

# 9714 Library Storage Module

Hardware Operator's Guide



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Information contained in this publication is subject to change. In the event of changes, the publication will be revised. Comments concerning its contents should be directed to:

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# Summary of Changes

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<b>EC Number</b>	<b>Date</b>	<b>Edition</b>	<b>Description</b>
110170	July 1996	First	Initial release.
111353	January 2000	Seventh	Updates for DLT8000, new template, miscellaneous cleanup.
111605	February 2001	Eighth	New template.

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# Preface

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This guide describes how to operate the library storage module (LSM). Most of the information pertains to hardware.

For specific drive information and customer server console commands, refer to your drive publications or software publications.

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.

This guide has four chapters and one appendix:

**Chapter 1** **“General Information”** describes the LSM hardware.

**Chapter 2** **“Controls and Indicators”** shows the locations of the power switch and operator panel, describes the functions of the softkeys, indicators, and display, and shows how to set the SCSI address and maximum usage count for the cleaning cartridge.

**Chapter 3** **“Operating the LSM”** contains the procedures to operate the LSM, including how to display the LSM status, power-on and power-off the units, perform automated operations (enter and eject a cartridge through the cartridge access port), and perform manual operations (mount and dismount cartridges).

**Chapter 4** **“Obtaining Maintenance Support”** describes how to contact Customer Support for LSM hardware or software problems.

**Appendix A** **“Cartridge Tape Information”** explains how to prepare, inspect, store, clean, and repair cartridges, and lists their specifications.

**Glossary** Defines new or special 9714 Library terms and abbreviations used in this guide.

**Index** Assists in locating information in this guide.

A [Reader’s Comment Form](#) at the back of the guide is for communicating suggestions or requests for change. We appreciate reader feedback.

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**Note:** Provides additional information that might be of special interest. A note can point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it relates.

**CAUTION:**

**Informs the user of conditions that might result in damage to hardware, corruption of customer data or application software, or long-term health hazard to people. A caution always precedes the related information.**

**WARNING:**

**Alerts the user to conditions that might result in injury or death. A warning always precedes the information to which it relates.**

## ■ Related Publications

The following list contains the names and order numbers of publications that provide additional information about the LSM, the drives, and cartridge tapes.

**DLT Publications**

<i>Quantum DLT4000 Cartridge Subsystem Product Manual</i>	313127601 (StorageTek) 81-60043-0x (Quantum)
<i>Quantum DLT7000 Tape Drive Product Manual</i>	313134501 (StorageTek) 81-60000-0x (Quantum)
<i>Quantum DLT8000 Tape Drive Product Manual</i>	81-60118-0x (Quantum)

**ANSI Publications**

*American National Standard Magnetic Tape and Cartridge for Information Interchange* ACS X3B5

**IBM Publications**

<i>Care and Handling of the IBM Magnetic Tape Cartridge</i>	GA32-0047
<i>Tape and Cartridge Requirements for the IBM 3480 Tape Drive</i>	GA32-004

To order additional copies of this guide or related publications, use one of these methods:

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You may have access to the following additional sources of information.

### **Customer Resource Center**

StorageTek's Customer Resource Center (CRC) is an online service that provides technical information such as software publications, user documentation, maintenance fixes, and answers to frequently asked questions. The CRC is for StorageTek employees and for contract customers and partners with a login and password.

The location of the CRC is <http://www.support.storagetek.com>

### **StorageTek Storefront**

The Storefront is StorageTek's external web site. The Storefront provides information about topics such as news bulletins, products, services, integrated solutions, customer support, and upcoming events. The storefront is accessible to all persons with a web browser.

The location of the Storefront is <http://www.storagetek.com>

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# Notices

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## ■ FCC Compliance Statement

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Some of the cables used to connect peripherals must be shielded and grounded as described in the installation manual. Operation of this equipment with the required cables that are not shielded and correctly grounded may result in interference to radio and TV reception.

Changes or modifications not expressly approved by StorageTek could void the user's authority to operate the equipment.

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VCCI-A

This equipment is in the Class A category information technology equipment based on the rules of Voluntary Control Council For Interference by Information Technology Equipment (VCCI). When used in a residential area, radio interference may be caused. In this case, user may be required to take appropriate corrective actions.

Consequently, when used in residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, etc. Read the instructions for correct handling.

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# General Information

The 9714 Library Storage Module (LSM) is the hardware component in an automated cartridge system. An automated cartridge system is a removable media, robotic system that mounts cartridges into a storage cell or into a drive for read and write operations.

[Figure 1-1 on page 1-2](#) and [Figure 1-2 on page 1-3](#) show the major components of an LSM, described in the following pages.

## ■ Library Storage Module Components

The LSM has four major, internal components:

- A robot
- Storage cells for 40 to 100 cartridges
- A cartridge access port (CAP) that can hold one cartridge
- One to six drives

### Robot

The robot moves cartridges between storage cells and drives when the customer server software makes a request. The robot includes the Z column assembly and the hand. [Figure 1-2 on page 1-3](#) shows the robot components.

The Z column assembly contains a Z column and Z carriage. The Z column attaches to the floor and the ceiling of the LSM, and rotates 140 degrees to allow access to all the cells in the LSM.

The hand mounts to the Z carriage. The Z carriage moves the hand vertically up and down the Z column to storage cells, drives, or the CAP.

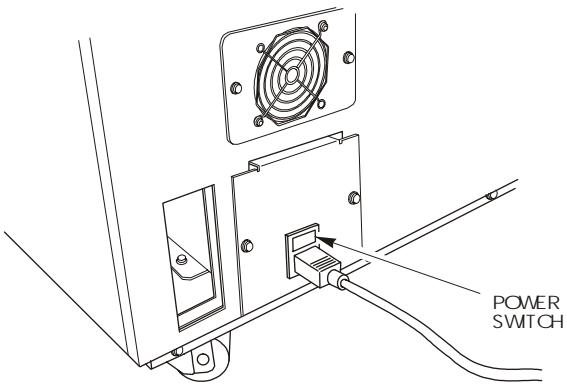
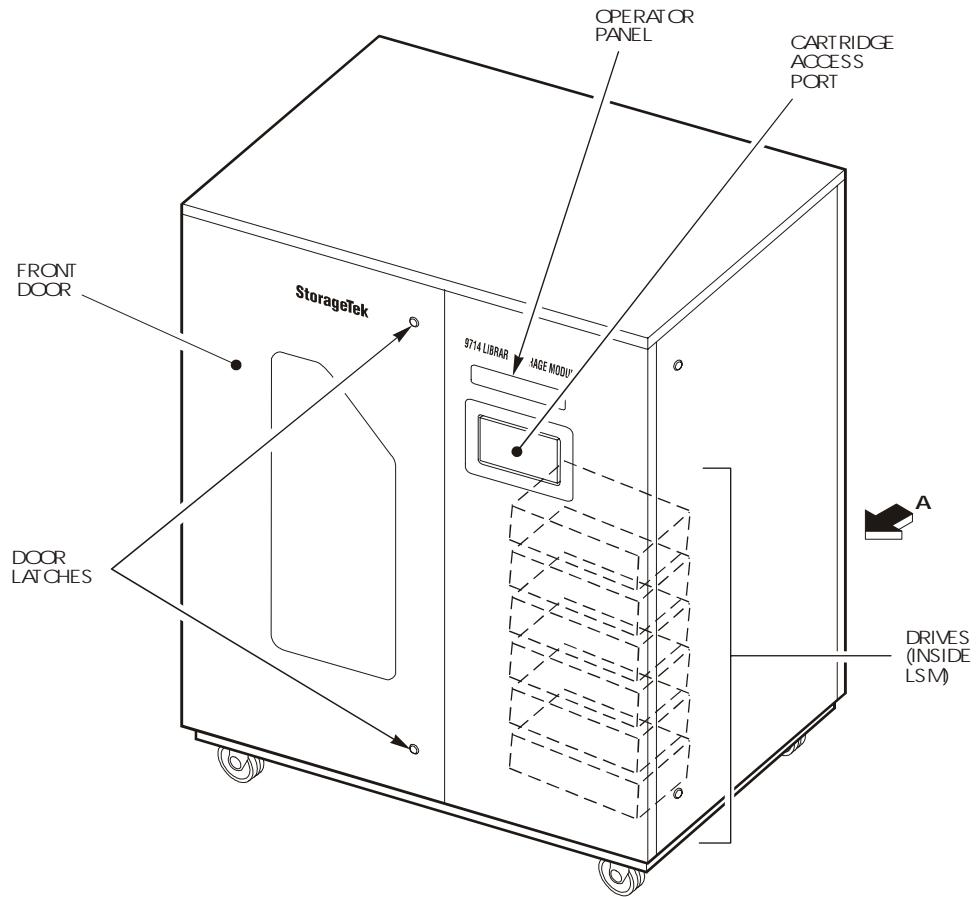
A camera located on the hand reads the cartridge volume serial numbers (VOLSERs) during audits, but is not used to locate cartridges during robotic moves or read the VOLSERs of cartridges in the drives. If you manually replace a cartridge in a drive, the host memory will retain the old VOLSER.

The camera reads the VOLSERs of all the cartridges in the LSM cells and stores the information on the PRC (processor) card. You must request a host update to add the information to the host memory.

An audit occurs when you power-on the LSM, open and close the LSM door, perform an initial program load (IPL) of the LSM, or make a request at the customer server console to audit the LSM.

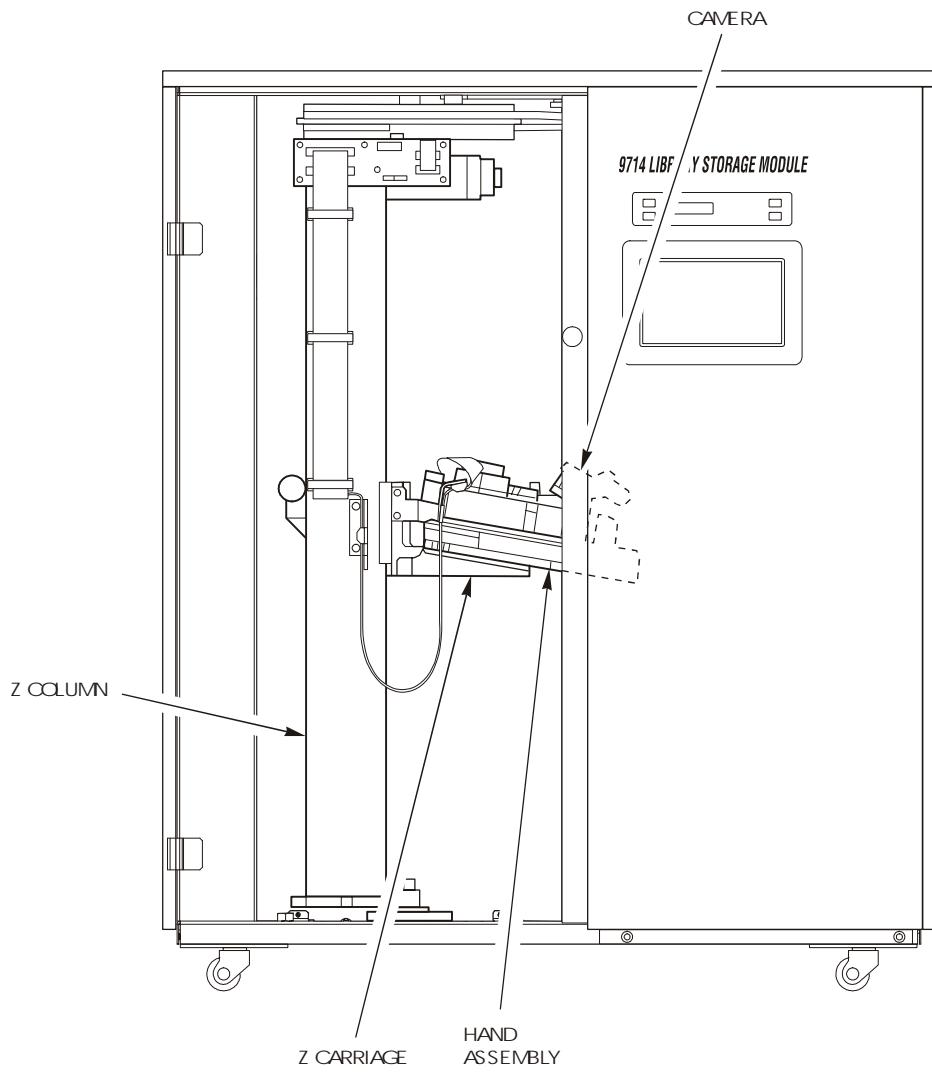
**Figure 1-1. LSM Major External Components**

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**VIEW A**

C61007

**Figure 1-2. Robot Components**

C61008

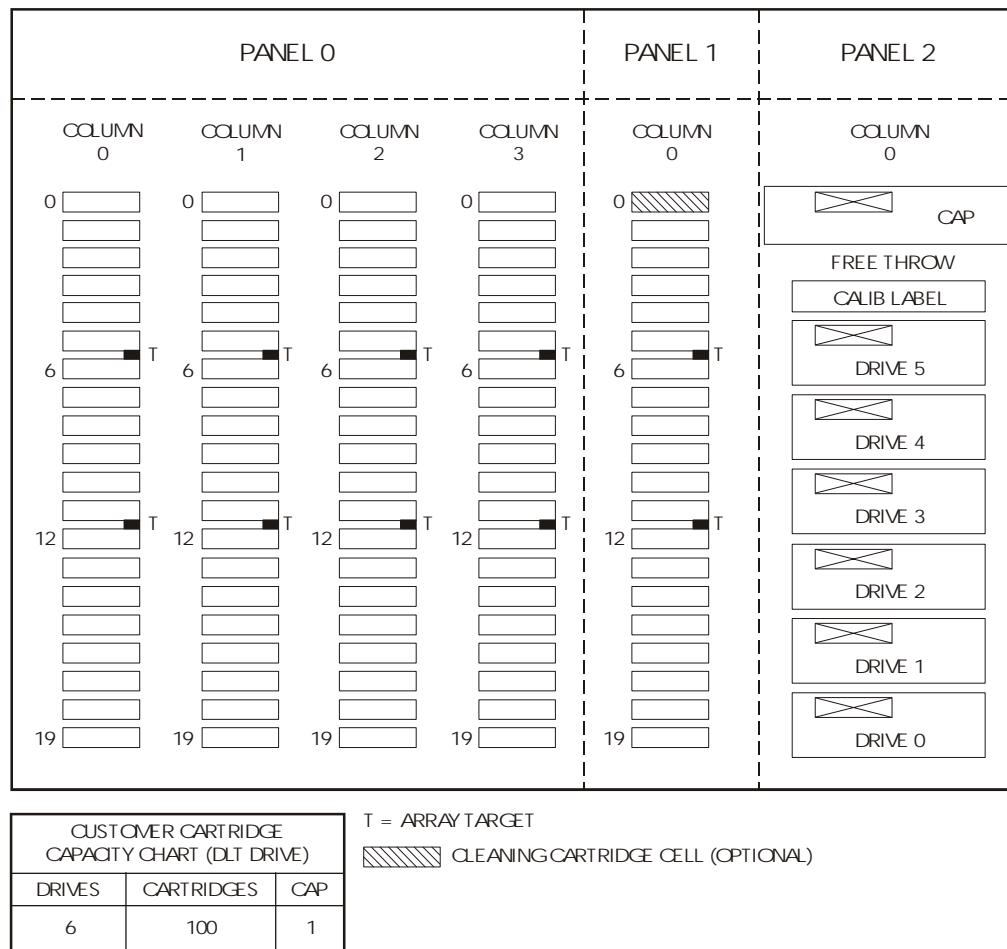
## Storage Cells

The LSM is configured by panel, column, row, and cell so that the customer server software can locate a cartridge. The LSM contains storage cells for 40, 60, 80, or 100 cartridges. Cartridges are stored in cell arrays that hold 6 or 14 cartridges, for a total of 20 cartridges per column. The columns are arranged in a semicircle around the robot assembly. [Figure 1-3 on page 1-4](#) shows the cell locations.

**Note:** The cell located at the top of Panel 1, Column1, is a designated cleaning cartridge cell if you have the AUTO CLEAN feature enabled, as described at the end of this chapter. If you do not, you can use that cell for a data cartridge.

The array targets are used for robotic calibration during IPL. The drive and CAP locations are not used to store cartridges. The FREE THROW designation below the CAP is the location where the hand can extend itself as an IPL test.

**Figure 1-3. Cell Locations**



## Cartridge Access Port

A CAP is the location where you can add a cartridge to or remove a cartridge from an LSM without interrupting normal cartridge mounts and dismounts by the robot assembly. The CAP is located in the drawer on the front LSM cover.

The hand uses the CAP as a storage location for an in-transit cartridge if the machine loses power. When power is restored, if the CAP is empty and the hand contains a cartridge, the hand will place the cartridge into the CAP. If the CAP is not empty, you must remove the cartridge from the hand. Refer to [“Removing a Cartridge from the Hand” in Chapter 3, “Operating the LSM.”](#)

You might use the CAP to load and unload cleaning cartridges. Refer to [“Replacing the Cleaning Cartridge” in Chapter 3, “Operating the LSM.”](#)

Refer to [“Entering the Cartridge through the CAP” in Chapter 3, “Operating the LSM”](#) and [“Ejecting the Cartridge through the CAP” in Chapter 3, “Operating the LSM”](#) for detailed procedures and figures.

## Drives

The cartridge is placed into the drive for data read or write operations. The LSM uses Digital Linear Tape (DLT4000, DLT7000, and DLT8000) drives. From one to six DLT drives can be installed, numbered 0 to 5, with 0 at the bottom.

**Note:** Some software might number the drives from one to six.

During LSM automated mode (see definition at the end of this chapter), the robotic hand will place the cartridge into the drive when the command is sent from the customer server software. During LSM manual mode, you might need to insert a cartridge into the drive yourself. Refer to [“Mounting a Cartridge into the Drive” in Chapter 3, “Operating the LSM”](#) for the procedure.

For specific drive information, refer to your drive publications.

## ■ LSM Safety Features

Safety features are incorporated into the LSM. If the front door to the LSM is opened, an electrical interlock removes power from the robot assembly.

Behind the side door, covers are placed over certain assemblies to prevent you from coming into contact with hazardous voltages and sensitive electronics. Do not open the side door—no operator activity is required behind this door.

## ■ Controlling Software

Controlling software within the customer server requests tape read/write operations to the drives and robotic move operations to the LSM components. The software determines where the cartridge is located by tracking the VOLSER and cell location during audits, then allocates which drive receives the cartridge. For specific information, refer to your software publications.

## ■ LSM Operating Modes

An operating mode is the manner in which an LSM and the controlling software (also referred to as the customer server software) interact. An LSM can operate in either automated mode or manual mode, as described below.

### Automated

Automated mode is the normal operating mode of the LSM. The controlling software instructs the robot to move the cartridge among the storage cells, drives, and CAP without operator intervention. The operator tasks include:

- Monitoring the LSM operator display for messages
- Entering a cartridge through the CAP
- Ejecting a cartridge through the CAP
- Replacing a cleaning cartridge

Refer to [Chapter 3, “Operating the LSM,”](#) for the procedures.

### Manual

Manual mode occurs when the LSM is no longer online or loses power. The operator tasks include:

- Opening the LSM front door
- Moving the robot
- Locating a cartridge
- Removing a cartridge from the hand
- Mounting a cartridge into a drive
- Dismounting a cartridge from a drive
- Returning the LSM to online status

Refer to [Chapter 3, “Operating the LSM,”](#) for the procedures.

## ■ AUTO CLEAN Feature

Drives might occasionally need to be cleaned to prevent read/write errors. When your LSM is configured during installation, the AUTO CLEAN feature can be enabled. If it is and a drive requires cleaning, the robot will receive a software message telling it to retrieve the cleaning cartridge from the cleaning cartridge 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 place a cleaning cartridge into the drive.

Refer to “[Setting the Cleaning Cartridge Count](#)” in Chapter 2, “[Controls and Indicators](#)” and “[Replacing the Cleaning Cartridge](#)” in Chapter 3, “[Operating the LSM](#)” for more information and procedures.

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This chapter shows the locations and describes the functions of the library storage module (LSM) operator panel and the power switch. It also shows how to set the SCSI address and the maximum usage count of the cleaning cartridge. Refer to the drive publications for information about operating the drives.

## ■ Operator Panel

The LSM operator panel is on the front door of the LSM. The panel contains softkeys and indicators, plus a two-line display. The display shows LSM status, configuration, test sequences, and error information. [Figure 2-1 on page 2-2](#) shows the panel and describes each item.

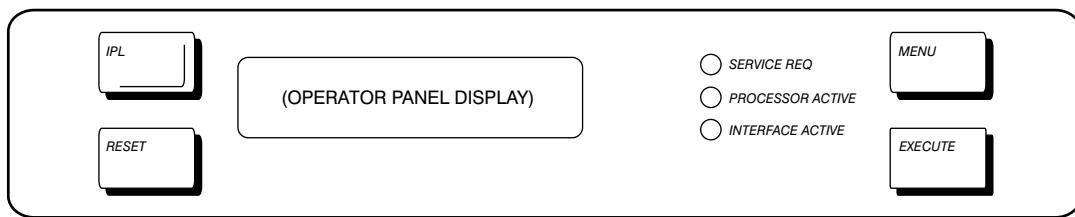
You use this panel to:

- Resolve machine problems.

If an error occurs, the display shows a fault symptom code (FSC) that you can give to the customer services engineer (CSE) or to your local service representative to help resolve problems. Write down the FSC as soon as it is displayed.

- Receive instructions to close the door or cartridge access port (CAP).
- Set the SCSI address.
- Set the maximum usage count of the cleaning cartridge.

Figure 2-1. LSM Operator Panel Softkeys, Indicators, and Display



<b>IPL</b>	Initiates the download from the diskette. The IPL sequence consists of PROM tests, boot tests, and machine initialization.
<b>RESET</b>	<b>DESIGNED FOR CSE USE ONLY!</b> NOT an operator activity. Initiates a dump.
<b>OPERATOR PANEL DISPLAY</b>	<p>Displays machine status and menu information. It also prompts the operator to perform certain functions.</p> <p>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.</p> <p>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."</p> <p>When the display shows "ONLINE CAP UNLOCKED," and you want it locked, open and close the CAP. The display will show "ONLINE CAP LOCKED."</p>
<b>SERVICE REQ</b>	Lights when the LSM requires service. The display indicates "INOP" and the fault symptom code.
<b>PROCESSOR ACTIVE</b>	Solid light until the functional code is active, then flashes on and off every second while the PRC card is active.
<b>INTERFACE ACTIVE</b>	Flashes whenever I/O is performed across a host interface or CSE port.
<b>MENU</b>	Used to set SCSI address and cleaning cartridge usage.
<b>EXECUTE</b>	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.

C61010

## ■ Setting the SCSI Address

You set the SCSI robotic address from the LSM operator panel. You might need to get the addresses from your systems administrator or CSE.

**Note:** When configuring the LSM, you will encounter a message that states 'Press execute for drive config info.' If you are not connected through a Windows NT network, ignore this option and press **MENU**. The CSE will select the drive addresses at the drives.

However, if the drives and/or LSM are connected through a Windows NT network, you must select the proper option.

Examples:

1. If you are connecting Drives 0 and 1 to the same bus on a Windows NT network, you must select the "on bus" option because the drives are on the same bus.
2. If Drives 0 and 1 are on separate Windows NT buses, you must select the "off bus" option because the drives do not share the same bus.

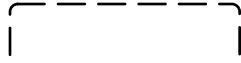
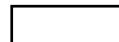
Refer to [Figure 2-2 on page 2-4](#) to make sure that you understand how to read the block diagrams. Usually, pressing **EXECUTE** means "yes," that you want to perform the activity in the block, and pressing **MENU** means "no," that you want to continue through the choices until your activity appears in the block. Usually, when you are at the end of the activity, you press **EXECUTE**. Press **MENU** if you make a mistake or need to go through the choices again.

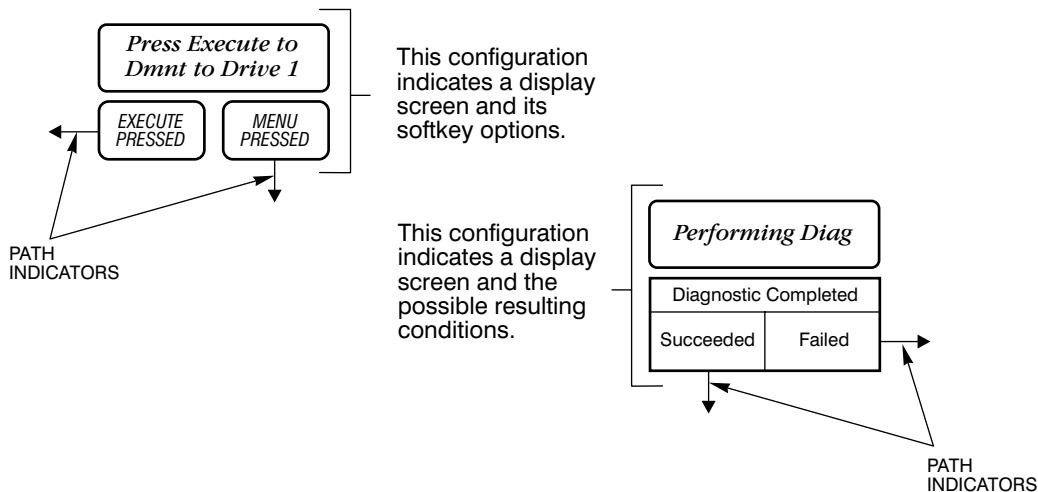
Refer to [Figure 2-3 on page 2-5](#) for the menu block diagrams that describe how to set the SCSI LSM and/or drive addresses to 0 through 7 if you have a PRS card, or 0 through 15 if you have a PRW card.

**CAUTION:**

**During this procedure, the panel displays "Press Execute to Enter Lib Size." Do not do this. This is not normally an operator function. Altering the library size can cause initialization errors.**

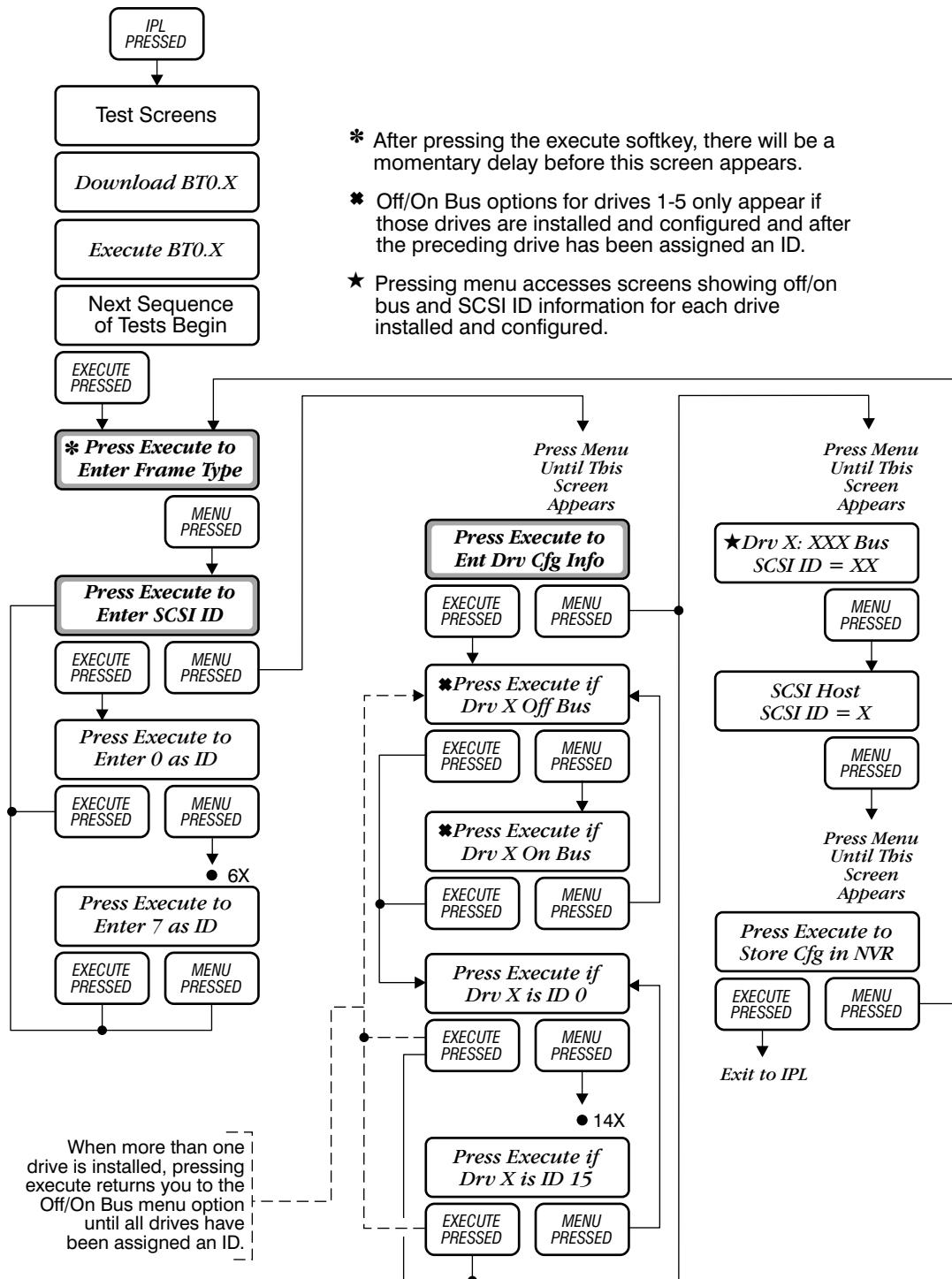
**Figure 2-2. Symbol Definitions for Menu Block Diagram****Symbol Definitions for Menu Block Diagrams**

<b>Press Execute to Run Diagnostics</b>	= display screen with actual display screen text from a top level menu
<b>Press Execute to Dmnt to Drive 1</b>	= display screen with actual display screen text from sub-menus
<b>Most Recent FSC</b>	= display screen and type of information screen is displaying
<b>EXECUTE PRESSED</b> <b>MENU PRESSED</b>	= operator panel softkey operations used in menu sequences
	= menu options that do not always appear
 with text	= result, action, or condition (not a screen display)
bullet (●)	= repeat previous menu action
a bullet (●) plus a number and a multiplication symbol (Example: ● 3X)	= the number of times a previous menu action is repeated between the first and last option in a sequential menu set
 A	= off page connector

**How Used....**

C61011

**Figure 2-3. Setting the SCSI Address**



## ■ Setting the Cleaning Cartridge Count

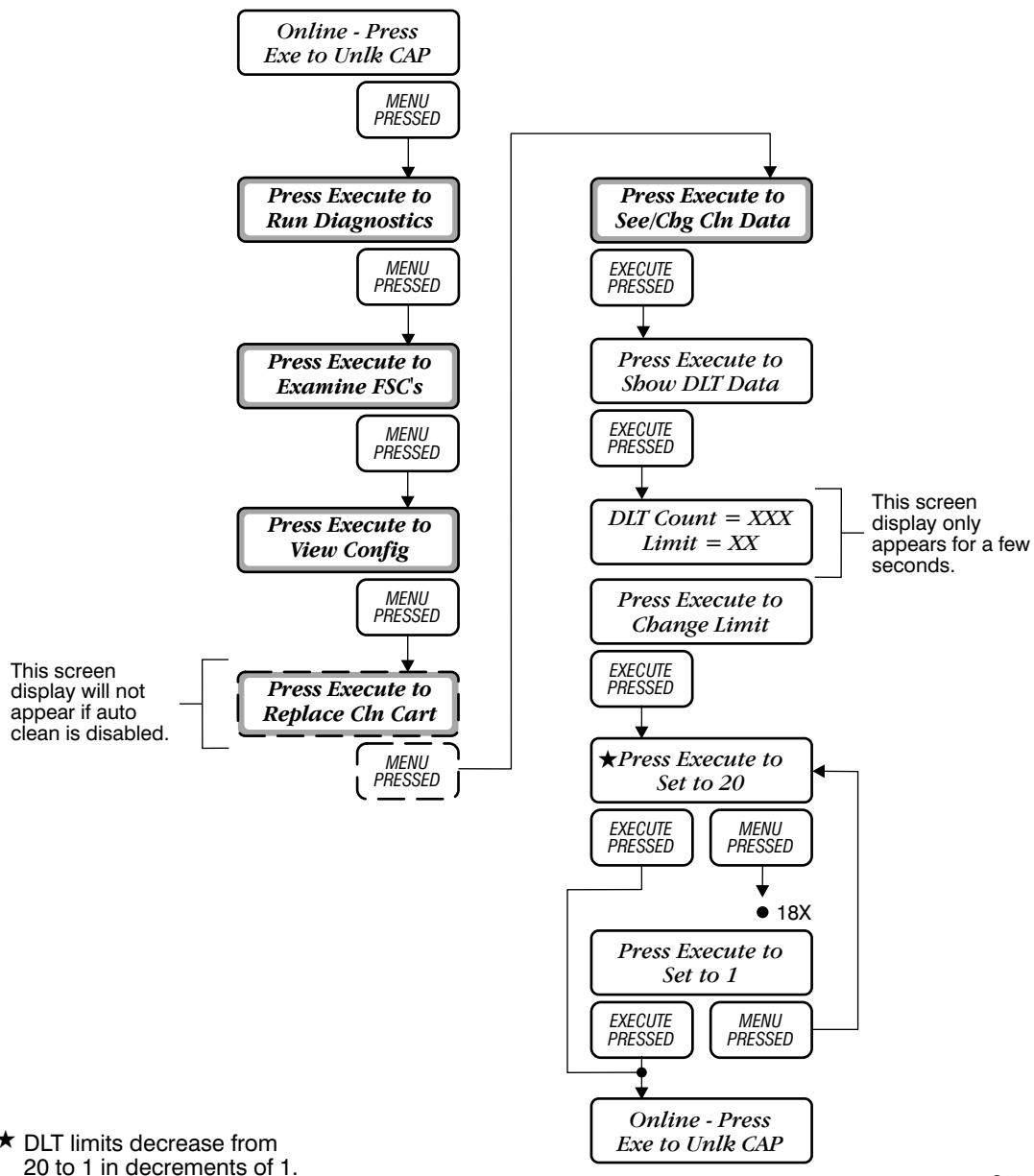
Drives might occasionally need to be cleaned to prevent read/write errors. The drives are cleaned with a special cleaning cartridge. After so many uses, the cartridge must be thrown away.

If your LSM was configured during installation to have the AUTO CLEAN feature enabled, you can use the LSM operator panel to set the maximum number of times a cartridge can be used. The *DLTTapeDriveProductManual* suggests that you use a DLT cleaning cartridge about 20 times.

Refer to [Figure 2-2 on page 2-4](#) to make sure that you understand how to read the block diagrams. Usually, pressing EXECUTE means “yes,” that you want to perform the activity in the block, and pressing MENU means “no,” that you want to continue through the choices until your activity appears in the block. Usually, when you are at the end of the activity, you press EXECUTE. Press MENU if you make a mistake or need to go through the choices again.

Refer to [Figure 2-4 on page 2-7](#) for the menu block diagrams that describe how to set the count.

Figure 2-4. Setting the Maximum Usage Count of the Cleaning Cartridge

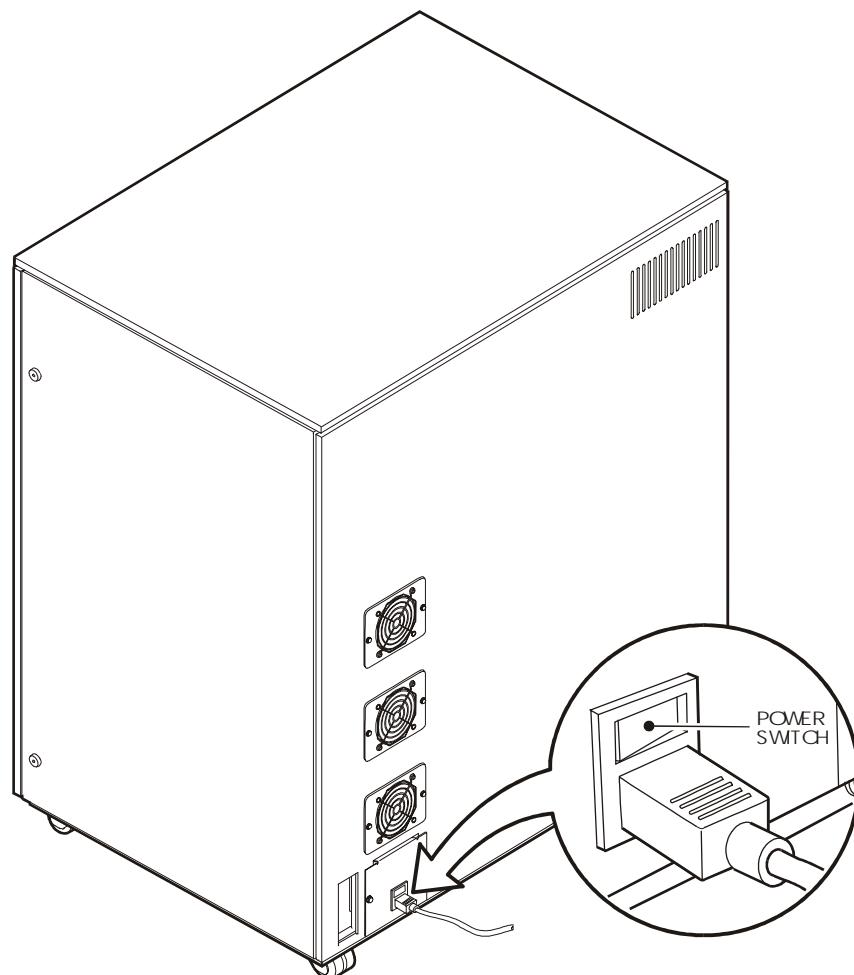


C61014

## ■ Power Switch

The power switch is an ON/OFF switch located in the bottom of the rear cover of the LSM, as shown in [Figure 2-5](#). To power on the LSM, press the switch to the ON position to supply power to the robot and the drives. To power off the LSM, make sure that all jobs being performed by the robot and the drives are complete, then press the switch to the OFF position to remove power from the robot and the drives.

**Figure 2-5. Power Switch Location**



# Operating the LSM

This chapter contains the procedures for:

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

**Note:** When the machine is controlled by the host, refer to your software publications and enter the command at the customer server console to perform the desired activity. For some activities, you might have to ask the systems administrator for the required information.

## ■ Powering-on and IPLing the LSM

**CAUTION:**

**To prevent damage to the DLT drive, make sure that each drive is empty and each DLT handle is up. On older model drives, you can see if the handle is down. On newer model drives, look for the white hub. If the hub is up, the handle is down. [Figure 3-1 on page 3-2](#) shows the handle positions.**

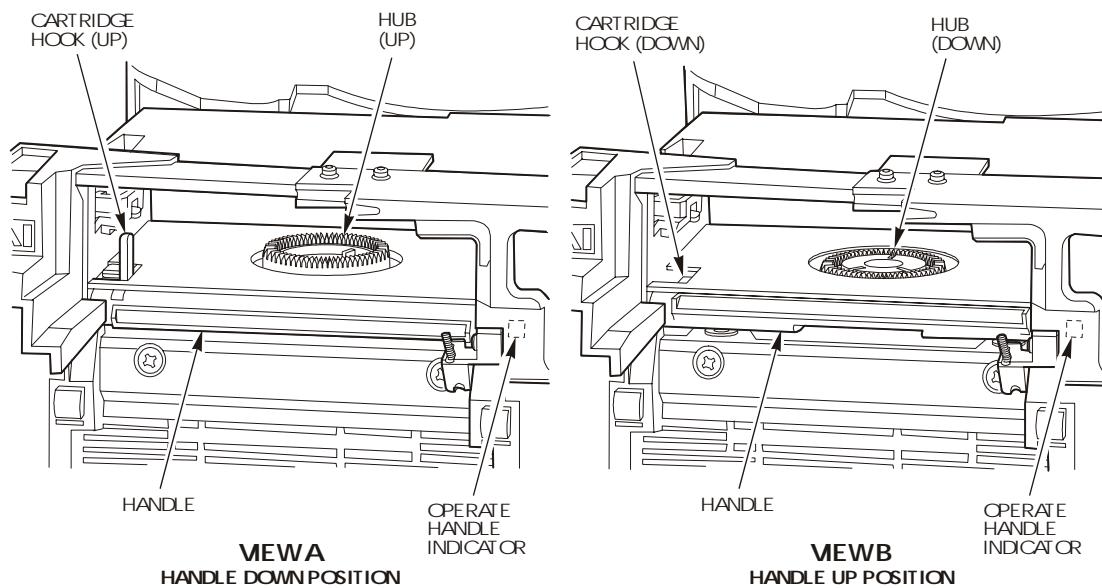
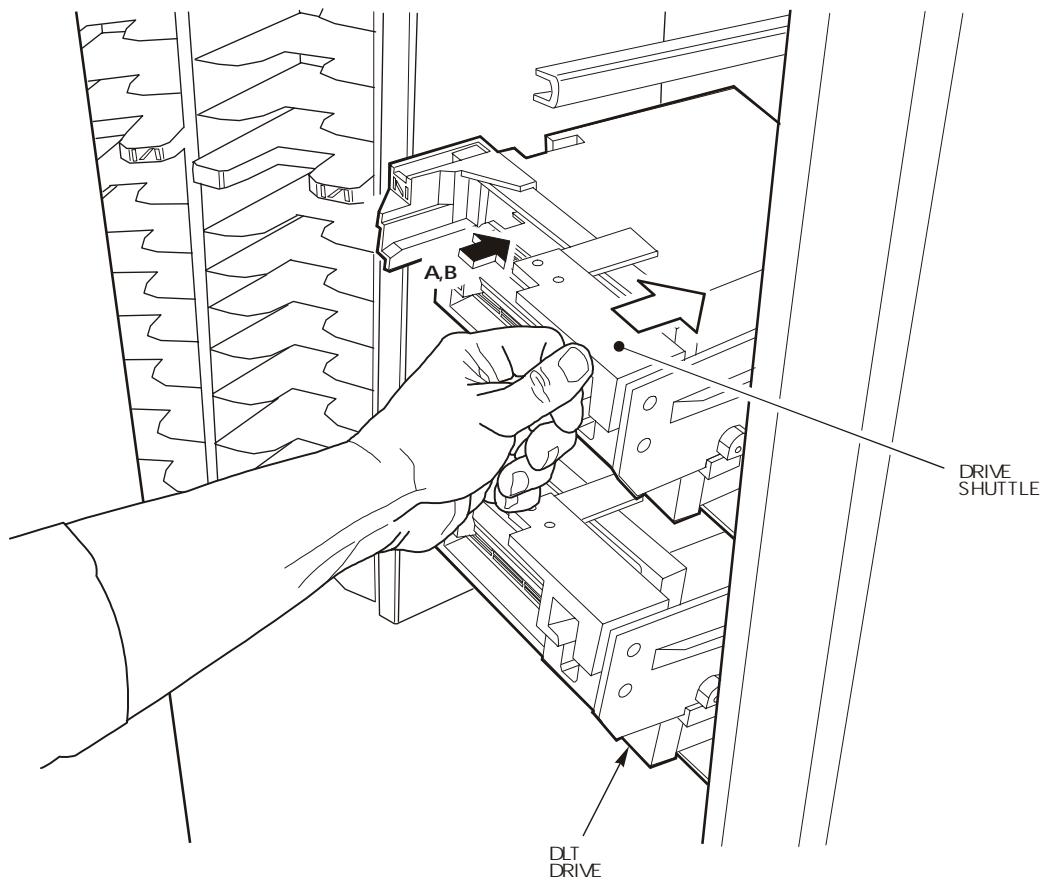
**If the handle is down and the Operate Handle indicator is on, push the shuttle all the way back, pause, then release. The handle will rise. If the indicator is off, contact your customer services engineer for assistance.**

To power-on the LSM, press the power switch (in the bottom of the rear cover of the LSM) to the ON position.

**Note:** If the LSM does not power-on, contact Customer Support and report the problem.

To IPL the LSM, press the IPL softkey on the operator panel to IPL the LSM.

**Figure 3-1. DLT Handle Position**



## ■ Powering-off the LSM

To power-off the LSM:

1. Make sure that no jobs are being run by the drives or robot.
2. Press the power switch (in the bottom of the rear cover of the LSM) to the OFF position.

## ■ Operating in Automated Mode

Automated mode is the normal operating mode of the LSM. When the LSM is online and the robot is mounting and dismounting cartridges, monitor the LSM operator panel display messages and respond appropriately.

When an LSM is online, you might need to:

- Enter a cartridge into the LSM through a cartridge access port (CAP)
- Eject a cartridge from the LSM through a CAP
- Replace the cleaning cartridge

The following pages describe how to perform these activities.

### Entering the Cartridge through the CAP

If the operator panel displays “ONLINE CAP UNLK DISABLD,” the CAP is locked by the host. Issue the command at the customer server console to allow the CAP to be unlocked. Then perform the numbered steps below.

If the operator panel displays “ONLINE - PRESS EXE TO UNLK CAP,” go directly to the steps below.

To access the CAP so that you can enter cartridges into it:

1. Press **EXECUTE** on the LSM operator panel.
  - a. The panel displays “ONLINE CAP UNLK PENDING.”
  - b. The CAP drawer begins to slide toward you.
  - c. The panel displays “ONLINE CAP UNLOCKED.”
2. Pull the drawer further toward you. Hold onto the drawer.

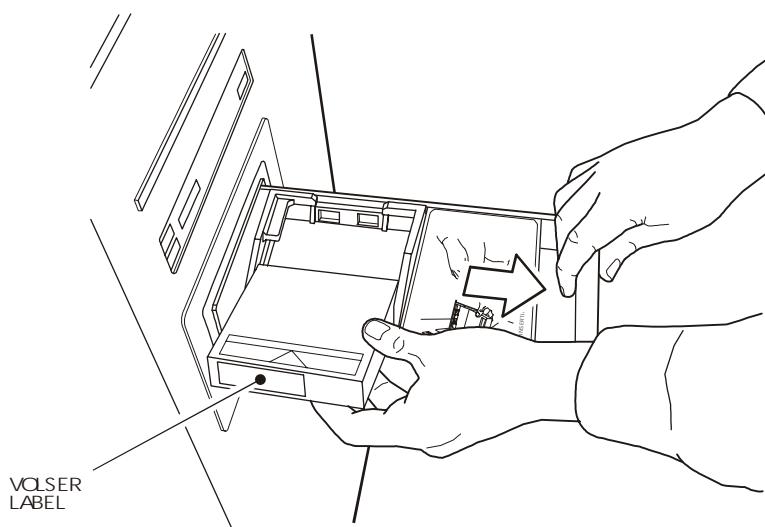
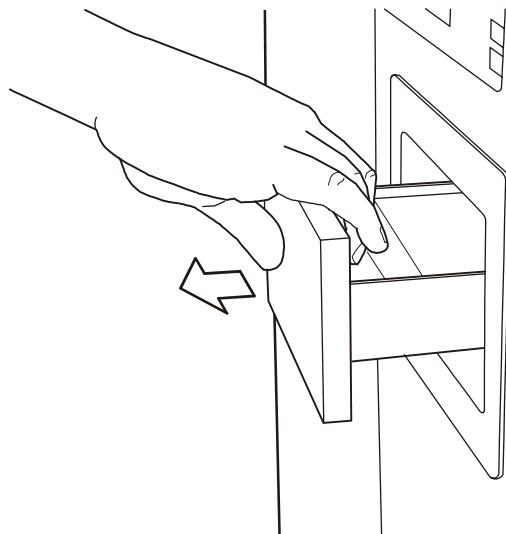
#### **CAUTION:**

**You must enter the cartridges properly or you might damage the robot or the drive, or cause the LSM to stop operating.**

3. Referring to [Figure 3-2 on page 3-5](#), enter the cartridge so that it lies flat, with the VOLSER showing on the left side of the cartridge as you face the LSM and the tape leader block cutout toward the LSM.

4. Slide the drawer into the LSM. The lock automatically engages.

**Note:** 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. With some host software, the LSM might stop operating. With other host software, 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 later during an audit, because the camera still will not be able to read a VOLSER on the cartridge.

**Figure 3-2. Entering a Cartridge through the Cartridge Access Port**

E61016

## Ejecting the Cartridge through the CAP

When you want the robot to eject a cartridge from the LSM through the CAP, use the customer server console to enter the VOLSER of the cartridge you require. The robot will retrieve it and place it into the CAP.

If the operator panel displays “ONLINE CAP UNLK DISABLD,” the CAP is locked by the host. Issue the command at the customer server console that puts the LSM in the “ONLINE - PRESS EXE TO UNLK CAP” mode. Then perform the numbered steps below.

If the operator panel displays “ONLINE - PRESS EXE TO UNLK CAP,” go directly to the steps below.

To gain access to the CAP so that you can remove a cartridge from it:

1. Press **EXECUTE** on the operator panel.
  - a. The operator panel displays “ONLINE CAP UNLK PENDING.”
  - b. The CAP drawer begins to slide toward you.
  - c. The operator panel displays “ONLINE CAP UNLOCKED.”
2. Pull the drawer further toward you. Hold onto the drawer.
3. Remove the cartridge and properly store it *outside* the LSM. Refer to [“Storing the Cartridges” in Appendix A, “Cartridge Tape Information.”](#)
4. Slide the CAP drawer into the LSM. The lock automatically engages.
5. Repeat these steps until all the desired cartridges have been removed.

## Replacing the Cleaning Cartridge

The following paragraphs pertain to you if your LSM has the AUTO CLEAN feature enabled. You can use the View Configuration section of the block diagrams in [Chapter 2, “Controls and Indicators,”](#) to determine whether the feature is enabled.

If the feature is not enabled, you will need to keep track of how many times a cleaning cartridge has been used and throw it away when necessary.

When a cleaning cartridge has been used a number of times, as defined in [“Setting the Cleaning Cartridge Count” in Chapter 2, “Controls and Indicators,”](#) the LSM operator panel displays “CLEANING CARTRIDGE USED UP.” You must remove the expired cartridge and place a new cartridge into the CAP. If your machine has AUTO CLEAN enabled, use the procedure below to replace the cartridge.

**Note:** The *Quantum DLT Tape Drive Product Manual* recommends using a cleaning cartridge about 20 times.

### 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.**

Cleaning cartridges have a unique 3-character alphanumeric prefix in their VOLSER (default is “CLN”). Cleaning cartridges cannot be used as scratch cartridges or initialized by software utilities.

## Replacing the Expired Cleaning Cartridge

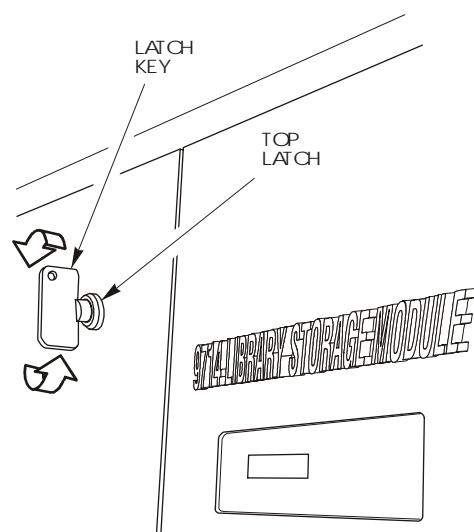
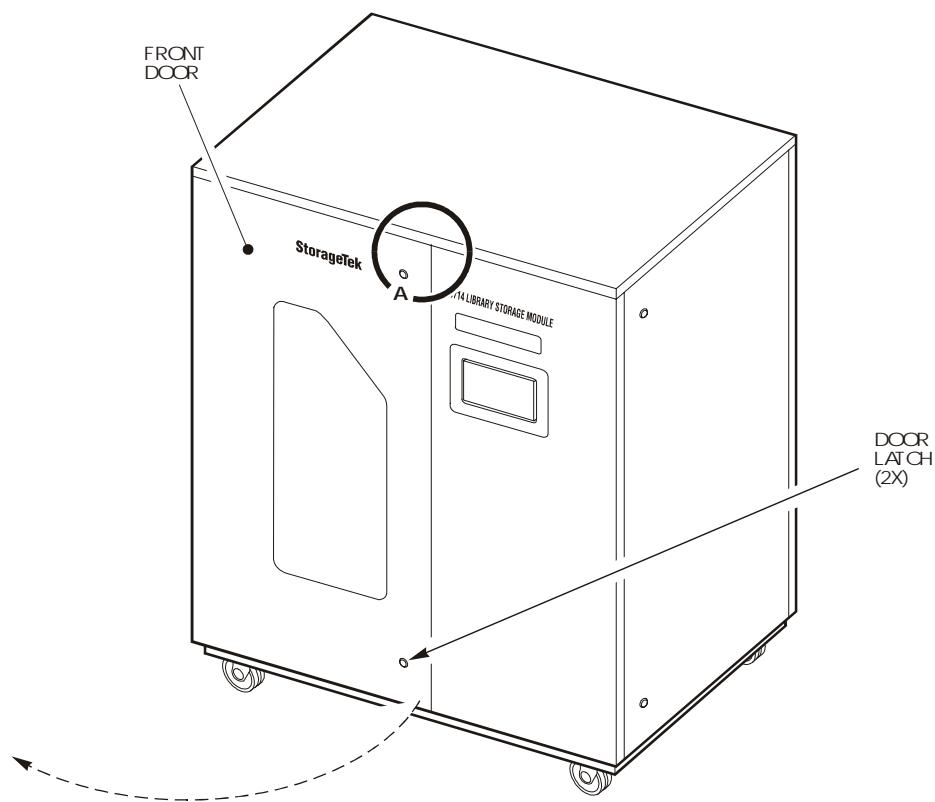
To replace the expired cleaning cartridge:

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 DLT CART.”
3. Press **EXECUTE**.
  - a. The hand takes the old cleaning cartridge from its cell inside the LSM and places it into the CAP.
  - b. The CAP drawer begins to slide toward you.
4. Pull the drawer further toward you. Hold onto the drawer.
5. Remove the expired cartridge from the CAP.
6. Throw away the old cartridge.
7. Place *one* new cleaning cartridge into the CAP cell.
8. Slide the CAP drawer into the LSM. The lock automatically engages.
  - a. The robot performs a brief audit.
  - b. The operator panel displays “MOVING CLEANING CART TO CELL.”
  - c. The hand places the cartridge into its cell.
  - d. The operator panel displays “ONLINE CAP UNLK DISABLD” or “ONLINE - PRESS EXE TO UNLK CAP.”

## ■ Operating in Manual Mode

The following pages contain operations you can perform when the LSM is in manual mode. Manual mode occurs when the LSM is no longer online or loses power.

**Figure 3-3. Opening the LSM Front Door**



**DETAIL A**

C61017

## Opening the LSM Front Door

You must open the front door to perform manual operations. Refer to [Figure 3-3 on page 3-8](#).

1. Make sure that all jobs have ended and place the LSM offline. If the LSM operator panel does not say OFFLINE, refer to your software publication and enter the command at the customer server console to place the LSM offline.

**CAUTION:**

**Potential static electricity damage to electrical components. Take precautions against electrostatic discharge by touching unpainted metal (gray or gold) before reaching into the library. Avoid touching any electrical components.**

2. Open the front door by using a latch key to unlock the top and bottom latches. Turn the key counterclockwise.

## Moving the Robot

After you open 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 you attempt to move any portion of the robot.

**CAUTION:**

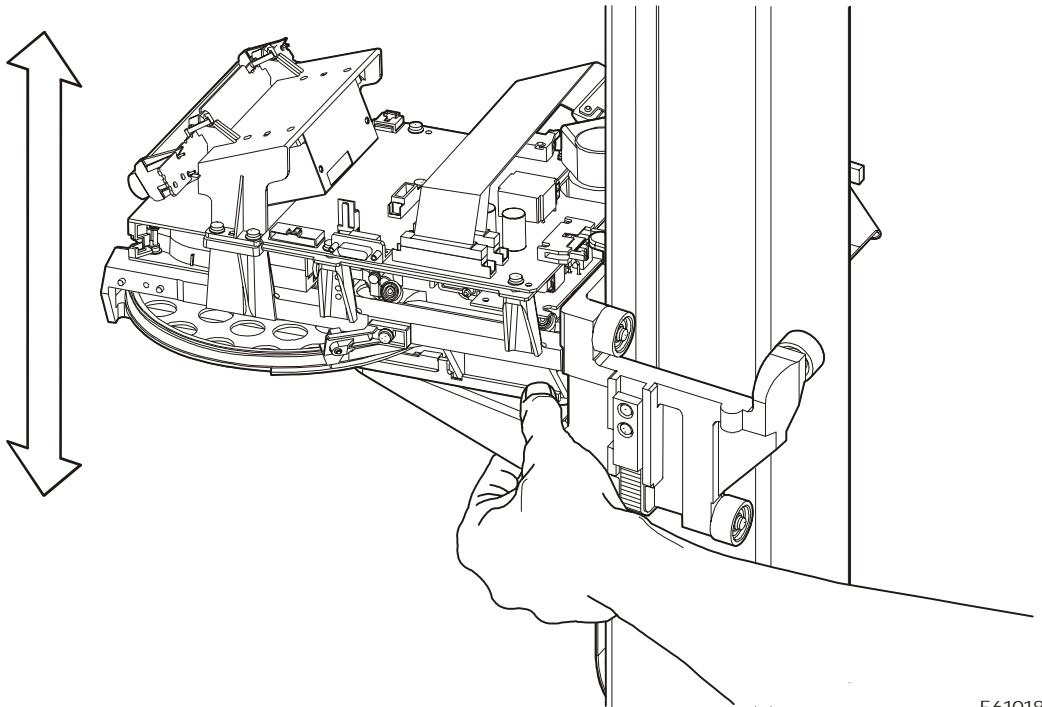
**Possible equipment damage:**

- **To prevent damaging 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 hand pulley (refer to [Figure 3-8 on page 3-14](#)) to retract the reach mechanism. If the LSM goes offline due to a power failure, the reach mechanism might be extended into a storage cell or drive. If the robot is rotated when this condition exists, the hand will be damaged.**
- **Move the Z column and Z carriage only as shown in [Figure 3-4 on page 3-10](#) and [Figure 3-5 on page 3-11](#).**
- **Do not touch exposed electrical parts when moving any part of the robot.**

## Raising and Lowering the Z Carriage

If you need to raise or lower the hand, *slowly and carefully* move it by placing your hand on the Z carriage as shown in [Figure 3-4](#).

**Figure 3-4. Raising and Lowering the Z Carriage**



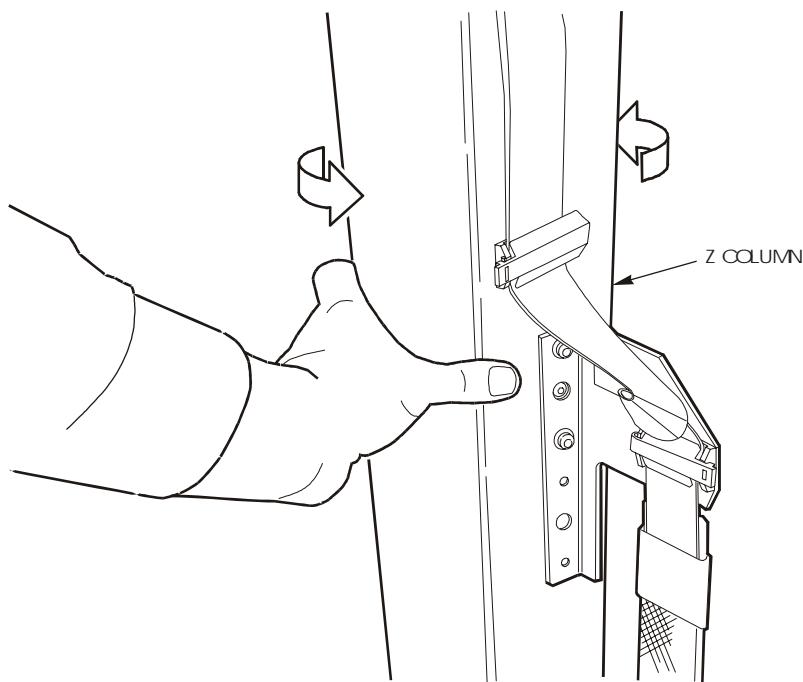
E61018

## Rotating the Z Column

If you need to rotate the Z column, grasp it and *carefully* rotate it, as shown in [Figure 3-5](#).

The Z column rotates 140 degrees. If the column meets resistance and stops before the desired position is reached, it has contacted a stopping mechanism. Do not force it. Rotate the column in the opposite direction.

**Figure 3-5. Rotating the Z Column**



E61019

## Locating the Cartridge in the Storage Cells

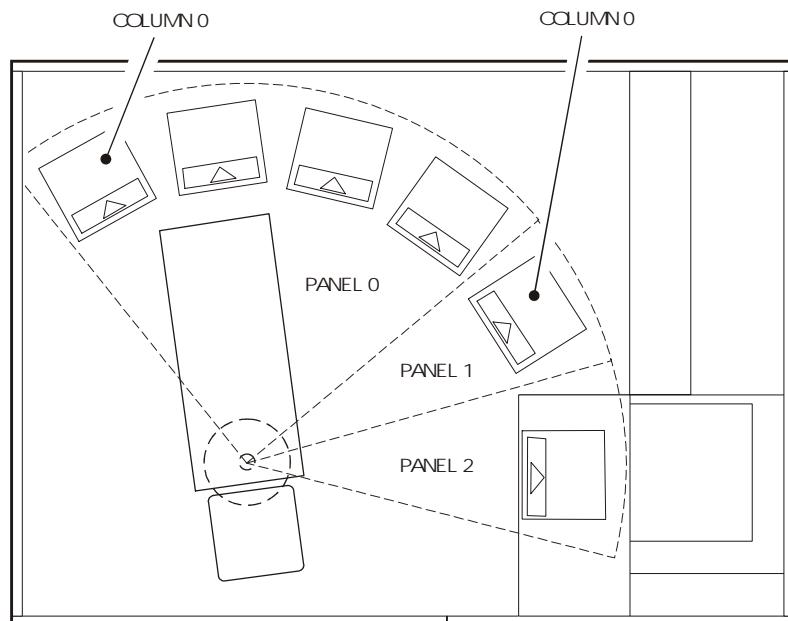
Figure 3-6 and Figure 3-7 on page 3-13 show the locations of the panels, rows, and columns of the cartridge storage cells in a configuration with six drives installed. The decal at the top of each column also provides location information.

**CAUTION:**

**If AUTO CLEAN is enabled, do not place a regular cartridge in the reserved cleaning cartridge cell or the LSM might not be able to complete its initialization routines. If it does not initialize, it cannot be placed online.**

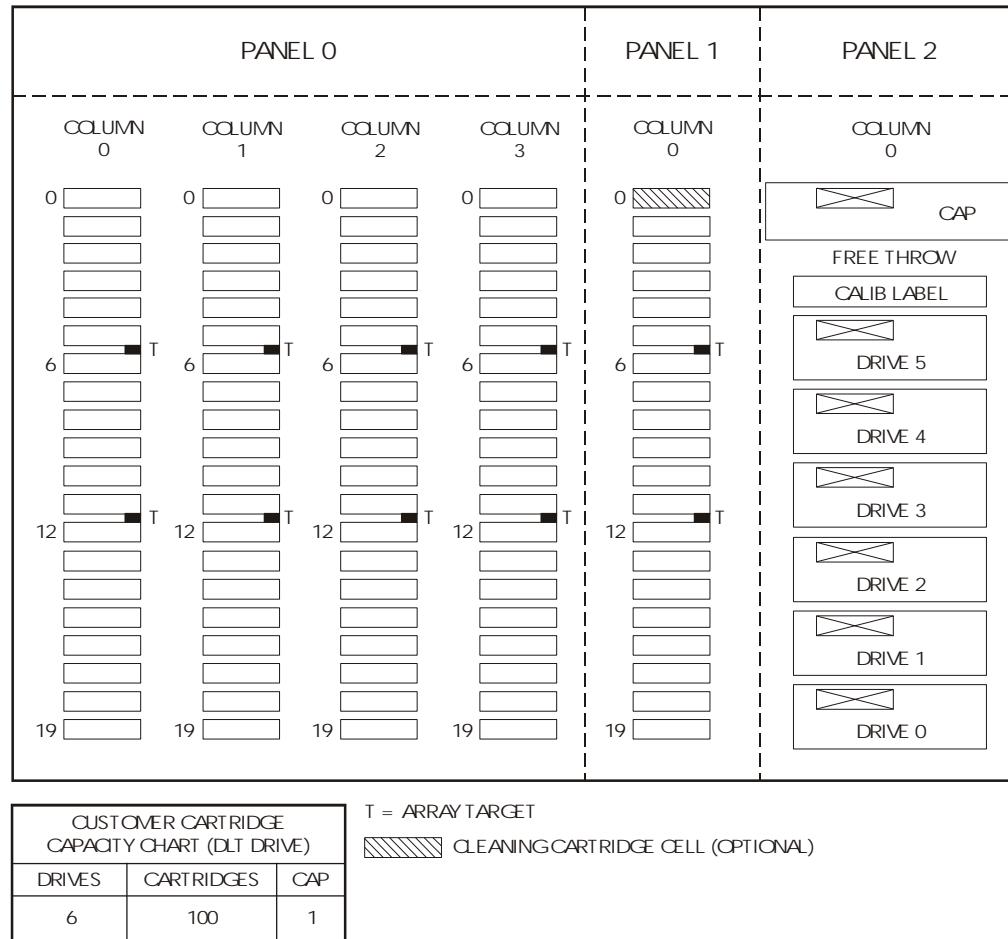
**Note:** You can use the View Config option to determine if your LSM has AUTO CLEAN enabled. Refer to Figure 2-4 on page 2-7 to see how to reach the View Config menu.

**Figure 3-6. Locating Cartridges—Top View**



**9714 - TOP VIEW**

C61020

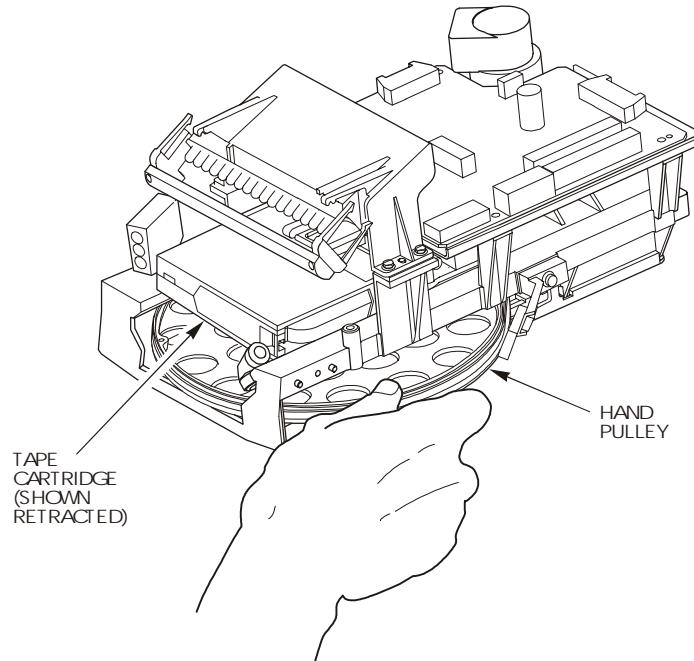
**Figure 3-7. Locating Cartridges—Panels, Columns, Rows**

C61009

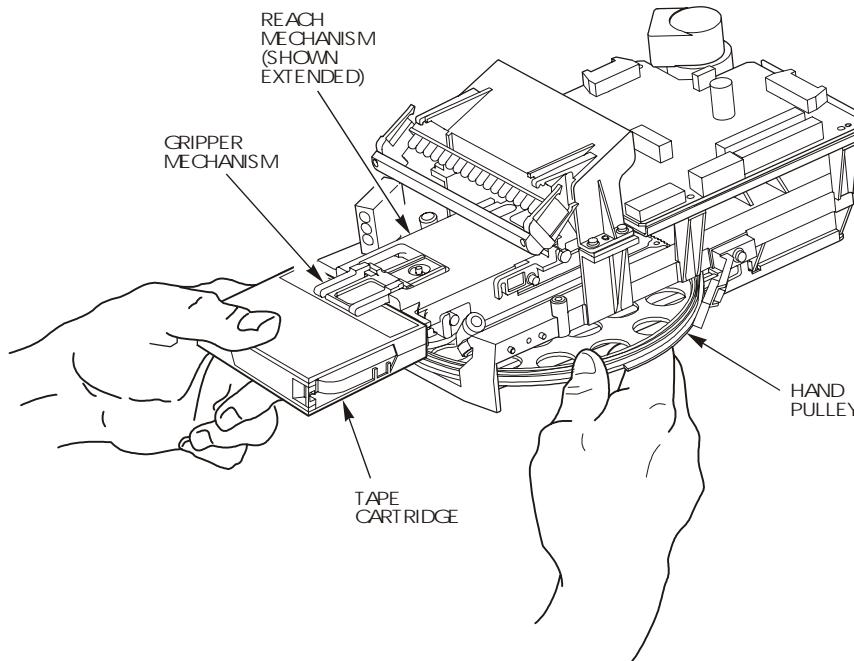
## Removing a Cartridge from the Hand

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

**Figure 3-8. Extending the Gripper**



C61022

**Figure 3-9. Removing a Cartridge from the Hand****CAUTION:**

**Follow the procedures described in “[Moving the Robot](#)” on page 3-9.  
Failing to do so could damage the hand.**

**Make sure that you do not touch the TWH card on the hand assembly.  
The card contains ESD-sensitive components and could be damaged.**

To remove a cartridge from the hand:

1. Rotate the Z column until the hand is located on the left, top side of the LSM (Panel 0 Column 0).
2. Turn the hand pulley (refer to [Figure 3-8 on page 3-14](#)) until the gripper mechanism is extended to its full position (refer to [Figure 3-9](#)).
3. Hold the hand pulley with one hand and grasp the cartridge with the other. Pull gently on the cartridge until it is released from the gripper mechanism, as shown in [Figure 3-9](#).

**CAUTION:**

**Make sure that the gripper mechanism is fully retracted. If it is left extended and you turn the robot, the gripper mechanism will strike a storage cell.**

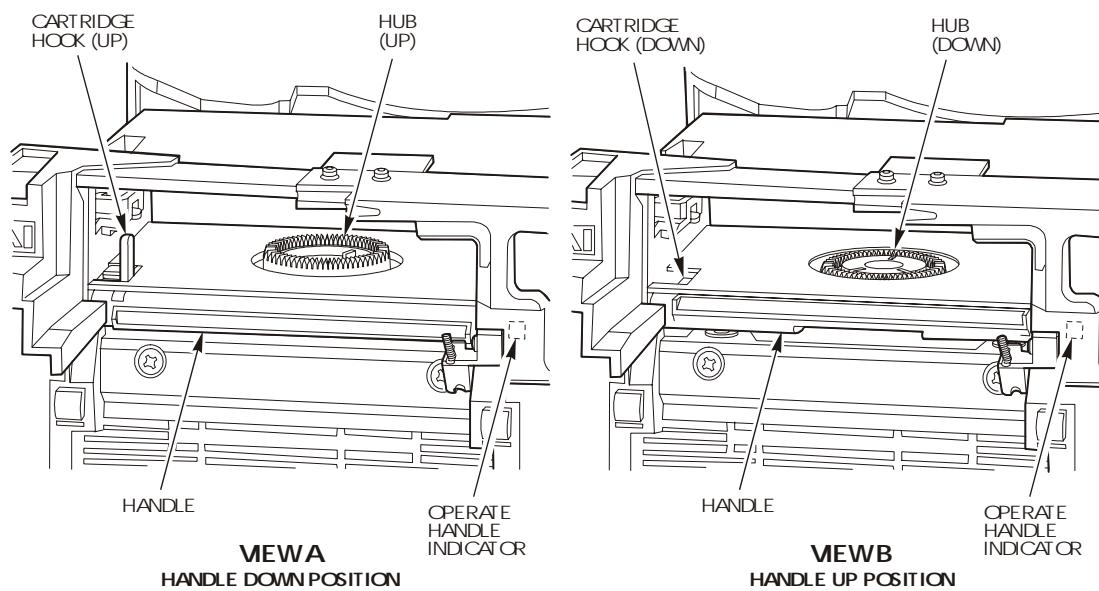
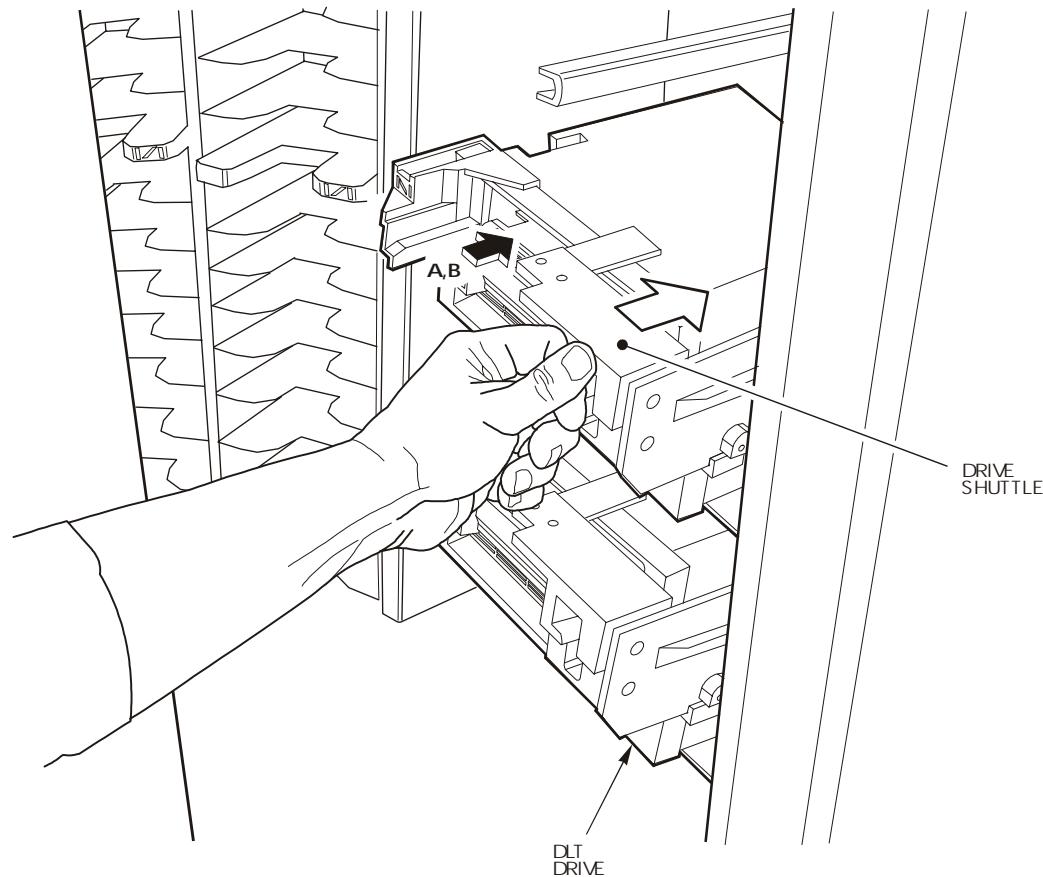
4. Turn the hand pulley until the hand is fully retracted.

## Mounting a Cartridge into the Drive

**CAUTION:**

Before you mount a cartridge into the drive, you must make sure that power is on, and that the Operate Handle indicator is on. On older model drives, use the 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.

**Figure 3-10. DLT Handle Position**

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To mount a cartridge into a drive:

1. Obtain the cartridge VOLSER, location, and drive number from the customer server console.
2. Open the LSM front door by using a latch key to unlock the top and bottom latches. Refer to [Figure 3-3 on page 3-8](#).
3. Locate the cartridge.
4. Make sure that the DLT handle is up, and the cartridge hook and hub are down. [Figure 3-10 on page 3-17](#) shows the handle positions.

**CAUTION:**

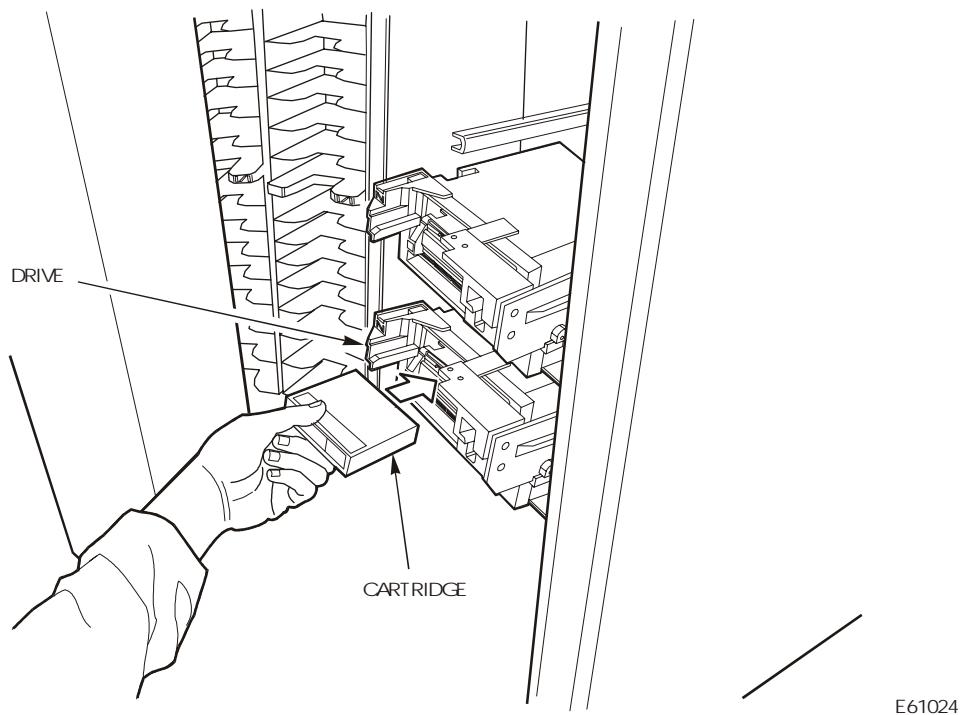
**You must insert the cartridge properly or you will damage the drive. Fully insert and seat the cartridge into the drive. Make sure that the cartridge has a readable VOLSER.**

5. Hold the cartridge so that the VOLSER is facing you, as shown in [Figure 3-11 on page 3-19](#).
6. Insert the cartridge into the shuttle and seat it in the back of the drive.
7. Push the shuttle all the way back, pause for three 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 onto 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.**

**Figure 3-11. Inserting a Cartridge into the Drive**



## Dismounting a Cartridge from a Drive

To dismount a cartridge from a drive:

1. Obtain the drive number from the customer server console and place the drive offline.
2. Open the LSM front door by using a latch key to unlock the top and bottom latches. Refer to [Figure 3-3 on page 3-8](#).
3. Locate the desired drive.
4. Make sure that the job is finished.
5. Make sure that the Operate Handle indicator is on. If it is not, press the Unload button on the drive to unload the drive. The indicator will turn on.
6. Push the shuttle all the way back, pause for three 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.

7. Remove the cartridge from the drive.
8. Properly store the cartridge outside the LSM. (Refer to [Appendix A, “Cartridge Tape Information.”](#))

## Returning the LSM to Online Status

To place the LSM online for automated operations:

1. **Make sure that the drive shuttle Operate Handle indicator is on and the handle is up.**
2. Close and lock the LSM doors. The robot will perform an audit of the cells.

# Obtaining Maintenance Support

4

This chapter describes what to do if problems occur with the LSM. In some cases, you might be able to correct the problem. In other cases, you must contact your service representative, as described in this chapter.

When the problem is caused by cartridge tapes, refer to [Appendix A, “Cartridge Tape Information.”](#) When the problem is caused by drives, refer to your drive operator’s guide.

Most of the time, a fault symptom code (FSC) will appear on the LSM operator panel display. Write down the information on the display and give the information to your customer representative or to the staff at Customer Support. Write down the FSC as soon as it is displayed.

## ■ Customer Support

Customer Support is available 24 hours a day, seven days a week, to customers with StorageTek maintenance contracts and to StorageTek customer service engineers (CSEs).

## ■ Customer Initiated Maintenance

Customer Initiated Maintenance begins with a telephone call from a customer to the StorageTek Customer Support. The customer receives immediate attention from StorageTek personnel to record problem information and send a CSE to correct the problem.

To contact the Customer Support about a problem:

1. Call the StorageTek central dispatcher at 1-800-525-0369.
2. Tell the central dispatcher why you are calling. The central dispatcher asks several questions and sends a CSE. If you have answers to these questions when placing a service call, the process is much smoother and faster:
  - Site location number \_\_\_\_\_
  - Account name \_\_\_\_\_
  - Equipment model number \_\_\_\_\_
  - Contact name \_\_\_\_\_
  - Telephone number \_\_\_\_\_
  - Problem description \_\_\_\_\_
  - Urgency of problem \_\_\_\_\_

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# Cartridge Tape Information

A

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This appendix describes how to prepare and maintain cartridges. It also lists the cartridge specifications.

## ■ Preparing the Cartridges

The following pages describe how to prepare a cartridge for use in the LSM.

### Handling a Cartridge

Improper handling of cartridges can result in a loss of data or damage to a machine component.

To handle a cartridge correctly:

- Keep cartridges *clean*.
- Inspect a cartridge before each use and never put a damaged cartridge into a drive or LSM.
- 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

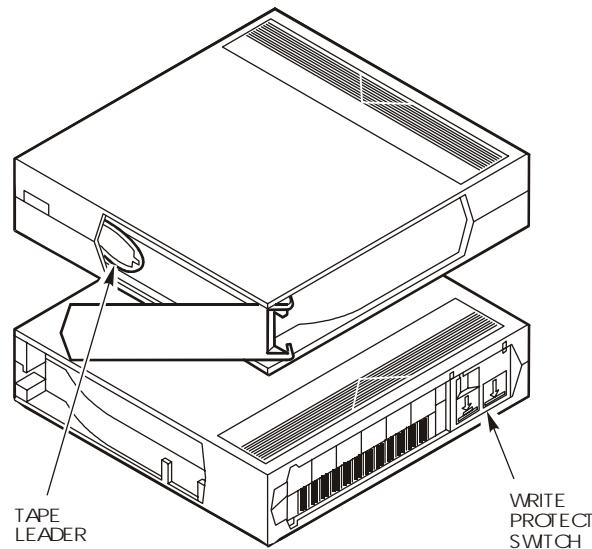
A defective or dirty cartridge can damage a drive. Always inspect a cartridge before inserting it into a drive or entering it into an LSM. See [Figure A-1 on page A-2](#). Look for:

- Cracked or broken cartridge
- Broken leader block
- Broken leader block latch
- Damaged 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 DLT Cartridge**

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C61003

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## ■ Ordering DLT Cartridge Labels

To order DLT cartridge labels, contact Engineered Data Products (EDP) for a reference to a dealer who services your area.

Engineered Data Products, Inc. (EDP)  
2550 West Midway Blvd.  
Broomfield, CO 80020

U.S. Sales Line: 1-800-432-1337  
Fax: 303-465-4936

Engineered Data Products Europe, Ltd.  
43 Redhills Road  
South Woodham Ferrers  
Chelmsford; Essex CM3 5UL

Phone: (44) 1245-322380  
Fax: (44) 1245-323484

[Table A-1](#) lists the EDP DLT cartridge label specifications.

**Table A-1. EDP DLT Cartridge Label Specifications**

Data Cartridge Label	Diagnostic Cartridge Label	Cleaning Cartridge Label
EDP PN 1703-OD	EDP PN 1703-DG	EDP PN 1703-CN
Bar code 3 of 9	Bar code 3 of 9	Bar code 3 of 9
Dimensions: 0.82" x 2.20"	Dimensions: 0.82" x 2.20"	Dimensions: 0.82" x 2.20"
Sold in sets of 200	Sold in sets of 20	Sold in sets of 20
Customer to specify numeric sequence	Customer to specify numeric sequence	Customer to specify numeric sequence

**Note:** Labels are available from a variety of suppliers. When ordering, make sure that the manufacturer's labels comply with *StorageTek DLT Cartridge Label Family Specification*.

## Applying the Cartridge Labels

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.

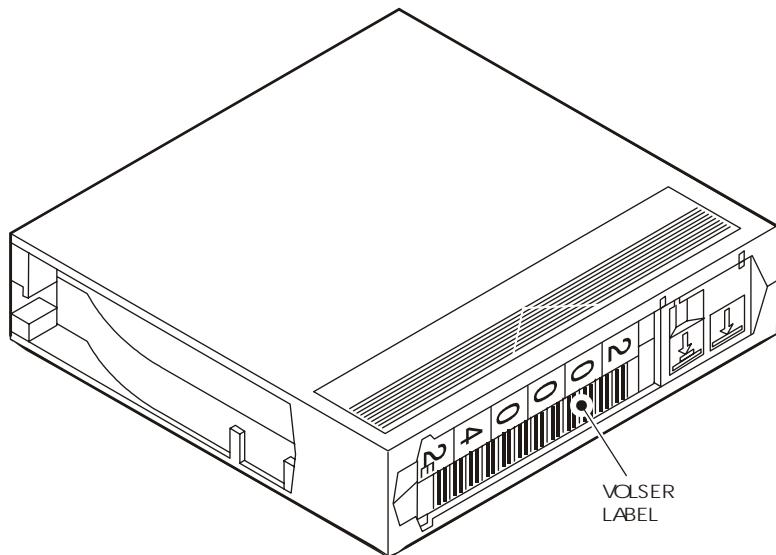
The kinds of cartridge labels you might need to apply are:

- DLTtape III VOLSER
- DLTtape IIIXT VOLSER
- DLTtape IV VOLSER
- Diagnostic cartridge VOLSER
- Cleaning cartridge VOLSER

Referring to [Figure A-2](#), insert the label into the recessed areas provided on each cartridge.

**Figure A-2. Applying the Cartridge Labels**

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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 Cartridge Exterior](#)" on page [A-6](#).
3. Locate the label you require:
  - 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 a "DG" at the beginning of the VOLSER.
  - Cleaning cartridge has a "CLN" at the beginning of the VOLSER.
4. Hold the cartridge so that the write-protect switch is toward you.
5. Slide the label under the slots in the recessed area.

If you do not intend to ever replace this label with a different label, if you wish, you can peel the backing from the label and carefully slide it under the slots, pressing it into place.

**Notes:**

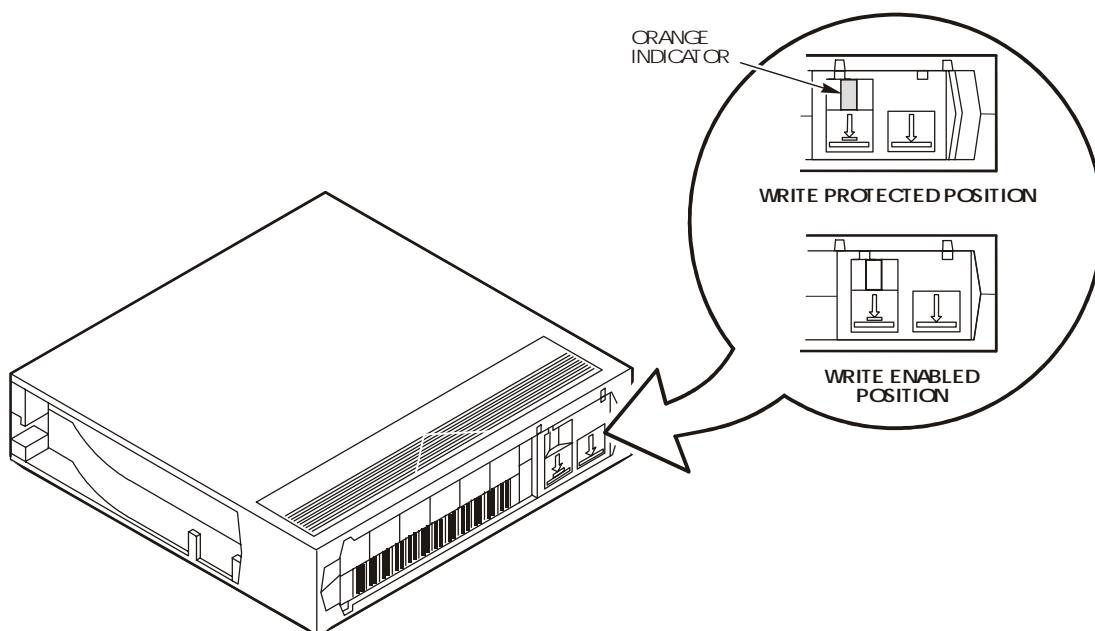
1. Make sure that the labels are not placed elsewhere on the cartridge surface.
2. Make sure that the edges of the labels do not curl up; curling causes the cartridge to stick in the drive loader and the robot to misread the VOLSER.
3. Use labels that do not leave a residue when removed.
4. Make sure that the label contains a VOLSER and media letter.

**Setting the Write-protect Switch**

You can set the write-protect switch so that the cartridge is read only (nothing can be written on the tape). Refer to [Figure A-3](#), and slide the switch to the left so that the orange indicator is visible. In this position, the drive can only read data from the tape and cannot write data.

You can set the write-protect switch so that the cartridge is write enabled. Refer to [Figure A-3](#), and slide the switch to the right so that the orange indicator is not visible. In this position, the drive can write as well as read data. This setting is recommended when entering cartridges into the LSM.

**Figure A-3. Setting the Write-protect Switch**



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## ■ **Maintaining Cartridges**

The following pages describe how to store and clean cartridges, use cleaning cartridges, and repair a detached leader block.

### **Storing the Cartridges**

When you store 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 Cartridge Exterior**

**CAUTION:**

**Do not use certain solvents to remove labels or to clean cartridges because they can damage the cartridges. Do not use 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, part 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.

### **Repairing the Detached Leader Block**

When a tape is damaged, use a backup tape. If a leader block is detached, the cartridge or tape has no obvious damage, 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 to another tape.

## ■ Cartridge Environmental Specifications

[Table A-2](#) refers to the international standard ECMA-209 operating and storage environments for DLT cartridges.

**Table A-2. DLT Cartridge Environmental Specifications**

<i>Operating environment</i>	
Temperature	10–40°C (50–104°F)
Relative humidity	20%-80% noncondensing
Wet bulb temperature	25°C (77°F) maximum

**CAUTION:**

**Tape temperatures above 49°C (120°F) might damage the tapes. If during storage or transportation a cartridge has been exposed to conditions outside the above values, before using the cartridge, keep the cartridge within those operating environment specifications for at least as long as the time period that the cartridge was not within the specifications, up to two hours. Make sure that the cartridge has no moisture on it.**

**When storing DLT cartridges, the stray magnetic field at any point on the tape shall not exceed 4000A/m. Make sure that the cartridge has no moisture on it.**

<i>Cartridge storage environment</i>	
Temperature	16–32°C (61–90°F)
Relative humidity	20%-80% noncondensing
Wet bulb temperature	26°C (79°F) maximum

*Cartridge storage environment for cartridges intended for archiving data for one year or more*

Temperature	18–26°C (64–79°F)
Relative humidity	20%-60%

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# Glossary

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The following terms are used in this guide or apply to this product.

## A

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

**automated mode** A relationship between an LSM and all attached hosts. In automated mode, the LSM moves cartridges among the storage cells, CAP, and drives. 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.

**cartridge access port (CAP)** An assembly that allows an operator to enter or eject a cartridge during automated operations. The CAP is located inside a drawer on the front door of the LSM.

**cartridge tape** Magnetic tape enclosed in a plastic housing.

**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.

**CIM customer initiated maintenance.**

The customer calls Customer Support to report a problem.

**configuration** The description of an LSM, listing the panel types and drives.

**CSE** *See* customer services engineer.

**customer services engineer (CSE)** An employee trained to install, maintain, and repair equipment.

## D

**diagnostic programs** Tests, accessible through the LSM operator panel, that allow a local user to run offline tests within the LSM.

**DLT (digital linear tape) drive** A device that reads from or writes onto a magnetic tape.

## F

**fault symptom code (FSC)** Error or information code generated by functional or diagnostic software that may directly or indirectly be used to indicate the field replaceable unit (FRU) that is probably causing the error.

**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.

**in-transit cartridge** A cartridge left in the robot hand. If the CAP is empty, the hand places the cartridge into the CAP. If it is not empty, the operator must remove the cartridge.

**IPL** *See* initial program load.

## L

**library storage module (LSM)** A unit that contains the storage area for cartridges, the robot that moves the cartridges, and the drives.

**LSM** *See* library storage module.

## M

**manual mode** A relationship between an LSM and all attached hosts. An LSM operating in manual mode has been placed offline to all host CPUs and requires human assistance to perform cartridge operations.

## O

**online** State of being controlled directly by or in direct communication with a computer. Available for functional use.

## P

**PRC card** The central processing unit card for the LSM.

**PRS card** The card that interfaces the LSM control side with a SCSI host; attached to the PRC card. This card supports single-ended and differential operation, up to eight addresses.

**PRW card** The card that interfaces the LSM control side with a SCSI host; attached to the PRC card. This card supports differential operation, up to 16 addresses.

## R

**robot** Electromechanical device for locating and moving cartridges.

## S

**SCSI** *See* Small Computer Systems Interface.

**Small Computer Systems Interface (SCSI)** A data interface between the drives and host.

## V

**VOLSER** *See* volume serial label.

**volume serial label (VOLSER)** An alphanumeric label used by host software to identify a volume. It is attached to the spine of a cartridge and can be read by people and the camera.

**volume** Magnetic cartridge.

## Z

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

**Z carriage** The assembly that moves the hand vertically up and down the Z column to storage cells, drives, and the CAP.

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# Reader's Comment Form

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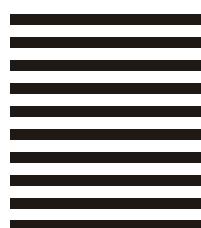
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