StorageTek TIMBERWOLF™ 9740
Tape Library

Hardware Operator's Guide

95693
Revision: P

TimberWolf 9740 Tape Library

Hardware Operator's Guide

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Summary of Changes

EC	Date	Revision	Description
111257	November 1999	H	Changes as noted in this revision.
111486	May 2000	J	Changes as noted in this revision.
111516	August 2000	K	Changes as noted in this revision.
111545	October 2000	L	Changes as noted in this revision.
111714	December 2001	M	Changes as noted in this revision.
114111	September 2005	N	Changes as noted in this revision.
114166	September 2006	P	Covers and Title Page: Replaced the information with Sun Microsystems, Inc. information. Summary: Removed the List of Pages. Preface: Replaced Additional Information verbiage with Sun boilerplate verbiage. Notices: Replaced the verbiage with Sun boilerplate verbiage. Chapter 1: Removed the model number from Figure 1-1. Chapter 5: Replaced the verbiage with Sun boilerplate verbiage. Appendix A: Replaced the "Ordering Cartridge Tapes and Labels" section with "Ordering Media." Glossary: Removed the feature code 99DR.

Contents

Figures

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Preface

This guide describes how to operate the TimberWolf 9740 Library Storage Module (LSM). Most of the information in this guide pertains to the hardware.

Note: Refer to the appropriate publications for specific information about the controller transport units, tape drives, software commands, and console messages.

This guide is intended primarily for data center operators who operate the LSM. System programmers and computer system administrators might also find the information in this guide useful.

Organization

This guide has the following organization:

Chapter 1	"General Information" describes the LSM hardware.
Chapter 2	"Controls and Indicators" shows the locations of the power switch and operator panel, and describes their functions. This chapter also shows how to set the SCSI address and maximum usage count for the cleaning cartridge.
Chapter 3	"Operating the LSM" contains operating procedures. The procedures include how to power-on and power-off the LSM, perform automated operations (enter and eject cartridges through the cartridge access port), cleaning the tape drives, and perform manual operations (mount and dismount cartridges).
Chapter 4	"Drives" contains an overview about the different types of controller transport units and tape drives that attach to the LSM.
Chapter 5	"Service" describes how to contact Customer Support for assistance if the LSM has a problem.
Appendix A	"Cartridge Tape Information" describes how to prepare, inspect, store, clean, and repair cartridges. It also lists cartridge specifications.
Glossary	The Glossary defines new or special terms and abbreviations used in this publication.
Index	The Index assists in locating information in this publication.

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Alert messages call your attention to information that is especially important or that has a unique relationship to the main text or graphic.

Note: A note provides additional information that is of special interest. A note might point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it pertains.

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Related Publications

Additional information is contained in the following publications, some of which are delivered with this product.

Publication	Part Number
Cartridge Drive Publications	
9490 Operator's Guide	9634
SD-3 Operator's Guide	9787
Tape Drive Publications	
Quantum DLT 4000 Cartridge Subsystem Product Manual	3131276xx
Quantum DLT 7000 Cartridge Subsystem Product Manual	3131345xx
Quantum DLT 8000 Cartridge Subsystem Product Manual	81-60118-xx
T9840 Tape Drive User's Reference Manual	95739
T9940 Tape Drive Operator's Guide	95989

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General Information

1

This chapter describes the library storage module (LSM) for an automated cartridge system (ACS). An ACS is a removable media, robotic system that mounts cartridges into storage cells, tape drives, cartridge access port (CAP), or cartridge exchange mechanism (CEM).

Figure 1-1 on page 1-2 and Figure 1-2 on page 1-3 show the location of the major components for the LSM.

Library Storage Module Components

The LSM has four major components:

- A robot
- A cartridge access port (CAP) that holds up to 14 cartridges
- Storage cells for 326 or 494 cartridges
- An *optional* cartridge exchange mechanism (CEM)

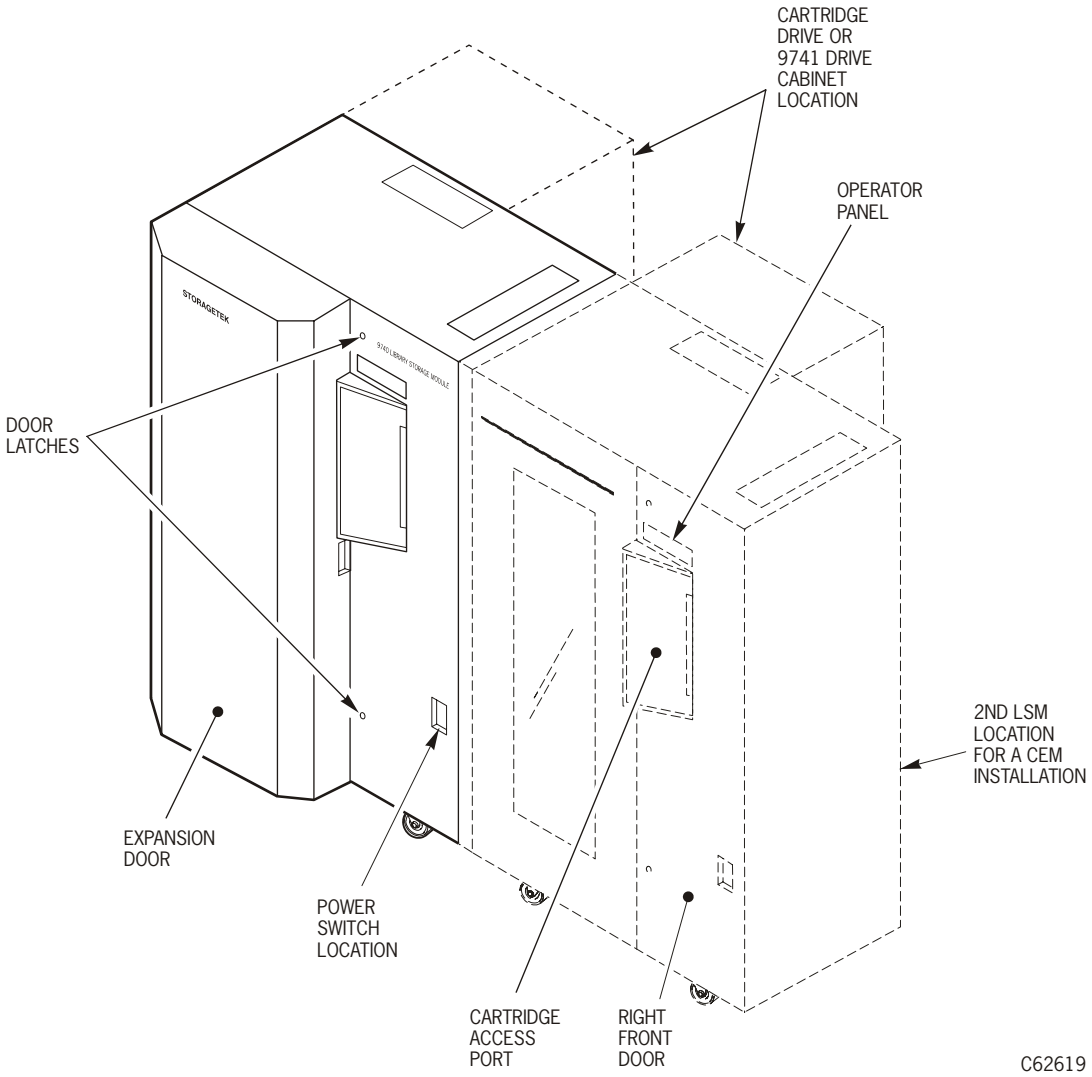
Attached to the rear of the LSM is either:

- A cartridge drive that houses 9490 or SD-3 controller transport units
- A 9741 or 9741E Drive Cabinet that houses DLT and/or T9840 drives
- An expanded 9741 Drive Cabinet with T9940 drives

Supported tape drives for this LSM include:

- 9490 or SD-3 cartridge transport units (CTUs)
- DLT drives
- T9840 or T9940 tape drives
- A combination of DLT and T9840 or T9940 tape drives

Figure 1-1. External Components (C62619)



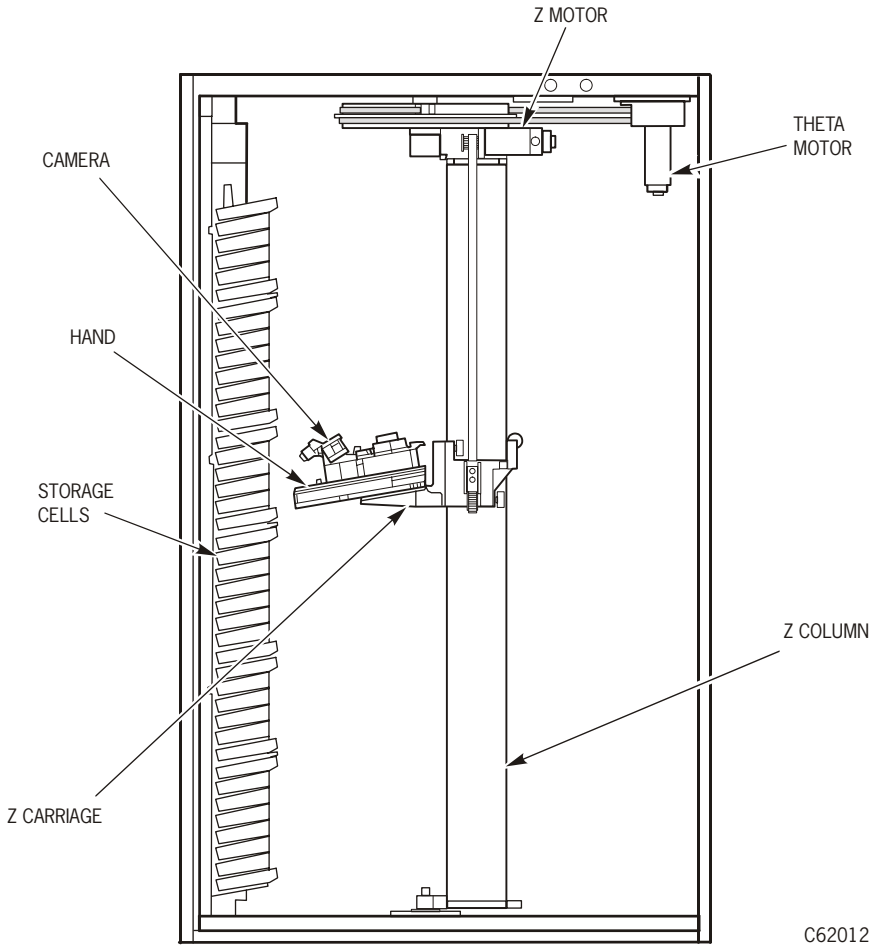
Robot

Figure 1-2 on page 1-3 shows the robot components. The robot is a mechanism that moves cartridges between storage cells, CTUs, tape drives, CAP, or CEM. The robot consists of the Z column assembly, hand, and camera assembly.

The Z column assembly contains a Z column, theta motor, and Z carriage. The Z column attaches to the floor and ceiling of the LSM. The theta motor rotates the Z carriage to allow access to all of the cells in the LSM.

The hand consists of a reach mechanism and gripper assembly that mount and dismount the cartridge tapes. The hand attaches to the Z carriage which moves the hand vertically along the Z column.

Figure 1-2. Robot Components (C62012)



The camera assembly on the hand reads the cartridge volume serial numbers (VOLSERs) during audits, but is not used to locate cartridges during robotic moves. An audit occurs when:

- You power-on the LSM.
- You open and close an LSM door.
- You press the IPL (initial program load) button on the LSM.
- A host request is made at the customer console to audit the LSM.

The VOLSER information is stored on the library controller card. You must request a host update to add the information to the host memory.

Note: The camera does not read the VOLSERs of cartridges in the CTUs or tape drives. If you manually mount a cartridge, the host memory will retain the VOLSER that was last automatically requested for that CTU or tape drive.

Cartridge Access Port

The cartridge access port (CAP) is a storage area where you add cartridges to or remove cartridges from an LSM. The CAP is located on the right front door.

LSMs are shipped with the type of CAP that allows you to place 14 cartridges, one at a time, into the cells, or with a CAP that allows you to place a preloaded 10-cartridge magazine into the CAP.

Note: The 10-cell cartridge magazine holds DLT cartridges.

Storage Cells

The LSM contains storage cells for 326 or 494 cartridges. The number of cells is determined by whether the LSM has the standard left front door or the expansion door.

Cartridges are stored in cell arrays that hold 6 or 14 cartridges. The cell arrays are stacked in columns and the columns are arranged in a circle around the robot assembly.

CAUTION:
***Equipment problems*: The cartridges must be inserted into the storage cells with the customer label on top and the VOLSER facing the person doing the inserting. If the cartridges are inserted into the cells upside down, the LSM will stop during operation.**

Cartridge Exchange Mechanism

The cartridge exchange mechanism (CEM) is an optional feature that allows a robot to pass a cartridge from one LSM to another. For instance, when the host software makes a mount request, and all the drives in the LSM are busy, with this feature the robot can place the cartridge to the next LSM. The robot in that LSM can then place the cartridge into one of its drives.

You can connect up to six LSMs together using the CEM. The LSMs are numbered from left to right as you face the front of the LSMs. LSM0 is always at the far left and all other LSMs are numbered consecutively and in ascending order toward the right as you face them (to LSM5).

Note: The CEM *does not* support libraries using a SCSI interface.

Cartridge Drives and Cabinets

The cartridge drive attaches to the rear of the LSM and contains:

- Two or four 9490 (TimberLine) CTUs
- One to four SD-3 (RedWood) CTUs

The 9741 or 9741E drive cabinets attach to the rear of the LSM and contains:

- One to ten Digital Linear Tape (DLT) drives
- One to ten T9840 Tape Drives
- One to ten T9940 Tape Drives

Each CTU or tape drive holds the cartridge for read/write operations. For more specific information, refer to your CTU or tape drive publications.

Notes:

- Only two of the three drive types that can be installed in a 9741 or 9741E Drive Cabinet are allowed to be mixed in the same cabinet.
- The T9940B drive cannot be installed in a 9740 LSM if the library uses a SCSI control path.

See Chapter 4, "Drives" for more information about these drives.

LSM Safety Features

Safety features are incorporated into the LSM. If the front doors to the LSM are opened, electrical interlocks remove power from the robot assembly.

Behind the right front door, covers are placed over the library controller card and the LSM power supply to prevent contact with the hazardous voltages and sensitive electronics.

Controlling Software

Controlling software is the interface between the host operating system and the LSM. The software determines where the cartridge is located by tracking the VOLSER and cell location during audits, then allocates which CTU or drive receives the cartridge.

If the LSM goes offline for any reason, you can mount and dismount cartridges manually, as described in Chapter 3, "Operating the LSM."

LSM Specifications

Table 1-1 lists the LSM specifications:

Table 1-1. LSM Specifications

Description	Specification
Power cable	**US/Canada** 100-120 VAC UL/CSA power cable **International** 200 to 240 VAC HAR power cable
Input voltage range Nominal voltage	100 or 240 VAC 100 to 254 VAC
Power configuration	**US/Canada:** 100-120 VAC, single phase, 47 to 63 Hz, 20 a Service, 3-wire **International:** 200 to 240 VAC, single phase, 47 to 63 Hz, 10 a Service 3-wire
Power consumption	200 W
Maximum heat output	683 Btu/hr
Temperature Operating Storage Shipping	 15º to 32ºC (59º to 90ºF) 10º to 40ºC (50º to 104ºF) -40º to 60ºC (-40º to 140ºF)
Relative Humidity Operating Storage Shipping	 20% to 80% (noncondensing) 10% to 95% (noncondensing) 10% to 95% (noncondensing)
Wet Bulb Maximum Operating Storage Shipping	 29.2º C (84.5ºF) 35º C (95ºF) 35º C (95ºF)
Altitude Operating Storage Shipping	 0 to 3.05 km (0 to 10,000 ft.) 0 to 3.05 km (0 to 10,000 ft.) 0 to 15.24 km (0 to 50,000 ft.)

Controls and Indicators

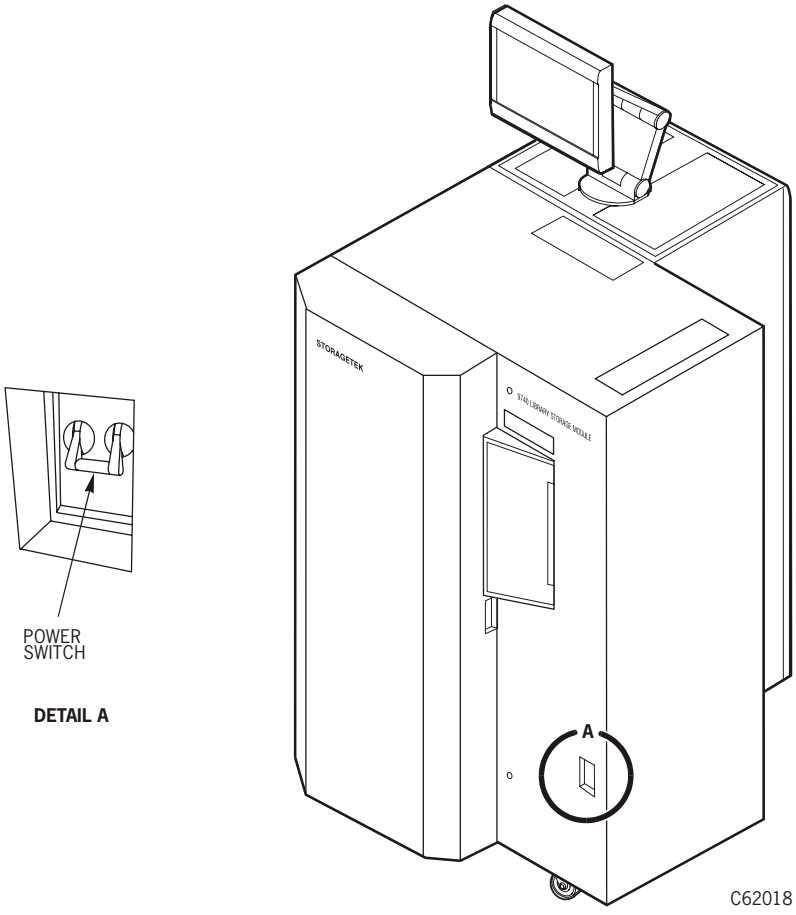
2

This chapter shows and describes the power switch and operator panel for the LSM. It also describes how to set the SCSI address as well as the maximum usage count of the cleaning cartridges. Refer to the controller transport unit or tape drive operator guides for information about operating those units.

Power Switch

The LSM power switch is a circuit breaker located in the lower right corner of the right front door of the LSM. The switch provides power to the LSM only. Figure 2-1 shows the LSM power switch location.

Figure 2-1. LSM Power Switch (C62018)



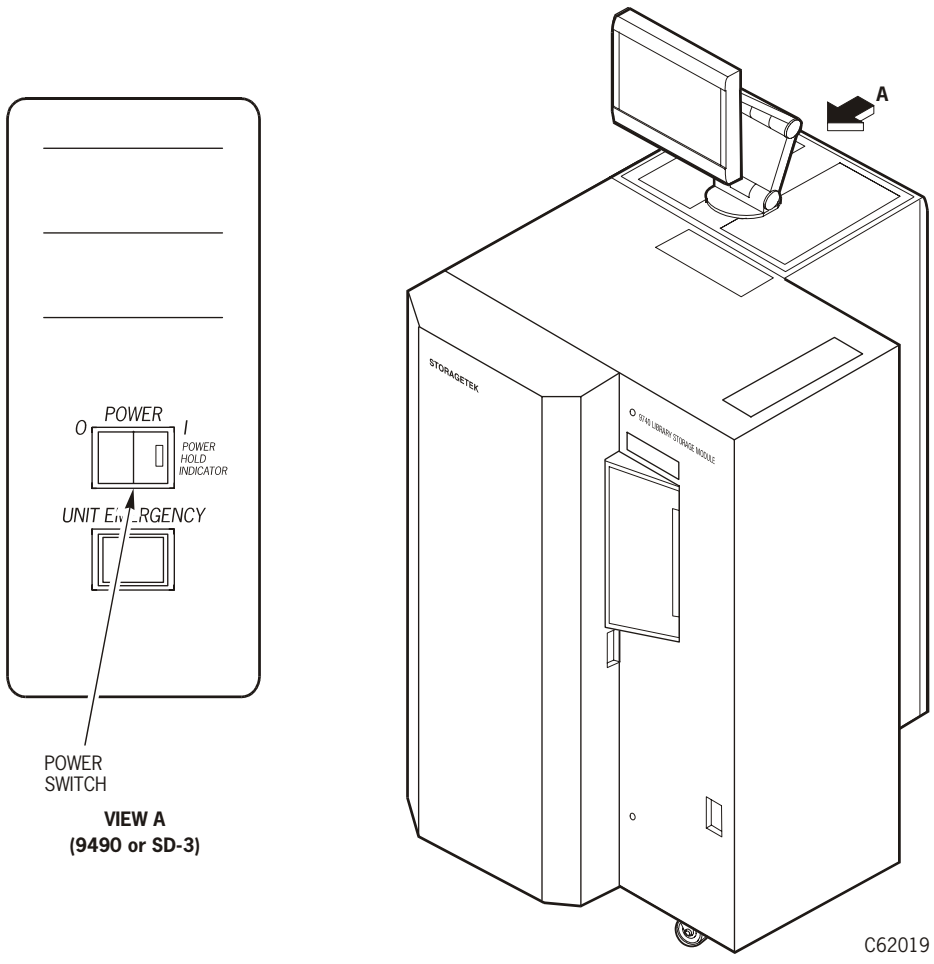
Tape Drives and Cabinets

Drives that are housed in the standard and expanded (9741 and 9741E) Drive Cabinet each have their own power supply that attaches to a power strip at the base of the cabinet. To power down drives in the 9741/9741E Drive Cabinet the circuit breaker that provides power to the drives must be switched off. Do the same to power off the LSM.

Controller Transport Units

The controller transport units also have their own power supplies, but they have a power switch on they outside of the cartridge drive that the operator is allowed to use. If you need to power down the LSM and drives, toggle down the LSM power switch and push the cartridge drive power switch. Figure 2-2 on page 2-2 shows the power switch location for 9490 and SD-3 Cartridge Drives.

Figure 2-2. 9490 and SD-3 Cartridge Drive Power Switch Location (C62019)



Operator Panel

The operator panel is mounted to the right front door of the LSM. The panel contains function keys (also referred to as softkeys) and indicators, plus a two-line display. The operator panel displays LSM status, configuration, test sequences, and error information.

Figure 2-3 on page 2-4 shows the panel and describes each item.

Use the operator panel to:

- Resolve machine problems

  If an error occurs, a fault symptom code (FSC) is displayed. Forward this code to your service representative to help resolve the problem. Write down the FSC as soon as it appears to retain an accurate history of what happened.

  The display also instructs you to close the door or cartridge access port.

- Set the SCSI address.

  See Figure 2-4 on page 2-5 and Figure 2-5 on page 2-6 for this procedure.

- Set the maximum usage count of the cleaning cartridges.

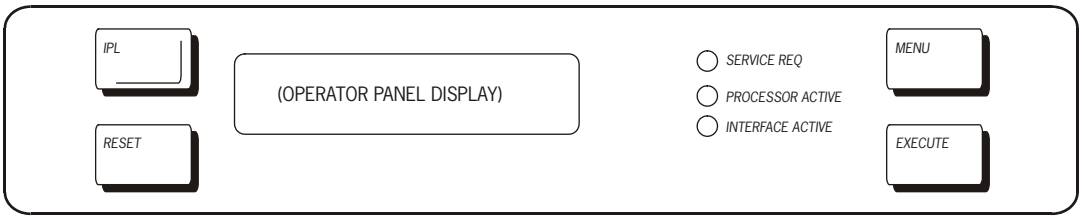
  See Figure 3-2 on page 3-6 for this procedure.

Setting the SCSI Address

You set the SCSI address from the operator panel. See Figure 2-4 on page 2-5 and Figure 2-5 on page 2-6 for the menu block diagrams that describe how to set the SCSI address to 0 through 7 if you have the PRS card, or 0 through 15 if you have the PRW card.

CAUTION:
***Initialization errors*: During this procedure, the panel displays `Press Execute to Enter Lib Size`. This is not normally an operator function. Altering the library size can cause initialization errors if the size is set incorrectly to full size and the library only holds 326 cartridges instead of 494 cartridges. Press the MENU button and continue through the choices as shown in the block diagram.**

Figure 2-3. Operator Panel Function Keys, Indicators, and Displays (C62014)



IPL	Initiates the download from the diskette. The IPL sequence consists of PROM tests, boot tests, and machine initialization.
RESET	**DESIGNED FOR CSE USE ONLY!** NOT an operator activity. Initiates a dump.
OPERATOR PANEL DISPLAY	Displays machine status and menu information. It also prompts the operator to perform certain functions. When the display shows "ONLINE - PRESS EXE TO UNLK CAP," and you want to unlock the CAP so that you can place a cartridge into it, press EXECUTE to send a message to the robot to unlock the CAP. When the display shows "ONLINE CAP UNLK DISABLD," the CAP is locked by the host. To open the CAP for entering cartridges, enter the "open" command from the system console. The display will change to "ONLINE PRESS EXECUTE TO UNLOCK CAP." Once you have pressed EXECUTE, the display will change to "ONLINE CAP UNLK PENDING." The robot will then unlock the CAP and the display will show "ONLINE CAP UNLOCKED." When the display shows "ONLINE CAP UNLOCKED," and you want it locked, open and close the CAP. The display will show "ONLINE CAP LOCKED."
SERVICE REQ	Lights when the LSM requires service. The display indicates "INOP" and the fault symptom code.
PROCESSOR ACTIVE	Solid light until the functional code is active, then flashes on and off every second while the controller card is active.
INTERFACE ACTIVE	Flashes whenever I/O is performed across a host interface or CSE port.
MENU	Used to set SCSI address and cleaning cartridge usage.
EXECUTE	Used to unlock the CAP. When the display shows "ONLINE CAP LOCKED," press EXECUTE to send a message to the robot to unlock the CAP. Also used to set SCSI address and cleaning cartridge usage.

C62014

Figure 2-4. Symbol Definitions for Menu Block Diagram (C62015)

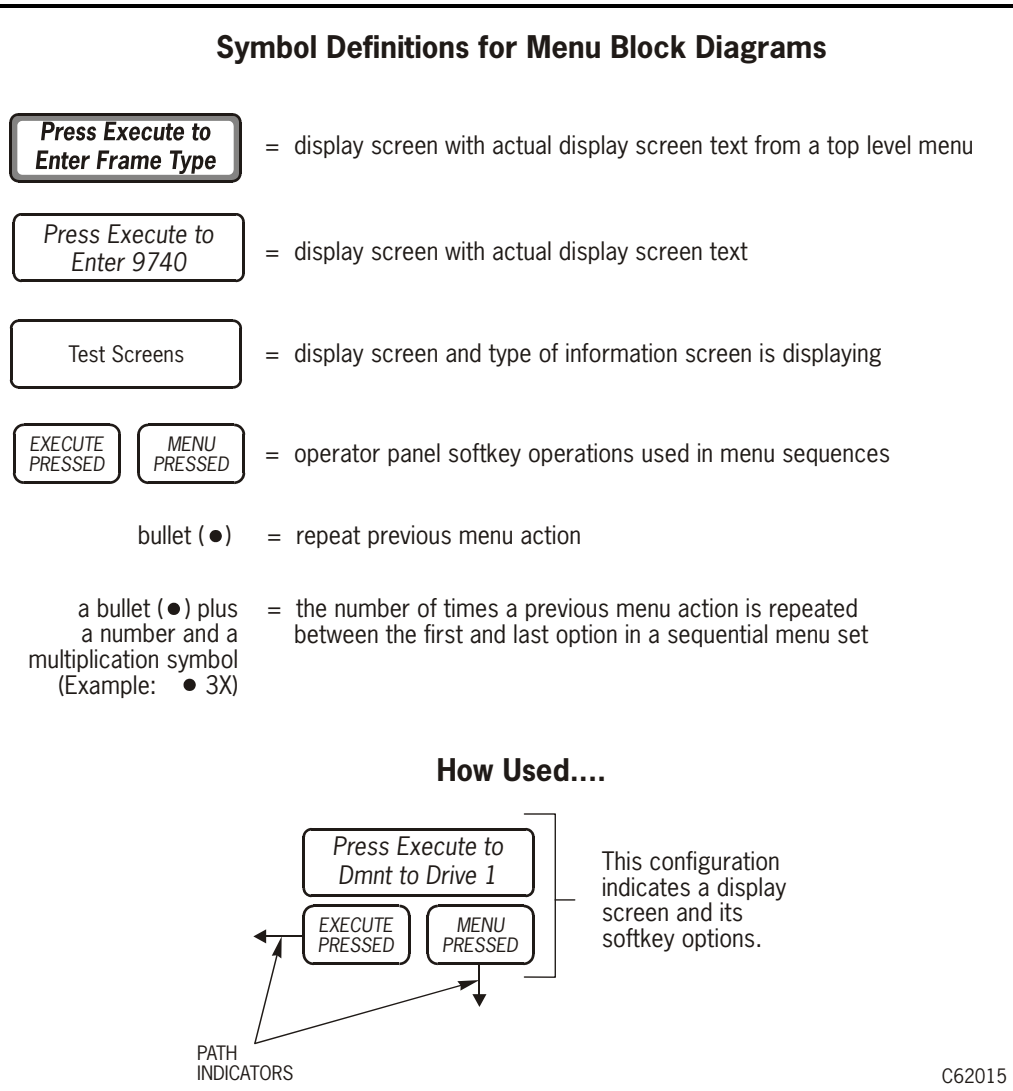
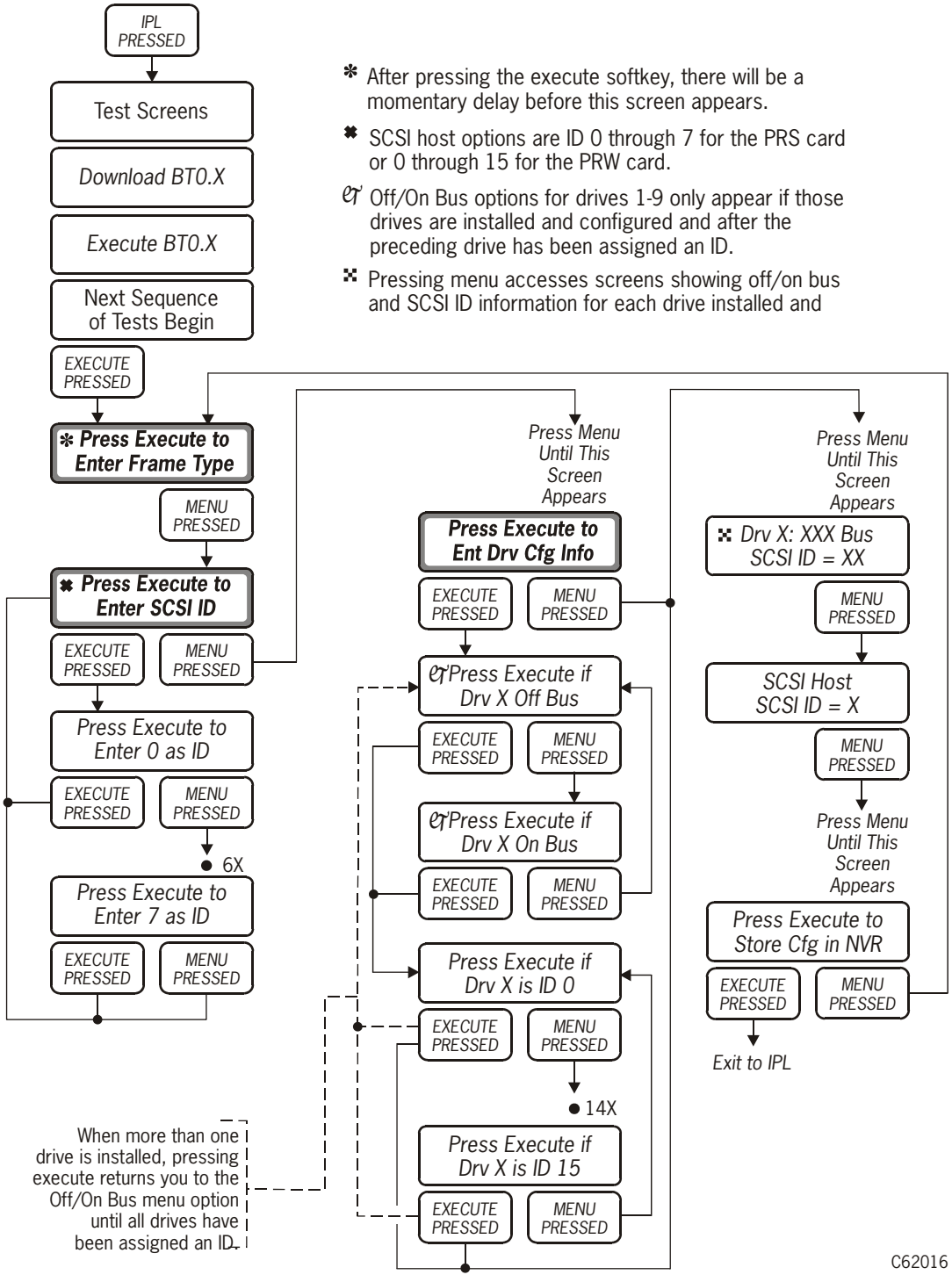


Figure 2-5. Setting the SCSI Address (C62016)



Operating the LSM

3

This chapter contains the procedures for:

- Powering-on or IPLing the LSM
- Powering-off the LSM
- Operating in automated mode
- Operating in manual mode

When the machine is controlled by the host, refer to your software publications and enter the command from the operator console to do the desired activity.

Powering-on or IPLing the LSM

To power-on or IPL the LSM, lift the power switch at the bottom right corner of the right front door of the LSM. When the LSM has been powered-on, you can press the IPL function key located on the operator panel to IPL the LSM.

When you do either activity:

- The operator panel displays PROM, boot, and initialization information.
- The operator panel displays "`ONLINE - PRESS EXE TO UNLK CAP`.

Note: If the LSM does not power-on, contact the Central Support Remote Center and report the problem.

Powering-off the LSM

To power-off the LSM, enter the command at the operator console to place the LSM and controller transport units (CTUs) and drives offline.

Push down the power switch on the bottom right corner of the right front door of the LSM.

If this is an emergency, press the power switch on the cartridge drive to the off position. This is only applicable to 9490 and SD-3 Cartridge Drives.

If you have a standard or expanded (9741 or 9741E) Drive Cabinet with DLT, T9840, or T9940 drives and you have an emergency, you must switch the circuit breaker off to kill power to the drives.

Operating the LSM in Automated Mode

When the LSM is online and operating in automated mode, it performs many tasks that you would otherwise perform manually. However, to keep the LSM operating efficiently while the robot is mounting and dismounting cartridges, you may need to do the following:

- Monitor your operator console and the LSM operator panel for messages and respond appropriately
- Load cartridges into the LSM through the cartridge access port (CAP)
- Eject cartridges from the LSM through the CAP
- Replace cleaning cartridges

The instructions on the following pages describe how to perform these activities.

Loading Cartridges through the CAP

If the operator panel displays `ONLINE CAP UNLK DISABLD`, the CAP is locked by the host. Issue the command at the operator console to allow the CAP to be unlocked.

When the operator panel displays `ONLINE - PRESS EXE TO UNLK CAP`, follow the steps below.

To unlock the CAP:

1. Press EXECUTE on the operator panel.
   a. The operator panel displays `ONLINE CAP UNLK PENDING`.
   b. The hand unlocks the CAP.
   c. The operator panel displays `ONLINE CAP UNLOCKED`.
2. Open the CAP to gain access to the cells.

   The operator panel displays `ONLINE CAP UNLOCKED`.

CAUTION:
***Potential equipment damage*: You must enter the cartridges properly or you might damage the robot, CTU, or tape drive, or cause the LSM to stop operating.**

3. Enter the cartridges so that they lie flat, with the customer label on top and the tape leader block cutout on the right-hand side, or insert the cartridges into a magazine and insert the magazine into the CAP.

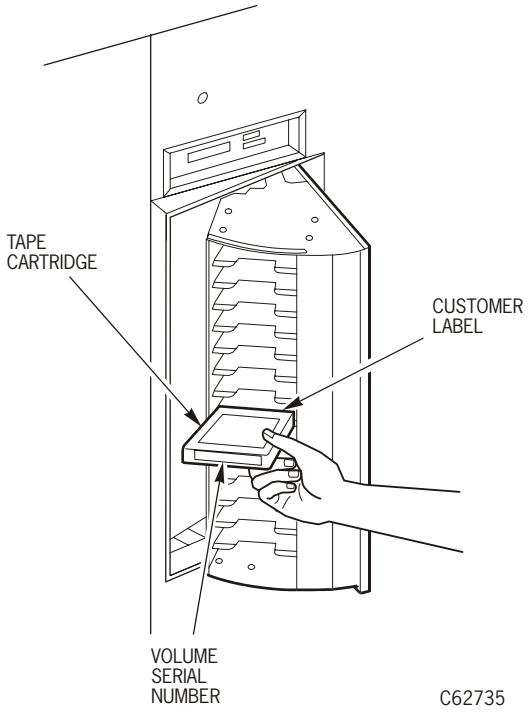
   See Figure 3-1 on page 3-3 for an example of how to load the cartridges.

4. Close the CAP. The lock automatically engages.

Notes:

- The host software determines what happens when you enter a cartridge upside down or with an unreadable label. Under normal conditions, the camera on the hand audits the CAP and recognizes that a cartridge is present, but the hand does not move it. You must remove the cartridge from the CAP and correct the problem.
- For some systems, you are prompted to type in a label number when no VOLSER is read. If you do type in a label number, you might cause a problem during an audit, because the camera still cannot read an unreadable VOLSER on the cartridge.

Figure 3-1. Loading a Cartridge into the Cartridge Access Port (C62735)



Ejecting Cartridges through the CAP

Refer to your specific software publications for instructions about having the robot insert the desired cartridges into the CAP.

To eject cartridges through the CAP:

1. Enter the VOLSERs of the cartridges you want ejected at the operator console. The robot will retrieve them and insert them into the CAP.
2. If the operator panel displays `ONLINE CAP UNLK DISABLD`, the CAP is locked by the host. Issue the command at the operator console to change the LSM to the `ONLINE - PRESS EXE TO UNLK CAP` mode.
3. When the operator panel displays `ONLINE - PRESS EXE TO UNLK CAP`, press EXECUTE on the operator panel.
   a. The operator panel displays `ONLINE CAP UNLK PENDING`.
   b. The hand unlocks the CAP.
   c. The operator panel displays `ONLINE CAP UNLOCKED`.
4. Open the CAP to gain access to the cells.
5. Remove the cartridges and store them *outside* the LSM, or
6. Remove the magazine from the CAP, remove the cartridges from the magazine, and store them *outside* the LSM.
7. Close the CAP. The lock automatically engages.
8. Repeat these steps until the robot has inserted all of the desired cartridges into the CAP and you have removed them.

Cleaning Drives in the LSM

Drive cleaning can be initiated either by the operator or by the backup application. The following information describes the functions the operator needs to perform to clean the drives.

Operator-initiated cleaning is handled in one of two ways:

- For a SCSI interface
- For a serial interface

Before attempting to clean any drives in the LSM, make sure you know what type of interface (control path) is installed at your site: SCSI or serial. If you do not know, ask your service representative.

Note: The T9940 drive cannot be installed in a 9740 LSM if the library uses a SCSI control path. Thus, the section entitled "SCSI Interface" does not apply to T9940 drives.

SCSI Interface

If your control path is SCSI, these items are true:

- You have the option of using the AUTO CLEAN function or cleaning the drives manually.
- All drive cleaning is set up and controlled through the operator panel.
- The LSM automatically tracks the number of cleaning cycles performed by the AUTO CLEAN function on any particular cleaning cartridge.

AUTO CLEAN Feature

The AUTO CLEAN feature can be enabled when your LSM is configured during installation. When a drive requires cleaning, the robot receives a message telling it to retrieve the cleaning cartridge from the cleaning cell in the LSM and place it into the drive.

If AUTO CLEAN is not enabled, you must periodically look at the lights on the drive. When the Use Cleaning Cartridge light is on, you must manually place a cleaning cartridge into the drive.

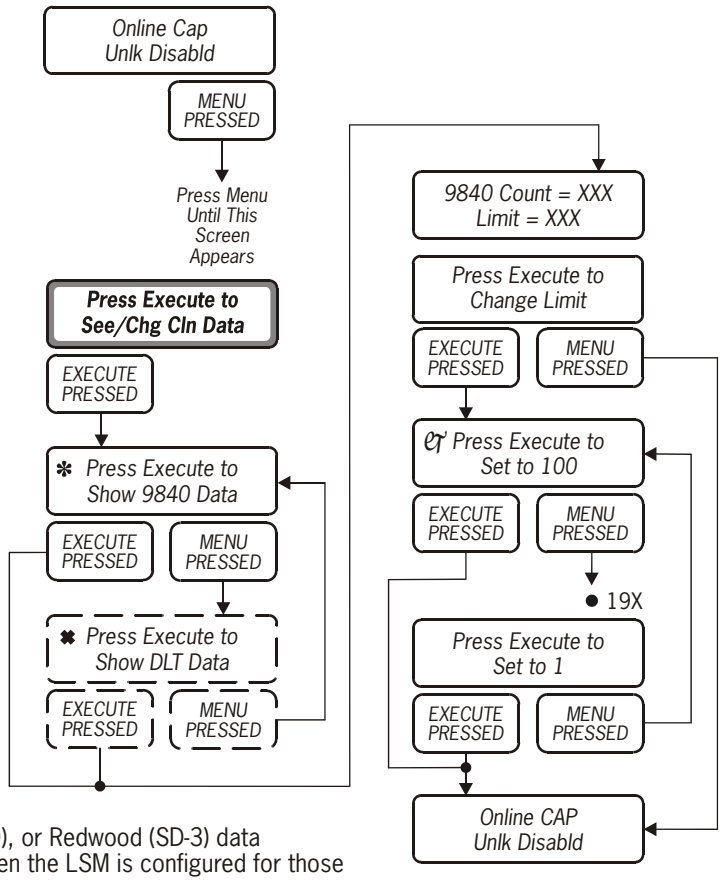
See "Setting the Cleaning Cartridge Usage Count" on page 3-6 for more information and procedures.

Setting the Cleaning Cartridge Usage Count

You can use the operator panel to set the maximum number of times a cartridge can be used to make sure that it is effective. Remember that each drive's cartridge has a maximum number of cleans, and must be replaced when it expires.

See Figure 3-2 for the menu block diagrams to set the usage count.

Figure 3-2. Setting the Usage Count of the Cleaning Cartridge (C62017)



✻ DLT, 3490 (9490), or Redwood (SD-3) data appears here when the LSM is configured for those drives only.

✖ This menu option only appears when the LSM is configured for a mixed drive environment of 9840s and DLTs or CTU environment of 9490s (3490) and

☞ **9840** limits decrease from 100 to 1 in decrements of 5; **DLT** from 20 to 1 in decrements of 1; **3480** from 500 to 1 in decrements of 25; **Redwood** from 100 to 1 in decrements of 5.

C62017

Replacing Cleaning Cartridges

When an LSM operating in an SCSI control path environment is in AUTO CLEAN mode, the only method to use to replace an expired cleaning cartridge is by selecting the Change Cln Cart utility from the main operator panel menu and following these instructions.

Notes:

- Do not load cleaning cartridges through the door of the LSM because the cleaning usage will not increment. You must use the Change Cln Cart utility and then load the cleaning cartridge through the CAP.
- In an LSM having both DLT and 9840 drives, make sure you specify the proper type of cleaning cartridge when asked by the Change Cln Cart utility.

With microcode version 1.9.xx and lower:

The clean counter increments for each clean. When the clean counter is equal to the set clean limit value (for example, 20 cleans for DLT cleaning cartridge), a `Cleaning Cartridge Used Up` message is displayed on the LSM operator panel. This message disappears with the next operator panel message or SCSI command.

If a drive indicates that it needs cleaning, the LSM continues to use an expired cleaning cartridge, incrementing the clean counter for each cleaning mount. When an expired cleaning cartridge is inserted into the drive, the drive will run the cleaning tape to the end and detect that the cleaning cartridge is expired but will not reset the clean indicator on the drive.

If the next tape successfully loads the drive clean indicator will disappear. Executing Change Cln Cart from the operator panel resets the library's clean counter to 0.

With microcode version 1.10.xx and higher, same as above except:

When the clean counter is equal to the clean limit value, an asterisk (*) is displayed on the right side of the top line on the operator panel to indicate that the cleaning cartridge is expired. The asterisk remains on the display, even when other messages display, until you execute Change Cln Cart.

During early portions of a library initialization, the asterisk temporarily does not display. However, once the library has been initialized, the asterisk reappears if the clean counter exceeds the set clean limit.

Serial Interface

If your control path is serial, these items are true:

- You *do not* have the option of using the AUTO CLEAN function from the operator panel.
- All drive cleaning is managed by and controlled through the host. The manner which ACSLS (Automated Cartridge System Library Software) handles automatic cleaning operations is defined in the *ACSLS 5.3x System Administrator's Guide*, PN 34767.

  This guide explains that the LSM alerts ACSLS of the cleaning request and ACSLS schedules the operation. The next time a mount request is received for the given transport, a cleaning tape is first mounted to the transport and the cleaning cycle completes before the requested data tape is mounted as requested.
- ACSLS automatically tracks the number of cleaning cycles performed by any particular cleaning cartridge.

Setting the Cleaning Cartridge Usage Count

In the event that all cleaning cartridges are expired, the original mount request will be honored without the prior cleaning operation. For that mount and for each subsequent mount to the uncleaned drive, a message will be posted in the event log: `No Cleaning Cartridge Available` for the specified drive. The *ACSLS Messages* document, PN 20177, explains the meaning of the message in detail, recommending required action to add more cleaning cartridges.

Replacing Cleaning Cartridges

The "Cleaning Transports" section in the *ACSLS 5.3 System Administrator's Guide*, PN 34767 explains how to enter cleaning tapes into the library and how to define them as cleaning tapes using the Set Clean command. This command allows the user to specify maximum usage for the cleaning tape.

Unlocking the CAP and Removing Non-cleaning Cartridges

If the operator panel displays `ONLINE CAP UNLK DISABLD`. The CAP is locked by the host.

Issue the command at the operator console that puts the LSM in the `ONLINE - PRESS EXE TO UNLK CAP` mode. Then perform the steps below.

When the operator panel displays `ONLINE - PRESS EXE TO UNLK CAP`, go directly to the steps below.

You must remove all cartridges that might be in the CAP, or the operator panel will display `CAP BUSY`. To open the cap so that you can remove cartridges from it, you must first unlock it.

To unlock the CAP:

1. Press EXECUTE on the operator panel.
   a. The operator panel displays `ONLINE CAP UNLK PENDING`.
   b. The hand unlocks the CAP.
   c. The operator panel displays `ONLINE CAP UNLOCKED`.
2. Open the CAP to gain access to the cells.
3. Remove the cartridges and store them *outside* the LSM, or remove the magazine from the CAP. Then remove the cartridges from the magazine and store them *outside* the LSM.
4. Close the CAP. The lock automatically engages.

Replacing Expired Cleaning Cartridges

1. Press MENU until the operator panel displays `PRESS EXECUTE TO REPLACE CLN CART`.
2. Press EXECUTE.
   The operator panel displays `PRESS EXECUTE TO REPLACE 3480 CART`.
   - If you want to replace the *3480* cleaning cartridge, press EXECUTE.
   - If you want to replace the *helical* cleaning cartridge, press MENU.

     `PRESS EXECUTE TO REPLACE HELICAL CART`.
   - If you want to replace the *DLT* cleaning cartridge, press MENU again.

     `PRESS EXECUTE TO REPLACE DLT CART`.
   - If you want to replace the *9840* cleaning cartridge, press MENU again.

     `PRESS EXECUTE TO REPLACE 9840 CART`.
3. Press EXECUTE and wait until the CAP unlocks.
   The hand takes the old cleaning cartridge from its cell and inserts it into the CAP and then unlocks the CAP.
4. Open the CAP and remove and discard the old cartridge.
5. Insert *one* new cleaning cartridge into a CAP cell and close the CAP.
   a. The robot performs a brief audit.
   b. The operator panel displays `MOVING CLEANING CART TO CELL`.
   c. The hand inserts the cartridge into its cell.
   d. The operator panel displays `ONLINE CAP UNLK DISABLD` or `ONLINE – PRESS EXE TO UNLK CAP`. Exit menu.

Operating in Manual Mode

When an LSM is offline, you might be:

- Opening the LSM front doors
- Moving the robot
- Locating a cartridge in the storage cells
- Mounting and dismounting a cartridge
- Removing a cartridge from the hand
- Returning the LSM to online status

The following information describes how to perform these activities.

Opening the LSM Front Doors

You must open the right front door, then the left front door to perform manual operations. See Figure 3-3 on page 3-11.

1. Make sure that all jobs have ended and place the LSM offline.
2. Open the LSM right front door by using the door key to unlock the top and bottom latches. Turn the key counterclockwise.

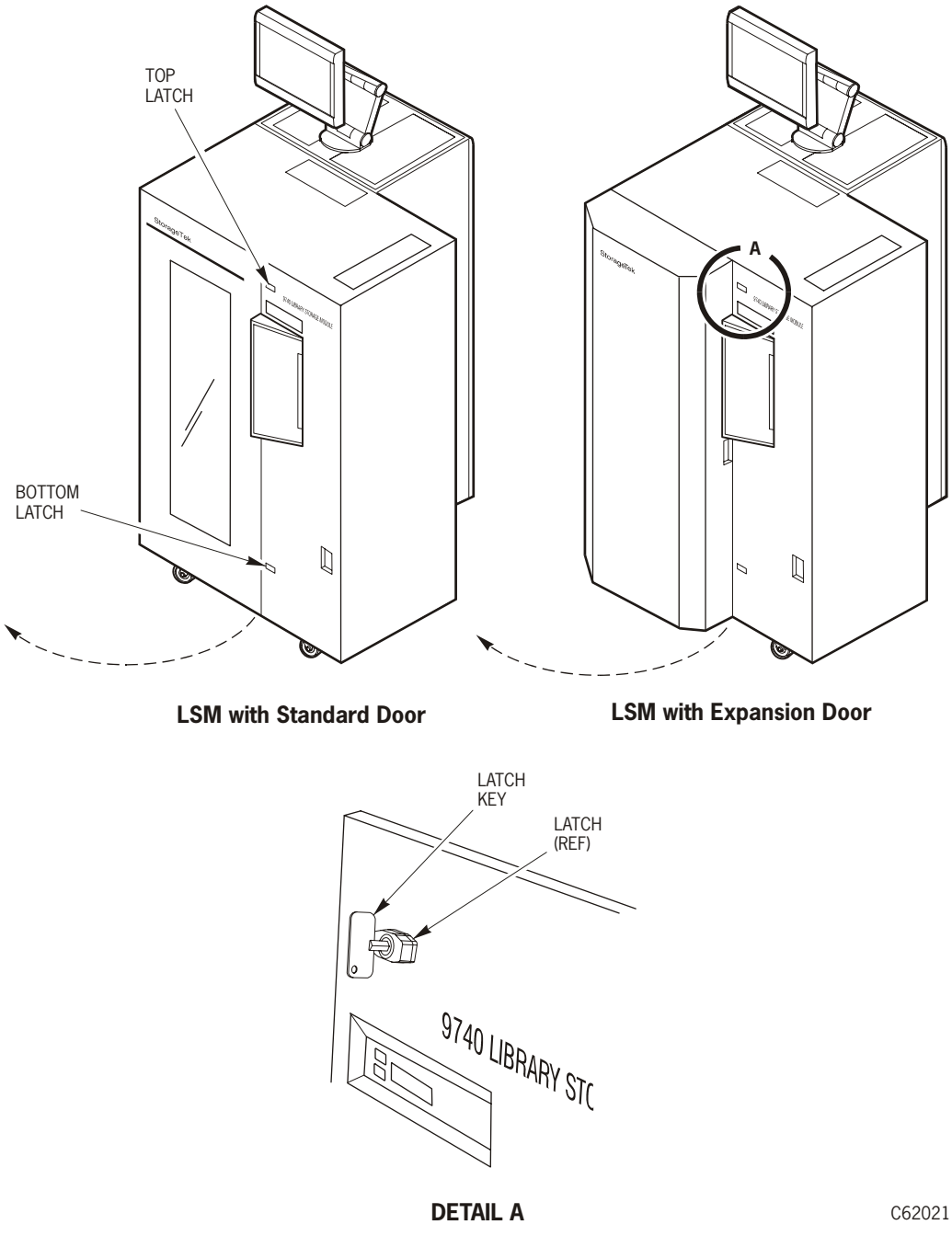
CAUTION:
***Components are Sensitive to Static Electricity*: Even a small electrostatic discharge (ESD) can damage an electrical component inside the LSM. A damaged component may not fail immediately, but over time, it will become worse, possibly causing an "intermittent" problem. Make sure you touch gray, unpainted metal or wear an antistatic wrist strap before reaching inside the LSM.**

After you have opened the door to the LSM:

- With your finger, touch a gray, unpainted metal surface, such as the LSM frame, just inside the front door of the unit.
- Keep your body movement to a minimum as you touch the drives or library components.

3. Open the LSM left front door. For the standard door, pull gently from the top right corner. For the expansion door, pull from the recessed area on the right side.

Figure 3-3. Opening Front Doors (C62021)



Moving the Robot

After opening the LSM doors, you might need to move the robot to make it easier to access the stored cartridges or the drives.

Read and observe the following caution before attempting to move any portion of the robot.

CAUTION:
***Potential equipment damage*: Do not touch exposed electrical parts when moving any part of the robot.**

To prevent damage to the hand or Z carriage, make sure that the reach mechanism on the hand is fully retracted before moving any part of the robot. Turn the belt drive to retract the reach mechanism.

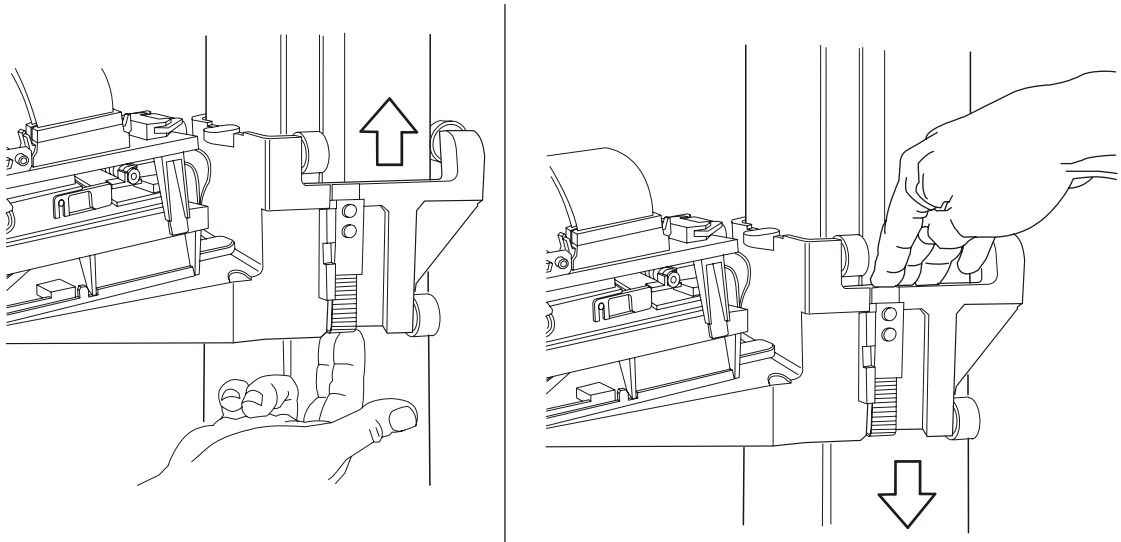
If the LSM goes offline because of a power failure, the reach mechanism might extend into a storage cell or drive. If the robot is rotated in this condition, the hand will be damaged.

Move the Z column and Z carriage only, as shown in Figure 3-4 and Figure 3-5 on page 3-13.

Raising and Lowering the Z Carriage

If you need to raise or lower the hand, slowly and carefully push down or push up by placing your fingers on the Z carriage as shown in Figure 3-4.

Figure 3-4. Raising and Lowering the Z Carriage (E62022)

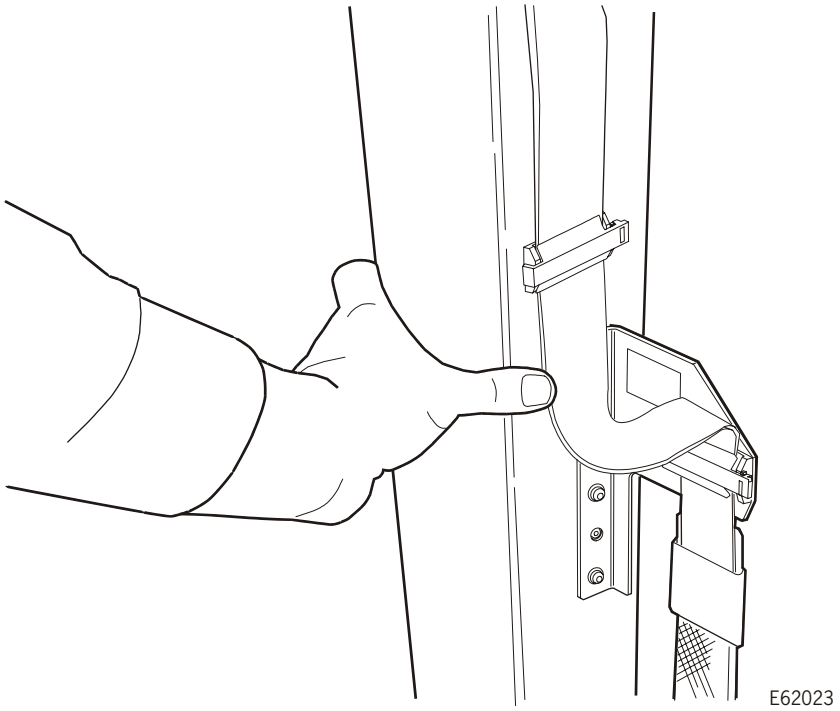


Rotating the Z Column

CAUTION:
***Potential equipment damage*: The Z column *does not* rotate a full 360 degrees. If you meet resistance when rotating it, do not force it. Rotate the Z column in the opposite direction.**

If you need to rotate the Z column, grasp it and *carefully* rotate it, as shown in Figure 3-5. If the Z column meets resistance and stops before the desired position is reached, it has contacted a stopping mechanism. Rotate the Z column in the opposite direction.

Figure 3-5. Rotating the Z Column (E62023)



Locating a Cartridge in the Storage Cells

Figure 3-6 through Figure 3-9 illustrate the locations of the panels, rows, and columns of the cartridge storage cells in a typical LSM configuration.

Note: There is a decal at the top of each column that also provides location information.

Figure 3-6. Locating Cartridges–Top View (C62024)

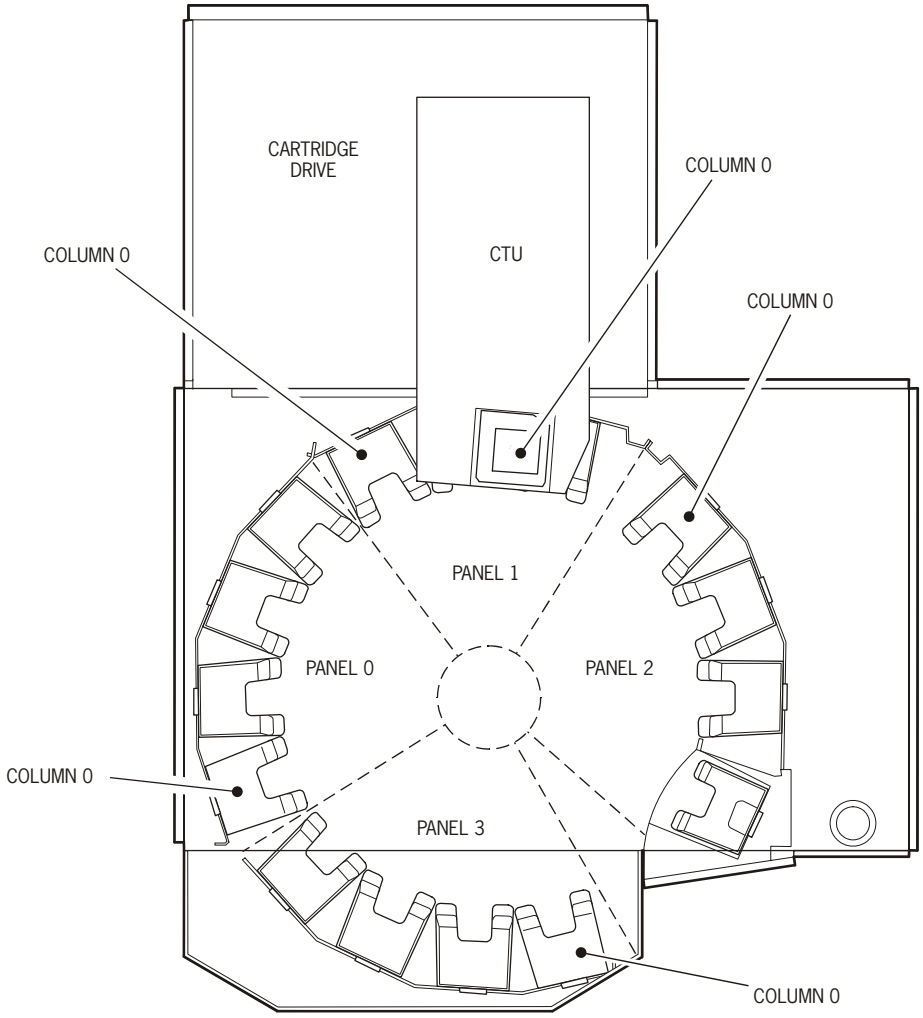


Figure 3-7. Locating Cartridges–Panels, Cells, Rows, Cartridge Drive (C62013)

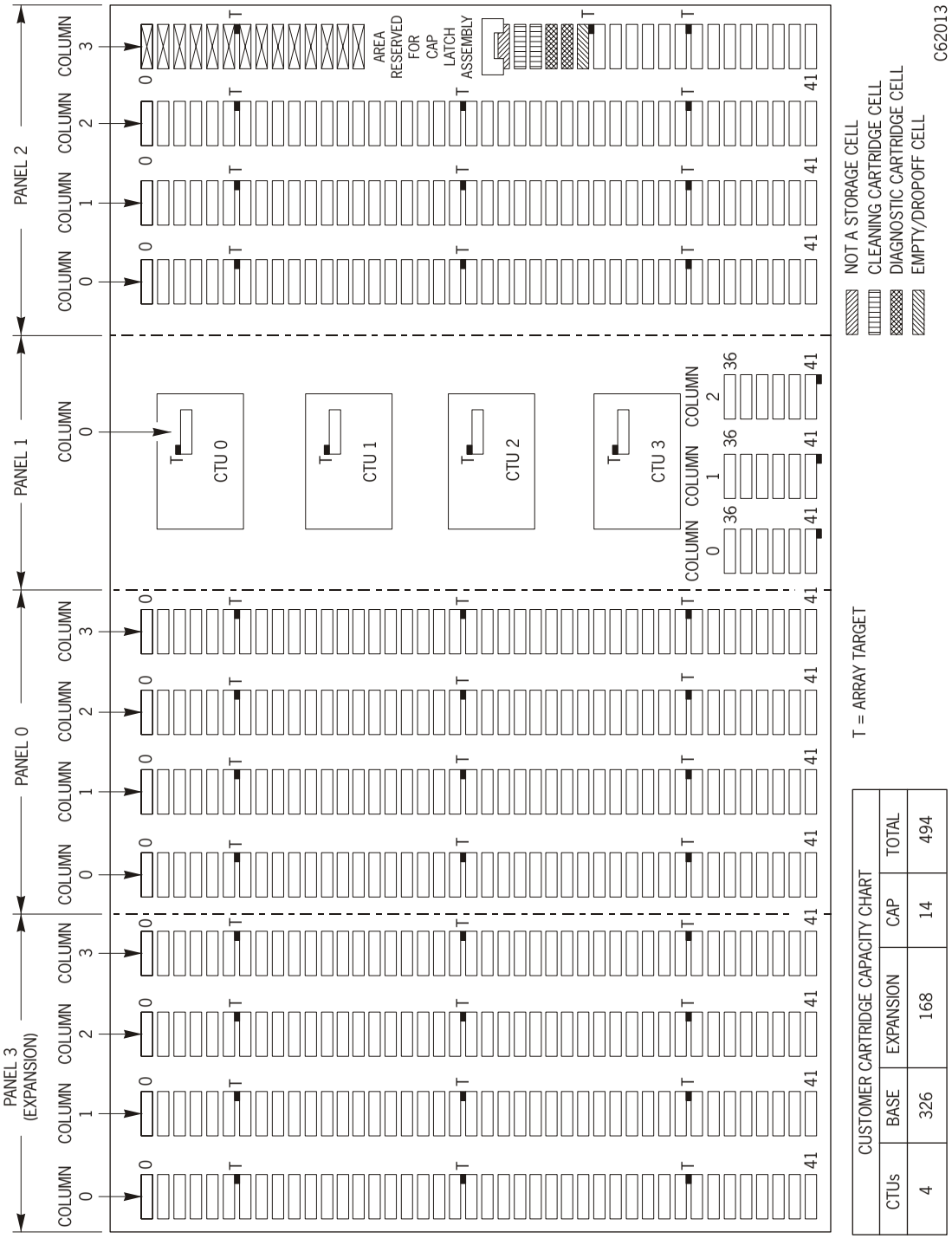


Figure 3-8. Locating Cartridges–Panels, Cells, Rows, Drive Cabinet (C62377)

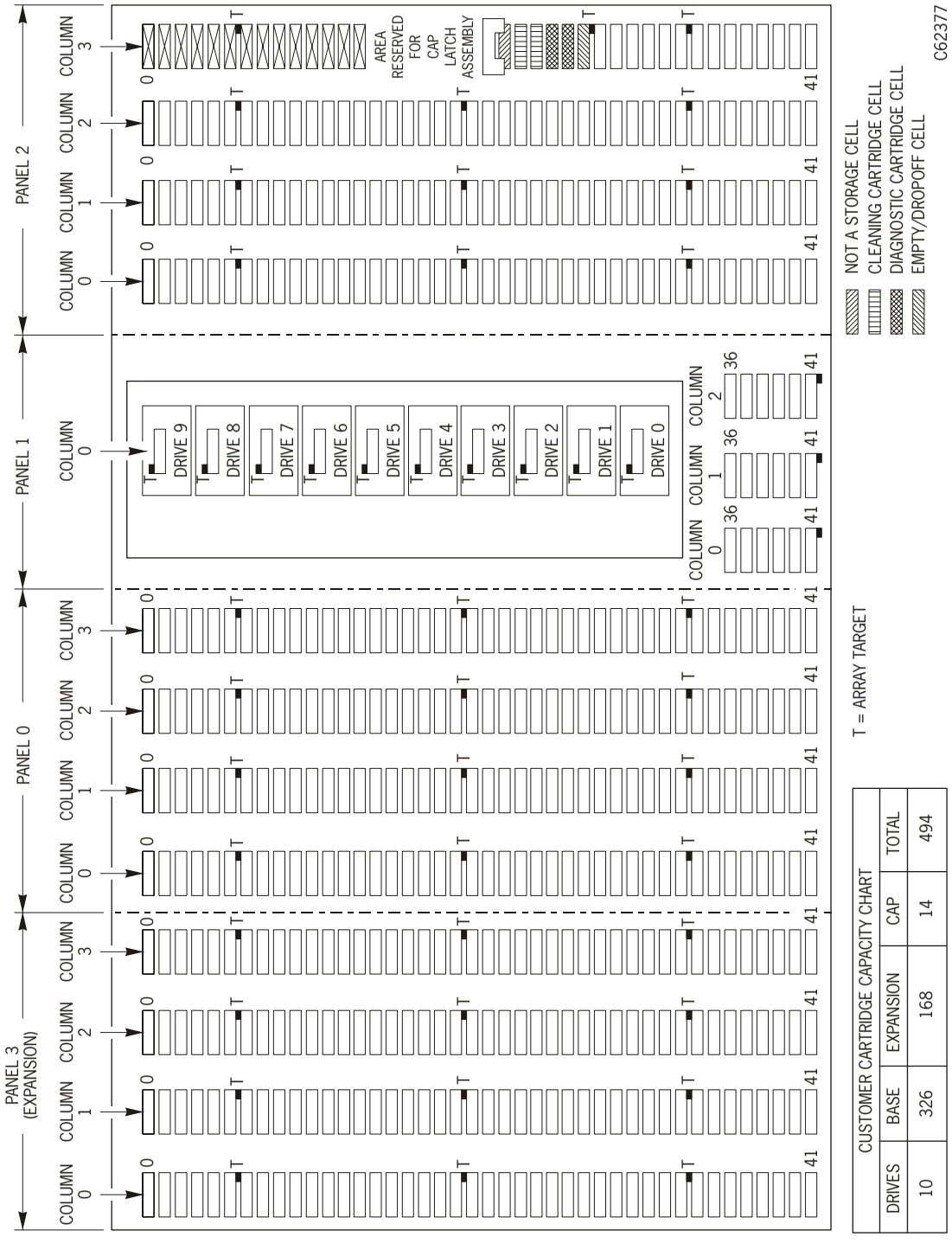


Figure 3-9. Locating Cartridges–Panels, Cells, Rows, CEM (C62524)

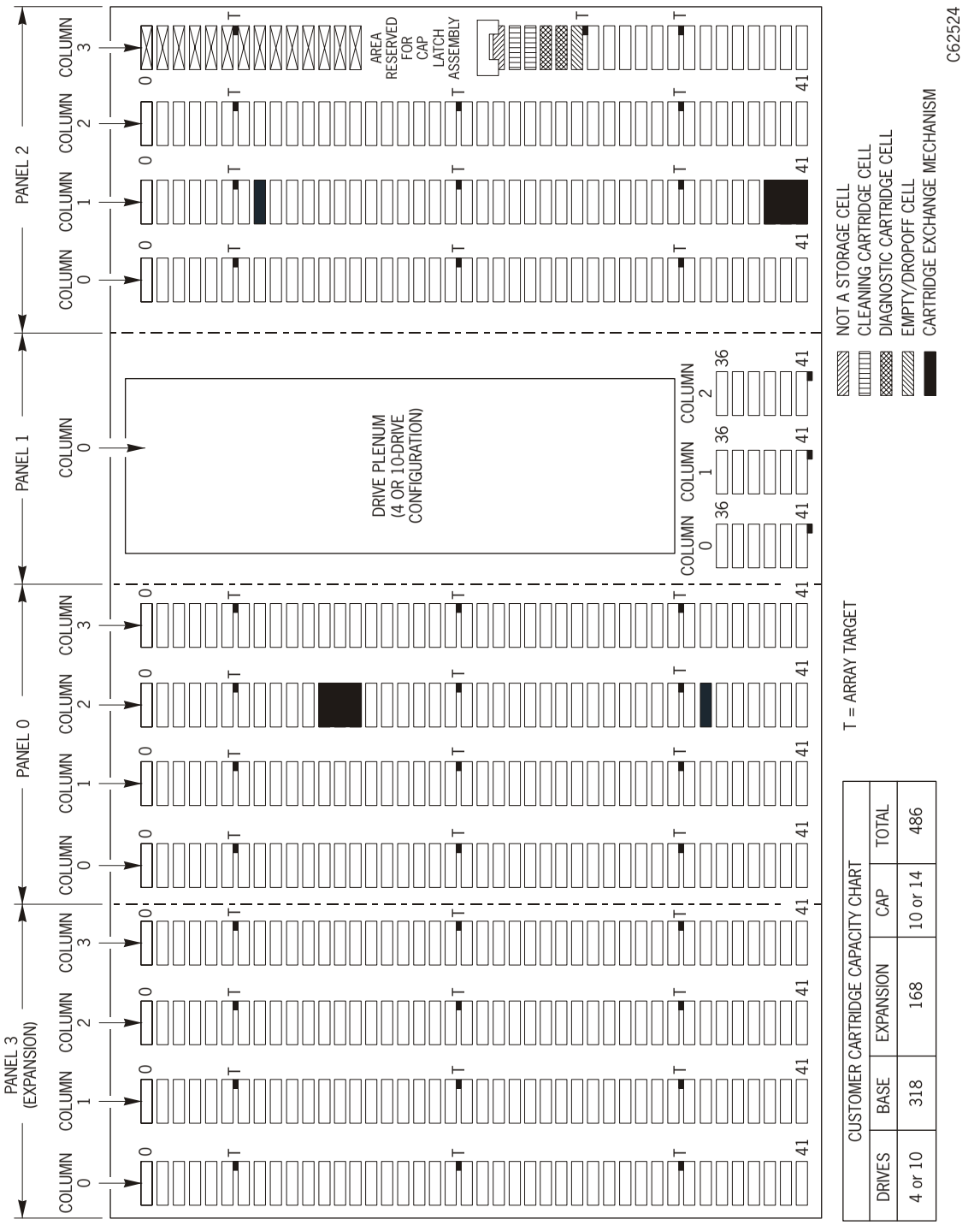


Figure 3-10. Diagnostic and Cleaning Cartridge Cell Locations (C62733)

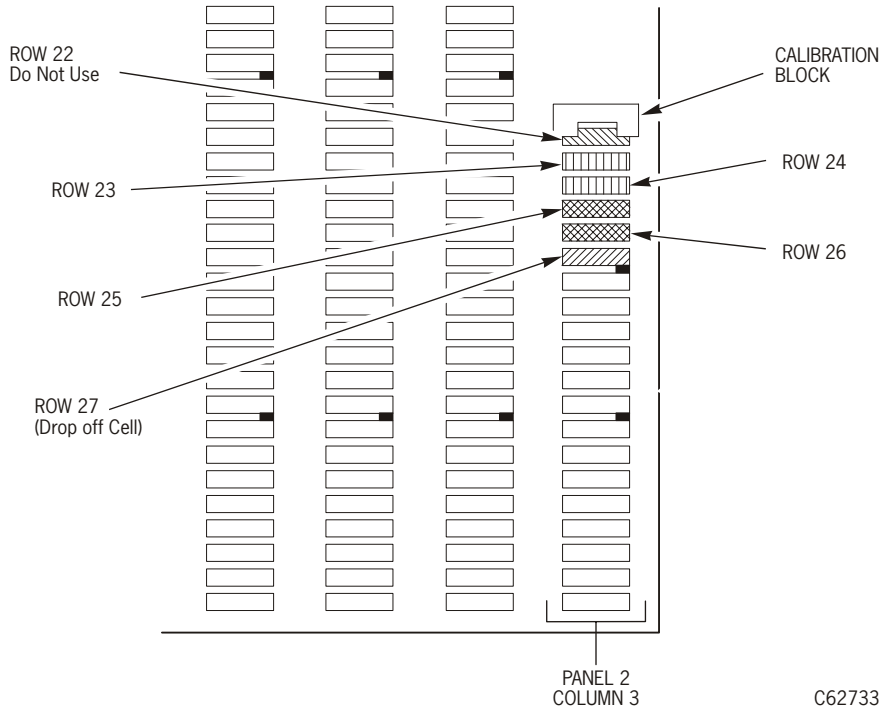


Figure 3-10 shows the cell locations of cartridges stored in the playground. These cells are used to store diagnostic and cleaning cartridges, and to provide an empty/dropoff cell for the robot if the LSM loses power while a cartridge is in the hand.

Table 3-1 on page 3-19 designates where the respective cartridges for each drive type are located in the playground.

CAUTION:
***Proper operation*: Do not insert cartridges into the reserved cells or the LSM will not be able to complete its initialization routines. If the LSM does not initialize, it cannot be placed online.**

Table 3-1. Playground Cartridge Locations

Drive Combinations	Diagnostic Cell	Cleaning Cell
9490	25	23
SD-3	26	24
9490 SD-3	25 26	23 24
DLT	26	24
T9840	25	23
T9940	25	23
T9840 DLT	25 26	23 24
T9940 T9840	25 26	23 24
T9940 DLT	25 26	23 24

Note: No more than two drive types can be mixed in the 9741/9741E Drive Cabinet.

Mounting and Dismounting Cartridge Tapes

When you are operating in manual mode, you may need to mount and dismount cartridge tapes from different types of CTUs and tape drives.

To mount and dismount cartridge tapes:

1. Open the right front door of the LSM by using the door key to unlock the top and bottom latches. See Figure 3-3 on page 3-11.
2. Open the LSM left front door.
   - For the standard door, pull gently from the top right corner.
   - For the expansion door, pull from the recessed area on the right side.
3. To mount a cartridge obtain the VOLSER, location, and drive number from the operator console. Locate the cartridge and mount it into the drive.
4. To dismount a cartridge, locate the CTU or drive. Remove the cartridge from the drive and place it *outside* the LSM.

The following information details the mount and dismount procedures for each cartridge and device type. Proceed to the appropriate section for information about the specific drive installed in the LSM.

Note: See Chapter 4, "Drives" for examples of operator panel displays.

Mounting a Cartridge into a 9490 or SD-3 CTU

See "Controller Transport Units" on page 4-1 for more information.

WARNING:
***Personal injury*: To avoid injury to your hand, keep your fingers out of the transport; the elevator lowers automatically when a cartridge is inserted.**

To mount a cartridge into a transport when the LSM is offline:

1. Follow the steps in "Mounting and Dismounting Cartridge Tapes" on page 3-19.
2. Make sure that the transport elevator is up. If it is not, wait until the previous job is finished, then remove the cartridge from the drive and place it *outside* the LSM.

CAUTION:
***Potential equipment damage*: You must insert the cartridge properly or you will damage the drive.**

Use standard, ETape, or EETape 9490 cartridges for 9490 transports. Use DATA D3 helical tape cartridges for SD-3 transports.

3. Insert the cartridge with the customer label on top and the VOLSER toward you.

Note: If a transport has been running, it might not accept the tape unless you place the transport into manual mode. To do this:

1. Press the READY button on the CTU panel to turn the *Ready* light off.
2. Press the UNLOAD button to reset the carriage on the transport to allow the transport to be loaded in manual mode.

Dismounting a Cartridge from a 9490 or SD-3 CTU

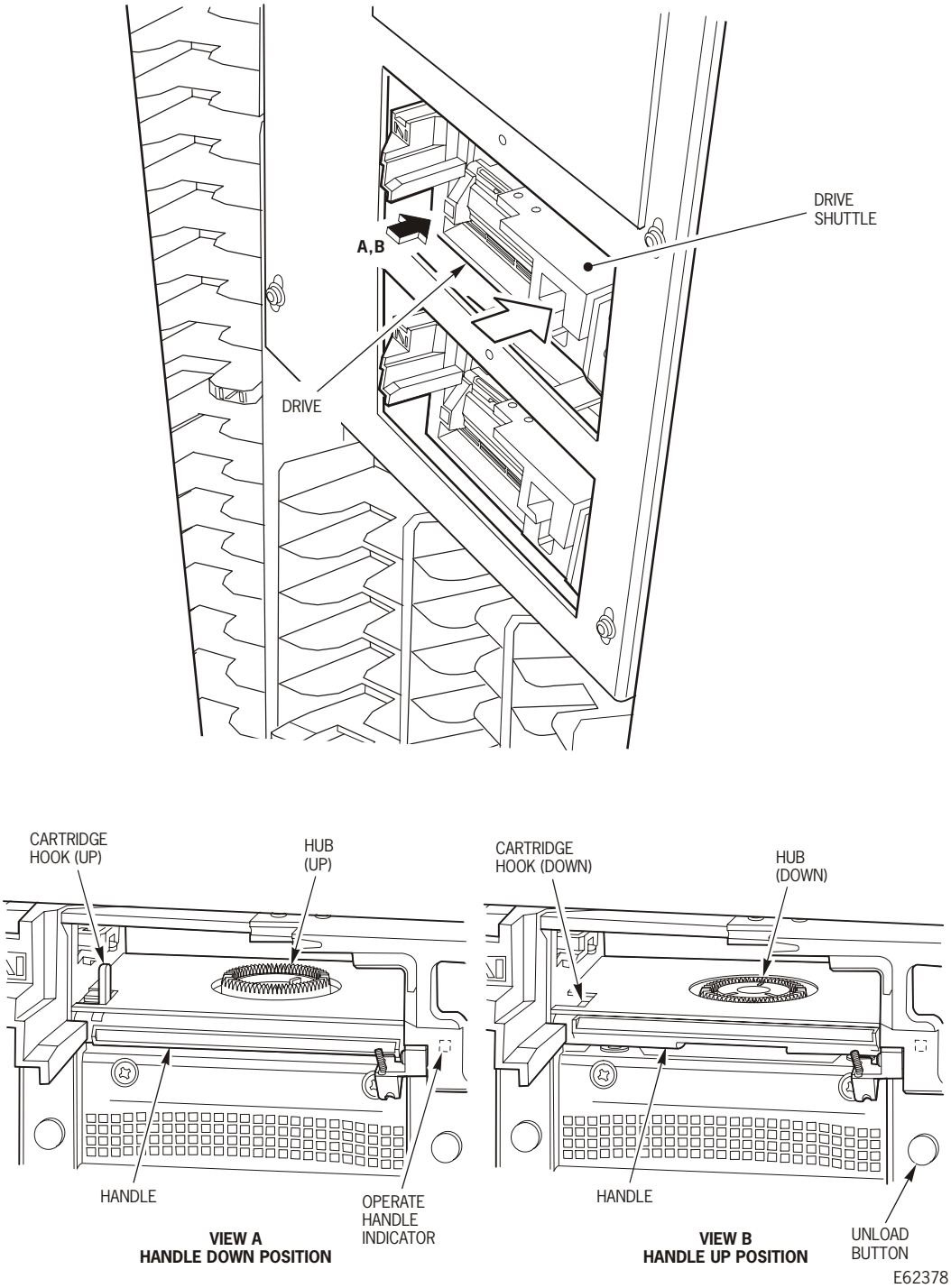
To dismount a cartridge from a transport when the LSM is offline:

1. Press the READY button on the CTU to make it not ready.
2. Press the UNLOAD button on the CTU.
3. Remove the cartridge from the raised elevator.
4. Store the cartridge *outside* the LSM.

Mounting a Cartridge into a DLT Drive

Use Figure 3-11 and "Digital Linear Tape Drives" on page 4-4 for the following procedures:

Figure 3-11. DLT Handle and Hub Positions



CAUTION:
***Potential equipment damage*: Before mounting a cartridge into the drive, make sure that power is on, and that the *Operate Handle* indicator is on. Use the drive shuttle to operate, not the drive handle.**

A safety mechanism protects the drive if you try to operate it in an incorrect state. The shuttle will not operate if this mechanism is activated. To reset the safety mechanism, wait for the *Operate Handle* indicator to turn on. Pull firmly on the shuttle, then push the shuttle in completely. If the cartridge did not eject, or if the handle did not rise, pull and push again.

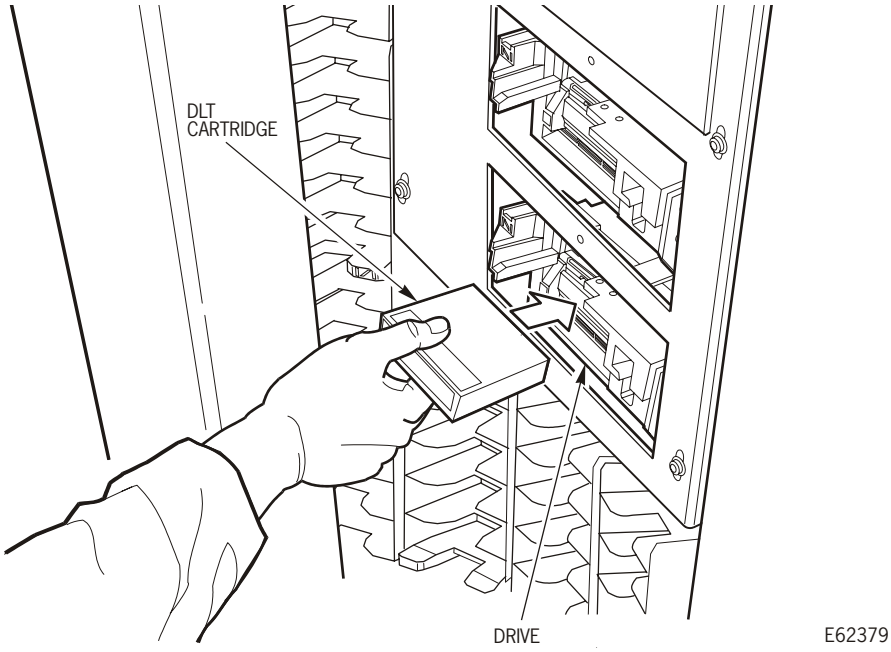
To mount a cartridge into a DLT drive:

1. Follow the steps in "Mounting and Dismounting Cartridge Tapes" on page 3-19.
2. Make sure that the DLT handle is up and the cartridge handle hook and hub are down. (See Figure 3-11 on page 3-21 for more information.)

CAUTION:
***Potential equipment damage*: Insert the cartridge properly or you will damage the drive. Use only DLT cartridges for DLT drives.**

3. Hold the cartridge so that the VOLSER is facing you and the write protect switch is on the right side of the cartridge, as shown in Figure 3-12.

Figure 3-12. Mounting a DLT Cartridge (E62379)



4. Insert the cartridge into the shuttle and push the cartridge into the back of the drive until it is firmly seated.

5. Push the shuttle completely back, pause for about two seconds, then release the shuttle.

CAUTION:
If the cartridge has been ejected from the drive, you must remove it from the shuttle before you can reload it into the drive. Otherwise, the shuttle will become jammed by simultaneously holding on to the cartridge and lowering the handle.

If this happens, release the cartridge from the shuttle latch under the right side of the cartridge. Then push the cartridge into the drive and lower the handle.

Dismounting a Cartridge from a DLT Drive

To dismount a cartridge from a DLT drive:

1. Make sure that the *Operate Handle* indicator is on.

2. Push the shuttle completely back, pause for about two seconds, then release the shuttle.

   Note: If the cartridge does not come out of the drive, remount the cartridge by releasing it from the shuttle latch under the right side of the cartridge. Then push the cartridge into the drive and lower the handle. If this fails, the tape leader might be dislodged and require rethreading.

3. Remove the cartridge from the drive.

4. Store the cartridge *outside* the LSM.

Mounting a Cartridge into a T9840 Drive

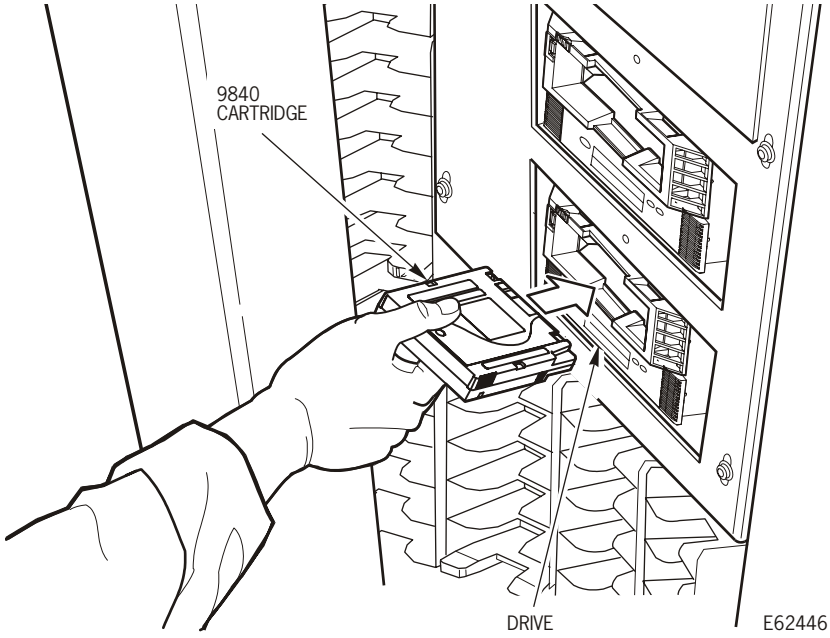
Important: T9840A/B and T9840C VolSafe cartridges are not interchangeable. T9840C tape drives can read the 20-GB VolSafe tape cartridges used in T9840A and T9840B drives, but cannot write to them. The 40-GB VolSafe tape cartridges used in T9840C drives cause a load error when mounted in a T9840A or T9840B drive.

See "T9840 and T9940 Tape Drives" on page 4-5 for more information.

To load the cartridge in a T9840 drive:

1. Follow the steps in "Mounting and Dismounting Cartridge Tapes" on page 3-19.
2. Insert the cartridge into the drive using the direction shown in Figure 3-13.
3. Wait for one of the following messages to display and take the appropriate action, if necessary:
   - The `Ready A` message displays when the drive is VolSafe-enabled and loaded with a write-enabled VolSafe cartridge.
   - The `Ready F` (File Protected) message displays when a write-protected cartridge loads successfully.
   - The `Ready U` (File Unprotected) message displays when a cartridge that is not write-protected loads successfully.
   - The `NTReady` message displays when the tape in the cartridge has lost tension. Follow the instructions outlined in the *T9840 Tape Drive User's Reference Manual* to correct this condition.
   - The `LOAD`*`xxxx`* message displays when the cartridge unsuccessfully loads, where the *`xxxx`* is a fault symptom code.

Figure 3-13. Mounting a Cartridge into a T9840 Drive (E62446)



Dismounting a Cartridge from a T9840 Drive

To unload the cartridge from a T9840 drive:

1. Ensure that the drive is not selected.

CAUTION:
***Loss of data*: Pressing the Unload switch during a write operation causes the drive to try to write the remaining data before the tape unloads. An operator display of** "UnWrxxxx" **(unwritten data, where** xxxx **is the fault symptom code) means the write failed and some data is not written to the tape.**

2. Press the Unload switch.

One of the following conditions can occur:

- After the tape rewinds, the cartridge ejects from the drive. Remove the cartridge from the drive and place it outside of the LSM.
- The cartridge fails to eject after the tape rewinds. Refer to the *T9840 Tape Drive User's Reference Manual* to correct this condition.
- If the Unload switch is pressed during a write operation, the drive tries to write the remaining data before the cartridge unloads. If the `UnWr`*`xxxx`* (Unwritten Data) message displays, where *xxxx* is the fault symptom code, the attempt failed and some data remains unwritten to the tape. For more information about recovering from an Unwritten Data condition, refer to the *T9840 Tape Drive User's Reference Manual*.

Mounting a Cartridge into a T9940 Drive

See "T9840 and T9940 Tape Drives" on page 4-5 for more information.

To load the cartridge in a T9940 drive:

1. Follow the steps in "Mounting and Dismounting Cartridge Tapes" on page 3-19.
2. Insert the cartridge into the drive as shown in Figure 3-14 on page 3-27.
3. Wait for one of the following messages to display and take the appropriate action, if necessary:
   - The `Ready F` (File-protected, write protected) message displays when a write-protected cartridge tape loaded successfully.
   - The `Ready U` (File-unprotected, write-enabled) message displays when a cartridge that is not write-protected loads successfully.
   - The `LOAD`*`xxxx`* message displays when the cartridge unsuccessfully loads, where the *`xxxx`* is a fault symptom code.

Dismounting a Cartridge from a T9940 Drive

To unload the cartridge from a T9940 drive:

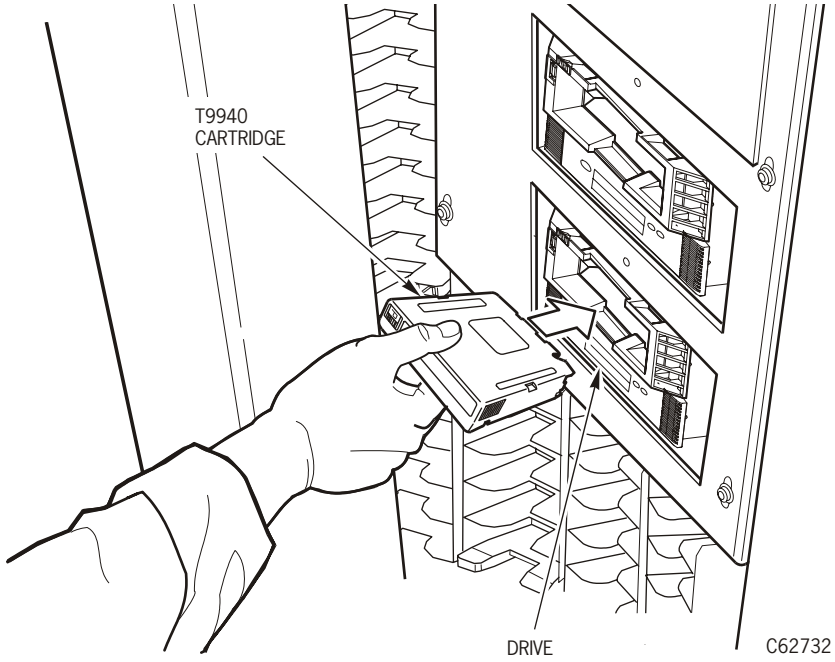
1. Ensure that the T9940 drive is not selected.

CAUTION:
***Loss of data*: Pressing the Unload switch during a write operation causes the drive to try to write the remaining data before the tape unloads. An operator display of** "UnWr xxxx" **(unwritten data, where** xxxx **is the fault symptom code) means the write failed and some data is not written to the tape.**

2. Press the Unload switch. One of the following conditions can occur:

- After the tape rewinds, the cartridge ejects from the T9940 drive. Remove the cartridge from the T9940 drive and place it outside of the LSM.
- The cartridge fails to eject after the tape rewinds. Refer to the *T9940 Tape Drive Operator's Guide*, PN 95989, to correct this condition.
- If the Unload switch is pressed during a write operation, the T9940 drive tries to write the remaining data before the cartridge unloads. If the `UnWr`*`xxxx`* (Unwritten Data) message displays, where *`xxxx`* is the fault symptom code, the attempt failed and some data remains unwritten to tape.

Figure 3-14. Mounting a Cartridge into a T9940 Drive (C62732)



Removing a Cartridge from the Hand

If the LSM goes offline because of a power failure, a cartridge might be left in the hand. If you need the cartridge to complete a job request, you can manually remove it from the hand and mount it into a drive for a read/write operation.

CAUTION:
***Potential equipment damage*: Follow the procedures described in "Moving the Robot" on page 3-12. Failing to do so could damage the hand.**

Standard Door Procedure

To remove a cartridge from the hand *when* your LSM has a standard door:

1. Rotate the Z column until the hand is located on the left, top side of the LSM (Panel 0 Column 0).
2. If a cartridge is in the top cell, remove it so you have more room to perform the next step.
3. Rotate the reach mechanism drive belt until the gripper is extended to its full position, as shown in Figure 3-15 on page 3-28.
4. Hold the reach mechanism drive belt with one hand and grasp the cartridge with the other. Gently pull on the cartridge until it is released from the gripper, as shown in Figure 3-16 on page 3-29.

5. Turn the reach mechanism drive belt until the gripper is fully retracted.
6. If a cartridge was in the top cell, re-insert it properly into the cell.

Expansion Door Procedure

To remove a cartridge from the hand *when* your LSM has an expansion door:

1. Rotate the Z column until the hand is facing the expansion door location.
2. Rotate the reach mechanism belt drive until the gripper is extended to its full position, as shown in Figure 3-15 on page 3-28.
3. Hold the reach mechanism belt drive with one hand and grasp the cartridge with the other. Pull gently on the cartridge until it is released from the gripper, as shown in Figure 3-16 on page 3-29.

CAUTION:
***Potential equipment damage:* Make sure that the gripper is fully retracted. If it is left extended and you turn the robot, the gripper will strike a storage cell. If it is left extended and the hand is facing the LSM door when it is closed, the door will strike the gripper.**

4. Turn the reach mechanism belt drive until the gripper is fully retracted.

Figure 3-15. Extending the Gripper (C62026)

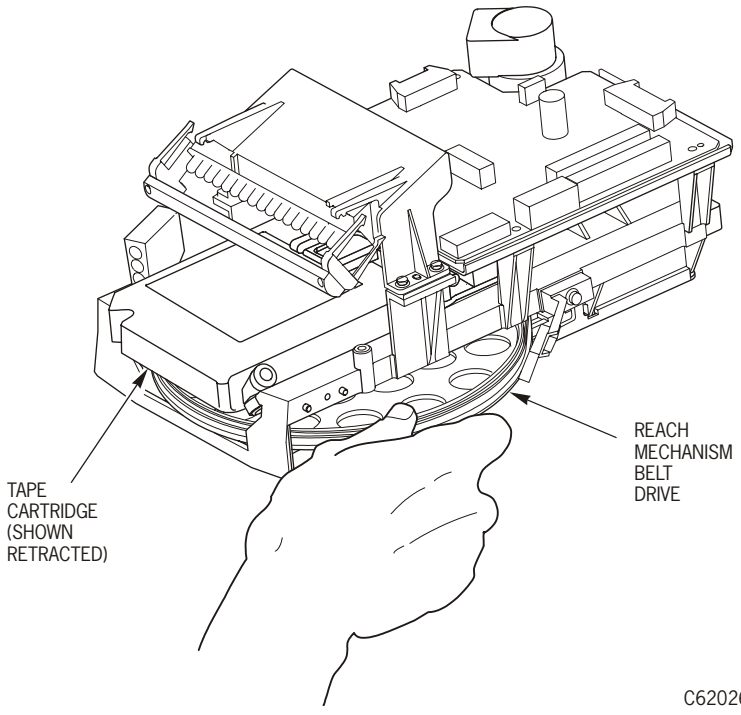
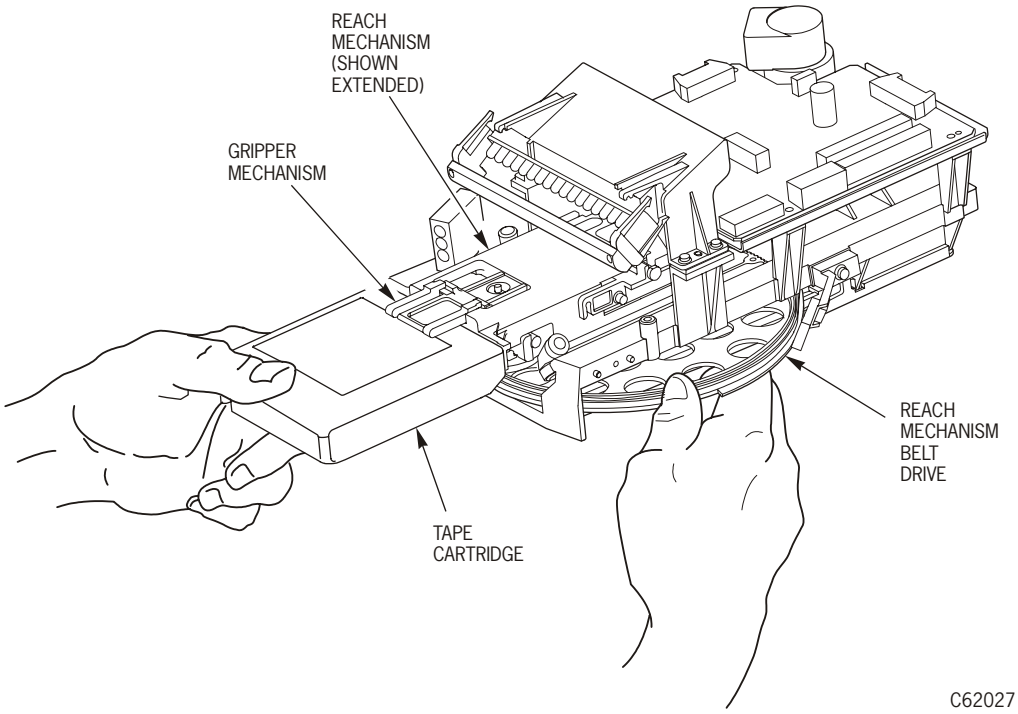


Figure 3-16. Removing a Cartridge from the Hand (C62027)



Returning the LSM Online

To place the LSM online for automated operations:

1. Refer to your specific drive publications for instructions about making the drives ready. For DLT, make sure that the *Operate Handle* light is on and the handle is up.
2. Close and lock the LSM doors. The robot will conduct an audit of the LSM.
3. Place the LSM online by entering the command at the customer server operator console.
4. Refer to your specific software publications for instructions about placing the cartridges you removed into the CAP and having the robot insert the cartridges into the LSM cells.

Drives

4

This chapter contains an overview about the controller transport units (CTUs) and tape drives for the 9740 Library Storage Module (LSM).

Note: See Appendix A for information about the cartridge tapes.

CTUs mount in cartridge drives that attach to the rear of the LSM. Each cartridge drive can contain:

- Two or four 9490 (TimberLine) CTUs
- One to four SD-3 (RedWood) CTUs

Tape drives mount inside the 9741 or 9741E Drive Cabinets that attach to the rear of the LSM. These drive cabinets can contain:

- One to ten Digital Linear Tape (DLT) drives
- One to ten T9840 Tape Drives
- One to ten T9940 Tape Drives
- A combination of DLT, T9840, or T9940 drives

Note: Only two of the three drive types that can be installed in a 9741/9741E Drive Cabinet are allowed to be mixed in the same cabinet.

Controller Transport Units

Controller transport units (CTUs) are independent subassemblies within the cartridge drive. Each CTU consists of a separate controller and transport and provides a 1-by-1 architecture. Because of this 1-by-1 architecture:

- Operation of one CTU does not effect the operations of any other CTUs in the cartridge subsystem.
- Maintenance on a CTU does not disrupt operations of any other CTUs in the cartridge drive or cartridge subsystem.

The *controller* contains all the circuit cards required for operation, such as: the interface card, read and write cards, and microprocessors.

The *transport* contains the electrical, mechanical, and pneumatic components required for tape motion, read and write operations, loading and unloading of the cartridge tape.

There are two types of CTUs that attach to the LSM: 9490 and SD-3.

9490

The 9490, also known as TimberLine, is a high-performance information storage and retrieval system that uses Extended Enhanced tape (called EETape), Enhanced Capacity cartridge tape (called E-Cart or E-Tape), and standard length cartridges as the storage medium.

The 9490 supports three tape-recording formats:

- 36-track, extended (read *and* write)
- 18-track, extended (read *only*)
- 18-track, standard (read *only*)

All three recording formats are compatible with the American National Standards Institute (ANSI) and European Computer Manufacturers Association (ECMA) specifications.

SD-3

The SD-3, also called RedWood, is a high-performance helical-scan information storage and retrieval system.

The subsystem reads and writes on half-inch magnetic tape cartridges in American National Standards Institute compatible helical-scan recording format. These cartridge tapes *are not compatible* with linearly recorded cartridges and are available in the following types:

- 10 gigabyte “A” cartridge = 91 meters (298 feet)
- 25 gigabyte “B” cartridge = 204 meters (668 feet)
- 50 gigabyte “C” cartridge = 392 meters (1,286 feet)
- 50 gigabyte VolSafe “C” cartridge = 392 meters (1,286 feet)
- Cleaning “D” cartridge for cleaning the tape path

Power Switch

Figure 4-1 on page 4-3 shows the power switch. This switch is located on the upper rear panel of the cartridge drive.

Operator Panel

Figure 4-2 on page 4-3 shows the location of the library operator panel. When a library is in manual mode this panel provides the operators with the same information as the overhead display and controls as the front control panel.

Figure 4-1. Power Control Panel

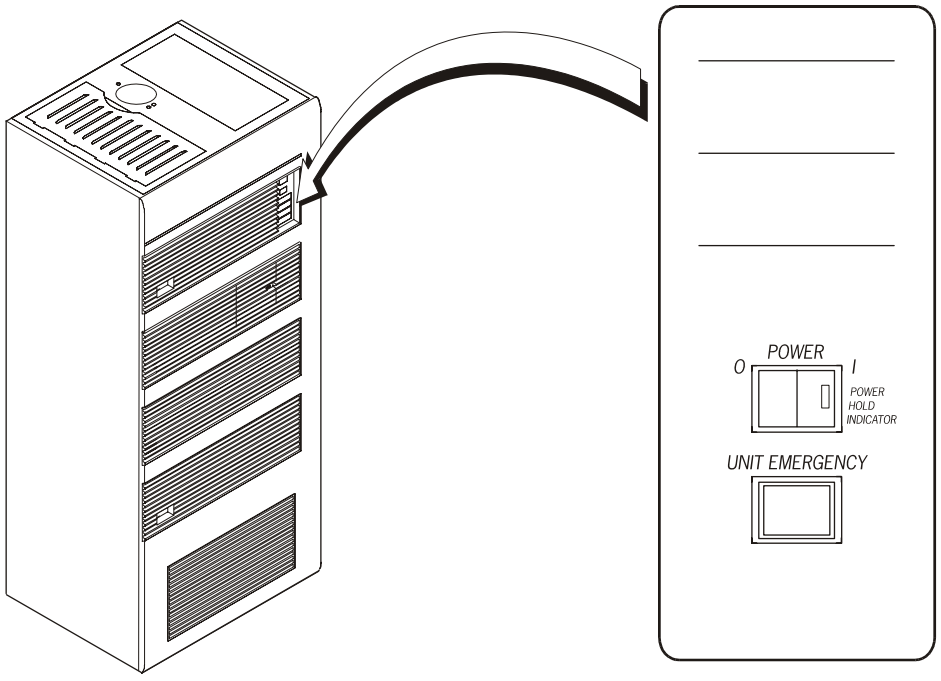
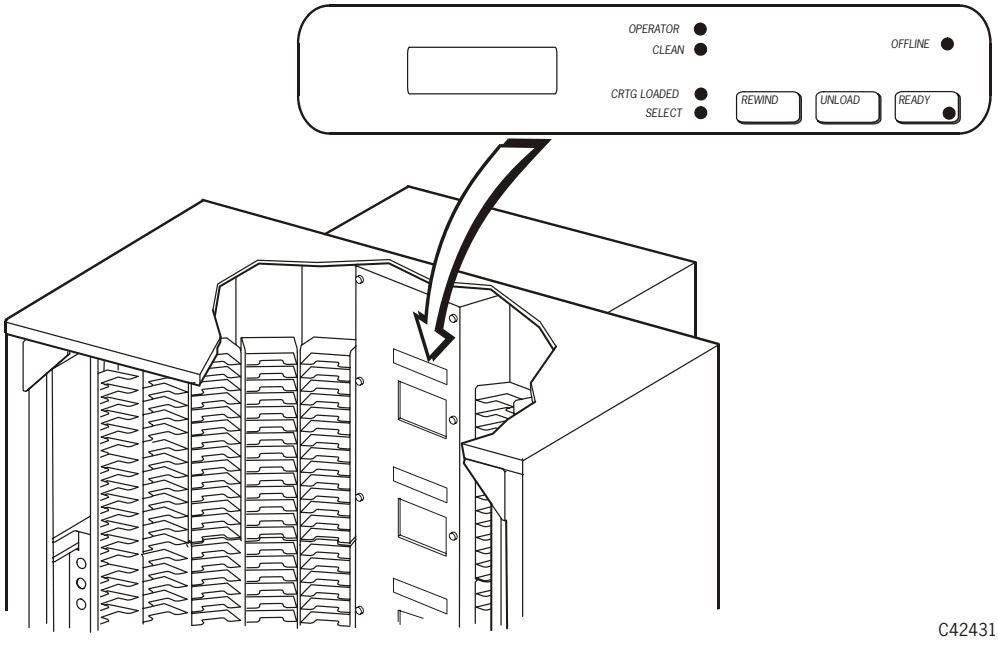


Figure 4-2. Library Operator Panel



9741/9741E Drive Cabinet

The drive cabinet houses from 1 to 10 DLT, 9840, T9840, or T9940 tape drives or a combination of these tape drives.

Digital Linear Tape Drives

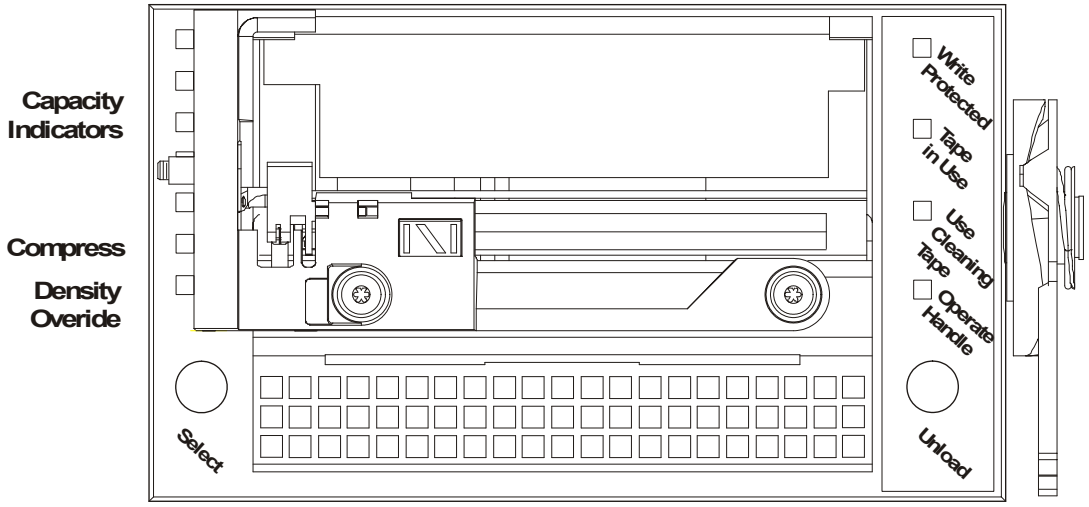
Digital Linear Tape (DLT) drives mount inside a 9741/9741E Drive Cabinet. These drives are high-performance, large-capacity, streaming cartridge tape products. The tape drive design includes a quad-channel read/write head with high-efficiency data compression to maximize data throughput and to minimize access time.

DLT products use half-inch wide tape. The DLTtape™ IV data cartridges are designed exclusively for the DLT 4000, DLT 7000, and DLT 8000 tape drives.

Operator Panel

Figure 4-3 shows an example of a DLT operator panel. When a library is in manual mode you will use this panel to load and unload tapes.

Figure 4-3. DLT Operator Panel



T9840 and T9940 Tape Drives

The **T9840 Tape Drives** are small, modular, high-performance tape drives. These drives are designed for fast-access tape storage of data. Three models are currently available, T9840A and T9840B, which are 20-GB drives and T9840C, which is a 40-GB drive.

The T9840 Tape Drives use cartridge tapes that have the same physical size as 3490 or T9940 cartridge tapes; however, they are not interchangeable. These cartridge tapes have the supply and take-up reels inside the cartridge which permits midpoint loading and fast access. The media identification labels for T9840 cartridge tapes have unique letters:

- **R** identifies T9840 standard and VolSafe data cartridge tapes.

  Note: T9840A/B and T9840C VolSafe cartridges are not interchangeable. T9840C tape drives can read the 20-GB VolSafe tape cartridges used in T9840A and T9840B drives, but cannot write to them. The 40-GB VolSafe tape cartridges used in T9840C drives cause a load error when mounted in a T9840A or T9840B drive.

- **U** identifies T9840 cleaning cartridges.

The **T9940 Tape Drive** is a small, modular, high-performance tape drive for high-capacity storage applications. Two models are currently available, T9940A and T9940B.

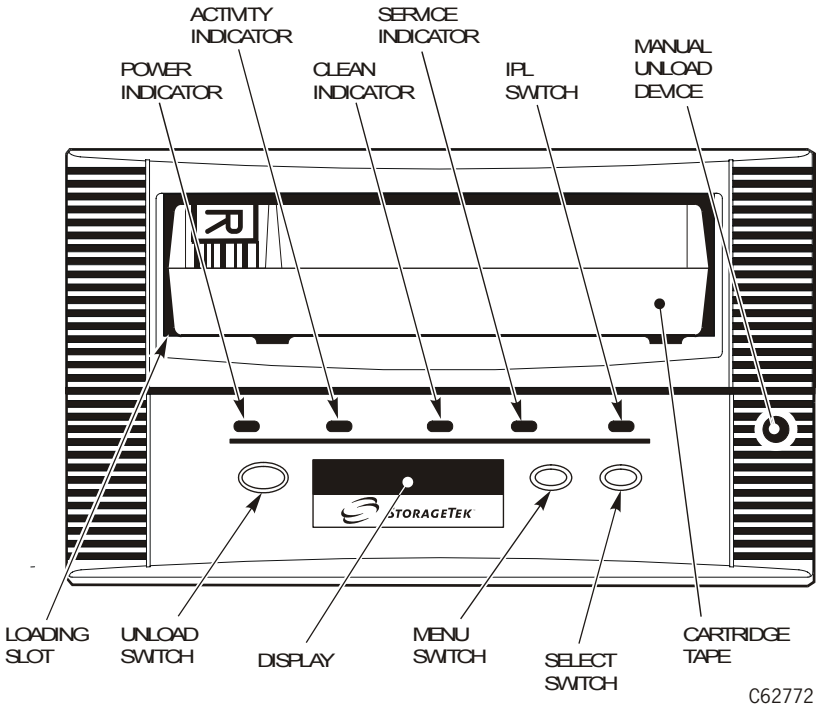
T9940 is a 60-GB drive and T9940B is a 200-GB drive. The T9940 media identification labels for the cartridge tapes have unique letters:

- **P** identifies data cartridges.
- **W** identifies cleaning cartridges.

Operator Panel

Figure 4-4 is an example of the operator panel:

Figure 4-4. T9840/T9940 Operator Panel



Service

5

This chapter describes what to do if problems occur with the 9740 Library Storage Module. In some cases, you might be able to correct the problem. In other cases, you must contact your service provider to correct the problem.

Notes:

- Refer to Appendix A, "Cartridge Tape Information" when the problem is caused by a cartridge.
- Refer to your drive publications for additional information when the problem is caused by a controller transport unit or tape drive.

Most of the time, a fault symptom code (FSC) appears on the library operator panel display. Write down the FSC information and give the information to your service representative or to the staff at the Customer Services Support Center (CSSC).

Customer Services Support Center

Customer support is available 24 hours a day, seven days a week, to customers with Sun or StorageTek maintenance contracts and to Sun employees. You can find additional information about customer support on the Customer Resource Center (CRC) Web site at:

http://www.support.storagetek.com

Customer-initiated Maintenance

Customer-initiated maintenance begins with a telephone call from you to Sun Microsystems StorageTek Support. You receive immediate attention from qualified Sun personnel, who record problem information and respond with the appropriate level of support.

To contact Sun Microsystems StorageTek Support about a problem:

1. Use a telephone to call the StorageTek Customer Services Support Center at:

   ☎**1-800-525-0369** (from within the United States) or

   ☎**303-673-4056** (from outside the United States) or

   See "Sun's Worldwide Offices" on page 5-2 for information about International customer support centers.

2. Describe the problem to the call taker. The call taker will ask several questions and will either route your call to a trained support technician or dispatch a service representative.

If you have the following information when placing a service call, the process will be much easier:

Account name _____

Site location number _____

Contact name _____

Telephone number _____

Equipment model number _____

Device address _____

Device serial number (if known) _____

Urgency of problem _____

Fault Symptom Code (FSC) _____

Problem description _____

_____

_____

_____

_____

Sun's Worldwide Offices

You may contact any of Sun's worldwide offices to discuss complete storage, service, and support solutions for your organization. You can find address and telephone number information on Sun's external Web site at:

http://www.sun.com/worldwide/

Cartridge Tape Information

A

This appendix contains information about the cartridge tapes used in the controller transport units (CTUs) and tape drives for the LSM.

Cartridge Requirements

Cartridges must meet specifications defined in *American National Standard Magnetic Tape and Cartridge for Information Interchange*, ACS X3B5.

Refer to your drive vendor's publication and Web site for specific cartridge requirements and specifications.

Colored cartridges are approved only if the measured reflection density is greater than 0.1 as measured by an X-rite 404G color reflection densitometer. For more information about colored cartridges, contact your StorageTek marketing representative.

Handling a Cartridge

Improper handling of cartridges can result in a loss of data or damage to a library component. To handle a cartridge correctly:

- Make sure the leader block is latched every time you pick up a cartridge.
- Keep cartridges *clean.*
- Inspect a cartridge before each use, and *never* put a damaged cartridge into a drive or library.
- Never release a leader block and pull tape from a cartridge.
- Never open a cartridge.
- Do not handle tape that is outside the cartridge; the tape edge might be damaged.
- Do not expose the tape or cartridge to direct sunlight or moisture.
- Do not expose a recorded cartridge to magnetic fields; this might destroy data on the tape.

Inspecting a Cartridge

A defective or dirty cartridge can damage a drive. Always inspect a cartridge before inserting it into a drive or a library.

Look for:

- Cracked or broken cartridge
- Broken leader block
- Broken leader block latch
- Damaged write-protect selector or write-protect switch
- Liquid in the cartridge
- Labels not firmly attached or extending over the cartridge edge
- Any other obvious damage

Figure A-1. Inspecting a 9490 (3480-style) Cartridge (C62454)

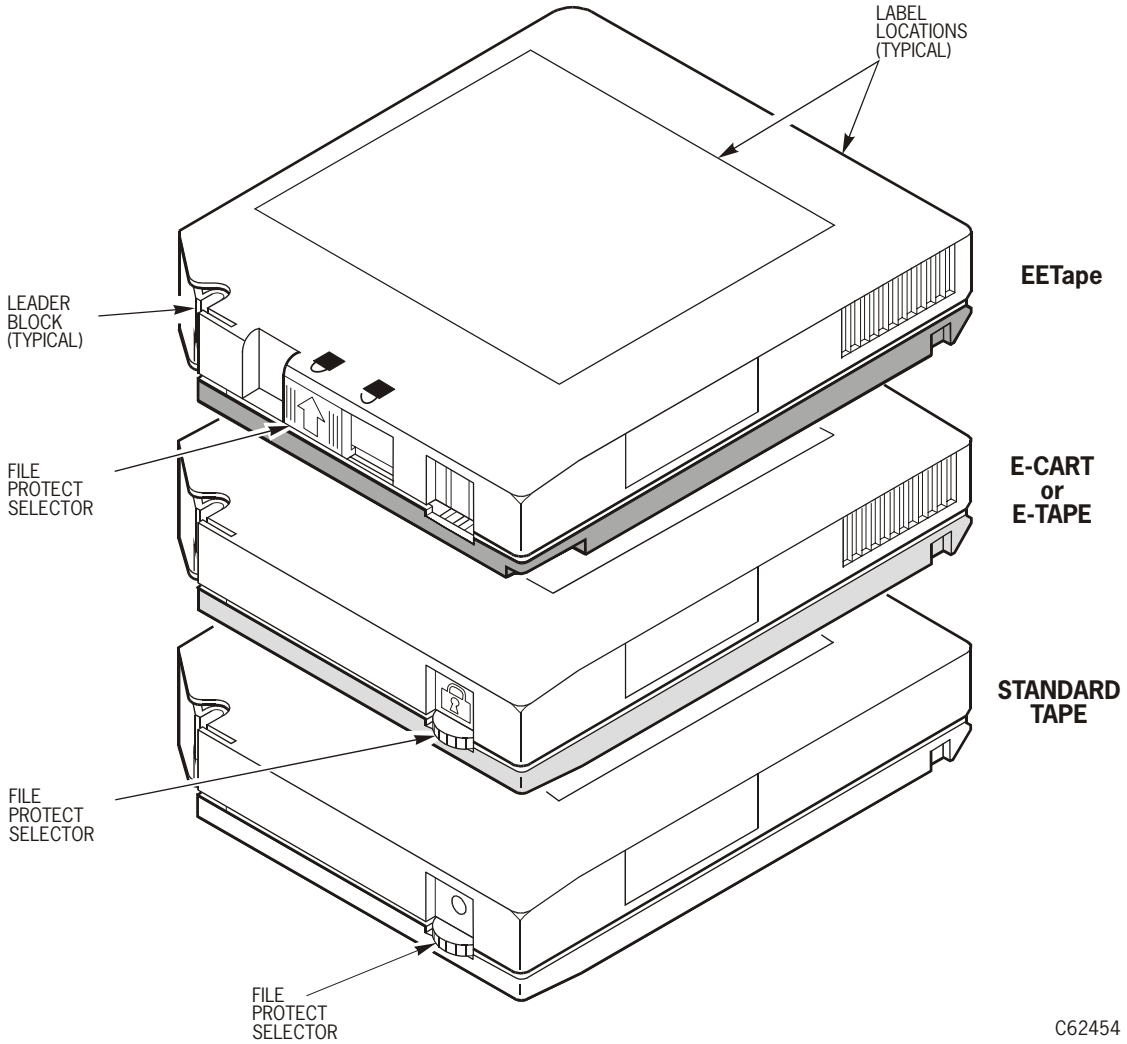


Figure A-2. Inspecting an SD-3 Helical Scan Cartridge

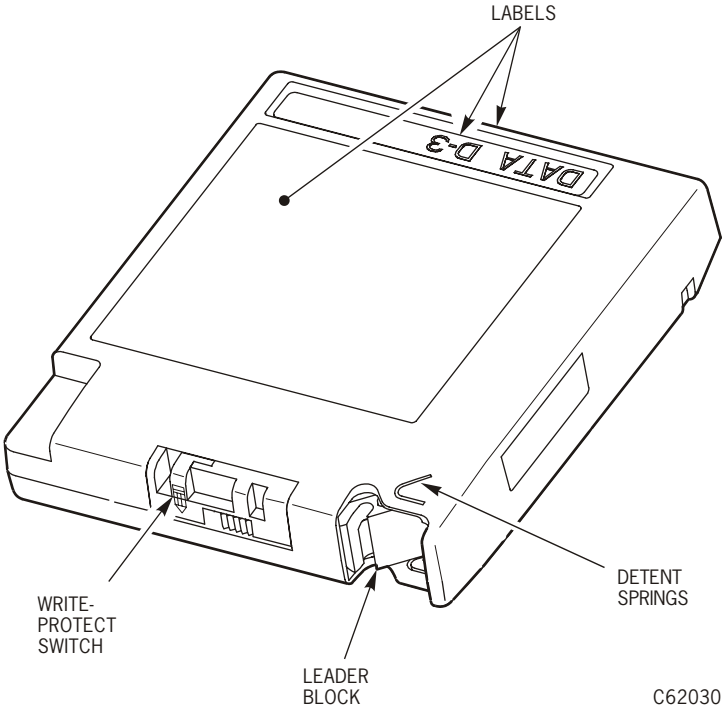


Figure A-3. Inspecting a DLT Cartridge

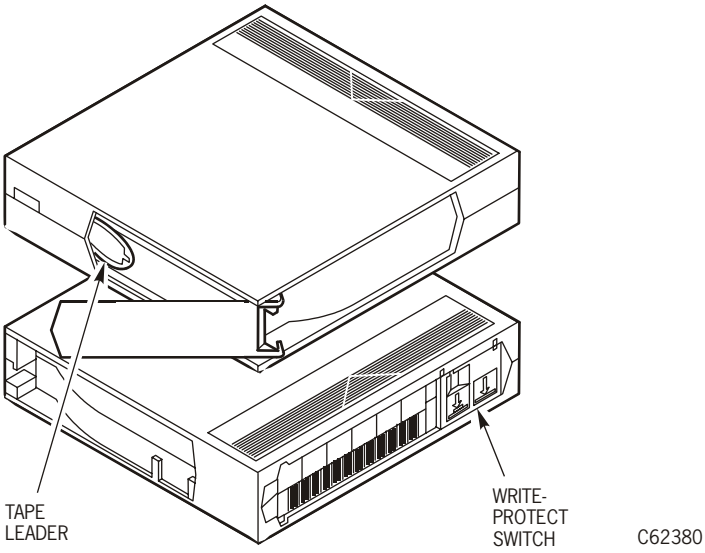


Figure A-4. Inspecting a T9840 Cartridge (C62715)

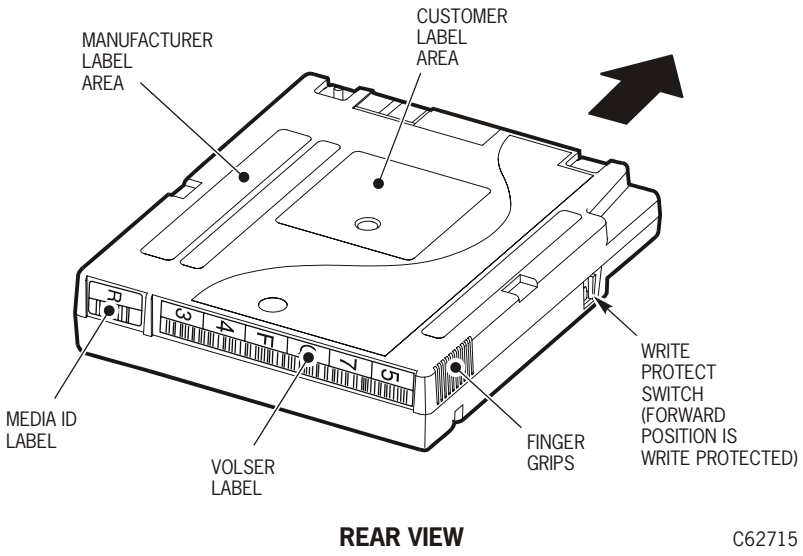
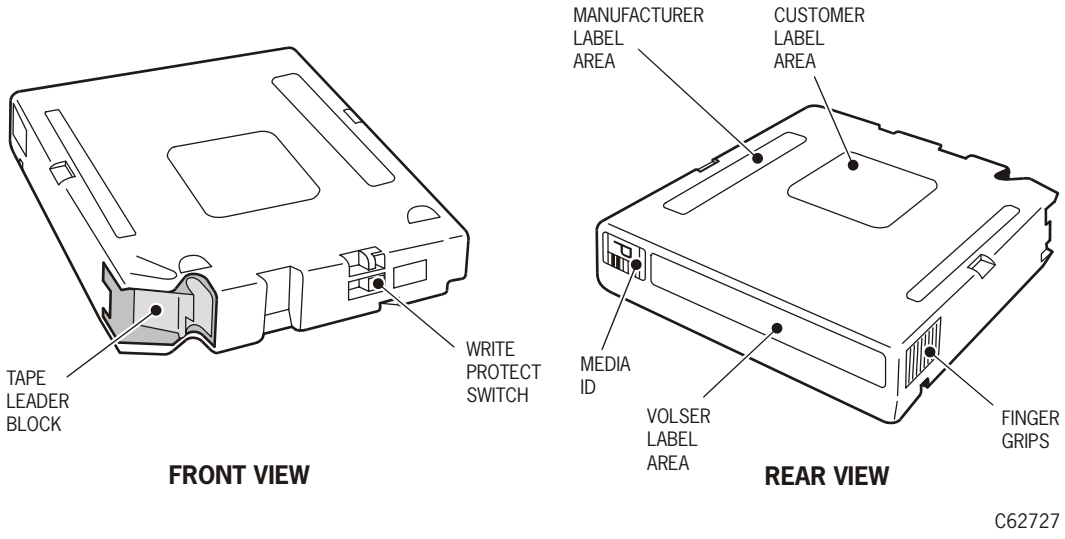


Figure A-5. Inspecting a T9940 Cartridge (C62727)



Storing Cartridges

When storing a cartridge:

- Do not take a cartridge out of its protective wrapping until you are ready to use it. Use the tear string, not a sharp instrument, to remove the wrapping.
- Store cartridges in a clean environment that duplicates the conditions of the room in which they are used.
- Before using a cartridge, make sure that it has been in its operating environment for at least 24 hours.

Cleaning the Cartridge Exterior

CAUTION:
Possible equipment damage: **The following solvents can damage the cartridge. Do not use them to remove labels or to clean cartridges: acetone, trichloroethane, toluene, xylene, benzene, ketone, methylethyl ketone, methylene chloride, ethyldichloride, esters, ethyl acetate, or similar chemicals.**

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

Use StorageTek Tape Cleaner Wipes, PN 4046289-01, to clean the cartridges. These wipes are saturated with isopropyl alcohol. Do not let any solution touch the tape or get inside the cartridge.

Using Cleaning Cartridges

Cleaning cartridges have a VOLSER prefix of DG CLN or CLNxxx. These cartridges cannot be used as scratch cartridges or initialized by software utilities.

When a transport needs to be cleaned, the 9740 and CTU interact automatically; no host software interaction is required. During a dismount, the 9740 software polls the CTU to determine if the transport needs to be cleaned. If it does, the hand removes a cleaning cartridge from its cell and inserts it into the transport.

If the LSM has no cleaning cartridges, you are prompted to enter a cleaning cartridge into the CAP.

CAUTION:
Do not re-enter a cleaning cartridge that has been ejected from an LSM. When you enter a cleaning cartridge, the software considers it to be new and sets the usage counter to zero.

When a cleaning cartridge is used the specified number of times, it is automatically placed into the CAP, and the operator panel displays "(3480, SD-3, DLT, T9840, or T9940) CLEANING CART USED UP." See "Replacing Cleaning Cartridges" or "Replacing Cleaning Cartridges" in Chapter 3, "Operating the LSM," for this procedure.

Repairing a Detached Leader Block

When a tape is damaged, use a backup tape. If a leader block is detached and there is no obvious damage to the cartridge or tape, and you have no backup tape, you may repair the leader block using a repair kit provided by your supplier. You can use the tape one time to copy the data onto another tape.

Ordering Media

Contact your authorized selling agent for Sun-approved labeled cartridges. You must select the volume serial number (VOLSER) range and other label options when ordering cartridges. If you choose to order additional labels, order them from any standard media vendor.

Labels used in StorageTek libraries can be made by any vendor that produces a label that meets the Sun Label Specification. Some vendors (not all inclusive) are:

- EDP/Colorflex http://www.colorflex.com
- NetC http://www.netcllc.com
- WrightLine/American Eagle Systems http://www.americaneaglesys.com
- Dataware http://www.datawarelabels.com

These Web sites contain links to third party sites. These links are provided as a convenience to you and not as an endorsement by Sun. Sun is not responsible for the content of these linked Web sites and does not make any representations regarding the content or accuracy of any content on such Web sites.

For technical questions, contact the Sales Support at:

Telephone: 1.800.ask4stk (1.800.275.4785)
E-mail: sales_support@storagetek.com.

Applying Labels

Cartridge labels reflect the cartridge media and usage. The types of cartridge labels you might need to apply are:

- Customer
- VOLSER
- Cleaning
- Diagnostic
- Media labels

Notes:

- Make sure that the labels are not placed elsewhere on the cartridge surface.
- Make sure that the edges of the labels do not curl up.
- Use labels that do not leave a residue when removed.
- Make sure that the label contains a VOLSER.

The following information describes how to apply labels to the cartridges.

CAUTION:
***Potential equipment problems*: Applying labels in the wrong location, curling edges, or leaving excess residue could cause the cartridge to stick in the hand, drive, or cell.**

Non-DLT Cartridges

The labels must be within the indented area of the cartridge so that the edges of the label are parallel to the edges of the cartridge. The label should be close to the inside edge of the indented area but must *never* overlap.

See Figure A-6 through Figure A-11 for the proper location of the labels.

To apply the labels:

1. Make sure that the cartridge has been at room temperature for at least 24 hours.
2. Clean the surface where the labels will be placed using a cleaning solution made for this purpose. See "Cleaning the Cartridge Exterior" on page A-5.
3. Peel the backing from the VOLSER label.
4. Hold the cartridge so that the leader block is above the write-protect selector and is facing away from you.
5. Position the label with the VOLSER characters to the left, so you can read them from top to bottom. Press the label into place.
6. If the cartridge requires a media label, peel the backing from it and place the label in the recessed area to the left of the VOLSER. Press into place.

Figure A-6. 3480 Cartridge Label Locations (C62031)

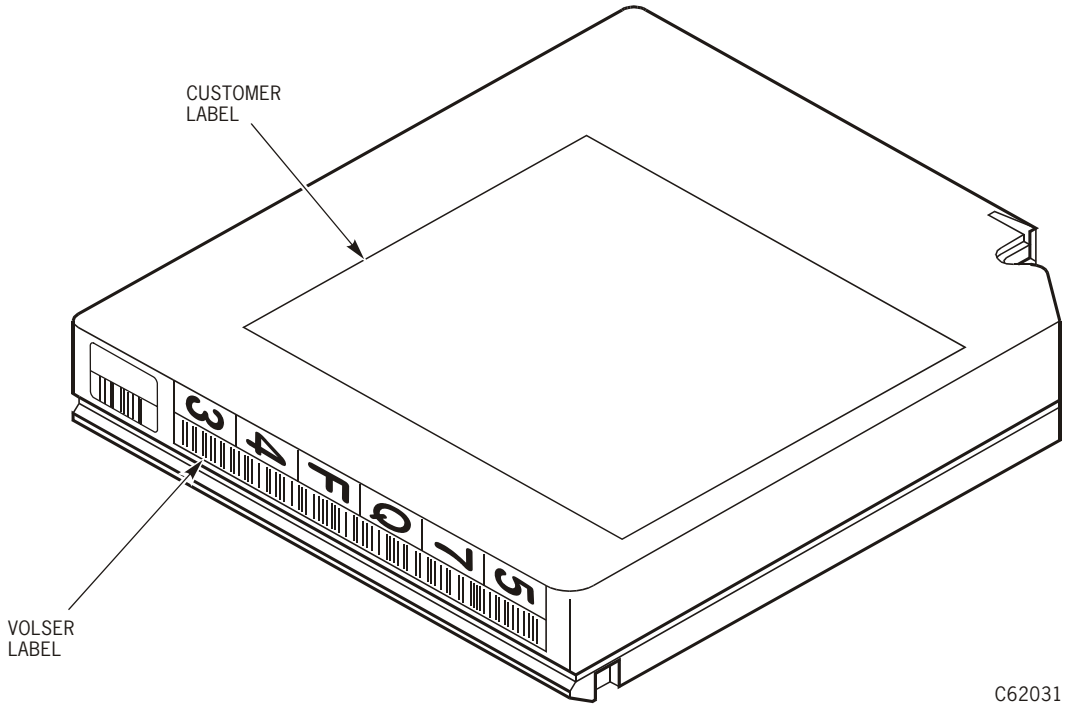


Figure A-7. ETape Cartridge Label Locations (C62528)

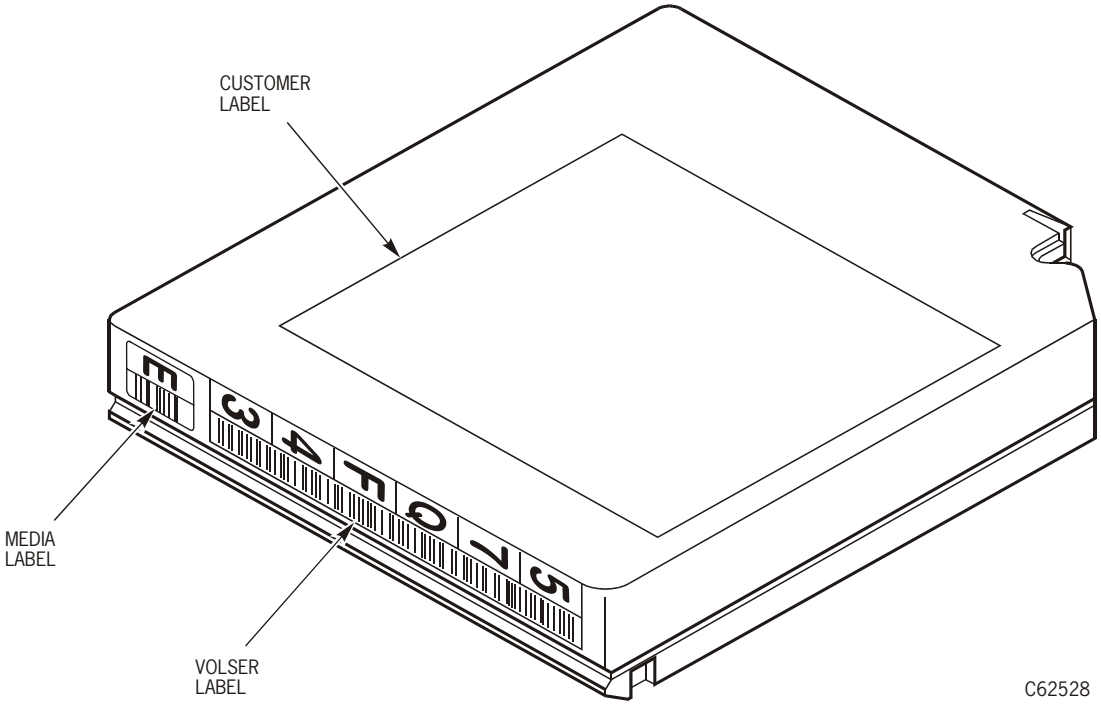


Figure A-8. EETape Cartridge Label Locations (C62526)

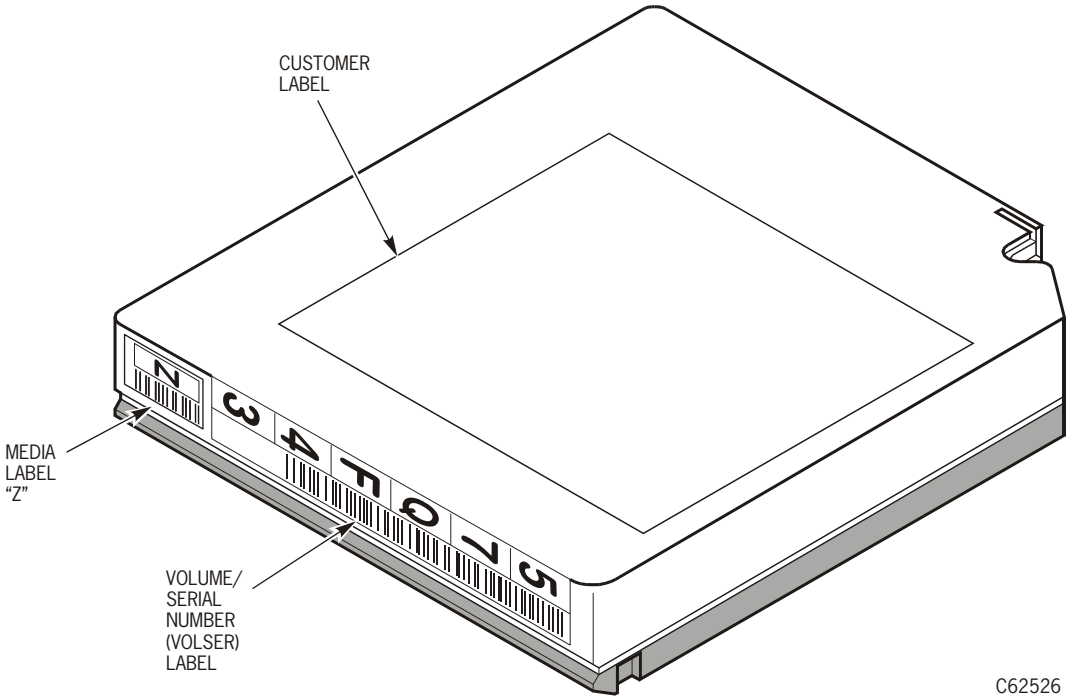


Figure A-9. Helical Scan Cartridge Label Locations (C62032)

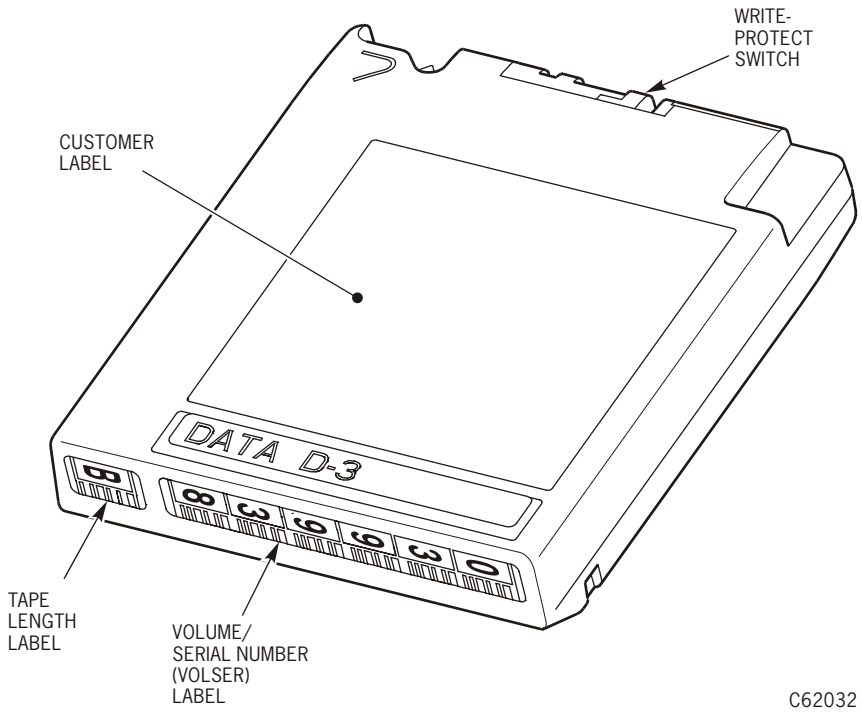


Figure A-10. T9840 Cartridge Label Locations (C62444)

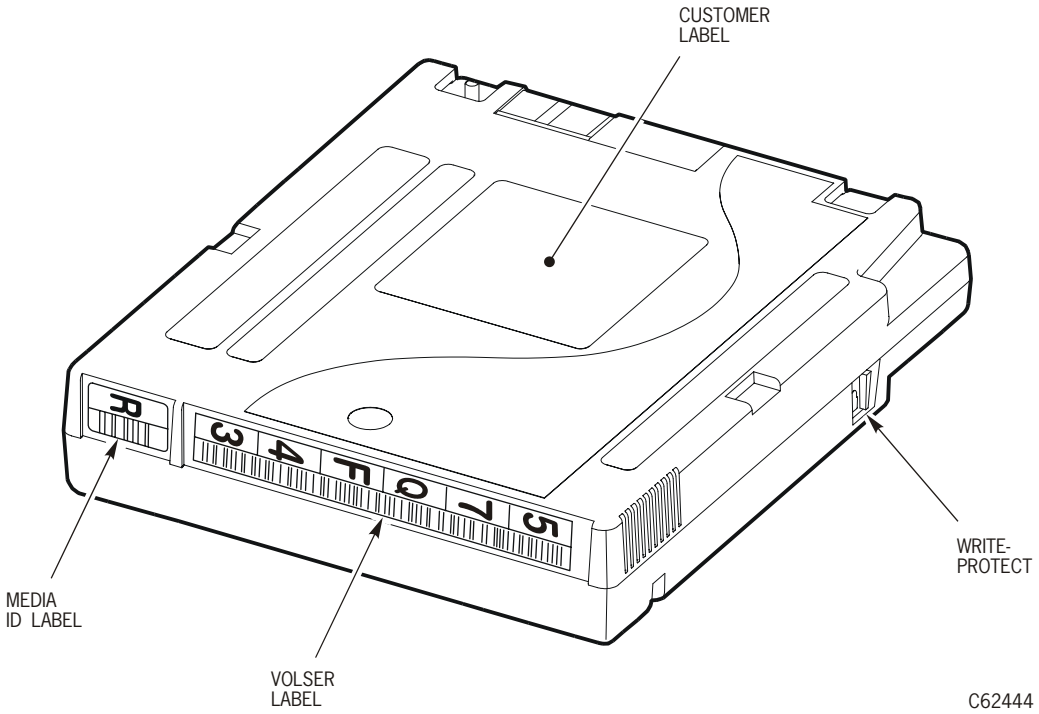
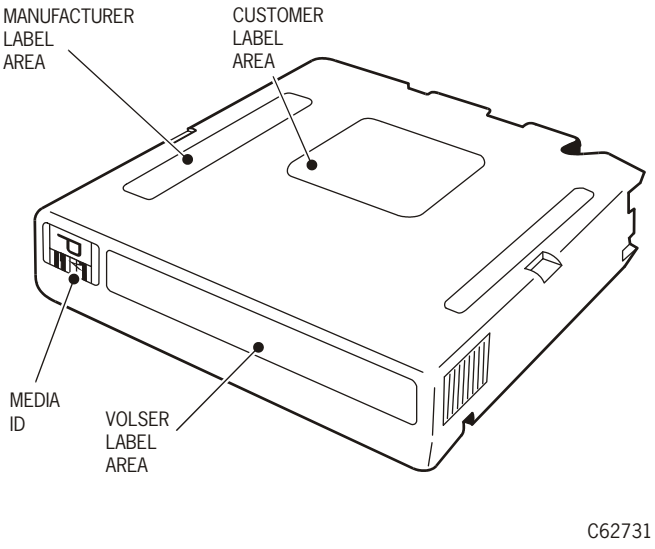


Figure A-11. T9940 Cartridge Label Location (C62731)



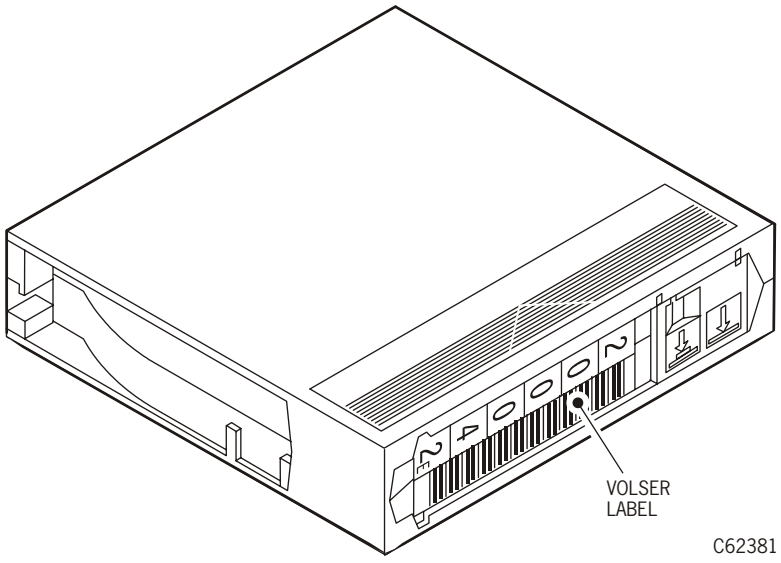
DLT Cartridges

The DLTtape VOLSER letter located next to the last number in the VOLSER reflects the media. Cleaning cartridges have CLN in the VOLSER, diagnostic cartridges have DG in the VOLSER.

See Figure A-12 and insert the label into the recessed area on each cartridge:

1. Make sure that the cartridge has been at room temperature for at least 24 hours.
2. Clean the surface where the labels will be placed using a cleaning solution made for this purpose. See "Cleaning the Cartridge Exterior" on page A-5.
3. Locate the label that you need:
   - DLTtape III has a "C" next to the far left number, bar code down.
   - DLTtape IIIXT has an "E" next to the far left number, bar code down.
   - DLTtape IV has a "D" next to the far left number, bar code down.
   - Diagnostic cartridge has "DG" at the beginning of the VOLSER.
   - Cleaning cartridge has "CLN" at the beginning of the VOLSER.
4. Hold the cartridge so that the write-protect switch is toward you.
5. See Figure A-12 and slide the label under the slots in the recessed area. If desired, peel the backing from the label and then slide it under the slots. Press it into place.

Figure A-12. DLT Cartridge Label Locations (C62381)



Setting the Write-Protect Switch

Write-protect, also called file-protect, is a setting on cartridge tapes that prevents data form being written on the tape but reading data is still possible.

Write-enable is a setting that allows data to be written on the tape.

Notes:

- The write-enable setting is recommended when entering cartridges into the LSM.
- Some software features a virtual thumbwheel that allows read-only access to a cartridge that is not physically write-protected.

9490 Write-Protect Switch

To write-enable the 9490 cartridges:

1. Hold the cartridge with the write-protect switch towards you.
2. Locate the write-protect switch on the front of the cartridge.
3. Rotate the switch to the desired setting:

- To write-enable the standard cartridge, turn the thumbwheel until the white dot icon above the wheel disappears.
- To write-enable the ETape cartridge, turn the thumbwheel until the white padlock icon above the wheel disappears.
- To write-enable the EETape cartridge, slide the switch to the unlock symbol.

Figure A-13. Setting the 3480 Write-Protect Selector (C62033)

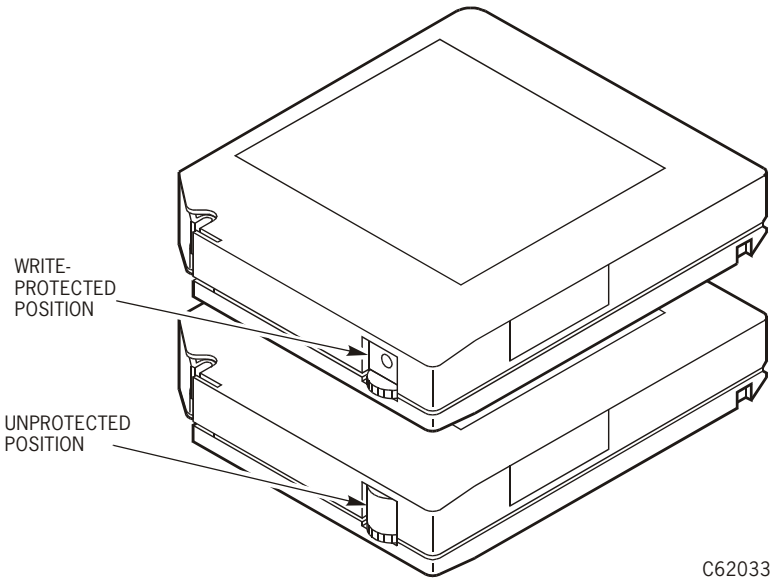


Figure A-14. Setting the ETape Write-Protect Selector (C62529)

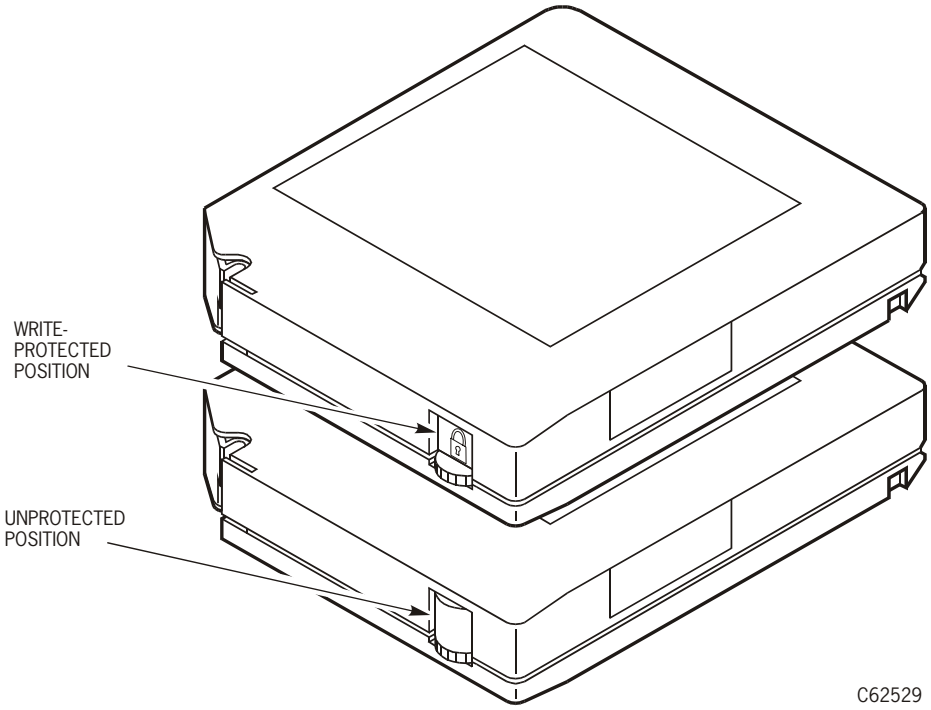
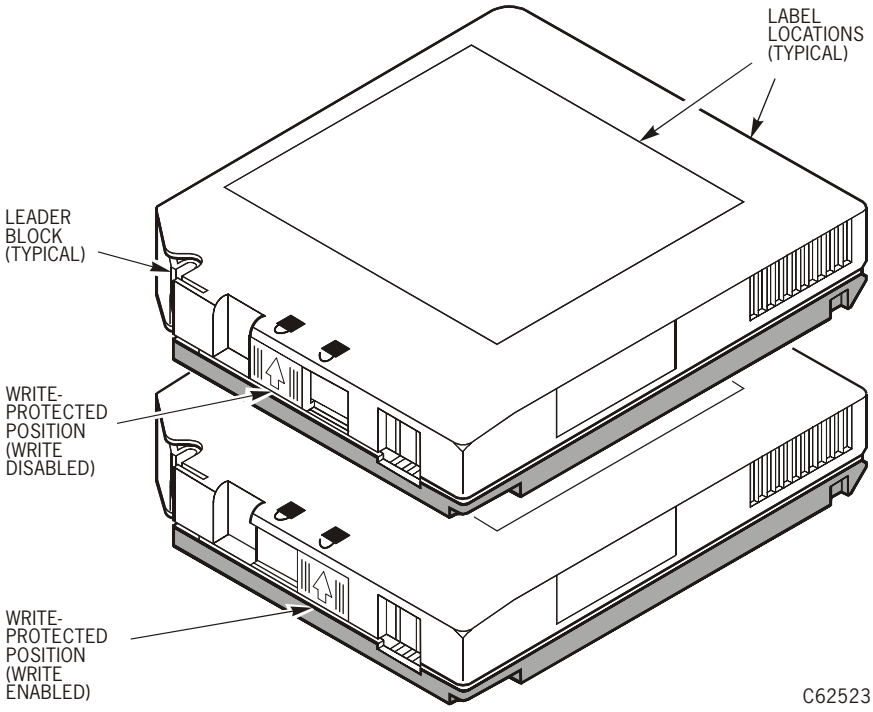


Figure A-15. Setting the EETape Write-Protect Selector (C62523)



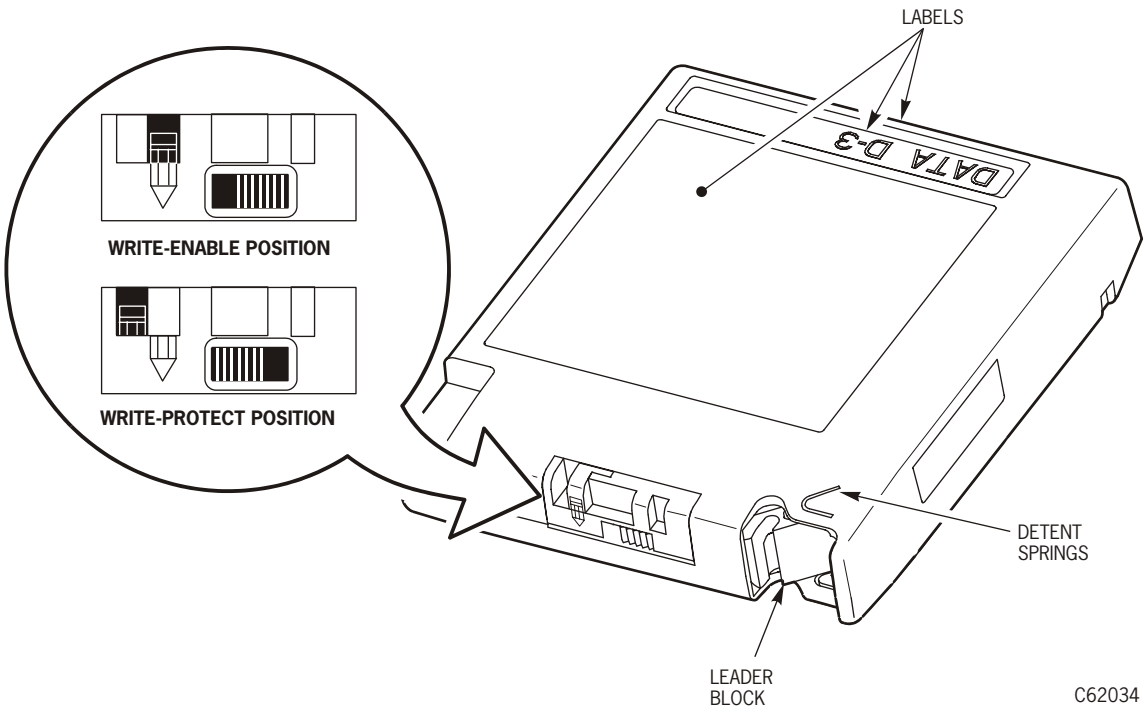
SD-3 Write-Protect Switch

To write-enable an SD-3 cartridge:

1. Hold the cartridge with the write-protect switch towards you.
2. Locate the write-protect switch on the front of the cartridge.
3. Slide the write-protect switch to the right so that the pencil icon is joined.

   To write-protect this cartridge, slide the switch to the left so that the pencil icon is split.

Figure A-16. Setting the Helical Scan Write-Protect Switch (C62034)



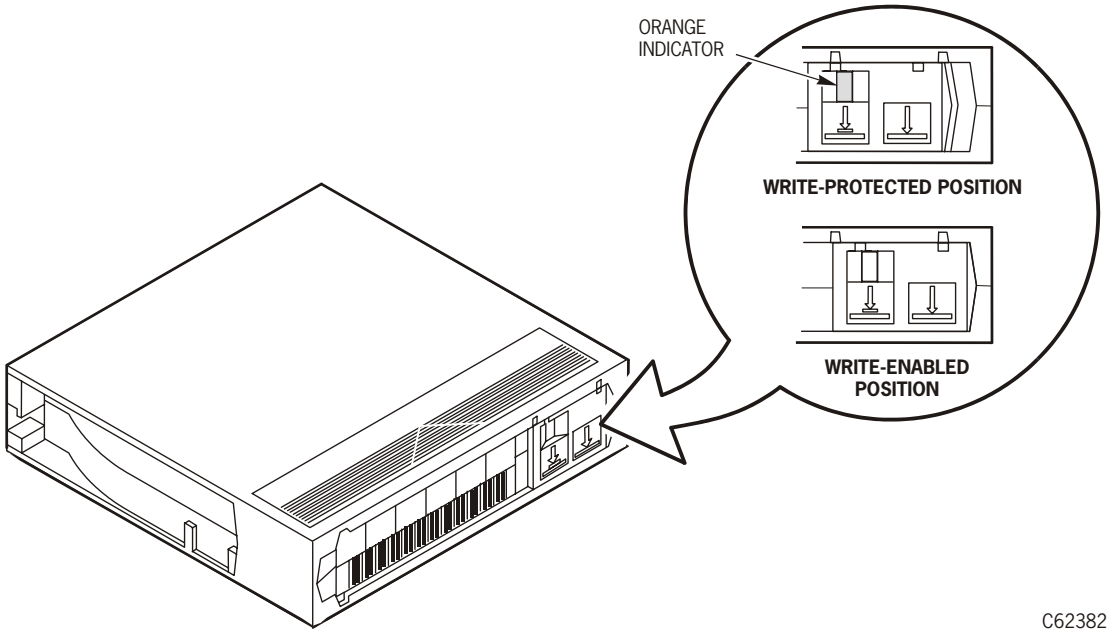
DLT Write-Protect Switch

To write-enable a DLT cartridge:

1. Hold the cartridge with the rear VOLSER label toward you.
2. Locate the write-protect switch on the front of the cartridge.
3. Slide the write-protect switch to the right so that the orange indicator is not visible.

   To write-protect this cartridge, slide the switch to the left so that the orange indicator is visible.

Figure A-17. Setting the DLT Write-Protect Switch (C62382)



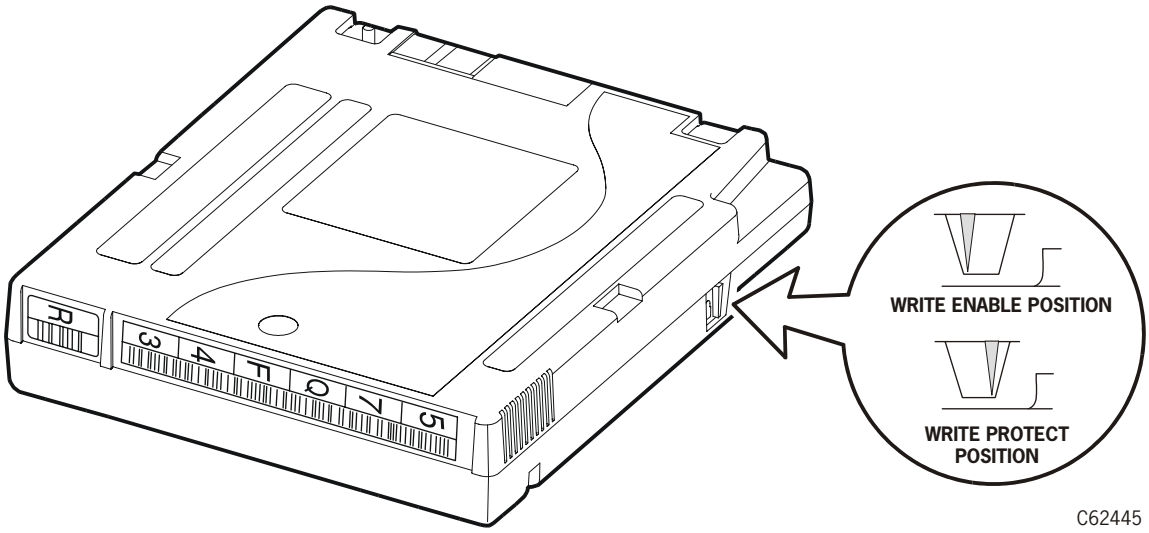
T9840 Write-Protect Switch

To write-enable a T9840 cartridge:

1. Hold the cartridge with the customer label side up and rear VOLSER label toward you.
2. Locate the write-protect switch on the right side of the cartridge.
3. Slide the write-protect switch to the back of the cartridge (towards you).

   To write-protect this cartridge, slide the write-protect switch to the front of the cartridge (away from you).

Figure A-18. Setting the T9840 Write-Protect Switch (C62445)

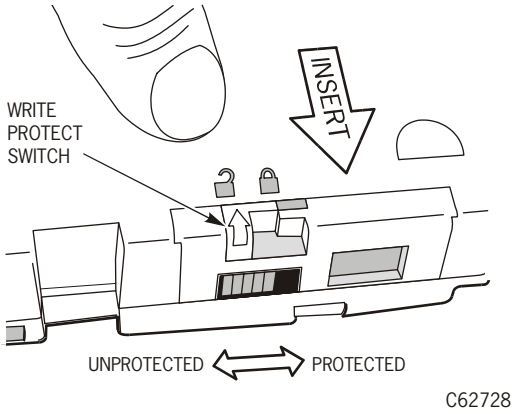


T9940 Write-Protect Switch

1. Hold the cartridge with write-protect switch towards you.
2. Locate the write-protect switch on the front of the cartridge.
3. Slide the write-protect switch to the left so the arrow points to the unlocked padlock icon.

   To write-protect this cartridge, slide the write-protect switch to the right so the arrow points to the locked padlock icon.

Figure A-19. Setting the T9940 Write-Protect Switch (C62728)



Environmental Specifications

The following tables list the different cartridge environmental specifications:

Table A-1. 9490 Cartridge Environmental Specifications

Operating Environment	
Temperature	15.6° to 32.2°C (60° to 90°F)
Relative humidity	20% to 80%
Wet bulb temperature	25.6°C (78°F) maximum
Cartridge Storage Environment	
Temperature	4.4° to 32.2°C (40° to 90°F)
Relative humidity	5% to 89%
Wet bulb temperature	26.7°C (80°F) maximum

Table A-2. SD-3 Cartridge Environmental Specifications

Operating Environment	
Temperature	15° to 27°C (59° to 81°F)
Relative humidity	30% to 60%
Wet bulb temperature	25°C (77°F) maximum
Cartridge Storage Environment	
Temperature	5° to 32°C (41° to 90°F)
Relative humidity	5%-80%
Wet bulb temperature	26°C (80°F) maximum

Table A-3. DLT Cartridge Environmental Specifications

Operating Environment	
Temperature	10° to 40°C (50° to 104°F)
Relative humidity	20% to 80% noncondensing
Wet bulb temperature	25°C (77°F) maximum
Cartridge Storage Environment	
Temperature	16° to 32°C (61° to 90°F)
Relative humidity	20% to 80% noncondensing
Wet bulb temperature	26°C (79°F) maximum

Table A-4. T9840 Cartridge Environmental Specifications

Operating Environment	
Temperature	15.6º to 32.2ºC (60º to 90ºF)
Relative humidity	20% to 80%
Wet bulb temperature	26ºC (78.8ºF)
Cartridge Storage Environment	
Temperature	
Archive	5º to 25.5ºC (41º to 78ºF)
Non-archive	5º to 32ºC (41º to 90ºF)
Relative humidity	
Archive	40% to 60%
Non-archive	5% to 80%
Wet bulb temperature	26ºC (78.8ºF)

Table A-5. T9940 Cartridge Environmental Specifications

Operating Environment	
Temperature	15.6º to 32.2ºC (60º to 90ºF)
Relative humidity	20% to 80%
Wet bulb temperature	26ºC (78.8ºF)
Cartridge Storage Environment	
Temperature	
Archive	18º to 26ºC (65º to 79ºF)
Non-archive	5º to 32ºC (41º to 90ºF)
Relative humidity	
Archive	40% to 60%
Non-archive	5% to 80%
Wet bulb temperature	26ºC (78.8ºF)

Glossary

This glossary defines terms and abbreviations used in this publication.

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

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

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

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

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

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

Numeric

9490 A device that reads from or writes to a 3480 tape, ETape, or EETape. *Also referred to as* TimberLine.

9741 A drive cabinet that attaches to the rear of the LSM. It contains DLT drives, T9840 drives, or both.

9741E A drive cabinet that attaches to the rear of the LSM. It holds DLT, T9840, and T9940 drives.

A

ACSLS Automated Cartridge System Library Software.

audit (1) For an LSM, a part of its IPL sequence that catalogs all cartridge locations within the LSM cells and retains the data in the library controller card's memory.

(2) For a host, its request to catalog the cartridges in an LSM by LSM number, panel, row, and column.

automatic mode A relationship between an LSM and all attached hosts. An LSM operating in automatic mode handles cartridges without operator intervention. This is the normal operating mode of an LSM that has been placed online to all host CPUs.

C

CAP *See* cartridge access port.

cartridge The plastic housing around the tape. A plastic leader block is attached to the tape for automatic threading when loaded in a drive. The spine of the cartridge contains a VOLSER label listing the volume identification number. The media ID label allows cartridge capacity to be identified.

cartridge access port (CAP) A device in the library that allows an operator to insert or remove cartridges during library operations.

cartridge drive (CD) A device containing two or four cartridge transports with associated power and pneumatic supplies.

cartridge exchange mechanism (CEM) A mechanism that allows a cartridge to pass from one library storage module (LSM) to another in a multiple LSM automated cartridge system.

cartridge tape A composite of the plastic housing and the magnetic tape.

catalog The inventory of all cartridge storage locations in an LSM; this inventory is by LSM number, panel, row, column.

cell A slot in the LSM that is used to store a cartridge.

CEM *See* cartridge exchange mechanism.

CIM Customer initiated maintenance. The customer calls Customer Services Support Center (CSSC) to report a problem.

client A functional unit that receives shared services from a server. (T)

configuration The physical description of a library listing the panel types, cartridge capacity, type of host connection, and number of drives.

controller transport unit (CTU) The functional area, within a cartridge drive, that contains control logic and an associated electromechanical device for threading tape from a cartridge, moving the tape across a read/write head, and writing data onto or reading data from the magnetic tape.

CSSC *See* Customer Services Support Center.

Customer Services Support Center (CSSC) Sun StorageTek's customer services organization. Customers with Sun and StorageTek maintenance contracts may contact the CSSC.

D

diagnostic programs Automated offline tests that a service representative uses to evaluate and troubleshoot equipment.

Digital Linear Tape (DLT) A type of magnetic tape storage device marketed by several companies. DLT cartridges are ½-inch wide and come in several sizes ranging from 20 to over 80 GB.

dismount To remove a cartridge from a drive.

F

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

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

FRU *See* field replaceable unit.

FSC *See* fault symptom code.

I

ID Identifier or identification.

initial program load (IPL) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors with diagnostic routines activate these routines at IPL execution.

L

library One or more Sun StorageTek automated cartridge systems (ACSs), together with the attached transports or tape drives and the ACSLS software that controls and manages the ACSs.

library storage module (LSM) A housing that contains tape cartridges and a robot that moves the tapes between storage cells and the attached transports or drives. *Synonymous with* tape library.

M

manual mode A relationship between a library and all attached hosts. Libraries operating in manual mode are placed offline to all host CPUs and require human assistance to perform cartridge operations.

mount To place a cartridge tape in a drive or transport and make it accessible to the host system.

O

offline (1) Neither controlled by, nor communicating with, a computer. *Contrast with* online. (IBM)

(2) Not active or available for access in a system.

online (1) Pertaining to the operation of a functional unit when under the direct control of the computer. *Contrast with* offline. (I)

(2) Active and available for access in a system.

R

robot Electromechanical device for locating and moving cartridges.

S

SCSI *See* small computer systems interface.

SD-3 A high-performance information storage and retrieval system that reads and writes in helical-scan format. *Also referred to as* RedWood.

servo A device that uses closed-loop feedback to govern physical positioning.

small computer systems interface (SCSI) A local interface operating over a wide range of transfer rates using a common command set for all devices attached to the interface. It connects host computer systems to a variety of peripheral devices.

T

T9840 A two-reel (supply and take-up reels) tape drive that reads from and writes to magnetic tapes.

T9940 A single-reel tape drive that reads from and writes to magnetic tapes..

T9x40 A term used to denote T9840 and/or T9940 when the specific drive or tape cartridge is not important.

tape drive An electromechanical device that moves magnetic tape and includes the mechanisms for writing and reading data to and from the tape.

V

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

VOLSER *See* volume serial label.

volume A data carrier that mounts and dismounts as a unit; for example, a reel of magnetic tape or a disk pack.

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

Z

Z column assembly The column that allows the hand mechanism in the LSM to move vertically.

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