SL3000 Modular Library System Systems Assurance Guide</i>
SL8500	100,000 <sup>8</sup>	640 <sup>9</sup>	<i>SL8500 Modular Library System System Assurance Guide</i>

1. T9840A/B only.
2. T9840A only.
3. T9840A/B/C only.
4. T9940A/B only.
5. There are two mixed-media configurations in the L5500 ACS.
6. Total number of mixed drives, including the Linear Tape Open (LTO) Ultrium Drives. The LTO required, associated PLM unit blocks three T9x40 power supply slots; therefore, in a mixed drive cabinet, a maximum 17 drive slots are available for T9x40 drives.
7. T9840C/D only.
8. A single library holds 1,448 to 10,000 cartridges; and, the library can hold up to 100,000 cartridges in a ten module library complex.
9. The single module has slots for 64 tape drives. A 10-module complex has a maximum of 640 tape drives.

# T9940

The next pages provide the following information for T9940 tape drives:

- Physical specifications
- Power specifications
- Performance specifications
- Environmental requirements
- Library attachments

**Note** – The specifications in this appendix can change. For current information, contact your sales representative.

## Physical Specifications

This section lists the physical specifications of T9940 tape drives, in rack mount and library attached configurations.

### Rack-mount Configuration

The rack mount configuration of the T9940 tape drive consists of two drives, mounted on shock absorbers, and two power supplies contained within a rack mount tray.

[TABLE A-10](#) lists the physical specifications of the T9940 rack mount configuration.

**TABLE A-10** T9940 Tape Drive Rack Mount Physical Specifications

Characteristic	Value
Dimensions	483 mm (19.0 in.) wide
	267 mm (10.5 in.) high
	635 mm (25.0 in.) deep plus 7.6 cm (3 in.) for cables
Weight	36.5 kg (80.5 lb)

### Library-Attached Configuration

The library-attached configuration of the T9940 tape drive mounts on trays that fit inside:

- An 9741 (expanded) or 9741E drive cabinet that attaches to StorageTek 9310, 9360, 9740, and L5500 libraries
- The StorageTek L180/L700x/L1400x library
- The StorageTek StreamLine SL8500 modular library system

Refer to the appropriate library System Assurance Guide for the physical dimensions and weights of the library and cabinet.

[TABLE A-11 on page 71](#) lists the weights of the library tape drives and accessories, including trays, power supplies, and cables.

**TABLE A-11** T9940 Tape Drive Library attached Weights

<b>Library</b>	<b>Weight, Drive plus Library Tray (SCSI)</b>
9310/9740/L5500	9.1 kg (20 lb)
L180/L700x/L1400x	9.6 kg (21.2 lb)
SL8500	10.4 kg (24.0 lb)

## Power Specifications

[TABLE A-12](#) lists the power specifications of the T9940 tape drive.

**TABLE A-12** T9940 Tape Drive Power Specifications

<b>Characteristics</b>	<b>Value</b>
Input voltage	100 to 240 VAC
Input frequency	50 to 60 Hz
Power consumption	82 Watts
Power dissipation	280 Btu/hr
Power factor	0.96 minimum


## Performance Specifications

This section describes tape drive and data cartridge performance.

### Tape Drive

TABLE A-13 lists performance specifications of the T9940 tape drive.

**TABLE A-13** T9940 Tape Drive Performance Specifications


Characteristic	Value	
	T9940A	T9940B
<b>Capacity and Performance</b>		
Capacity, native	60 GB	200 GB <sup>1</sup>
		
Data buffer size	16 MB	64 MB
Tape speed, read/write	2 m/sec	3.4 m/sec
Performance, native (head-to-tape)		
(uncompressed)	10 MB/sec	30 MB/sec <sup>1</sup>
(compressed, maximum)	35 MB/sec	70 MB/sec
Burst (FC / FICON)	100 MB/sec	200 MB/sec
Burst (ESCON)	17 MB/sec	17 MB/sec
<b>Interface data</b>		
Fibre Channel	1 Gb	2 Gb
Ultra-SCSI HVD	40 MB/sec	N/A
ESCON	20 MB/sec	20 MB/sec
FICON	NA	2 Gb
<b>Access times</b>		
Tape load and thread to ready	18 sec	18 sec
File access, first (average)	59 sec	59 sec
Rewind (maximum/average)	90/45 sec	90/45 sec
Unload	18 sec	18 sec
<b>Reliability</b>		
Mean time between failure (MTBF)		
Power on @ 100% duty cycle	290,000 hr	290,000 hr
Tape load @ 10/day (100K loads)	240,000 hr	240,000 hr
Tape path motion (TPM)	196,000 hr	196,000 hr
@ 70% duty cycle		
Head life @ 70% TPM duty cycle	8.5 yr.	8.5 yr.
Uncorrected bit error rate	1 x 10 <sup>-18</sup>	1 x 10 <sup>-18</sup>
Undetected bit error rate	1 x 10 <sup>-33</sup>	1 x 10 <sup>-33</sup>
1. VR2 is a trademark of Overland Storage. VR2 technology is used to achieve T9940B capacity and performance.		



## Data Cartridge

TABLE A-14 lists physical and performance specifications of the 9940 data cartridge.

**TABLE A-14** 9940 Data Cartridge Specifications

Characteristic	Value
<b>Cartridge physical data</b>	
Drive compatibility	T9940A, T9940B
Form factor	1/2 in. cartridge, 3490/3490E
Width	109 cm (4.29 in.)
Length	125 cm (4.92 in.)
Height	25.4 cm (1.00 in.)
Weight	262 g (9.17 oz)
Drop strength	1.00 m (39.4 in.)
<b>Tape media data</b>	
Capacity, native (uncompressed)	60 GB (Low density, T9940A) 200 GB <sup>1</sup> (High density, T9940B)
	
Tracks	288 (Low density, T9940A) 576 (High density, T9940B)
Track-following servo	Factory pre-recorded  <b>Caution</b> – Bulk-erase will destroy pre-recorded servo tracks. DO NOT DEGAUSS T9940 CARTRIDGES.
Formulation	Advanced metal particle (AMP)
Physical thickness	9 microns (mm)
Physical length	700 m (2,296 ft)
Recordable length (including MIR)	650 m (2,134 ft)
<b>Reliability</b>	
Archival life	15 - 30 years
Short-length durability	80,000 write/read passes minimum
Long-life durability	3,000 write/read passes minimum
Load/unloads	10,000 minimum
Uncorrected bit error rate	$1 \times 10^{-18}$
Permanent errors	Zero

1. VR2 is a trademark of Overland Storage. VR2 technology is used to achieve T9940B capacity.

## Environmental Requirements

This section describes environmental requirements for the tape drive, power supply, and cartridges for T9940 tape drives.

### Tape Drive and Power Supply

TABLE A-15 lists the environmental requirements for the tape drive and the power supply for T9940 tape drives.

**TABLE A-15** T9940 Environmental Requirements

Characteristic	Value
<b>Temperature</b>	
Operating	15° to 32°C (60° to 90°F)
Storage	10° to 40°C (50° to 104°F)
Shipping	-40° to 60°C (-40° to 140°F)
<b>Relative Humidity, Non-Condensing</b>	
Operating	20% to 80%
Storage	10% to 95%
Shipping	10% to 95%
<b>Wet Bulb Maximum</b>	
Operating	29°C (84°F)
Storage	35°C (95°F)
Storage	35°C (95°F)
<b>Altitude</b>	
Operating	0 to 3.05 km (0 to 10,000 ft)
Storage	0 to 3.05 km (0 to 10,000 ft)
Shipping	0 to 15.24 km (0 to 50,000 ft)
<b>Air Flow Requirements</b>	
Maximum media temperature	49°C (120°F)
Maximum chip T <sub>j</sub>	90°C (194°F) unless otherwise specified for a particular component

## Cartridges

TABLE A-16 lists the environmental requirements for 9940 cartridges.

**TABLE A-16** 9940 Cartridge Environmental Requirements

Characteristic	Value
<b>Temperature</b>	
Operating <sup>1</sup>	15° to 32°C (60° to 90°F)
Storage (up to four weeks)	5° to 32°C (41° to 90°F)
Storage (archival)	18° to 26°C (65° to 79°F)
Shipping <sup>2</sup>	4° to 40°C (40° to 104°F)
<b>Relative Humidity, Non-Condensing</b>	
Operating <sup>1</sup>	20% to 80%
Storage (up to four weeks)	5% to 80%
Storage (archival)	40% to 60%
Shipping <sup>2</sup>	5% to 80%
<b>Wet Bulb Maximum</b>	
Operating <sup>1</sup>	26°C (78.8°F)
Storage (non-archive)	26°C (78.8°F)
Storage (archival)	26°C (78.8°F)
Shipping <sup>2</sup>	26°C (78.8°F) with no condensation
<ol style="list-style-type: none"> <li>1. The conditioning time before use is 24 hours.</li> <li>2. The shipping environment must not exceed the limit of the storage environment, archive or non-archive, for longer than 10 days.</li> </ol>	

## Library Attachments

TABLE A-17 lists the libraries to which T9940 tape drives can attach. To order the correct accessories to install T9940 tape drives in a library environment, refer to the system assurance guide for the library.

**TABLE A-17** T9940 Tape Drive Library Attachments

<b>Product</b>	<b>Cartridges (Maximum)</b>	<b>Drives (Maximum)</b>	<b>Guide</b>
9310 PowderHorn	Approx. 6,000	80	<i>Nearline Enterprise 9310/4410/9360 LSM System Assurance Guide</i>
9740 TimberWolf	494	10	<i>TimberWolf 9740 Library Storage Module System Assurance Guide</i>
L180	Approx. 180	6	<i>L180/L700x/L1400x Tape Libraries Ordering and Configuration Guide</i>
L700x/L1400x	Approx. 700	12	<i>L180/L700x/L1400x Tape Libraries Ordering and Configuration Guide</i>
L5500 ACS	Maximum 2000/3500 <sup>1</sup>	80 <sup>2</sup>	<i>L5500 Automated Cartridge System System Assurance Guide</i>
SL8500	100,000 <sup>3</sup>	640 <sup>4</sup>	<i>System Assurance Guide</i>

1. There are two mixed-media configurations in the L5500 ACS.
2. Total number of mixed drives, including the LTO Ultrium Drives. The LTO required, associated PLM unit blocks three T9x40 power supply slots; therefore, in a mixed drive cabinet, a maximum of 17 drive slots are available for T9x40 drives.
3. Basic library holds 1,448 to 10,000 cartridges; and, the library can hold up to 100,000 cartridges in a ten module library complex.
4. The single module has slots for 64 tape drives. A 10-module complex has a maximum of 640 tape drives.

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## Controlling Contaminants

### Environmental Contaminants

Control over contaminant levels in a computer room is extremely important because tape libraries, tape drives, and tape media are subject to damage from airborne particulates. Most particles smaller than ten microns are not visible to the naked eye under most conditions, but these particles can be the most damaging. As a result, the operating environment must adhere to the following requirements:

- ISO 14644-1 Class 8 Environment.
- The total mass of airborne particulates must be less than or equal to 200 micrograms per cubic meter.
- Severity level G1 per ANSI/ISA 71.04-1985.

Oracle currently requires the ISO 14644-1 standard approved in 1999, but will require any updated standards for ISO 14644-1 as they are approved by the ISO governing body. The ISO 14644-1 standard primarily focuses on the quantity and size of particulates as well as the proper measurement methodology, but does not address the overall mass of the particulates. As a result, the requirement for total mass limitations is also necessary as a computer room or data center could meet the ISO 14644-1 specification, but still damage equipment because of the specific type of particulates in the room. In addition, the ANSI/ISA 71.04-1985 specification addresses gaseous contaminations as some airborne chemicals are more hazardous. All three requirements are consistent with the requirements set by other major tape storage vendors.

### Required Air Quality Levels

Particles, gasses and other contaminants may impact the sustained operations of computer hardware. Effects can range from intermittent interference to actual component failures. The computer room must be designed to achieve a high level of cleanliness. Airborne dusts, gasses and vapors must be maintained within defined limits to help minimize their potential impact on the hardware.

Airborne particulate levels must be maintained within the limits of *ISO 14644-1 Class 8 Environment*. This standard defines air quality classes for clean zones based on airborne particulate concentrations. This standard has an order of magnitude less particles than standard air in an office environment. Particles ten microns or smaller are harmful to most data processing hardware because they tend to exist in large

numbers, and can easily circumvent many sensitive components' internal air filtration systems. When computer hardware is exposed to these submicron particles in great numbers they endanger system reliability by posing a threat to moving parts, sensitive contacts and component corrosion.

Excessive concentrations of certain gasses can also accelerate corrosion and cause failure in electronic components. Gaseous contaminants are a particular concern in a computer room both because of the sensitivity of the hardware, and because a proper computer room environment is almost entirely recirculating. Any contaminant threat in the room is compounded by the cyclical nature of the airflow patterns. Levels of exposure that might not be concerning in a well ventilated site repeatedly attack the hardware in a room with recirculating air. The isolation that prevents exposure of the computer room environment to outside influences can also multiply any detrimental influences left unaddressed in the room.

Gasses that are particularly dangerous to electronic components include chlorine compounds, ammonia and its derivatives, oxides of sulfur and petrol hydrocarbons. In the absence of appropriate hardware exposure limits, health exposure limits must be used.

While the following sections will describe some best practices for maintaining an ISO 14644-1 Class 8 Environment in detail, there are some basic precautions that must be adhered to:

- Do not allow food or drink into the area.
- Cardboard, wood, or packing materials must not be stored in the data center clean area.
- Identify a separate area for unpacking new equipment from crates and boxes.
- Do not allow construction or drilling in the data center without first isolating sensitive equipment and any air targeted specifically for the equipment. Construction generates a high level of particulates that exceed ISO 14644-1 Class 8 criteria in a localized area. Dry wall and gypsum are especially damaging to storage equipment.

## Contaminant Properties and Sources

Contaminants in the room can take many forms, and can come from numerous sources. Any mechanical process in the room can produce dangerous contaminants or agitate settled contaminants. A particle must meet two basic criteria to be considered a contaminant:

- It must have the physical properties that could potentially cause damage to the hardware.
- It must be able to migrate to areas where it can cause the physical damage.

The only differences between a potential contaminant and an actual contaminant are time and location. Particulate matter is most likely to migrate to areas where it can do damage if it is airborne. For this reason, airborne particulate concentration is a useful measurement in determining the quality of the computer room environment. Depending on local conditions, particles as big as 1,000 microns can become airborne, but their active life is very short, and they are arrested by most filtration devices.

Submicron particulates are much more dangerous to sensitive computer hardware, because they remain airborne for a much longer period of time, and they are more apt to bypass filters.

## Operator Activity

Human movement within the computer space is probably the single greatest source of contamination in an otherwise clean computer room. Normal movement can dislodge tissue fragments, such as dander or hair, or fabric fibers from clothing. The opening and closing of drawers or hardware panels or any metal-on-metal activity can produce metal filings. Simply walking across the floor can agitate settled contamination making it airborne and potentially dangerous.

## Hardware Movement

Hardware installation or reconfiguration involves a great deal of subfloor activity, and settled contaminants can very easily be disturbed, forcing them to become airborne in the supply air stream to the room's hardware. This is particularly dangerous if the subfloor deck is unsealed. Unsealed concrete sheds fine dust particles into the airstream, and is susceptible to efflorescence -- mineral salts brought to the surface of the deck through evaporation or hydrostatic pressure.

## Outside Air

Inadequately filtered air from outside the controlled environment can introduce innumerable contaminants. Post-filtration contamination in duct work can be dislodged by air flow, and introduced into the hardware environment. This is particularly important in a downward-flow air conditioning system in which the sub-floor void is used as a supply air duct. If the structural deck is contaminated, or if the concrete slab is not sealed, fine particulate matter (such as concrete dust or efflorescence) can be carried directly to the room's hardware.

## Stored Items

Storage and handling of unused hardware or supplies can also be a source of contamination. Corrugated cardboard boxes or wooden skids shed fibers when moved or handled. Stored items are not only contamination sources; their handling in the computer room controlled areas can agitate settled contamination already in the room.

## Outside Influences

A negatively pressurized environment can allow contaminants from adjoining office areas or the exterior of the building to infiltrate the computer room environment through gaps in the doors or penetrations in the walls. Ammonia and phosphates are often associated with agricultural processes, and numerous chemical agents can be produced in manufacturing areas. If such industries are present in the vicinity of the data center facility, chemical filtration may be necessary. Potential impact from automobile emissions, dusts from local quarries or masonry fabrication facilities or sea mists should also be assessed if relevant.

## Cleaning Activity

Inappropriate cleaning practices can also degrade the environment. Many chemicals used in normal or “office” cleaning applications can damage sensitive computer equipment. Potentially hazardous chemicals outlined in the “[Cleaning Procedures and Equipment](#)” section should be avoided. Out-gassing from these products or direct contact with hardware components can cause failure. Certain biocide treatments used in building air handlers are also inappropriate for use in computer rooms either because they contain chemicals, that can degrade components, or because they are not designed to be used in the airstream of a re-circulating air system. The use of push mops or inadequately filtered vacuums can also stimulate contamination.

It is essential that steps be taken to prevent air contaminants, such as metal particles, atmospheric dust, solvent vapors, corrosive gasses, soot, airborne fibers or salts from entering or being generated within the computer room environment. In the absence of hardware exposure limits, applicable human exposure limits from OSHA, NIOSH or the ACGIH should be used.

## Contaminant Effects

Destructive interactions between airborne particulate and electronic instrumentation can occur in numerous ways. The means of interference depends on the time and location of the critical incident, the physical properties of the contaminant and the environment in which the component is placed.

## Physical Interference

Hard particles with a tensile strength at least 10% greater than that of the component material can remove material from the surface of the component by grinding action or embedding. Soft particles will not damage the surface of the component, but can collect in patches that can interfere with proper functioning. If these particles are tacky they can collect other particulate matter. Even very small particles can have an impact if they collect on a tacky surface, or agglomerate as the result of electrostatic charge build-up.

## Corrosive Failure

Corrosive failure or contact intermittence due to the intrinsic composition of the particles or due to absorption of water vapor and gaseous contaminants by the particles can also cause failures. The chemical composition of the contaminant can be very important. Salts, for instance, can grow in size by absorbing water vapor from the air (nucleating). If a mineral salts deposit exists in a sensitive location, and the environment is sufficiently moist, it can grow to a size where it can physically interfere with a mechanism, or can cause damage by forming salt solutions.



## Shorts

Conductive pathways can arise through the accumulation of particles on circuit boards or other components. Many types of particulate are not inherently conductive, but can absorb significant quantities of water in high-moisture environments. Problems caused by electrically conductive particles can range from intermittent malfunctioning to actual damage to components and operational failures.

## Thermal Failure

Premature clogging of filtered devices will cause a restriction in air flow that could induce internal overheating and head crashes. Heavy layers of accumulated dust on hardware components can also form an insulative layer that can lead to heat-related failures.

## Room Conditions

All surfaces within the controlled zone of the data center should be maintained at a high level of cleanliness. All surfaces should be periodically cleaned by trained professionals on a regular basis, as outlined in the [“Cleaning Procedures and Equipment”](#) section. Particular attention should be paid to the areas beneath the hardware, and the access floor grid. Contaminants near the air intakes of the hardware can more easily be transferred to areas where they can do damage. Particulate accumulations on the access floor grid can be forced airborne when floor tiles are lifted to gain access to the sub-floor.

The subfloor void in a downward-flow air conditioning system acts as the supply air plenum. This area is pressurized by the air conditioners, and the conditioned air is then introduced into the hardware spaces through perforated floor panels. Thus, all air traveling from the air conditioners to the hardware must first pass through the subfloor void. Inappropriate conditions in the supply air plenum can have a dramatic effect on conditions in the hardware areas.

The subfloor void in a data center is often viewed solely as a convenient place to run cables and pipes. It is important to remember that this is also a duct, and that conditions below the false floor must be maintained at a high level of cleanliness. Contaminant sources can include degrading building materials, operator activity or infiltration from outside the controlled zone. Often particulate deposits are formed where cables or other subfloor items form air dams that allow particulate to settle and accumulate. When these items are moved, the particulate is re-introduced into the supply airstream, where it can be carried directly to hardware.

Damaged or inappropriately protected building materials are often sources of subfloor contamination. Unprotected concrete, masonry block, plaster or gypsum wall-board will deteriorate over time, shedding fine particulate into the air. Corrosion on post-filtration air conditioner surfaces or subfloor items can also be a concern. The subfloor void must be thoroughly and appropriately decontaminated on a regular basis to address these contaminants. Only vacuums equipped with High Efficiency Particulate Air (HEPA) filtration should be used in any decontamination procedure. Inadequately filtered vacuums will not arrest fine particles, passing them through the unit at high speeds, and forcing them airborne.

Unsealed concrete, masonry or other similar materials are subject to continued degradation. The sealants and hardeners normally used during construction are often designed to protect the deck against heavy traffic, or to prepare the deck for the application of flooring materials, and are not meant for the interior surfaces of a supply air plenum. While regular decontaminations will help address loose particulate, the surfaces will still be subject to deterioration over time, or as subfloor activity causes wear. Ideally all of the subfloor surfaces will be appropriately sealed at the time of construction. If this is not the case, special precautions will be necessary to address the surfaces in an on-line room.

It is extremely important that only appropriate materials and methodology are used in the encapsulation process. Inappropriate sealants or procedures can actually degrade the conditions they are meant to improve, impacting hardware operations and reliability. The following precautions should be taken when encapsulating the supply air plenum in an on-line room:

- Manually apply the encapsulant. Spray applications are totally inappropriate in an on-line data center. The spraying process forces the sealant airborne in the supply airstream, and is more likely to encapsulate cables to the deck.
- Use a pigmented encapsulant. The pigmentation makes the encapsulant visible in application, ensuring thorough coverage, and helps in identifying areas that are damaged or exposed over time.
- It must have a high flexibility and low porosity to effectively cover the irregular textures of the subject area, and to minimize moisture migration and water damage.
- The encapsulant must not out-gas any harmful contaminants. Many encapsulants commonly used in industry are highly ammoniated or contain other chemicals that can be harmful to hardware. It is very unlikely that this out-gassing could cause immediate, catastrophic failure, but these chemicals will often contribute to corrosion of contacts, heads or other components.

Effectively encapsulating a subfloor deck in an on-line computer room is a very sensitive and difficult task, but it can be conducted safely if appropriate procedures and materials are used. Avoid using the ceiling void as an open supply or return for the building air system. This area is typically very dirty and difficult to clean. Often the structural surfaces are coated with fibrous fire-proofing, and the ceiling tiles and insulation are also subject to shedding. Even before filtration, this is an unnecessary exposure that can adversely affect environmental conditions in the room. It is also important that the ceiling void does not become pressurized, as this will force dirty air into the computer room. Columns or cable chases with penetrations in both the subfloor and ceiling void can lead to ceiling void pressurization.

## Exposure Points

All potential exposure points in the data center should be addressed to minimize potential influences from outside the controlled zone. Positive pressurization of the computer rooms will help limit contaminant infiltration, but it is also important to minimize any breaches in the room perimeter. To ensure the environment is maintained correctly, the following should be considered:

- All doors should fit snugly in their frames.
- Gaskets and sweeps can be used to address any gaps.

- Automatic doors should be avoided in areas where they can be accidentally triggered. An alternate means of control would be to remotely locate a door trigger so that personnel pushing carts can open the doors easily. In highly sensitive areas, or where the data center is exposed to undesirable conditions, it may be advisable to design and install personnel traps. Double sets of doors with a buffer between can help limit direct exposure to outside conditions.
- Seal all penetrations between the data center and adjacent areas.
- Avoid sharing a computer room ceiling or subfloor plenum with loosely controlled adjacent areas.

## Filtration

Filtration is an effective means of addressing airborne particulate in a controlled environment. It is important that all air handlers serving the data center are adequately filtered to ensure appropriate conditions are maintained within the room. In-room process cooling is the recommended method of controlling the room environment. The in-room process coolers re-circulate room air. Air from the hardware areas is passed through the units where it is filtered and cooled, and then introduced into the subfloor plenum. The plenum is pressurized, and the conditioned air is forced into the room, through perforated tiles, which then travels back to the air conditioner for reconditioning. The airflow patterns and design associated with a typical computer room air handler have a much higher rate of air change than typical comfort cooling air conditioners so air is filtered much more often than in an office environment. Proper filtration can capture a great deal of particulates. The filters installed in the in-room, re-circulating air conditioners should have a minimum efficiency of 40% (Atmospheric Dust-Spot Efficiency, ASHRAE Standard 52.1). Low-grade pre-filters should be installed to help prolong the life of the more expensive primary filters.

Any air being introduced into the computer room controlled zone, for ventilation or positive pressurization, should first pass through high efficiency filtration. Ideally, air from sources outside the building should be filtered using High Efficiency Particulate Air (HEPA) filtration rated at 99.97% efficiency (DOP Efficiency MILSTD-282) or greater. The expensive high efficiency filters should be protected by multiple layers of pre-filters that are changed on a more frequent basis. Low-grade pre-filters, 20% ASHRAE atmospheric dust-spot efficiency, should be the primary line of defense. The next filter bank should consist of pleated or bag type filters with efficiencies between 60% and 80% ASHRAE atmospheric dust-spot efficiency.

ASHRAE 52-76 Dust spot efficiency %	Fractional Efficiencies %		
	3.0 micron	1.0 micron	0.3 micron
25-30	80	20	<5
60-65	93	50	20
80-85	99	90	50
90	>99	92	60
DOP 95	--	>99	95

Low efficiency filters are almost totally ineffective at removing sub-micron particulates from the air. It is also important that the filters used are properly sized for the air handlers. Gaps around the filter panels can allow air to bypass the filter as it passes through the air conditioner. Any gaps or openings should be filled using appropriate materials, such as stainless steel panels or custom filter assemblies.

## Positive Pressurization and Ventilation

A designed introduction of air from outside the computer room system will be necessary to accommodate positive pressurization and ventilation requirements. The data center should be designed to achieve positive pressurization in relation to more loosely controlled surrounding areas. Positive pressurization of the more sensitive areas is an effective means of controlling contaminant infiltration through any minor breaches in the room perimeter. Positive pressure systems are designed to apply outward air forces to doorways and other access points within the data processing center to minimize contaminant infiltration of the computer room. Only a minimal amount of air should be introduced into the controlled environment. In data centers with multiple rooms, the most sensitive areas should be the most highly pressurized. It is, however, extremely important that the air being used to positively pressurize the room does not adversely affect the environmental conditions in the room. It is essential that any air introduction from outside the computer room is adequately filtered and conditioned to ensure that it is within acceptable parameters. These parameters can be looser than the goal conditions for the room since the air introduction should be minimal. A precise determination of acceptable limits should be based on the amount of air being introduced and the potential impact on the environment of the data center.

Because a closed-loop, re-circulating air conditioning system is used in most data centers, it will be necessary to introduce a minimal amount of air to meet the ventilation requirements of the room occupants. Data center areas normally have a very low human population density; thus the air required for ventilation will be minimal. In most cases, the air needed to achieve positive pressurization will likely exceed that needed to accommodate the room occupants. Normally, outside air quantities of less than 5% make-up air should be sufficient (ASHRAE Handbook: Applications, Chapter 17). A volume of 15 CFM outside air per occupant or workstation should sufficiently accommodate the ventilation needs of the room.

## Cleaning Procedures and Equipment

Even a perfectly designed data center requires continued maintenance. Data centers containing design flaws or compromises may require extensive efforts to maintain conditions within desired limits. Hardware performance is an important factor contributing to the need for a high level of cleanliness in the data center.

Operator awareness is another consideration. Maintaining a fairly high level of cleanliness will raise the level of occupant awareness with respect to special requirements and restrictions while in the data center. Occupants or visitors to the data center will hold the controlled environment in high regard and are more likely to act appropriately. Any environment that is maintained to a fairly high level of cleanliness and is kept in a neat and well organized fashion will also command respect from the room's inhabitants and visitors. When potential clients visit the room they will interpret the overall appearance of the room as a reflection of an

overall commitment to excellence and quality. An effective cleaning schedule must consist of specially designed short-term and long-term actions. These can be summarized as follows:

Frequency	Task
Daily Actions	Rubbish removal
Weekly Actions	Access floor maintenance (vacuum and damp mop)
Quarterly Actions	Hardware decontamination Room surface decontamination
Bi-Annual Actions	Subfloor void decontamination Air conditioner decontamination (as necessary)

## Daily Tasks

This statement of work focuses on the removal of each day's discarded trash and rubbish from the room. In addition, daily floor vacuuming may be required in Print Rooms or rooms with a considerable amount of operator activity.

## Weekly Tasks

This statement of work focuses on the maintenance of the access floor system. During the week, the access floor becomes soiled with dust accumulations and blemishes. The entire access floor should be vacuumed and damp mopped. All vacuums used in the data center, for any purpose, should be equipped with High Efficiency Particulate Air (HEPA) filtration. Inadequately filtered equipment cannot arrest smaller particles, but rather simply agitates them, degrading the environment they were meant to improve. It is also important that mop-heads and dust wipes are of appropriate non-shedding designs.

Cleaning solutions used within the data center must not pose a threat to the hardware. Solutions that could potentially damage hardware include products that are:

- Ammoniated
- Chlorine-based
- Phosphate-based
- Bleach enriched
- Petro-chemical based
- Floor strippers or re-conditioners

It is also important that the recommended concentrations are used, as even an appropriate agent in an inappropriate concentration can be potentially damaging. The solution should be maintained in good condition throughout the project, and excessive applications should be avoided.

## Quarterly Tasks

The quarterly statement of work involves a much more detailed and comprehensive decontamination schedule and should only be conducted by experienced computer room contamination-control professionals. These actions should be performed three to four times per year, based on the levels of activity and contamination present. All room surfaces should be thoroughly decontaminated including cupboards, ledges, racks, shelves and support equipment. High ledges and light fixtures and generally accessible areas should be treated or vacuumed as appropriate. Vertical surfaces including windows, glass partitions, doors, etc. should be thoroughly treated. Special dust cloths that are impregnated with a particle absorbent material are to be used in the surface decontamination process. Do not use generic dust rags or fabric cloths to perform these activities. Do not use any chemicals, waxes or solvents during these activities.

Settled contamination should be removed from all exterior hardware surfaces including horizontal and vertical surfaces. The unit's air inlet and outlet grilles should be treated as well. Do not wipe the unit's control surfaces as these areas can be decontaminated by the use of lightly compressed air. Special care should also be taken when cleaning keyboards and life-safety controls. Specially treated dust wipes should be used to treat all hardware surfaces. Monitors should be treated with optical cleansers and static-free cloths. No Electro-Static Discharge (ESD) dissipative chemicals should be used on the computer hardware, since these agents are caustic and harmful to most sensitive hardware. The computer hardware is sufficiently designed to permit electrostatic dissipation thus no further treatments are required. After all of the hardware and room surfaces have been thoroughly decontaminated, the access floor should be HEPA vacuumed and damp mopped as detailed in the Weekly Actions.

## Biennial Tasks

The subfloor void should be decontaminated every 18 months to 24 months based on the conditions of the plenum surfaces and the degree of contaminant accumulation. Over the course of the year, the subfloor void undergoes a considerable amount of activity that creates new contamination accumulations. Although the weekly above floor cleaning activities will greatly reduce the subfloor dust accumulations, a certain amount of surface dirt will migrate into the subfloor void. It is important to maintain the subfloor to a high degree of cleanliness since this area acts as the hardware's supply air plenum. It is best to perform the subfloor decontamination treatment in a short time frame to reduce cross contamination. The personnel performing this operation should be fully trained to assess cable connectivity and priority. Each exposed area of the subfloor void should be individually inspected and assessed for possible cable handling and movement. All twist-in and plug-in connections should be checked and fully engaged before cable movement. All subfloor activities must be conducted with proper consideration for air distribution and floor loading. In an effort to maintain access floor integrity and proper psychrometric conditions, the number of floor tiles removed from the floor system should be carefully managed. In most cases, each work crew should have no more than 24 square feet (six tiles) of open access flooring at any one time. The access floor's supporting grid system should also be thoroughly decontaminated, first by vacuuming the loose debris and then by damp-sponging the accumulated residue. Rubber gaskets, if present, as the metal framework that makes up the grid system should be removed from the grid

work and cleaned with a damp sponge as well. Any unusual conditions, such as damaged floor suspension, floor tiles, cables and surfaces, within the floor void should be noted and reported.

## Activity and Processes

Isolation of the data center is an integral factor in maintaining appropriate conditions. All unnecessary activity should be avoided in the data center, and access should be limited to necessary personnel only. Periodic activity, such as tours, should be limited, and traffic should be restricted to away from the hardware so as to avoid accidental contact. All personnel working in the room, including temporary employees and janitorial personnel, should be trained in the most basic sensitivities of the hardware so as to avoid unnecessary exposure. The controlled areas of the data center should be thoroughly isolated from contaminant producing activities. Ideally, print rooms, check sorting rooms, command centers or other areas with high levels of mechanical or human activity should have no direct exposure to the data center. Paths to and from these areas should not necessitate traffic through the main data center areas.





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## Glossary

This glossary defines new or special terms and abbreviations used in *this guide*. For definitions about other 9840/T9840/T9940 drive subsystem terms, or terms about other StorageTek products, refer to the glossary in the appropriate manuals.

Many of the definitions are taken from the *IBM Dictionary of Computing*. The following letters in parentheses following the definition 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 Electrotechnical Commission (ISO/IEC/JTC1/SC1).

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

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

### A

#### **access time**

The mean time in seconds from the load ready position to a distance being approximately half way from COT (center of tape) to either EOT (end of tape).

#### **ACSLs**

*See* automated cartridge system library software.

#### **adapter**

Hardware used to join different connector types.

#### **ANSI**

American National Standards Institute.

#### **Arbitrated Loop**

One topology used in Fibre Channel that provides multiple connections for devices that share a single loop, over which only two devices can communicate at once.

**Arbitrated Loop Physical Address (AL\_PA)**

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

**Automated Cartridge System Library Software (ACSL)**

UNIX-based software that allows multiple computing platforms to access a Nearline automated cartridge system (ACS).

**B****Bit**

(1) A unit of information equal to a 1 or a 0. (2) Either of the digits 0 or 1 when used in the binary numeration system. (T)

**British thermal unit (Btu)**

A standard measure of a device's heat output. The amount of heat required to raise one pound of water one degree Fahrenheit.

**Btu**

See British thermal unit.

**Byte**

(1) A string that consists of a number of bits, treated as a unit, and representing a character. (T) (2) A number of bits, treated as a unit, and representing a character.

**C****Calorie**

The amount of heat required to raise one kilogram of water one degree Celsius. Equal to 3.968 Btu.

**cartridge**

A storage device that consists of magnetic tape on supply and take up reels, in a protective housing. (IBM).

**Cartridge Scratch Loader (CSL)**

In the 9840 tape drive, a device attached to the 9840 drive which automatically feeds cartridges to the drive. Cartridges are manually placed in an input bin, and after use, are deposited automatically in an output bin.

**cleaning cartridge**

A cartridge containing special material used to clean the tape path in a transport.

**Client System Component (CSC)**

Software that provides an interface between the client computing system's operating system and the StorageTek library software, such as ACSLS, HSC, or LibraryStation.

**connector**

An electrical part used to join two or more other electrical parts. (IBM)

**CSC**

See Client System Component.

**CSE**

See Customer Services Engineer.

**CSL**

See Cartridge Scratch Loader.

**Customer Services Engineer (CSE)**

An employee trained to install, maintain, and repair StorageTek equipment.

**configuration**

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

**D****daisy chain**

A method of device interconnection for determining interrupt priority by connecting the interrupt sources serially.

**data migration**

The orderly movement of data from one storage medium to another.

**differential**

A SCSI bus alternative with a maximum cable length of 25 meters (82 feet).

**E****Enterprise Systems Connection (ESCON)**

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

**equipment rack**

A free-standing cabinet or framework that holds electronic equipment.

**ESCON**

*See* Enterprise Systems Connection.

**F****fabric**

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

**FC**

*See* Fibre Channel

**FIB**

Format identifier block. A FIB is required to identify tapes written by a T9840C or T9840D tape drive. The T9840C has a unique FIB, and the T9840D has a unique FIB. Earlier generation drives detect the FIB (T9840A/B identify the FIB for tapes written by either a T9840C or T9840D while the T9840C detects the FIB for tapes written by a T9840D).

**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)

**Fibre Channel (FC)**

The ANSI standard that defines an ultra high-speed, content independent, multi-level data transmission interface that can support multiple protocols simultaneously, support connectivity to millions of devices over copper and/or fiber optic physical media, and provides the best characteristics of both networks and channels, over diverse topologies.

**Fibre Connection (FICON)**

An 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**

See Fibre Connection.

**field replaceable unit (FRU)**

An assembly that is replaced in its entirety when any of its components fails. (IBM)

**firmware**

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

**FRU**

See field replaceable unit.

**frame**

A cabinet that holds an array of tape drives for attachment to a library.

**G****GB**

See Gigabyte.

**Gb**

Gigabit, equal to  $10^9$  bits.

**GBIC**

See Gigabit Interface Converter

**gigabit (Gb)**

One billion ( $10^9$ ) bits.

**Gigabit Interface Converter (GBIC)**

An adapter that connects a fiber-optic or copper-wire cable to a Fibre Channel hub or switch.

**gigabyte (GB)**

One billion ( $10^9$ ) bytes when referring to disk and tape capacity. When referring to memory capacity, one gigabyte equals 1,073,741,824 in decimal notation.

## H

**hardware**

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

**HBA**

*See* host bus adaptor

**host**

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

**host bus adapter (HBA)**

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

**host interface**

Interface between a network and host computer. (T)

**Host Software Component (HSC)**

The StorageTek software that provides client volume location information through its Control Data Set (CDS) and provides the interface to the Nearline ACS hardware and client operator console.

**HSC**

*See* Host Software Component

**hub**

A piece of hardware, separate from the actual FC interface accessible on the backplane of a device, which houses the port bypass circuitry for configurations of 8 to 16 ports per hub. Hubs may be cascaded to support larger configurations, and can usually support a mix of both electrical and optical media ports in the same hub.

## I

**IBM**

International Business Machines, Inc.

**ID**

Identifier or identification.

**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 a internet environment. (IBM)

**Internet Protocol (IP) v4 address**

A four-byte value that identifies a device and makes it accessible through a network. The format of an IPv4 address is a 32-bit numeric value written as four numbers separated by periods. Each number can be from 0 to 255. For example, 129.80.145.23.

### **Internet Protocol (IP) v6 address**

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

## **L**

### **LCU**

*See library control unit.*

### **library**

(1) A library is composed of one or more automated cartridge systems (ACSs), attached transports (such as cartridge drives or controller transport units), volumes placed into the ACSs, host software that controls and manages the ACSs and associated volumes, and the library control data sets that describe the state of the ACSs. (2) A robotic system that stores, moves, mounts, and dismounts cartridges that are used in data read or write operations. (3) A hardware component in a tape automation system.

### **library control unit (LCU)**

The portion of an automated library that controls the choosing, mounting, dismounting, and replacing of cartridges.

### **library management unit (LMU)**

The portion of an automated cartridge system that controls the library storage module and communicates with the Host Software Component.

### **LibraryStation**

Software that allows an MVS system to be used as a library control server.

### **library storage module (LSM)**

A housing that contains cartridges and a robot that moves the tapes between storage cells and the attached transports. Synonymous with tape library.

### **LMU**

*See library management unit.*

### **load time**

The time from when a cartridge is first put into the loader and the instruction is given to load the cartridge to when the drive becomes ready. This includes the lowering of the elevator, engaging the tape and read/write head, successfully reading of the MIR, successfully read of the FIB (if needed), and then moving the tape to the nearest location of where first data would normally be located on tape.

### **long wave**

Fiber optics transmission using 1310 nm wavelength laser.

### **LSM**

*See library storage module.*

## **M**

### **megabyte (MB)**

Megabytes or 1,000,000 bytes for disk or tape storage, but 1,048,576 (220) bytes of memory capacity.

**migration**

See data migration.

**multimode**

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

**Multiple Virtual Storage (MVS)**

IBM's Multiple Virtual Storage, consisting of MVS/System Product Version 1 and the MVS/370 Data Facility Product operating on a System/370 processor. (IBM)

**MVS**

See Multiple Virtual Storage

**N****NCS**

See Nearline Control Solution.

**Nearline**

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

**Nearline Control Solution (NCS)**

An MVS-based Nearline software product that supports multiple MVS images sharing a library complex.

**O****operating system**

Software that controls the execution of program and that may provide services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominately software, partial hardware implementations are possible. (T)

**R****rack**

See equipment rack.

**Removable Media Library Software (RMLS)**

StorageTek software that runs on each iSeries host or LPAR, and provides robotic control via ACSLS to StorageTek libraries.

**RMLS**

See Removable Media Library Software.

**S****SCSI**

See small computer system interface.

**Shared Services Center**

A StorageTek office that processes orders.

**short wave**

iber optics transmission using 850 nm wavelength laser.

**single mode**

Fiber with a relatively narrow diameter, through which only one mode will communicate. Single mode fiber carries higher bandwidth than multimode fiber, but requires a light source with a narrow spectral width.

**small computer system interface (SCSI)**

An ANSI standard for controlling peripheral devices by one or more hosts.

**software**

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

**StorageTek SL8500 Modular Library System**

An automated tape library comprised of:

- Customer interface module
- Robotics interface module
- Drive and electronics module
- Storage expansion module (optional)

**switch**

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

**Systems Assurance**

The exchange of information among product-installation team members to promote an error-free installation and contribute to customer satisfaction.

**T****tape drive**

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

**V****VOLSER**

*See* volume serial number.

**volume serial number**

A number in a volume label assigned when a volume is prepared for use in a system. (IBM)



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