



# DLT 50/100 GB 5-Cartridge Mini-Library (SWXTL-BL)

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## User's Guide

EK-SM1TC-UG. C01

**Digital Equipment Corporation**  
**Maynard, Massachusetts**

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# *Revision Record*

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*This Revision Record provides a concise publication history of this guide. It lists the manual revision levels, release dates, and reasons for the revisions. It also describes how the changes to affected pages are marked in the guide.*

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The following revision history lists all revisions of this publication and their effective dates. The publication part number is included in the *Revision Level* column, with the last entry denoting the latest revision. This publication supports the StorageWorks 5-Cartridge DLT Mini-Library (SWXTL-BL).

<b>Revision Level</b>	<b>Date</b>	<b>Summary of Changes</b>
EK-SM1TC-UG. A01	April 1994	Original release
EK-SM1TC-UG. B01	September 1994	Added Appendix C containing information about using the tape loader under SunOS and Solaris operating systems.
EK-SM1TC-UG. C01	August 1996	Updated Appendix C-Product Notes for Sun™.





# *About This Guide*

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*This section identifies the users of this guide and describes the contents and structure. In addition, it includes a list of conventions used in this guide.*

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## **StorageWorks 5-Cartridge DLT Mini-Library User's Guide**

This guide provides product overview, installation, operation, and maintenance information for the 5-Cartridge DLT Tape Drive Mini-Library.

### **Intended Audience**

This guide is intended for people who will install, operate, and maintain the tape drive mini-library.

### **Document Structure**

This guide contains the following chapters:

#### **Chapter 1: Introduction**

Introduction gives an overview of the 5-Cartridge DLT Mini-Library, describes its components, and discusses the drive features.

#### **Chapter 2: Installing and Operating the Mini-Library**

This chapter describes unpacking, cable connections, configuring and installing the mini-library, setting the SCSI ID address, and the mini-library POST test. It also describes all of the functions of the mini-library operator control panel and the tape cartridge cassette.

#### **Chapter 3: Code Update (From Tape)**

Chapter 3 describes the code-update procedure for updating the code of the drive controller module in the mini-library.

#### **Chapter 4: Troubleshooting**

Troubleshooting provides a troubleshooting table to help diagnose common problems with the mini-library.

#### **Appendix A: Specifications**

Appendix A lists the technical specifications for the SWXTL-BL Mini-Library and the SWXTL-BA Tape Drive, and defines the SCSI command signal set.

### **Appendix B: Product Notes for Novell™ and MS-DOS™**

Appendix B provides information that should be read by the system administrator before installing the mini-library when it will be used with a host operating under the Novell, MS-DOS, or MS-DOS/WINDOWS operating systems.

### **Appendix C: Product Notes for SunOS™ and Solaris™**

Appendix B provides information that should be read by the system administrator before installing the mini-library when it will be used with a host operating under the SunOS and Solaris operating systems.

## **Conventions**

This guide uses the following conventions:

### **Documentation Conventions**

<b>Style</b>	<b>Meaning</b>
<b>boldface type</b>	<b>For emphasis</b>
<i>italic type</i>	<i>For emphasis and manual titles</i>

## Introduction

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*This chapter introduces and describes the product features of the 5-Cartridge DLT Mini-Library SWXTL-BL.*

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### 1.1 Product Overview

The 5-Cartridge DLT Mini-Library (SWXTL-BL) (Figure 1-1) is a high performance, streaming cartridge tape product designed for use on mid-range, and high-end computing systems. As a mini-library that performs automatic tape operations, the Mini-Library contains a ½-inch high-capacity DLT tape drive and a five-cartridge, SCSI-2 medium changer device (loader). With a typical load /unload cycle time of 20 seconds, the Mini-Library can provide unattended back-up of 100 GB (compressed) in about 11 hours.

The ½-inch tape drive uses data compression and compaction. The drive features a formatted capacity of 10 GB per cartridge (20 GB compressed) and a sustained user data transfer rate of 2.5 Mbytes/second (assumes a 2:1 data compression factor). The drive has a dual-channel read/write head and Lempel-Ziv (DLZ) high-efficiency data compression. The drive tape mark directory maximizes data throughput and minimizes data access time. The Mini-Library is housed in a tabletop enclosure and includes single-ended or differential driver/receivers.

#### 1.1.1 Fast Data Transfer Rate

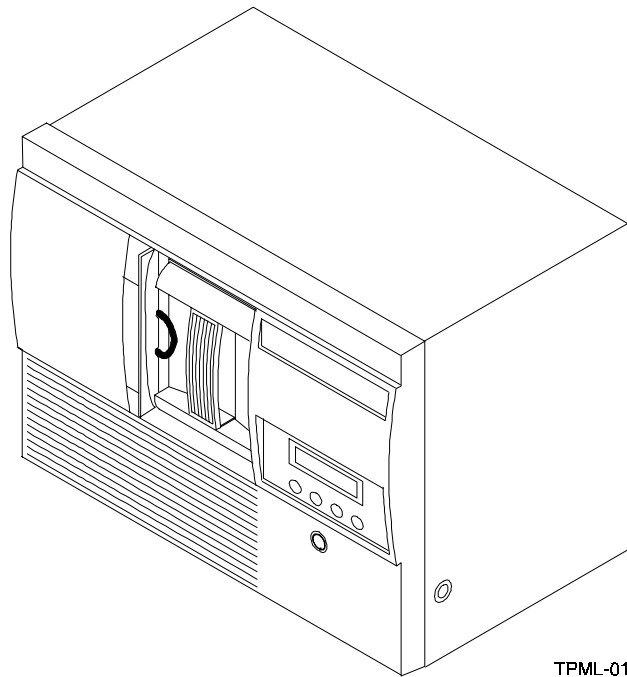
Used for unattended backups or archiving, the Mini-Library allows you to back-up a high data capacity at a high speed. When the Mini-Library operates in a non-compressed mode, the drive has a maximum transfer rate of 1.25 Mbytes/second. When operating in the compressed mode, the maximum transfer rate is 2.5 Mbytes/second write and 3 Mbytes/second read.

#### 1.1.2 High Capacity

The amount of data you can store on a tape cartridge can be 10 GB native capacity (uncompressed), or if you select the compression mode, 20 GB compressed. Built-in data compression increases the cartridge capacity and transfer rate 2 to 2.5 times.

The removable magazine in the Mini-Library has the capacity for five cartridges, providing a total capacity of 100 Mbytes *compressed*, or 50 Mbytes *uncompressed*. You can select compression on the mini-library front panel or through the host by using the SCSI MODE SELECT command.

**Figure 1–1 5-Cartridge DLT Mini-Library (SWXTL-BL)**



### **1.1.3 Compaction**

The compaction feature of the Mini-Library tape drive helps you store data efficiently. A read/write data cache of 2.0 Mbytes allows working space for the compaction, enabling maximum use of available tape space.

### **1.1.4 Media Durability**

The tape cartridge media, which provides superior media durability and data reliability, can endure 500,000 passes and has a shelf life of 20 years.

### **1.1.5 Compatibility**

Digital Equipment Corp. is committed to maintaining compatibility within the DLT family of tape products. The SWXTL-BL, the second generation of the mini-library family, offers users a smaller form factor and low cost alternative to the first generation mini-library. The SWXTL-BL features an LCD display that shows the operation of the mini-library with abbreviated messages.

The Mini-Library drive's default density is 10 GBytes (TZ87 format) compressed. The tape drive can write 2.6 (TK85 format), 6.0 (TK86 format), and 10 GBytes (TZ87) tape formats for 100% interchange compatibility with earlier TZ8x drives. On a write from BOT, the mini-library reformats the cartridge if a different density is selected.

Older data cartridges can be loaded for read or read/write purposes into the Mini-Library. Any cartridges recorded in 2.6, 6.0, 10, or 20 Gbyte (assumes 2:1 data compression) can be read and written by the tape drive. Refer to Table 1-1 to determine cartridge compatibility with the Mini-Library.

**Table 1-1 Read/Write Cartridge Compatibility with the Mini-Library (SWXTL-BL)**

<b>Cartridge Type/Format (Capacity)</b>	<b>Read/Write Ability in the SWXTL-BL</b>
CompactTape/TK50 (95 MBF)	Read only
CompactTape III/TK70 (296 MBF)	Read only
CompactTape III/TK85 (2.6 GBF)	Read/write in 2.6 GB mode <sup>1,2</sup>
CompactTape III/TK86 (6.0 GBF)	Read/write in 6.0 GB mode <sup>1,2</sup>
CompactTape III/TK87 (10 GBF or 20 GBF (assumes 2:1 compression))	Read/write in 10 GB mode or 10C (compressed) GB mode <sup>1,2</sup> .
CompactTape III/blank	Read/write in 2.6 <sup>1</sup> , 6.0 <sup>1</sup> , 10, or 10C (20.0 GBF, assumes 2:1 data compression) GB mode, as selected

<sup>1</sup> Read/write, backward compatible with drive of selected density.

<sup>2</sup> Recording format can be changed to 2.6, 6.0, 10, or 10C (compressed) GB mode on a write from BOT (beginning of tape).

The Mini-Library complies with the ANSI standard for SCSI-2. The tape media format follows applicable ECMA approved and ANSI proposed standards.

### 1.1.6 Code Update Capability

The mini-library drive includes Flash EEPROM technology that allows easy on-site installation of code updates from tape or over the SCSI bus.

### 1.1.7 Embedded Diagnostics

The mini-library has embedded power-on self-test (POST) and diagnostics that run automatically when you turn on the power.



## Installing and Operating the Mini-Library

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*This chapter describes the unpacking, installation, general configuration rules, POST test, and operation for the Mini-Library. It also describes the tape cartridge and magazine, and when to insert a cleaning tape cartridge.*

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### 2.1 Unpacking the Mini-Library

Before unpacking the mini-library, check the packing slip to ensure that the correct equipment has been shipped. Inspect the shipping carton for damage (crushed corners, punctures, etc.). The carton and packing material should be retained at the installation site for reshipment.

Unpack the mini-library and inventory the contents of the shipment. It should contain the following components:

**Table 2–1 Mini-Library Components**

Item	Digital Part Number	Quantity
5-cartridge mini-library	SWXTL-BL	1
Single tape cartridge unit	TK85K-01	5
Head cleaning cartridge	TK85-HC	1
SCSI terminator connector	12-30552-01	1
User's guide	EK-SM1TC-UG	1

Also, confirm that you have received, either as a separate shipment or as part of the same order (depending on your reseller), an appropriate SCSI-bus interface cable. Table 2-2 lists the SCSI cables corresponding to the type of SCSI interface controller mounted in your computer system.

**Table 2–2 Mini-Library SCSI Interface Cables**

Application	Drive-end Connector	Host-end Connector	Digital SCSI Cable Part Number
Low-Density to-Low-Density Cable <sup>1</sup>	Low-Density (50-pin)	Low-Density (50-pin)	BC19J-1E (18 inches) BC19J-06 (6.0 feet)
Low-Density to-High-Density Cable <sup>2</sup>	Low-Density (50-pin)	High-Density (50-pin)	BC09D-03 (3.0 feet) BC09D-06 (6.0 feet)

<sup>1</sup> The 50-pin low-to low-density cable is compatible with most ISA-type SCSI-bus adapters.

<sup>2</sup> The 50-pin high-density is compatible with either of:

- a. Most EISA-bus SCSI adapters.
- b. Daisy-chain connection to DEC BA350 (Pedestal) or DEC BA353 (Desktop) SCSI storage expansion cabinets.

**NOTE**

If you are connecting the mini-library to a fast, single-ended SCSI bus, the interface cable cannot exceed three meters (9.8 feet). If you are connecting the mini-library to a slow, single-ended SCSI bus, the interface cable can be up to six meters (19.7 feet) in length. Table 2-2 provides the part-number identifications for ordering the appropriate cables.

## 2.2 Power and SCSI Bus Terminator Connections

**NOTE**

The purpose of the shipping screw is to secure the mini-library elevator mechanism during shipment. Ensure the power switch is set to **off** whenever loosening or tightening the shipping screw. Also, always remove the tape cartridges from the magazine before shipping the mini-library.

After unpacking the mini-library, be sure to:

1. Loosen the shipping screw (Figure 2-1) by turning it counter clockwise before turning on the power.
2. Ensure the power switch on the rear panel of the Mini-Library is set to off (Figure 2-2).
3. Connect the power cord to the rear panel of the Mini-Library (Figure 2-2). Connect the other end of the cord to a nearby ac outlet.



Figure 2–1 Shipping Screw under the Mini-Library

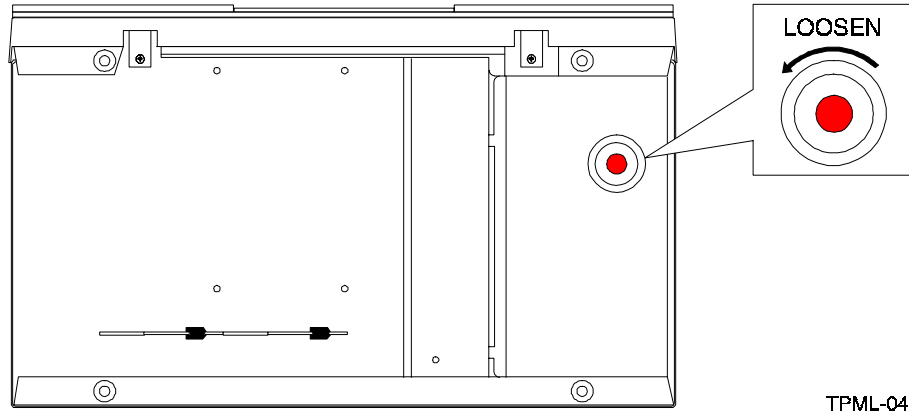
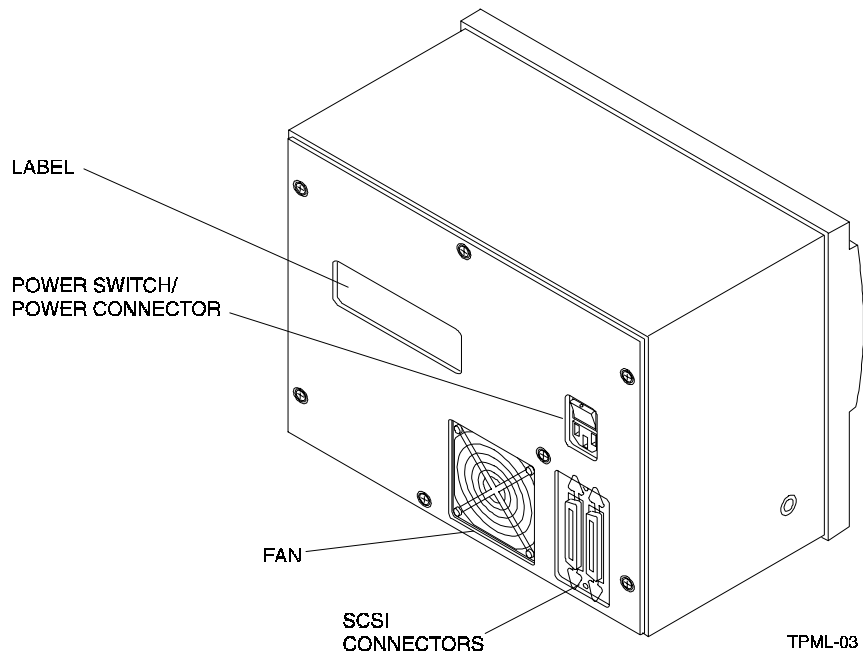
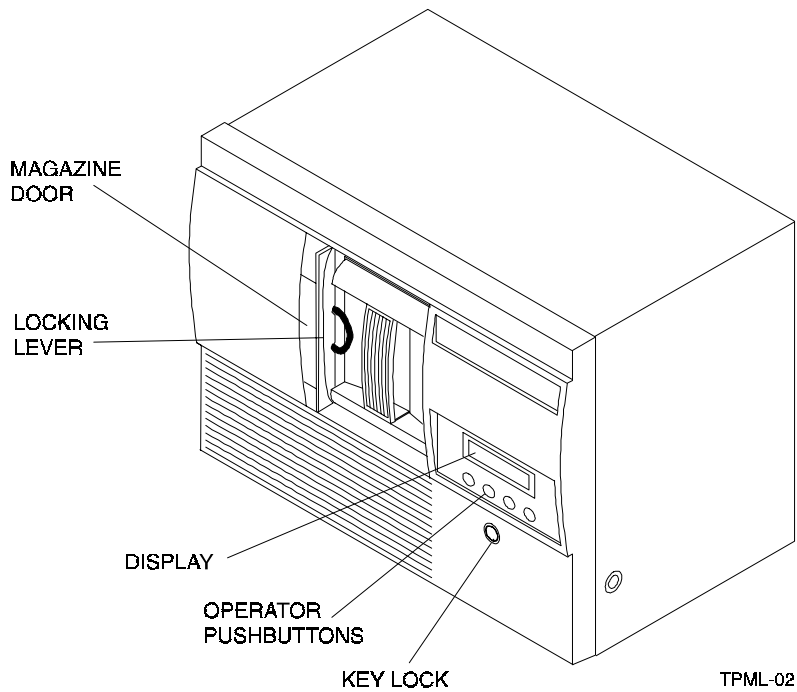


Figure 2–2 Mini-Library Rear Panel



**Figure 2-3 Mini-Library Front Panel**



**NOTE**

The mini-library uses an auto-ranging power supply and will accept a voltage range of 100 to 240 Vac and a frequency range from 50 to 60 Hz.

5. Terminate the SCSI bus as described in Table 2-3 below.

**NOTE**

The SCSI bus must be terminated at both ends of the bus, and at least one device must supply terminator power.

**Table 2-3 Adding a SCSI Bus Terminator**

mini-library is . . .	. . .
The last or only device on the bus and you are going to terminate the cables externally	<ol style="list-style-type: none"> <li>1. Connect the SCSI terminator to the right SCSI connector on the mini-library rear panel (Figure 2-2)</li> <li>2. Snap the wire cable clamps into place to secure the terminator.</li> </ol>
Not the last or only device on the SCSI bus	Ensure to install the terminator at the end of the SCSI bus.

6. Power on the mini-library by setting the power switch on the rear panel to on (1) (Figure 2-2) and observe the **LDR RDY** (loader ready) message in the mini-library display (Figure 2-3).
7. Unlock (enable) the operator control panel by turning the key in the keylock towards the unlock icon on the mini-library (Figure 2-3).
8. To open the magazine door, press the **Open** push-button on the front panel (Figure 2-4).

**CAUTION**

Never force or try to open the magazine door manually.  
Always use the **OPEN** push-button on the operator control panel which opens it electronically.

9. Turn the locking lever counter clockwise at the front of the mini-library (Figure 2-3) to rotate the magazine locking mechanism. This allows you to remove the magazine from the mini-library.

### 2.3 Introduction to the Mini-Library

The mini-library includes a SWXTL tape drive, a media loader, and a five-cartridge removable magazine. The same SCSI target controller controls the tape drive and the media loader. If the controller detects the loader's presence when the system is turned on, the loader is presented as a SCSI-2 medium changer device on LUN (Logical Unit) 1. If you issue the SCSI-2 medium changer commands to the Mini-Library:

- *Random access is enabled to the media stored in the magazine slots*
- *Sequential access is disabled to the media supported automatically in the auto-loading mode*

If you do not issue the SCSI-2 medium changer commands, the default mode of operation is sequential access to the media supported in the auto-loading mode. Auto loading is implemented as a side effect of the SCSI UNLOAD command (Table 2-4).

**Table 2-4 SCSI-2 Command Conditions**

	...
An UNLOAD is specified.	After winding the tape back into the cartridge and moving the cartridge from the drive to the magazine slot from which it came, the cartridge in the next slot is moved from the magazine into the drive and made ready.
The next slot is empty, or the cartridge unloaded was for the last slot in the magazine.	No cartridge is loaded into the drive.

## 2.4 Configuring and Installing the Mini-Library

This section describes the configuration rules and SCSI cable connections for the Mini-Library.

**NOTE**

Unless otherwise specified, the mini-library is set to SCSI ID 0 at the library.

### 2.4.1 Configuration Guidelines

Your system uses the SCSI ID to identify, or address, the mini-library. Follow these guidelines when configuring (Table 2-5) the mini-library for use on your system.

**Table 2-5 Configuration Guidelines**

If you are installing the mini-library as . . .	Then . . .
The only SCSI device on the bus or one of multiple SCSI devices on the bus.	Be sure to use a SCSI ID that is unique from any other device or system ID on the SCSI bus.
The last or only device on the SCSI bus.	You must terminate the bus by installing a terminator.

### 2.4.2 SCSI Cable Connection

Make the SCSI cable connection between the Mini-Library and the host system as follows:

1. Ensure the power switch on the Mini-Library is turned off.
2. Connect one end of the SCSI cable to the left most connector on the rear panel of the Mini-Library (see Figure 2-2) and snap the wire cable clamps into place to secure the cable.
3. Connect the other end of the SCSI cable to the SCSI connector on the host system, or for daisy-chained configurations, another SCSI device.
4. If the Mini-Library is the last SCSI device on the bus, ensure a SCSI bus terminator is connected to the other SCSI connector on the rear panel of the Mini-Library.

## 2.5 Power On Self Test

The Power On Self Test (POST) runs automatically when the Mini-Library is turned on. The POST checks the integrity of the installation to ensure it is wired and functioning properly. Perform the POST as follows:

1. Set the power switch on the rear panel of the Mini-Library to on (1).
2. Observe the sequence of events on the front panel display of the Mini-Library. They should be as defined in Table 2-6.
3. If any of the display messages in the sequence of events did not occur, refer to Table 2-7 for a POST analysis.

**Table 2–6 POST Display Messages**

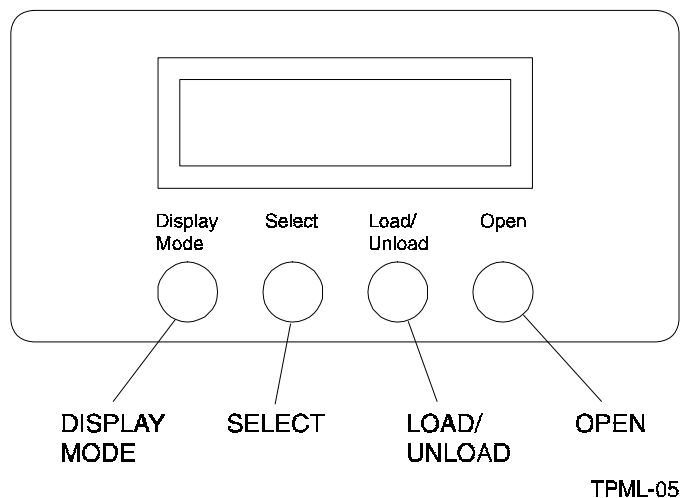
Event	Display Message
1	<b>LDR RST</b> (loader reset)
2	<b>LDR ACT</b> (loader active)
3	Series of numbers displayed while mini-library elevator goes up and down (audible).
4	<b>LDR RDY</b> (loader ready)

**Table 2–7 POST Test Analysis**

	...
All events in the Table occurred.	POST succeeded. The mini-library is ready for operation.
All events in the Table did not occur.	POST failed. You should see the display message LDR RST (loader reset). Verify the following: <ol style="list-style-type: none"> <li>1. SCSI bus is terminated properly.</li> <li>2. Set the mini-library power switch to off and then back on. If the POST test fails again, call your service representative.</li> </ol>

## 2.6 Mini-Library Operator Control Panel

The operator control panel contains four push-button switches as shown in Figure 2-4. Table 2-8 identifies the switches and defines their functions.

**Figure 2-4. Mini-Library Operator Control**

**Table 2–8 Operator Control Panel Functions**

Push-button	Function
Display Mode	Puts the mini-library in the <b>Normal</b> , <b>Density Select</b> , or <b>SCSI ID Select</b> mode.
Select	<ul style="list-style-type: none"> <li>• Selects SCSI ID and density.</li> <li>• Moves, in increments, the current slot number on the display to the next slot number.</li> </ul>
Load/Unload	<ul style="list-style-type: none"> <li>• Loads the cartridge currently selected into the tape drive.</li> <li>• Unloads the cartridge currently in the drive.</li> <li>• Resets the mini-library if a loader error has occurred. When the <b>ERR LDR</b> message displays, press the Load/Unload button to reset the mini-library</li> </ul>
Open	<ul style="list-style-type: none"> <li>• Opens the magazine door allowing access to the magazine for loading and unloading cartridges.</li> </ul>

Table 2-9 lists and describes the possible display messages which may be seen on the operator control panel during normal operation.

**Table 2–9 Operator Control Panel Display Messages**

Display Message	Description
WP	The cartridge in the drive is write-protected by one of the following: <ul style="list-style-type: none"> <li>• The write-protect switch on the cartridge is set to the write protect position</li> <li>• Host software write-protect qualifiers</li> </ul>
DRIVE ACT	Tape is reading or writing.
DRIVE RDY	A cartridge is in the drive and the tape is not moving.
DRIVE REW	Tape is rewinding.
HC	The read/write head needs cleaning.
LDR RDY	Power is on and no cartridge is in drive.
LDR ACT	Loader is moving a cartridge.
ERR MAG	The status of cartridges reported by the loader and drive is inconsistent.
ERR LDR	A loader transfer assembly error has occurred.
ERR DRV	A drive error has occurred.
ERR CTL	A controller error has occurred.
ERR UNK	An error of unknown origin has occurred.
SLOT 0 SLOT 1 SLOT 2 SLOT 3 SLOT 4	The current slot containing the cartridge. Each current slot number flashes on the display when its corresponding cartridge moves to or from the drive. Also used with the <b>ERR MAG</b> or <b>ERR LDR</b> message to show error type.
DNS SEL	The mini-library is in the Density Select mode.

**Table 2–9 Operator Control Panel Display Messages (continued)**

OVR	drive activity is as follows: <ul style="list-style-type: none"> <li>• <i>On</i> continuously indicates “density” on front panel</li> <li>• <i>Off</i> (default) indicates “density” selected automatically</li> <li>• <i>Flashing</i> indicates mini-library is in “density selection” mode</li> </ul>
2.6	drive activity is as follows: <ul style="list-style-type: none"> <li>• <i>On</i> continuously indicates tape is recorded in 2.6 format</li> <li>• <i>Flashing</i> indicates the tape is recorded in another density. You have selected this density for a write from BOT</li> </ul>
6	drive activity is as follows: <ul style="list-style-type: none"> <li>• <i>On</i> continuously indicates tape is recorded in 6 GB format</li> <li>• <i>Flashing</i> indicates the tape is recorded in another density. You have selected this density for a write from BOT</li> </ul>
10	drive activity is as follows: <ul style="list-style-type: none"> <li>• <i>On</i> continuously indicates tape is recorded in 10 GB format</li> <li>• <i>Flashing</i> indicates the tape is recorded in another density. You have selected this density for a write from BOT</li> </ul>
10C	drive activity is as follows: <ul style="list-style-type: none"> <li>• <i>On</i> indicates Compression mode enabled (10 GB density only)</li> <li>• <i>Off</i> indicates Compression mode disabled</li> </ul>

## 2.7 Key Lock

The key lock on the front panel of the Mini-Library (Figure 2-3) enables the operator control panel. The key lock prevents unauthorized removal of the magazine or cartridges, providing a measure of data security. To *unlock* (or enable) the operator control panel, insert and turn the key toward the opened lock icon next to the key lock (Figure 2-3). To *lock* (or disable) the operator control panel, insert and turn the key to the locked icon next to the key lock.

### CAUTION

Never force or try to open the magazine door manually. Always use the **OPEN** push-button on the operator control panel which opens it electronically.

## 2.8 Operator Control Panel Locked (Disabled)

When the tape magazine is inserted into the Mini-Library and the door is closed, the elevator scans the magazine. The first cartridge in the magazine automatically loads into the drive. When you are copying data to the tape, mini-library operations stop if one of the following conditions occurs:

- The storage capacity of the last tape cartridge is exceeded
- No tape cartridge is in the next sequential slot in the magazine
- The operator control panel pushbuttons are disabled

## 2.9 Operator Control Panel Unlocked (Enabled)

When the operator control panel push-buttons are unlocked or enabled, it allows the operator intervene. This enables the Mini-Library to load or unload cartridges as needed during backup procedures. When you are copying data to the tape, operations stop if one of the following conditions occurs:

- The storage capacity of the last tape cartridge is exceeded
- No tape cartridge is in the next sequential slot in the magazine

## 2.10 Setting the SCSI ID of the Mini-Library

To set the SCSI ID of the mini-library, you must first choose an unused SCSI ID between 0 and 7. Then set the SCSI ID from the operator control panel as follows:

1. Press and hold the **Display Mode** push-button (about five seconds) until the **SCSI ID SEL** message is displayed including the factory set SCSI ID.

Example:

SCSI ID SEL SCSI ID 0
--------------------------

2. Press the Select push-button with quick presses until you see the ID number you want in the display (Figure 2-4).
3. Press the **Display Mode** push-button again. When the display message **LDR RDY** appears, the mini-library drive cannot recognize the SCSI ID yet.
4. Issue a “bus reset” or turn the mini-library power off and on again for the drive to recognize the new SCSI ID.



## 2.11 Select Density

This section describes the mini-library's density select feature. You can select density by using any of the following steps:

**NOTE**

You can do a front panel density selection at any time, but the selection takes effect only on the next write from BOT.

1. On a Write from BOT, the tape density is selected by one of the following:
  - Front panel **Density Select** mode
  - Programmable host selection via your operating system
  - Native default density 10 GB and compress (assuming you did not use the **Select Mode** or the host selection)
2. On all read operations and all write append operations, the recorded density is the density to be used.

**CAUTION**

Executing any "Write from BOT" operations destroys existing data on tape.

### 2.11.1 Front Panel Density Select Mode

To select density via the front panel:

1. If a tape is loaded in the drive, the display shows the tape's pre-recorded density.
2. You can use the Mini-Library operator control panel at various times, not just after loading a tape. Density selection is inactive until the write from BOT command is issued. The controller remembers the density selection state until you do one of the following:
  - Change the density selection
  - Press the **Open** push-button to open the door
3. Enter the **Density Select** mode by pressing the **Display Mode** push-button and then the **Select** push-button on the operator control panel. Using the **Density Select** mode always overrides a host selection.

Example:

If you have loaded a tape with a pre-recorded density of 2.6 and you use the **Density Select** mode to select a density of 10:

Before a “Write from BOT” occurs, you should see the 2.6 continuously displayed, and the **10** and **OVR** flashing in the display, as shown:

<b>LDR RDY</b>		
2.6	10	OVR

After a “Write from BOT” occurs, you should see the selected density of **10** and the **OVR** should be continuously displayed as shown below

<b>LDR RDY</b>		
	10	OVR

Table 2-10 shows the results.

**Table 2–10 Results of not Using or Using Density Select Mode**

<b>Density Select</b> mode used	The display shows the actual density when the tape is reading and writing.
<b>Density Select</b> mode <b>not</b> used and the actual tape density is the same as the density you selected.	The display shows the actual density and <b>OVR</b> on continuously.
<b>Density Select</b> mode used and the actual tape density differs from the density you selected.	<p>On operation before “Write from BOT”, the display shows:</p> <ul style="list-style-type: none"> <li>• Actual tape density on continuously</li> <li>• Selected density flashing</li> <li>• <b>OVR</b> flashing</li> </ul> <p>On operation after “Write from BOT”, the display shows:</p> <ul style="list-style-type: none"> <li>• Selected density on continuously</li> <li>• <b>OVR</b> on continuously</li> </ul>

### 2.11.2 Programmable Host Selection via Your Operating System

To select density via the SCSI bus:

1. Do a SCSI MODE SELECT with the density you want. For more details, see the *DLT2000 Series Magnetic Tape Product Manual, (EK-TH4XX-IM)*.
2. Write data to the tape from BOT.

### 2.11.3 Native Default Density 10 GB and Compress

If you did not use the front panel **Density Select** mode or **Programmable Host** selection, the selection becomes the **native default density of 10 GB and Compress**.

## 2.12 Default Operating Modes

The Mini-Library operates in four modes: **Normal**, **Density Select**, **SCSI ID Select**, and **Code Select**.

### 2.12.1 Normal Mode

The **Normal** mode is used by default after you turn on or reset the mini-library. The information displayed during this mode depends on the state of the mini-library as follows:

**Table 2–11 Normal Mode Definitions**

display says . . .	means the . . .
LDR ACT	Loader is active
LDR RDY	Loader is inactive and no cartridge is in drive.
DRV RDY	Drive is ready
DRV ACT	Drive is active
DRV REW	Tape is rewinding
HC	Use cleaning tape
WP	Drive is in write-protect status

The push-button switch functions while in the **Normal** mode operates as follows:

- When you press and release the **Display Mode** push-button, the Mini-Library enters the **Density Select** mode of operation
- When you press and hold the **Display Mode** push-button for about 5 seconds, the Mini-Library enters the **SCSI ID Select** mode of operation

### 2.12.2 Density Select Mode

The **Density Select** mode allows you to select the drive density. The information displayed during this mode depends on the state of the mini-library as follows:

**Table 2–12 Density Select Definitions**

display says . . .	means the . . .
DNS SEL	Mini-Library is in the <b>Density Select</b> mode.
OVR	Front panel selection overrides host selection
DRV RDY	Drive is ready
DRV ACT	Drive is active
DRV REW	Tape is rewinding
HC	Use cleaning tape
WP	Drive is in write-protect status

When you press and release the **Display Mode** push-button switch once in the **Density Select** mode, the mini-library enters the **Normal** mode of operation.

### 2.12.3 SCSI ID Select Mode

The **SCSI ID Select** mode allows you to select the SCSI ID for the tape drive and to enter the **Code Update** mode of operation. If you cycle the power again or reset the Mini-Library, the SCSI ID you chose reappears after being stored. The information displayed during this mode depends on the state of the mini-library as follows:

**Table 2–13 SCSI ID Select Mode**

display says . . .	ans the . . .
SCSI ID SEL	Mini-library is in the <b>SCSI ID Select</b> mode.
SCSI ID 0	SCSI ID is set to 0
SCSI ID 1	SCSI ID is set to 1
SCSI ID 2	SCSI ID is set to 2
SCSI ID 3	SCSI ID is set to 3
SCSI ID 4	SCSI ID is set to 4
SCSI ID 5	SCSI ID is set to 5
SCSI ID 6	SCSI ID is set to 6
SCSI ID 7	SCSI ID is set to 7

If you press the **Select** push-button while in the **SCSI ID Select** mode, the stored SCSI ID you chose moves by one increment. If you press the **Select** push-button when the stored SCSI ID is 7, then the SCSI ID moves to 0.

If you press and release the **Display Mode** push-button in the **Density Select** mode, the Mini-Library enters the **Normal** mode of operation.

### 2.12.4 Code Update Mode

Refer to Chapter 3 to place the Mini-Library in the **Code Update** mode.

## 2.13 Tape Cartridge Description

The tape cartridge is a four-inch, gray, plastic cartridge containing 1,100 feet of ½-inch magnetic metal particle tape.

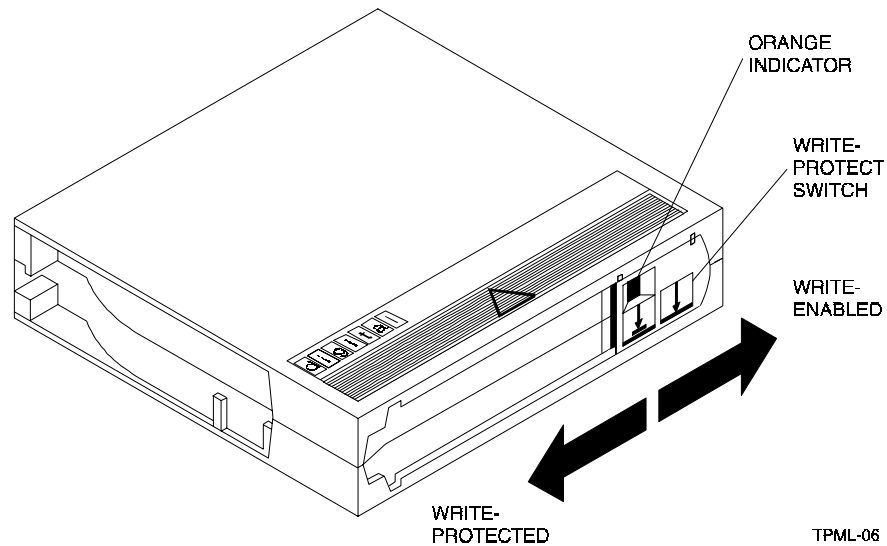
### 2.13.1 Cartridge Write-Protect Switch

The tape cartridge has a write-protect switch to prevent accidental erasure of data. Before loading the tape cartridge into the drive, position the write-protect switch on the front of the cartridge (Figure 2-5). When the switch is moved to the *left*, the cartridge is write-protected. When the switch is moved to the *right*, the cartridge is write enabled.

When you slide the switch to the left, the small orange rectangle is visible, which means data cannot be written to the tape. The arrow (beneath the orange rectangle and over the two lines on the write-protect switch) indicates that data cannot be written to the tape.

On the right side of the write-protect switch is another symbol: an arrow over one line. This symbol indicates that if you slide the write-protect switch to the right, data can be written to the tape.

Figure 2-5 Tape Cartridge Write-Protect Switch



### 2.13.2 Data Protection

If you move the cartridge write-protect switch to the left, and then load the tape, the **WP** (write protect) message displays. Table 2-14 describes what happens to data protection when you move the write-protect switch before loading the cartridge.

**Table 2-14 Before Loading the Cartridge**

When you move the write-protect switch . . .	. . .
To the left, the tape is write-protected, with the orange indicator showing	You cannot write data to the tape.
To the right, the tape is write-enabled	You cannot write data to the tape (if it is not software write-protected).

### 2.13.3 Ordering Cartridges

Table 2-15 lists the cartridges with order numbers for the 5-Cartridge DLT Mini-Library.

**Table 2-15. Cartridge Order Numbers**

Order Number	Description
TK85-01	CompacTape III cartridge. Five cartridges shipped with the mini-library.
TK85-HC	CleaningTape III cartridge. One cartridge ships with the mini-library.

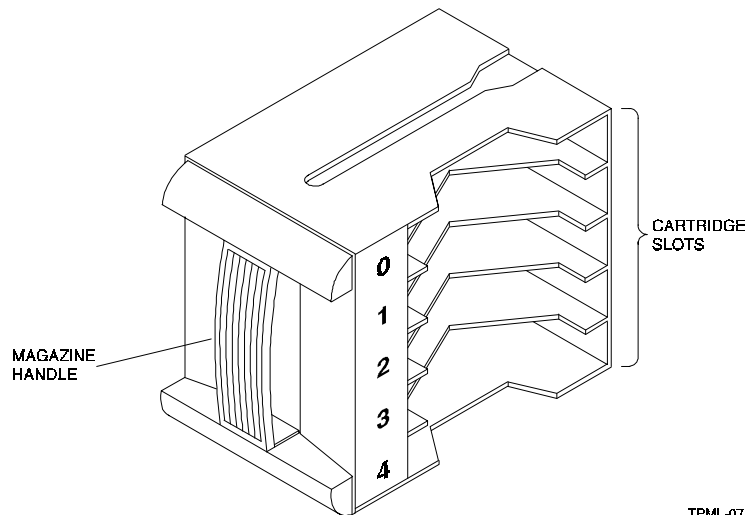
## 2.14 Description of the Magazine

The front of the magazine has numbers 0 through 4 marked, indicating each slot number (Figure 2-6).

**NOTE**

Insert and remove all cartridges at the front of the magazine.

**Figure 2–6 Mini-Library Magazine**



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### 2.14.1 Inserting a Cartridge into the Front of the Magazine

Before you insert a cartridge:

1. Grasp the cartridge with the write-protect switch facing you.
2. Set the cartridge's write-protect switch to the desired position as follows:

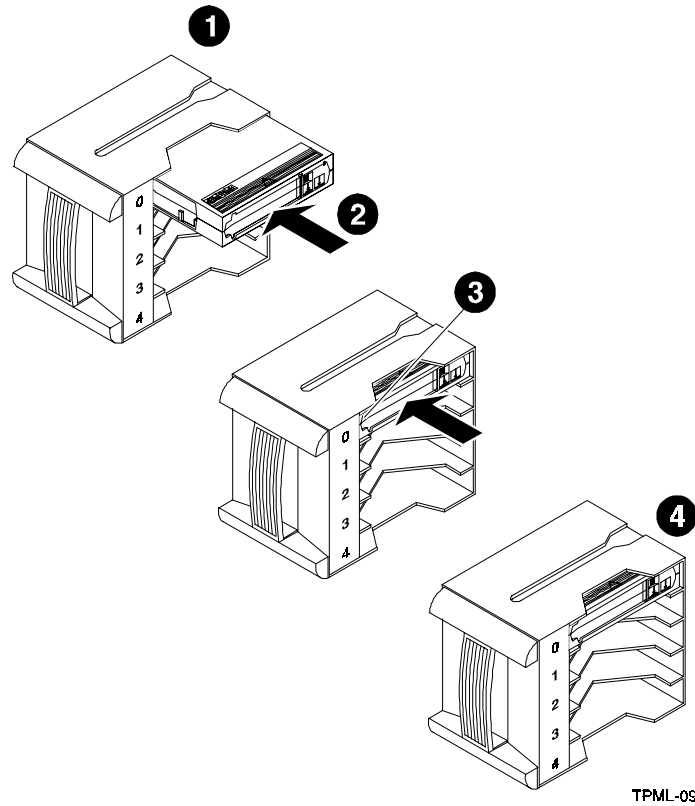
**Table 2–16 Setting the Write-Protect Switch**

If you want to . . .	Then . . .
Write to the tape	Slide the switch to the right (orange indicator is not visible).
Write-protect the tape	Slide the switch to the left (orange indicator is visible).

To insert a cartridge into the magazine (Figure 2-7):

1. Place the magazine on a flat surface with the slots facing you. Each slot is numbered to ensure you are inserting the cartridge correctly into the front of the magazine. Usually, cartridges are inserted into consecutive slots.
2. Insert the cartridge by pushing it into the slot until you hear a click.
3. Notice a small metal tab.
4. This holds the cartridge in place.

Figure 2-7 Inserting a Cartridge into the Magazine.



### 2.15 When to Use the Cleaning Tape Cartridge

Use Table 2-17 to determine when to use the cleaning cartridge.

Table 2-17 When to Use the Cleaning Cartridge

	ans ...	ou should ...
1. The <b>HC</b> message displays.	The drive head needs cleaning or the tape is bad. (See item 3)	Use the cleaning cartridge. Follow the instructions in this chapter to insert a cartridge into the magazine and load into the drive. When cleaning is complete, the cleaning cartridge unloads from the drive and returns to the magazine. The <b>LDR RDY</b> message displays.
2. A data cartridge causes the <b>HC</b> message to display frequently.	The data cartridge may be damaged.	Backup this data on another cartridge. Discard the old cartridge, which may be damaged. A damaged cartridge may cause unnecessary use of the cleaning cartridge.

**Table 2-17 When to Use the Cleaning Cartridge (continued)**

3. The <b>HC</b> message still displays after you clean the drive head.	Your data cartridge may be causing the problem.	Try another cartridge.
4. The <b>HC</b> message displays after you load the cleaning cartridge.	Cleaning has not been done and the cartridge is expired.	Replace the cleaning cartridge.

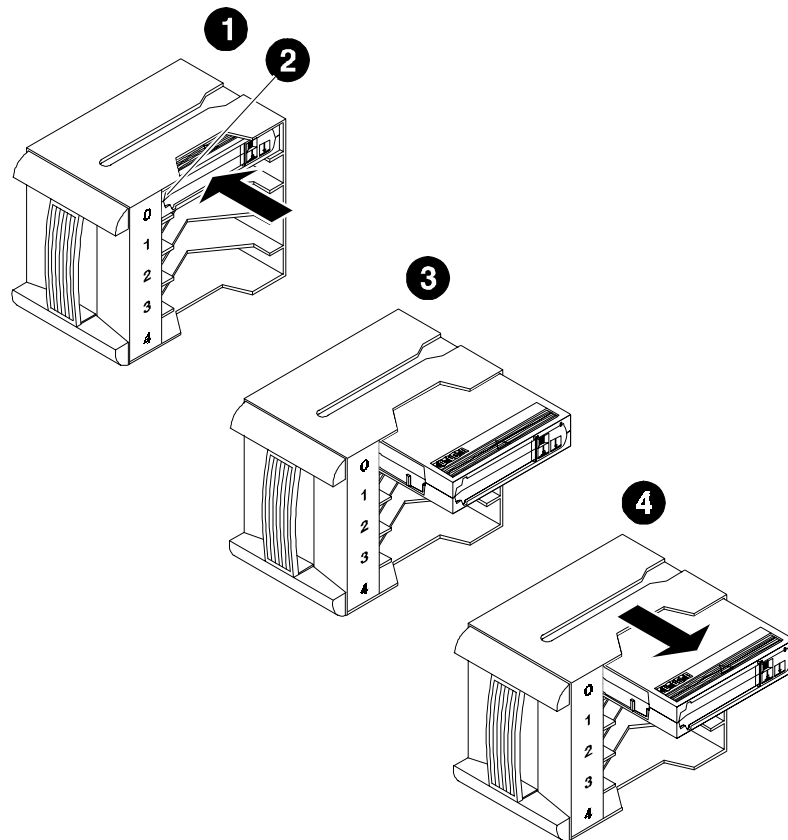
**NOTE**

The cleaning cartridge expires after approximately 20 uses.

**2.16 Removing a Cartridge from the Magazine**

To remove a cartridge from the magazine (Figure 2-8) press in on the cartridge where you can see the metal tab next to the slot number until it stops and you hear a click, then release. The slot has a spring-release action causing the cartridge to snap out.

**Figure 2-8 Removing a Cartridge from the Magazine**



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**CAUTION**

To prevent cartridge jams in the mini-library, never apply labels to the top or bottom of tape cartridges. Always use the space on the front of the cartridge for labels.

**2.17 Removing the Magazine from the Mini-Library**

To remove the magazine from the Mini-Library, first ensure the operator control panel is enabled or unlocked via the key lock (Figure 2-3). Then perform the following:

1. If a tape is loaded in the drive, press the **Load/Unload** push-button to unload the tape from the drive and load into the magazine. Press the **Open** push-button to open the door of the Mini-Library.
2. Slide the door all the way to the left.
3. Grasp the magazine's handle and pull the magazine out of the Mini-Library.

**2.18 Installing the Magazine into the Mini-Library****CAUTION**

Do not force the magazine door open manually. Always use the operator control panel **Open** push-button, which opens the door electronically.

To install the magazine, perform the following:

1. Ensure the door has moved all the way to the left.
2. Slide the magazine into the Mini-Library doorway while holding the magazine by the handle (Figure 2-6). Since the magazine is slotted, you can insert the magazine in the correct orientation only.
3. Slide the door to the right until it closes.

**2.19 Selecting a Cartridge from the Magazine**

After a successful initialization, the Mini-Library automatically selects the first slot containing a cartridge and the **Select** push-button is enabled. To select a cartridge, press the **Select** push-button to advance to the next slot containing a cartridge.

**2.20 Loading the Cartridge**

To load the cartridge from the magazine into the drive, press the **Load/Unload** push-button and observe the loading sequence as described in Table 2-18.

**Table 2–18 Cartridge Loading Sequence**

Stage	Event
1	The elevator moves to the selected slot.
2	The cartridge is then removed from the magazine and placed in the elevator.
3	The elevator moves to the drive position and inserts the cartridge into the drive.

**Table 2–18 Cartridge Loading Sequence (continued)**

4	The display reads <b>LDR ACT</b> until the tape has loaded to the beginning of the tape (BOT).
5	After the cartridge is loaded into the drive, the display reads <b>DRV ACT</b> .
6	After the cartridge is fully loaded and at BOT, the display reads <b>DRV RDY</b> .

**2.21 Unloading the Cartridge**

**CAUTION**

Do not press the **Load/Unload** push-button until backup or other tape operations are stopped at the terminal. Doing so can result in operation failure and drive unavailability.

**Table 2-19. Unloading the Cartridge**

If . . .	Then . . .
You want to unload the cartridge from the drive.	Press the Load/Unload push-button and observe the following: <ul style="list-style-type: none"> <li>• The <b>DRV REW</b> message displays</li> <li>• The cartridge unloads from the drive and the display reads <b>LDR ACT</b></li> <li>• When the cartridge returns to the magazine, the display reads <b>LDR RDY</b></li> </ul>
The <b>ERR LDR</b> message displays, showing a malfunction.	Press the <b>Load/Unload</b> push-button to reset the mini-library and try to clear the error.

**2.22 Opening the Magazine Door**

The **Open** push-button opens the magazine door for insertion or removal of the magazine. The push-button is disabled when the key lock is in the locked or disabled position. Table 2-20 describes magazine door operations.

**Table 2–20 Opening the Magazine Door**

When . . .	What . . .	Should . . .
A cartridge is not in the drive	The <b>LDR RDY</b> message displays before any operation begins.	Press the <b>Open</b> push-button. The door opens.
A cartridge is in the drive.	The <b>DRV RDY</b> message displays before the operation begins.	Press the <b>Open</b> push-button so the cartridge unloads from the drive and moves back into the magazine. The door opens.

In both situations described in Table 2-20, once you close the door again, a magazine scan begins and the **LDR ACT** message is displayed. When the scan completes, the **LDR RDY** message is displayed.

## *Code Update (From Tape)*

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*This chapter describes the Code Update overview and operating procedure.*

---

### **3.1 Code Update Overview**

The 5-Cartridge Mini-Library can automatically update the controller board firmware directly from a tape containing the appropriate information. Place the Mini-Library into code (firmware) update mode via the operator control panel and load the tape cartridge containing the SWXTL-BL code image file. The mini-library automatically reads and verifies the tape information as a valid SWXTL-BL code image. If the image data passes all the verifications, the image data is installed into the controller's non-volatile code memory. This chapter describes how to perform the code-update procedure.

#### **CAUTION**

During the code update, when the new image is actually being programmed into the FLASH EEPROMs, a power fail (but not BUS RESET) causes the controller module to be unusable. When doing a code update, take reasonable precautions to prevent a power failure.

#### **3.1.1 Updating Code on a Standalone SWXTL-BL**

You can update the Mini-Library code even when the Mini-Library is not attached to a SCSI bus. That is, you can update a standalone Mini-Library. However, to do an update, the power-on self-test (POST) must pass first. To pass, POST needs a properly terminated bus.

### **3.2 Code Update Procedure**

To do the code update, you must have a CompacTape cartridge with a copy of the code image. This section describes the procedure for updating the code of the drive controller module in the mini-library. The update is done from a cartridge that stores the code image. Code update from the host is also supported. For details, see the section on the SCSI WRITE BUFFER command in the *DLT2000 Series Magnetic Tape Product Manual*, (EK-TH4XX-IM).

### 3.2.1 Updating the Code on the Mini-Library

Update the code on the Mini-Library as follows:

1. Obtain or make a CompacTape with the code image of the specified revision level copied to it.
2. Put the Mini-Library into the code update mode as follows:
  - With the **LDR RDY** message displayed, press the operator control panel **Open** push-button to open the door and remove the magazine. Then close the door.
  - Remove all cartridges from the magazine and install the code update cartridge into the magazine,
  - Press the **Display Mode** push-button until the **SCSI IS SEL** message is displayed.
  - Press and hold the **Load/Unload** push-button until the **SCSI ID SEL** message starts to flash, immediately release the push-button and press the **Load/Unload** push-button again. The **CODE UPDATE MODE** message is displayed.
3. Press the **Open** push-button two times to open the magazine door. Load the magazine with the code update tape into the mini-library and close the door.
4. Wait until the elevator stops scanning the magazine and then press the **Load/Unload** push-button to load the code update tape into the tape drive and observe the following:

If ...	Then ...
The drive code revision is the same revision as that of the update tape.	The drive code does not go through an update.
The drive code revision is not the same revision as that of the update tape.	The drive code goes through an update, taking about 5 minutes.

5. During a drive code update, the drive:
  - Automatically reads the tape (calibration and directory processing cause the tape to move for a few minutes before data is actually read)
  - Examines the data
  - Verifies the data is a valid SWXTL-BL code image
  - When the drive code update completes, the controller's flash EEPROM memory is updated with the code image
  - Resets and goes through POST, and the code update tape cartridge returns to the magazine and the **LDR RDY** message displays
6. If the code update succeeds, the mini-library resets itself and a magazine scan takes place.

### 3.2.2 Interpreting the Results

Table 3-1 lists the conditional results of updating the code on the Mini-Library.

**Table 3–1 Code Update Results**

If ...	This means ...	And you should ...
The code update cartridge unloads from the drive and loads into the magazine slot from which it came	The update succeeded. The controller's flash EEPROM memory is updated with the new firmware image.	Begin operating the mini-library
The code update cartridge does not unload from the drive and load into the magazine.	<p>The update failed. The drive may reset and the <b>ERR UNK</b> message may display. The mini-library should still be usable, but this depends on why the update failed. The reasons for failure could be:</p> <ul style="list-style-type: none"> <li>The code update cartridge contains a corrupted image file or the file is built improperly.</li> </ul>	<ol style="list-style-type: none"> <li>1. Press the <b>Unload</b> button to unload the tape cartridge from the drive.</li> <li>2. Press the <b>Open</b> button to open the magazine door.</li> <li>3. Remove the magazine and close the door. The mini-library does an elevator scan.</li> <li>4. Open the door again. The message <b>LDR RDY</b> displays.</li> <li>5. Verify you have the valid image for your drive type (variant) in the magazine. Ensure the image copied to the tape cartridge is using a block size of 4096 bytes.</li> </ol> <p>If you still cannot do the update, call your service representative.</p>
	<ul style="list-style-type: none"> <li>The tape cartridge with the valid update image is not readable.</li> </ul>	<ol style="list-style-type: none"> <li>1. Press the <b>Unload</b> button to unload the tape cartridge from the drive.</li> <li>2. Press the <b>Open</b> button to open the magazine door.</li> <li>3. Remove the magazine and close door. The mini-library does an elevator scan.</li> <li>4. Open the door again. The message <b>LDR RDY</b> displays.</li> <li>5. Rebuild the valid image on a good cartridge.</li> <li>6. Try the code update procedure again using the valid tape image.</li> </ol> <p>If you still cannot do the update, call your service representative.</p>

**Table 3–1 Code Update Results (continued)**

<b>If . . .</b>	<b>This means . . .</b>	<b>And you should . . .</b>
	<ul style="list-style-type: none"><li>• A power failure occurs during the code update. The drive may be unusable</li></ul>	Try unloading the cartridge from the drive (as described in this table) to do the code update again. If you still cannot do the update, call your service representative.
	<ul style="list-style-type: none"><li>• A controller failure occurs. The drive is most likely unusable and needs to be replaced.</li></ul>	Turn off mini-library power and turn power back on again. If you still have a drive controller failure, call your service representative.

## Troubleshooting

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*This chapter provides troubleshooting tips for the mini-library.*

---

### 4.1 Mini-Library Push-button Conditions

Review the information in the previous chapters to ensure you are correctly operating the SWXTL-BL mini-library.

Before pressing the **Display Mode**, **Select**, **Load/Unload**, or **Open** push-buttons on the operator control panel, check for the conditions listed in Table 4-1 and ensure the following:

- Mini-library power is turned on
- Magazine door is closed
- Key lock is not set to lock (disable) on the operator control panel

Table 4-1 lists the operating conditions of the push-buttons on the operator control panel.

**NOTE**

Do not press the **Load/Unload** push-button to abort any function of the mini-library. Consult your applications user's guide for abort instructions.

**Table 4-1. Mini-Library Push-button Conditions**

If you want to . . .	First, ensure the . . .	Then you can press this push-button . . .
Select another slot in the magazine	<ul style="list-style-type: none"> <li>• Magazine contains at least two cartridges</li> <li>• <b>LDR RDY</b> displays</li> </ul>	<b>Select</b>
Load the selected cartridge into the tape drive	<ul style="list-style-type: none"> <li>• Magazine contains at least one cartridge</li> <li>• <b>LDR RDY</b> displays</li> </ul>	<b>Load/Unload</b>
Return the selected cartridge to its original slot in the magazine.	<b>DRV RDY</b> displays	<b>Load/Unload</b>
Clear a magazine or loader error.	<b>ERR MAG</b> or <b>ERR LDR</b> displays	<b>Load/Unload</b>
Open the door or unload the cartridge from the drive and open the door.	<b>LDR RDY</b> displays	<b>Open</b>

## 4.2 Backup Operation Failures

The following manual operations can cause back-up operations to fail during BACKUP:

- Loading write-protected CompacTape III cartridges when executing write operations
- Selecting the incorrect cartridge slot from which to initialize operations

## 4.3 Avoiding Basic Problems

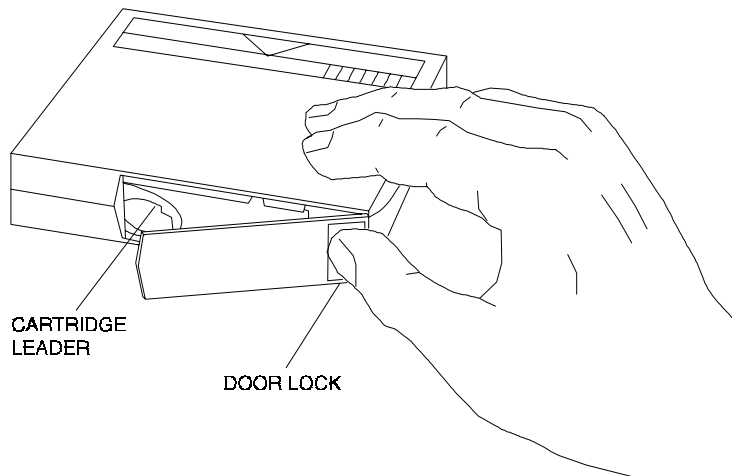
To avoid basic problems, follow these guidelines when operating the mini-library:

**CAUTION**

Do not touch the exposed magnetic tape. If the tape leader is not in the correct position, use a new cartridge.

- Use CompacTape III cartridges
- Check the tape leader in the cartridge by lifting the cartridge latch that opens the door to expose the leader. Release the door lock by lifting the lock with the thumb (Figure 4-1). Be sure the leader is in the same position as the one shown in Figure 4-1
- Ensure the magazine door is fully closed and the current slot is displayed for the starting cartridge
- Ensure *no* slots in the magazine are empty between the starting cartridge and the expected completion cartridge

**Figure 4-1. Opening the Cartridge Door to Check the Tape Leader**



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## 4.4 Error Conditions

Error conditions fall into these main categories:

- **Magazine Error** - In most cases, this error is an operator-correctable condition indicated when the **ERR MAG** message displays. If you cannot resolve the error, call your service representative.
- **Loader Error** - This a condition that most likely requires service from a service representative. It is indicated when the **ERR LDR** message displays.
- **Drive Error**
- **Controller Error**
- **Unknown Error**

### 4.4.1 Magazine Error Description Cases

A magazine error can occur during any of the following cases:

*Case 1* A cartridge was removed from the magazine incorrectly.

*Case 2* A cartridge was manually unloaded from the drive.

*Case 3* A cartridge that was loaded into the drive by the loader was manually unloaded and put back into the magazine.

*Case 4* A cartridge was manually inserted into the drive. This can occur only if the loader has been opened, requiring service intervention. It cannot occur under normal operation.

When the conditions listed above are present, the **ERR MAG** message displays, showing a situation that can be corrected by the operator. The only function available at this time is the **Open** push-button to open the door and remove the magazine.

### 4.4.2 Loader Error Description

The **ERR LDR** message tells you the mini-library has detected a fatal error in the loader transfer assembly. In some loader transfer assembly errors, the mini-library retries the error three times before showing an failure. All loader errors cause the **ERR LDR** message to display.

### 4.4.3 Clearing the Loader Error

When you press the **Load/Unload** push-button, the mini-library attempts to clear the error. When you press the **Open** push-button, the door opens to let you access the magazine.

### 4.4.4 Drive Error Description

The **ERR DRV** message tells you the mini-library has detected a fatal error in the tape drive. In some drive errors, the mini-library retries the error three times before showing a failure. All drive errors cause the **ERR DRV** message to display.

#### 4.4.5 Clearing a Drive Error

When you press the **Load/Unload** push-button, the mini-library attempts to clear the error. When you press the **Open** push-button, the door opens to let you access the magazine.

#### 4.4.6 Controller Error Description

The **ERR CTL** message tells you the mini-library has detected a fatal error in the controller. In some controller errors, the mini-library retries the error three times before showing a failure. All controller errors cause the **ERR CTL** message to display.

#### 4.4.7 Clearing the Controller Error

When you press the **Load/Unload** push-button, the mini-library attempts to clear the error. When you press the **Open** push-button, the door opens to let you access the magazine.

### 4.5 Power Problems

If the mini-library fan does not turn on, you don't see a display message, or your system does not recognize the mini-library:

- Check power plug to ensure it is secure
- Contact your service manager and verify that the mini-library configuration is correct
- If power problems still exist, contact your service representative



## Specifications

---

*This appendix contains the technical specifications for the mini-library and the internal TZ87N tape drive, and the definitions of the SCSI command signal set.*

---

**Table A-1. Mini-Library Specifications.**

Characteristic	Specification(s)
Height	11.8 in. (300 mm)
Width	16.3 in. (414 mm)
Depth	10.5 in. (267 mm)
Weight	31 lbs. (14 kg)
Noise Level	35 dB
Maximum number of cartridges	Five
Communications interface	SCSI-2 bus (single-ended or differential) with a separate SCSI LUN ID for the mini-library and tape drive
Mechanical load/unload cycle time	20 sec. (typical)
Power requirements (auto ranging)	
Voltage	100 to 240 Vac
Frequency	50 to 60 Hz
Power consumption	100 W, max.
Certification	
EMI	FCC class A, CE Mark Level 1 and VCCI Level 1
Safety (Qualified to:)	<ul style="list-style-type: none"><li>• UL 1950 Information Technology Inc., Electrical Business Systems</li><li>• CSA C22.2 950-M89-Information Technology Inc. Electrical Business Systems</li><li>• TUV EN60950, IEC 950, DIN VDE 0805 AS 05.92 DIN VDE 0805 AC 05.92</li></ul>
Operating temperature	50° to 104°F (10°to 40° C)
Non operating temperature	-40° to 150.8°F (-40°to 66°C) excluding media
Operating humidity	20 to 80% RH, maximum, non condensing
Non operating humidity	10 to 95% RH maximum, non condensing
Operating altitude	0 to 8,000 ft. (0 to 2438 m)
Non-operating altitude	0 to 12,000 ft. (0 to 3658 m)

**Table A-2. TZ87N Tape Drive Specifications.**

Characteristic	Specification(s)
Mode of operation	Streaming
Media	12.7 mm (1/2 in.) unformatted magnetic tape
Track density	256 tracks/in.
Bit density	62,500 bits/in.
Number of tracks	128
Transfer rate, raw native	1.71 MB/sec.
Transfer rate, user native	1.25 MB/sec.
Transfer rate, user compressed <sup>1</sup>	2.50 MB/sec., maximum write 3.00 MB/sec., maximum read
Tape speed	110 in./sec.
Track format	Two-track, parallel serpentine recording
Cartridge capacity	10.0 GB formatted, native 20.0 GB formatted, compressed
Mini-library capacity	100 GB <sup>1</sup>
Mini-library backup time	About 11 hrs. (100 GB)
Reliability	
Subsystem MTBF (10% duty cycle)	30,000 hrs. <sup>2</sup>
Mechanical	500,000 cycles

<sup>1</sup> Assumes a 2:1 compression ratio. However, actual compression ratio may vary as a function of data type.

<sup>2</sup> Digital Equipment Corp. does not warrant that the predicted figure represents any particular unit installed for customer use. The actual figure can vary from unit to unit.

**Table A-3. SCSI Command Set.**

SCSI Command Signal Definitions
Initialize Element Status
Inquiry
Mode Select
Mode Sense
Move Medium <sup>1</sup>
Request Sense
Read Element Status
Reserve
Receive Diagnostic Results
Send Diagnostic
Release
Test Unit Ready

<sup>1</sup> Random cartridge access is implemented as a SCSI Move Medium command on LUN 1. Implicit sequential cartridge access can be done using the UNLOAD command on LUN 0 or 1.

## *Product Notes for Novell<sup>™</sup> and MS-DOS<sup>™</sup>*

---

*This appendix provides information for the system administrator. It should be read before installing and using the SWXTL-BL DLT Tape Drive Mini-Library with a host system operating under the Novell, MS-DOS, or MS-DOS/WINDOWS operating systems.*

---

### **B.1 Host SCSI Interface**

The SWXTL-BL DLT Tape Drive Mini-Library utilizes the standard SCSI-2 command set to interface to the PC-based host system. Thus, the host system must be equipped with a SCSI adapter to properly interface the tape drive with the host. For example, the host SCSI adapter might interface the computer's EISA bus to the SCSI-2 port of the mini-library.

A host PC SCSI adapter will normally be supplied with a compatible software driver for use with its operating system. When operating under Novell and MS-DOS or MS-DOS/WINDOWS operating systems, the software driver must be pre-loaded according to the SCSI adapter's manufacturer's installation procedure to ensure a proper interface between the mini-library and the host. In addition, a user-level tape read/write software program may be required to implement tape support under the Novell, MS-DOS, or MS-DOS/WINDOWS environments. There are many commercial software products available that provide host or network-based data backup and restore, archiving, data logging, etc. functionality for these operating systems.

Before purchasing a user-level software product, ensure that the mini-library is supported by that product (see note below). Commercial software vendors usually publish a supported hardware list or have telephone technical support personnel that will answer questions regarding compatibility of a particular tape drive or other storage devices. When choosing a software product suitable for your application, follow the software vendor's installation procedure to implement support for your mini-library.

#### **NOTE**

The SWXTL-BL tape drive mini-library is functionally equivalent to the TZ875N (DEC part no.) tape drive. Commercial software products that support the TZ875N will also support the SWXTL-BL.





## *Product Notes for Sun™*

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*This appendix describes using the 5-cartridge DLT Mini-Library (SWXTL-BL) with a Sun™ SPARC system running Solaris™ 2.3 (or later) and SunOS™ 4.1.x. The appendix contains two major topics: Operating System Modifications and 5-Cartridge DLT Mini-Library Operation.*

---

### **C.1 Operating System Modifications**

#### **C.1.1 General Information**

Densities can only be changed at the beginning of the tape.

Front panel operation will override software control of density and compression settings.

To use software-controlled density selections, the drive must first be placed in “automatic” mode. To accomplish this, press the DENSITY SELECT button the required number of times until only the DENSITY OVERRIDE light is on.

Compression can be enabled or disabled at any time, with the change taking effect immediately when writing TZ875 density.

#### **C.1.2 Modifications Required for SunOS 4.1.x**

##### **C.1.2.1 Installation Procedure**

###### **NOTES**

1. The SWXTL-BL designation in the following procedure is the StorageWorks product name for "DEC TZ875".
2. In order to support the addition of this device, applicable drive information must be supplied in the `/sys/scsi/targets/st_conf.c` file. For additional information, read the **man** pages for "st".

##### ***C.1.2.1.1 System Modification***

Perform the following steps to modify the system for communication with the SWXTL tape drive:

1. From the command line, type:  
`cd /sys/scsi/targets`

---

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2. Edit the "st\_conf.c" file and carefully add the following structure before the entry for "/\* Exabyte 8mm 5GB cartridge \*/":

```

/* TZ875 100GB DLT Streaming /w Compression Cartridge tape drive
*/
{
  "DEC TZ875 10GB Cart. DLT Streaming /w Compression", 12 ,
  "DEC      TZ875",ST_TYPE_DEFAULT, 8192,
  (ST_BSF | ST_VARIABLE | ST_LONG_ERASE | ST_KNOWS_EOD),
  5000, 5000,
  { 0x17, 0x18, 0x80, 0x81 },
  { 0, 0, 0, 0 }
},

```

3. Verify that the above entry is added to the st\_conf.c file correctly.

Where,

- The first parameter (DEC TZ875 10GB Cart. DLT Streaming /w Compression) is the name given to the drive.
- The second parameter (12) is the length of the vendor ID provided by the "inquiry" command.
- The third parameter (DEC TZ875) is the vendor ID. (Ensure that five spaces are included between "DEC" and "TZ875" elements.)
- The fourth parameter (ST\_TYPE\_DEFAULT) is the drive type for the driver.
- The fifth parameter (8192) is the block size in bytes.
- The sixth parameter (ST\_BSF | ST\_VARIABLE | ST\_BSR | ST\_LONG\_ERASE | ST\_KNOWS\_EOD) comprises the drive options.
- The seventh parameter (5000) is the maximum number of read retries.
- The eighth parameter (5000) is the maximum number of write retries.
- The ninth parameter (0x17, 0x18, 0x80, 0x81) comprises the density codes (low \_hi) as defined below:
  - 0x17 is the vendor-unique density code for the TK85 (2.6 GB).
  - 0x18 is the vendor-unique density code for TK86 (6.0 GB).
  - 0x80 is the vendor-unique density code for the TK87 native in the uncompressed mode (10 GB).
  - 0x81 is the vendor unique code for the TK87 in the compressed mode (20 GB).
- The tenth parameter (0,0 . . .) is the speed code (not used).

#### ***C.1.2.1.2 Rebuilding of Kernel***

After you have edited the "st\_conf.c" file and added the above entry, rebuild the kernel using the standard procedure (for further help, refer to the **man** pages of the **config** command).

#### **NOTE**

If your SCSI host adapter is supported by the "probe-scsi" command, you can use this command at the boot prompt to verify that the connected device is correctly attached to the system.



### C.1.2.1.3 Rebooting of system

Reboot the system, using the following command at the boot prompt:

```
>boot
```

The system reboots with the newly compiled kernel and creates special files in **/dev** so that it can communicate with the SWXTL SBB. Verify that “DEC TZ875 100GB Cart. DLT Streaming /w Compression” is displayed as a target when the system is booting.

At this time the tape is configured in the **/dev** directory with **"rst"** (rewind on close) and **"nrst"** (no rewind on close) format. If the entry in the kernel configuration file for the SWXTL SBB were **st4**, for example, then **"rst"** would be **"rst4, rst12, rst20, rst28"** and **nrst** would be **"nrst4, nrst12, nrst20, nrst28"**.

- **rst4** and **nrst4** correspond to the 0x17 density mode (TK85 format)
- **rst12** and **nrst12** correspond to the 0x18 density mode (TK86 format)
- **rst20** and **nrst20** correspond to the 0x80 density mode (TK87 native format)
- **rst28** and **nrst28** correspond to the 0x81 density mode (TK87, *compressed* format)

### C.1.2.1.4 Testing the Mini-Library

To test the Mini-Library, back up the **“passwd”** file to tape using the **“tar”** command, as follows:

```
tar cvf /dev/rst4 /etc/passwd
```

The system responds with:

```
a /etc/passwd 1 blocks
```

Note that depending on the size of the file, a different number of blocks may be reported.

### C.1.2.1.5 Verification

Verify that the **“passwd”** file was written to tape using the following command:

```
tar tvf /dev/rst4
```

The system responds with:

```
/etc/passwd
```

The installation and verification procedure is now complete.

### C.1.2.2 Dump Parameters for the Tape Drive

The parameters that should be used when running the dump utility with the SWXTL tape drive are:

```
density = 62500 (BPI)
size = 1200 (1200-foot tape)
blocking factor = 126
```

#### Example 1

The following example shows backing up the entire disk partition onto the SWXTL tape drive:

```
dump 0dsbf 62500 1200 126 /dev/rst20 /dev/sd0g
```

For further help, refer to **man** pages of the **dump** command.

## C.1.3 Modifications Required

### C1.3.1 Installation Procedure

#### NOTES

1. The “SWXTL” designation in the following procedure is the StorageWorks product name for the TZ875 tape drive.
2. In order to support the addition of this device, drive information must be supplied in the `/kernel/drv/st.conf` file as global properties that apply to each of the targets, or as properties that are applicable to one target only. The “st driver” looks for the property called “tape-config-list”. For additional information, read the man page “st”. We recommend here the use of the global properties approach.

#### C.1.3.1.1 System Modification (Solaris 2.3)

Perform the following steps to modify the system to communicate with the SWXTL tape drive:

1. From the command line, type:

```
cd /kernel/drv
```

2. Edit the “**st.conf**” file by adding the following before the first occurrence of “name=”:

```
# entry for TZ875 tape drive
tape-config-list = "DEC      TZ875",
"DEC 100GB Cart. DLT Streaming /w Compression", "TZ875-data";
TZ875-data = 1,0x36,8192,0x1639,4,0x17,0x18,0x80,0x81,3;
```

where:

In the “**tape-config-list**” parameter:

- The first parameter (DEC TZ875) is the parameter returned by the SWXTL SBB on a SCSI inquiry command. (There should be five spaces between “DEC” and “TZ875” elements.)
- The second parameter (DEC 100GB Cart. DLT Streaming /w compression) is a *nickname* for the SWXTL drive.
- The third parameter is defined as follows:
  - In the “TZ875-data” string:
    - The first parameter (1) is the revision level of the software and is set to 1.
    - The second parameter (0x36) is the **tape type**, specifying “other” tape drive. (This is defined in `/usr/include/sys/mtio.h`.)
    - The third parameter (8192) is the block size in bytes.

- The fourth parameter (0x1639) defines the options selected. The 0x1639 value represents the following options:
 

ST_VARIABLE	=	0x0001
ST_BSF	=	0x0008
ST_BSR	=	0x0010
ST_LONG_ERASE	=	0x0020
ST_KNOWS_EOD	=	0x0200
ST_UNLOADABLE	=	0x0400
ST_LONG TIMEOUTS	=	0x1000
- The fifth parameter (4) defines the number of densities. The maximum definable number of densities is 4.<sup>1</sup>
- The sixth parameter (0x17) is the vendor-unique density code for the TK85 (2.6 GB).
- The seventh parameter (0x18) is the vendor-unique density code for TK86 (6.0 GB).
- The eighth parameter (0x80) is the vendor-unique density code for the TK87 native (10 GB).
- The ninth parameter (0x81) is the default density code for the TK87 *compressed* mode.
- The last parameter in the **SWXTL-data** parameter is the default density 3, TK87 in the *compressed* mode.

### C.1.3.2 System Modification (Solaris 2.4 and up)

Perform the following steps to modify the system to communicate with the SWXTL tape drive:

1. From the command line, type:

```
cd /kernel/drv
```

2. Edit the **“st.conf”** file by adding the following before the first occurrence of “name=”:

```
# entry for TZ875 tape drive
tape-config-list = "DEC      TZ875",
"DEC 100GB Cart. DLT Streaming /w Compression", "TZ875-data";
TZ875-data = 1,0x36,0,0x1639,4,0x17,0x18,0x80,0x81,3;
```

where:

In the **“tape-config-list”** parameter:

- The first parameter (DEC TZ875) is the parameter returned by the SWXTL SBB on a SCSI inquiry command. (There should be five spaces between “DEC” and “TZ875” elements.)
- The second parameter (DEC 100GB Cart. DLT Streaming /w compression) is a *nickname* for the SWXTL drive.

<sup>1</sup> This maximum definable number of densities is a Sun Operating System limitation.

- The third parameter is defined as follows:

In the “TZ875-data” string:

- The first parameter (1) is the revision level of the software and is set to 1.
- The second parameter (0x36) is the **tape type**, specifying “other” tape drive. (This is defined in `/usr/include/sys/mtio.h`.)
- The third parameter (0) is the block size in bytes (0 = variable block size).
- The fourth parameter (0x1639) defines the options selected. The 0x1639 value represents the following options:

ST_VARIABLE	=	0x0001
ST_BSF	=	0x0008
ST_BSR	=	0x0010
ST_LONG_ERASE	=	0x0020
ST_KNOWS_EOD	=	0x0200
ST_UNLOADABLE	=	0x0400
ST_LONG_TIMEOUTS	=	0x1000
- The fifth parameter (4) defines the number of densities. The maximum definable number of densities is 4.\*
- The sixth parameter (0x17) is the vendor-unique density code for the TK85 (2.6 GB).
- The seventh parameter (0x18) is the vendor-unique density code for TK86 (6.0 GB).
- The eighth parameter (0x80) is the vendor-unique density code for the TK87 native (10 GB).
- The ninth parameter (0x81) is the default density code for the TK87 *compressed* mode.
- The last parameter in the **SWXTL-data** parameter is the default density 3, TK87 in the *compressed* mode.

### C.1.3.3 System Shutdown

After you have edited the “**st.conf**” file, shut down the system as follows:

```
sync
cd /
shutdown -i0 -g0 -y
```

### C.1.3.4 Installation of the Tape Drive

Install the tape drive into the storage subsystem and power on the workstation. We recommend that the SWXTL SCSI device address be set to ID 4 or 5.

#### NOTE

If your SCSI host adapter is supported by the “`probe-scsi`” command, then you can use this command at the boot prompt to verify that the connected device is correctly attached to the system.

### C.1.3.5 Rebooting of System

Reboot the system using the following command at the boot prompt:

```
>boot -rv
```

Note that the switch "**r**" forces the kernel to be re-configured, and switch "**v**" enables a display of the system configuration at boot time.

The system compiles the kernel and creates special files in **/dev** so that it can communicate with the SWXTL SBB. Since you booted the system using the verbose switch, the system displays all of its SCSI targets. Verify that "DEC 100GB Cart. DLT Streaming /w Compression" is displayed as a target when the system is booting.

At this time, the tape drive is configured in the **/dev** directory in two ways: **rmt** format, and **rst** format.

#### "rmt" format

In this format, the drive is configured with various options. For further explanations, see the man pages on "**st**" (the modes are *x*, *xl*, *xm*, *xh*, *xc*, and *xu*, where *x* is the **rmt** number).

- Options *x*, *xu*, and *xc*, correspond to the 0x81, (TK87, *compressed*) density mode.
- Option *xl*, corresponds to the 0x17 (TK85) density mode.
- Option *xm* corresponds to 0x18 (TK86) density mode.
- Option *xh* corresponds to 0x80 (TK87, *native*) density mode.
- Option *b* associates with the BSD behavior and is for backward compatibility on all of the above options. For further information, refer to the man pages of "**mtio**".
- The *n* option provides access to the device with **no rewind**, similar to **nrst** (below), and is also applicable to all of the above options.

#### "rst" format

Special files "**rst**" (rewind on close) and "**nrst**" (no rewind on close) are also built and reside in the **/dev** directory. For example, if the SCSI target ID for the SWXTL drive is 4 and the drive is connected to the native SCSI bus, then "**rst**" will be "**rst4**, **rst12**, **rst20**, and **rst28**" and **nrst** will be "**nrst4**, **nrst12**, **nrst20**, and **nrst28**".

- **rst4** and **nrst4** correspond to the 0x17 density mode (TK85 format)
- **rst12** and **nrst12** correspond to the 0x18 density mode (TK86 format)
- **rst20** and **nrst20** correspond to the 0x80 density mode (TK87, *native* format)
- **rst28** and **nrst28** correspond to the 0x81 density mode (TK87, *compressed* format)

### C.1.3.6 Test

To test the SWXTL drive, back up the “**passwd**” file to tape using the “tar” command, as follows:

```
tar cvf /dev/rst4 /etc/passwd
```

The system responds with:

```
a /etc/passwd 1 blocks
```

Note that, depending on the size of the file, a different number of blocks may be reported.

### C.1.3.7 Verification

Verify that the “**passwd**” file was saved to tape using the following command:

```
tar tvf /dev/rst4
```

The system responds with

```
/etc/passwd
```

The installation and verification procedure is now complete.

## C.1.4 Running Sun Diagnostics (Optional)

The diagnostic exerciser provided with the Sun operating system (“sundiag”) does not support the generic DLT tape drive configuration. In order to run “sundiag”, you must modify the `st.conf` file in the `/kernel/drv` directory. Change the “**tape type**” in the SWXTL-data parameter from 0x36 (generic other type of drive) to 0x29 (Exabyte 8500 8mm cartridge) and re-boot the system with the “`boot -r`” option. You can now run “sundiag” when the system is up and running.

### CAUTION

Remember to change the “**tape type**” back to 0x36 and reboot the system with the “`boot -r`” option after running “sundiag”.

## C.1.5 Dump Parameters for the Tape Drive

The parameters that should be used when running the `ufsdump` utility with the SWXTL tape drive are as follows:

```
density (d) = 62500 (BPI)
```

```
blocking factor = 126
```

*Example,*

The following parameter is an example of how to back up the entire disk partition (`/dev/rdisk/c0t3d0s6`) onto the SWXTL tape drive:

```
ufsdump 0dbfo 62500 126 /dev/rmt/2 /dev/rdisk/c0t3d0s6
```

## C.2 SWXTL-BL 5-Cartridge Tape Loader Operation

The Solaris 2.x Operating System includes an Incremental File System Dump Utility (ufsdump). The ufsdump “-l (ell)” option has a time limitation of 120 seconds for an individual tape to be loaded. The specifications for the SWXTL Tape Drive indicate the maximum time to complete the operation is 187.8 seconds (rewind - 100 seconds for a 1200 foot tape; 28.4 seconds to unload; and 59.4 seconds to load). In compatible testing of the tape drive, Digital has found that the typical time to rewind, unload, and load the tape is 98 seconds, well within the limitation of the operating system.

The SunOS 4.1.x and Solaris 2.x Operating Systems provide a magnetic tape control utility (mt) that can be used with the offline switch to cause the Mini-Library to unload and then load the next tape.

The SunOS4.1.x Operating System provides no utility for use with the Mini-Library. Included in this appendix is a recommended and tested routine that will properly run the Mini-Library’s Autoloader to back up a file system.

### C.2.1 Solaris 2.x

Solaris 2.x provides an incremental file system dump utility called ufsdump.

The format of the ufsdump command is as follows:

```
/usr/lib/fs/ufs/ufsdump [options] [arguments] files-to-dump
```

**ufsdump** backs up all files specified by file-to-dump to magnetic tape, diskette, or disk file

**options** is a single string of one-letter ufsdump options

**arguments** are multiple strings whose association with the options is determined by order. That is, the first argument is associated with the first option that takes an argument; the second argument is associated with the second option that takes an argument, and so on.

**files-to-dump** normally operates on a whole file system or files within a file system changed after a certain date (incremental backup).

When used with the Mini-Library autoloader and the “-l (ell)” switch, ufsdump writes to the tape normally. When end-of-tape is reached, and the dump is not complete, ufsdump waits up to two minutes for the drive to again be ready. During this time, the autoloader loads a new tape. If the autoloader has completed loading, and the tape drive is ready, ufsdump continues to the dump. If the autoloader has not completed loading the next tape, operator intervention is required to start the next tape.

#### NOTE

The **ufsdump** option causes a new tape to be auto-loaded after unloading the current tape. The one exception to this rule is when the current tape is the last tape in the loader, (that is, the fifth tape or tape #4).

Example:

```
ufsdump 0u1(e11)f /dev/rmt/0 /usr
```

where:

- 0** dump the entire file system
- u** update the dump file data
- 1** wait up to two minutes for tape to unload and then load new tape
- f** specifies the file system to dump

### C.2.2 SunOS 4.1.x and Solaris 2.x

Sun operating systems contain a magnetic tape control utility call `mt` that can be used with the offline switch to cause the Mini-Library autoloader to unload and then load the next tape.

The `mt` command and its format is as follows:

```
mt [ -f tapename ] command... [ count ]
```

where:

**mt** sends commands to a magnetic tape drive. If tape name is not specified, the environment variable `TAPE` is used. If `TAPE` does not exist, `mt` uses the device `/dev/rmt/0`.

**tapename** refers to a raw tape device.

**count** - by default, `mt` performs the requested operation once. Multiple operations can be performed by specifying `count`.

**offline, fewoffl** - Rewind the tape and, if appropriate, take the drive unit offline by unloading the tape.

#### NOTE

The offline option causes a new tape to be auto-loaded after unloading the current tape. The one exception to this rule is when the current tape is the last tape in the loader (that is, the fifth tape or tape #4).

Example:

```
mt -f /dev/rst0 offline
```



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# Reader's Comments

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## SWXTL-BL 50/100 GB, 5-Cartridge DLT Tape Drive Mini-Library

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