StorageWorks™

TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library

(SWXTL-CL and SWXTL-CM)

User's Guide

Order Number: EK–SM1TG–UG. B01

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Revision Record

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.

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 TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library (SWXTL – CL and – CM).

Revision Level	Date	Summary of Changes
EK-SM1TG–UG. A01	January 1996	Original release
EK-SM1TG–UG. B01	March 1997	Revised Appendix C-Product Notes for Sun
		Revised Appendix E-Product Notes for Hewlett-Packard

About This Guide

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.

This guide provides product overview, installation, operation, and maintenance information for the TZ885 Model 100/200 GB DLT 5-Cartridge 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 Mini-library and defines the SCSI command signal set. Appendix A lists the physical, electrical, cooling, environmental, and environmental stabilization specifications for the tape drive.

Appendix B. Product Notes for Windows NT, Novell™ and MS-DOS™

Appendix B provides information for the system administrator about interfacing the TZ885 Model 100/200 GB Tape Drive with a host system operating under the Windows NT, Novell, MS-DOS, or MS-DOS/WINDOWS operating systems.

Appendix C. Product Notes for Sun

Appendix C provides information for the system administrator about interfacing the TZ885 Model 100/200 GB DLT Tape Drive with a Sun SPARC system running SunOS 4.1.x or Solaris 2.3 (or later).

Appendix D. Product Notes for IBM RS/6000

Appendix D provides information for the system administrator about interfacing the Mini-library with an IBM RS/6000 system running AIX3.2.5 (or later). The information covers the installation of the Mini-library hardware and configuring the system to communicate with the Mini-library.

Appendix E. Product Notes for Hewlett-Packard

Appendix E provides information for the system administrator about interfacing the Mini-library with an HP 9000 Series 700 system running HP-UX 9.05 (or later) or an HP 9000 Series 800 system running HP-UX 9.04 (or later). The information covers configuring the HP system to communicate with the Mini-library.

Associated Documents

In addition to this guide, the following documentation is useful to the reader:

Table 1 Associated Documents

Document Title	Order Number
DLT Cartridge Tape Handling Instructions	EK–TZ88N–RC
TZ88/TZ885/TZ887 Cartridge Tape Subsystem	EK–TZN57–PM

Conventions

This guide uses the following conventions:

Table 2 Style Conventions

Style	Meaning
boldface type	For emphasis
italic type	For emphasis and manual titles
`monospace type`	Screen text, file names, path names, directories, commands, and utilities

1

Introduction

This chapter introduces and describes the product features of the TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library. The chapter also describes of the data and cleaning tape cartridges, defines tape compatibility and provides tape cartridge ordering information.

1.1 Product Overview

The 5-Cartridge Mini-library , shown in Figure 1-1, is a high performance, streaming cartridge tape product designed for use on mid-range, and high-end computing systems. The Mini-library performs automatic tape operations, contains a ½-inch high-capacity DLT tape drive and a 5-cartridge, SCSI-2 medium changer device (loader) with a typical load /unload cycle time of 20 seconds. The Mini-library can provide unattended backup of 200 GB of data (compressed) at a rate of approximately 10.8 GB per hour.

The ½-inch tape drive uses data compression and compaction. The drive features a formatted capacity of 20 GB per CompacTape IV cartridge (40 GB compressed, assuming a 2:1 data compression factor) and a sustained user data transfer rate of 3 Mbytes/second. The drive has a dual-channel, read/write head and Lempel-Ziv (DLZ) high-efficiency data compression. A 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.

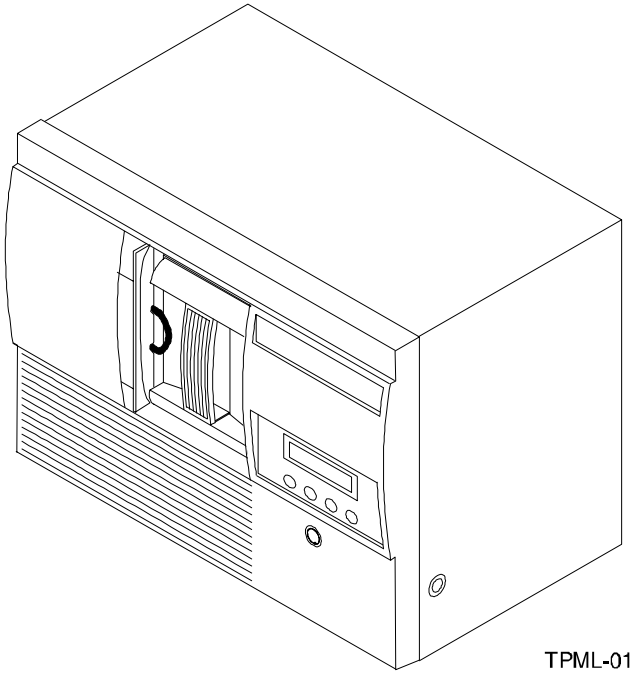
1.1.1 Fast Data Transfer Rate

Designed for unattended backups or archiving, the Mini-library has a maximum transfer rate of 1.5 Mbytes/second, uncompressed mode. In the compressed mode, the maximum transfer rate is 3.0 Mbytes/second write and 3.5 Mbytes/second read.

1.1.2 High Capacity

Using CompacTape IV tapes the Mini-library provides a total capacity of 100 Mbytes uncompressed or 200 Mbytes compressed. The magazine is removable and contains slots for 5 tape cartridges. Compression is selectable from the front panel or through the host by using a software command.

Figure 1–1 TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library



1.1.3 Compaction

The compaction feature of the Mini-library tape drive provides efficient data storage. A read/write data cache of 2.0 Mbytes allows working space for 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 Mini-library, the third generation of the Mini-library family, offers users a higher performance than, and double the capacity of, previous generations. It features an LCD display that shows the operation of the Mini-library with abbreviated messages.

The Mini-library drive's default density is 20 GB (TZ88 format) with compression enabled. The tape drive can also write 2.6 (TK85), 6.0 (TK86), and 10 GB (TZ87) tape formats for 100% interchange compatibility with earlier TZ8x drives. On a write from Beginning of Tape (BOT), if a different density is selected, the Mini-library reformats the cartridge.

Other data tape 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 GB can be read and written to by the tape drive. Refer to Table 1-1 to determine Mini-library cartridge compatibility.

Table 1-1 Read/Write Cartridge Compatibility with the Mini-library

Cartridge Type/Format (Capacity)	Read/Write Ability in the SWXTL-CL and -CM
CompacTape III/TK85 (2.6 GBF)	Read/write in 2.6 GB mode
CompacTape III/TK86 (6.0 GBF)	Read/write in 6.0 GB mode
CompacTape III/TK87 (10 GBF or 20 GBF compressed)	Read/write in 10 GB mode or 20 GB compressed mode
CompacTape IV/TZ88 (blank)	Read/write in 10, 10 compressed, 20 and 20 GB compressed densities

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 for 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.

1.2 Data Tapes

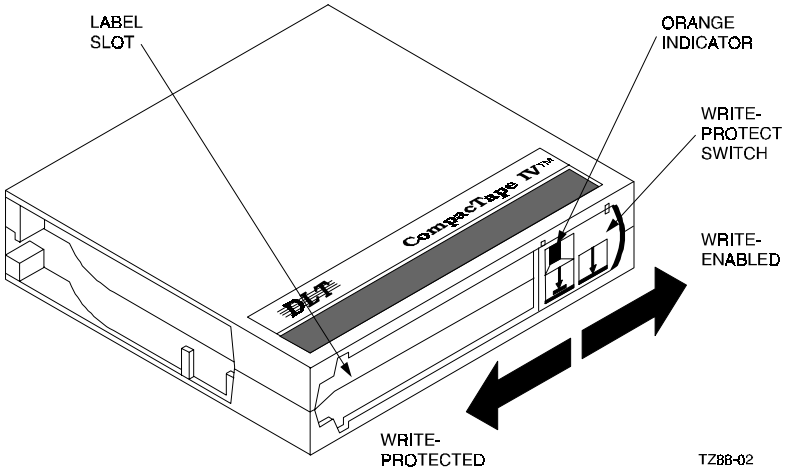
1.2.1 CompacTape IV Description

The CompacTape IV cartridge (shown in Figure 1–2) is a 4-1/8-inch square, black, plastic cartridge, containing 1800 (1778 usable) feet of 1/2-inch magnetic, metal particle (MP) tape. A write-protect slide switch prevents the tape drive from accidentally writing over previously stored data.

NOTE

CompacTape III tape cartridges can also be used with the Mini-library. The CompacTape III cartridge contains 1167 (usable) feet of 1/2-inch magnetic tape and has a storage capacity of 10 GB uncompressed and 20 GB compressed.

Figure 1–2 CompacTape IV Data Cartridge



1.2.2 Cartridge Packaging

Your CompacTape IV cartridge comes supplied with:

1. A set of slide-in labels
2. A cartridge-handling information sheet

1.3 Reading and Writing Data

The Mini-library's tape drive writes 64 pairs of tracks — 128 tracks total — on a CompacTape IV tape. The Mini-library's tape drive reads and writes data in a two-track parallel, serpentine fashion, traveling the entire length of tape on two tracks. The drive then steps the head, reverses tape direction, and continues to read/write on the next two tracks, repeating this same process for a total of 64 times per tape.

1.3.1 Write-Protect Switch

The CompacTape IV cartridge has a write-protect slide-bar switch on its front surface that prevents accidental erasure of data. When you move the switch to the left, a small orange rectangle appears in the aperture over the left arrow symbol indicating that the tape is write-protected. When you move the switch to the right, orange color covered, the tape is write-enabled and the tape drive can write to the tape. The symbols on the slide-bar switch indicate this function by depicting data flow as a downward-pointing arrow and the tape medium as a horizontal line below the arrow's point. The arrow on the left side of the slide-bar switch depicts a barrier line between the data-flow arrow and the tape; this symbolizes that the data cannot reach the tape when the switch is moved to the left. No such barrier line appears below the arrow on the right side of the switch, indicating that data can flow to the tape when the switch is moved to the right.

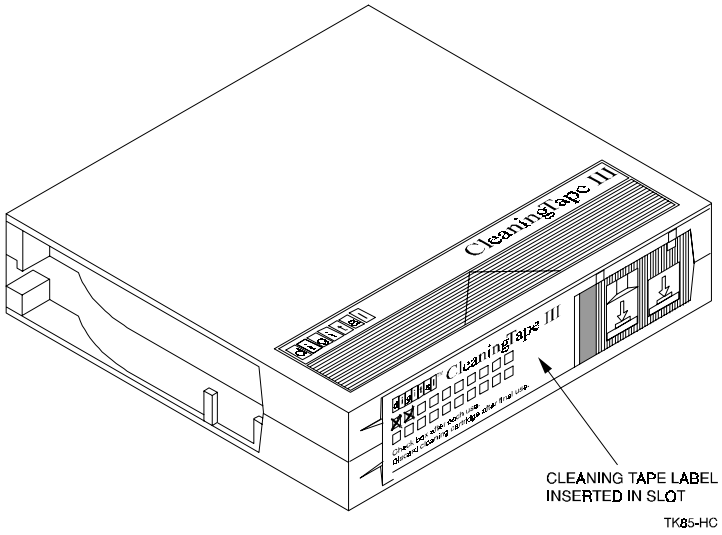
1.4 Head Cleaning Tape

Head cleaning tape is used to maintain the cleanliness of the read/write heads in the tape drive. Accumulation of dirt on the heads can cause read and/or write errors. The head cleaning tape should be used periodically, the length of the period depending on use of the drive.

1.4.1 CleaningTape III Description

The CleaningTape III cartridge is a 4-1/8-inch square, light yellow, plastic cartridge containing 1200 feet of 1/2-inch cleaning tape (see Figure 1–3).

Figure 1–3 Cleaning Tape



1.4.2 CleaningTape III Packaging

The CleaningTape III cartridge comes supplied with:

1. A slide-in label containing 20 boxes, one box to be checked off following each sequential use of the CleaningTape III cartridge.
2. A cartridge-handling information sheet.

1.4.3 CleaningTape III Cartridge Expiration

Each use of the CleaningTape III cartridge uses up some of the cleaning area on the tape. You can use the CleaningTape III cartridge approximately 20 times before the cleaning area is used up. After that many uses, the cartridge will be ineffective and should be replaced with a new cartridge.

To keep track of the number of times the tape has been used, place a check mark in one of the 20 boxes on the cartridge label after each cleaning.

1.5 Supplies

1.5.1 Cartridges Provided

Five CompacTape IV cartridges and one CleaningTape III cartridge are packed with each TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library.

1.5.2 How to Order Replacement Cartridges

You can order additional cartridges by contacting your Digital reseller.

Table 1–1 lists ordering numbers for the tape cartridges that can be used in the Mini-library. Tapes are available in various quantities.

Table 1–2 Ordering Numbers for Data Tapes and Cleaning Tape

CompacTape III Tapes	
Order Number	**Description**
TK85-HC	CleaningTape III Head Cleaning Cartridge
TK85K-01	CompacTape III Data Cartridge (quantity, 1)
TK85K-07	CompacTape III Data Cartridge (quantity, 7)
TK85K-A1	CompacTape III Data Cartridge (quantity, 945)

CompacTape IV Tapes	
Order Number	**Description**
TK88K-01	CompacTape IV Data Cartridge (quantity, 1)

2

Installing and Operating the Mini-library

This chapter describes the unpacking, installation, general configuration rules, Power On Self Test (POST), and operation of the Mini-library. It also discusses when to use a cleaning tape cartridge.

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. 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-CL or -CM	1
CompacTape IV tape cartridge	TK88K-01	5
Head cleaning cartridge	TK85-HC	1
Power Cord		1
SCSI terminator connector	12-30552-01	1
User's guide	EK-SM1TG-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[1]	Low-Density (50-pin)	Low-Density (50-pin)	BC19J-1E (18 inches) BC19J-06 (6.0 feet)
Low-Density to High-Density Cable[2]	Low-Density (50-pin)	High-Density (50-pin)	BC23G-01 (3.0 feet) BC23G-02 (6.0 feet)

[1] The 50-pin low- to low-density cable is compatible with most ISA-type SCSI-bus adapters.
[2] The 50-pin high-density is compatible with either of:
a. Most EISA-bus SCSI adapters.
b. Daisy-chain connection to StorageWorks SCSI storage enclosures.

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. Refer to Table 2–2 for cable types and ordering numbers.

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** (“0”) whenever loosening or tightening the shipping screw. Always remove the tape cartridges from the magazine before shipping the Mini-library.

After unpacking the Mini-library, be sure to:

1. Ensure the power switch (Figure 2-1) on the rear panel of the Mini-library is set to off (0).
2. Connect the power cord to the rear panel of the Mini-library (Figure 2-1).
3. Connect the other end of the cord to a nearby ac outlet

Figure 2–1 Mini-library Rear Panel

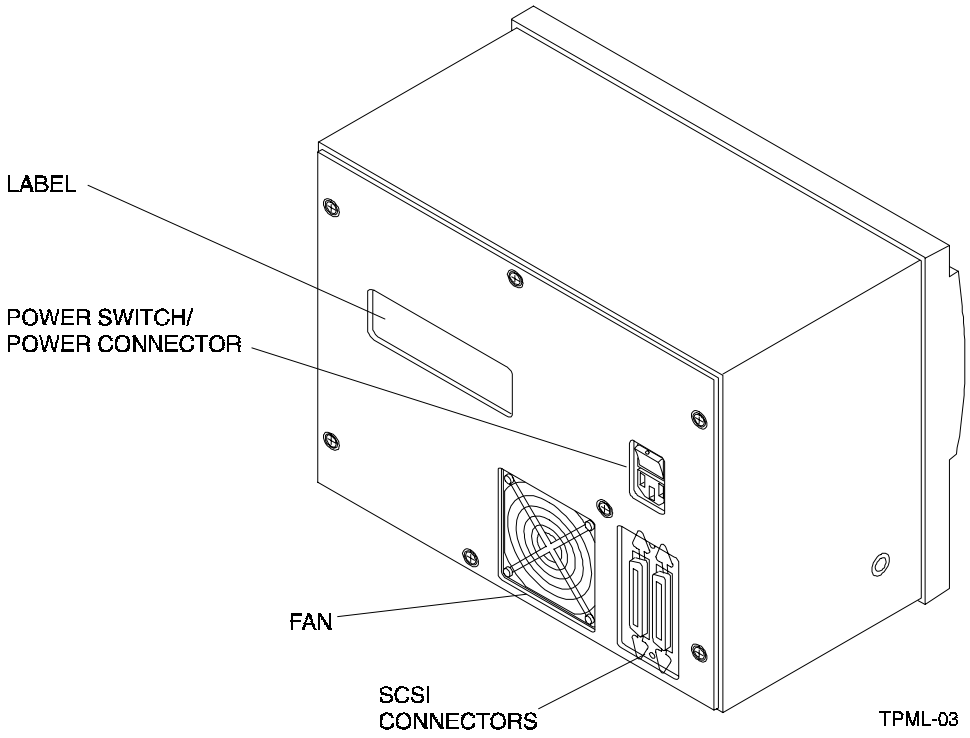
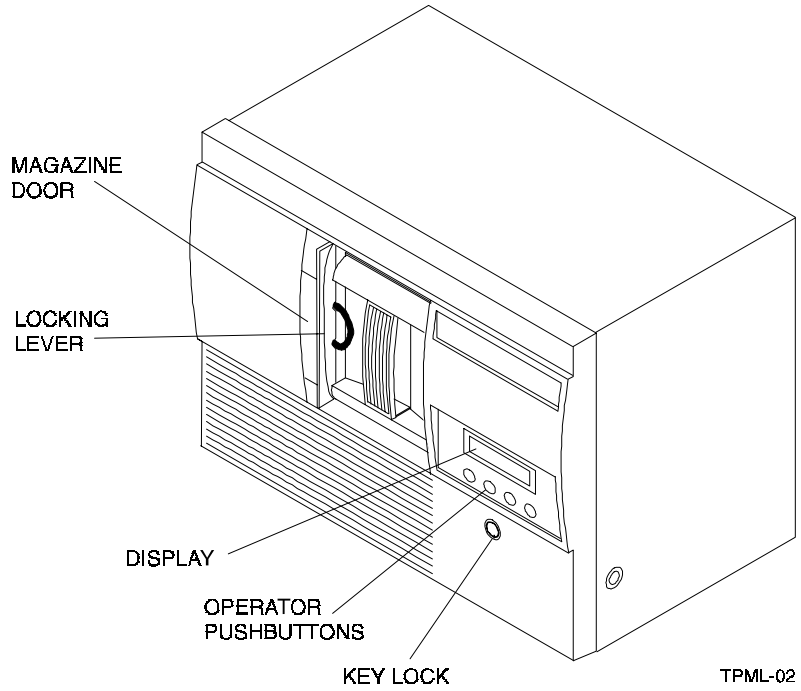


Figure 2–2 Mini-library Front Panel



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.

4. 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

If the Mini-library is . . .	Then . . .
The last or only device on the bus and you are going to terminate the cables externally	1. Connect the SCSI terminator to the right SCSI connector on the Mini-library rear panel (Figure 2-1). 2. Snap the wire cable clamps into place to secure the terminator.
Not the last or only device on the SCSI bus	Ensure to install the terminator at the end of the SCSI bus.

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

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.

8. Push the locking lever (shown in Figure 2-2) up to unlock the magazine. To remove the magazine from the Mini-library, pull the magazine handle straight forward.

2.3 Introduction to the Mini-library

The Mini-library includes a TZ885 tape drive, a media loader, and a 5-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 a 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 a SCSI UNLOAD command (Table 2-4).

Table 2–4 SCSI-2 Command Conditions

If. . .	Then . . .
An UNLOAD is specified.	After winding the tape back into the cartridge and moving the cartridge from the drive to its slot, 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 factory.

2.4.1 Configuration Guidelines

Your system uses the SCSI ID to identify, or address, the Mini-library. Follow the guidelines provided in (Table 2-5) when configuring 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 2-1) 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, connect a SCSI bus terminator 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. The sequence is 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	LDR RST (loader reset)
2	LDR ACT (loader active)
3	Slot numbers are displayed as each slot is checked for media. (Elevator goes up and down.)
4	LDR RDY (loader ready)

Table 2–7 POST Test Analysis

If ...	Then ...
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: 1. SCSI bus is terminated properly. 2. Set the Mini-library power switch to off and then back on. If the POST test fails again, call your service representative.

2.6 Mini-library Operator Control Panel

The operator control panel contains four push-button switches as shown in Figure 2-3. Table 2-8 identifies the switches and defines their functions.

Figure 2–-3 Mini-library Operator Control Panel

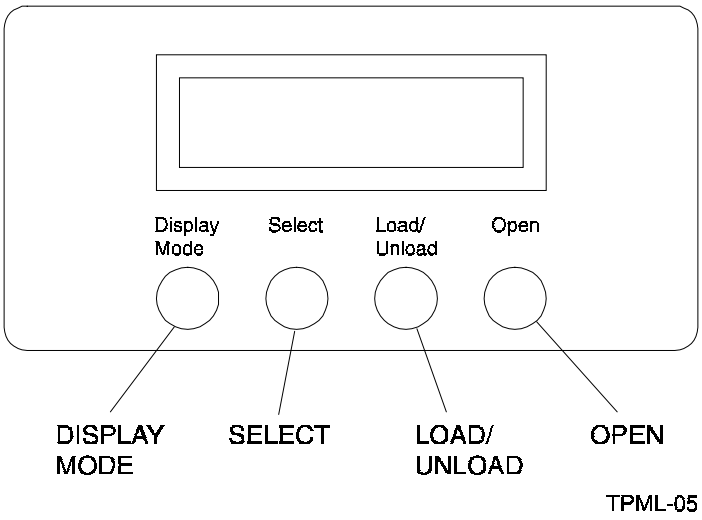


Table 2–8 Operator Control Panel Functions

Push-button	Function
Display Mode	Puts the Mini-library in the Normal, Density Select, or SCSI ID Select mode.
Select	• Selects SCSI ID and density. • Moves, in increments, the current slot number on the display to the next slot number.
Load/Unload	• Loads the cartridge currently selected into the tape drive. • Unloads the cartridge currently in the drive. • Resets the Mini-library if a loader error has occurred. When the ERR LDR message displays, press the Load/Unload button to reset the Mini-library
Open	• If power is on and the unit unlocked, opens the magazine door allowing access to the magazine for loading and unloading cartridges.

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: • The write-protect switch on the cartridge is set to the write protect position • Host software write-protect qualifiers
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 ERR MAG or ERR LDR message to show error type.

Table 2–9 Operator Control Panel Display Messages (Continued)

Display Message	Description
DNS SEL	The Mini-library is in the Density Select mode.
OVR	Tape drive activity is as follows: • *On* continuously indicates "density" on front panel • *Off* (default) indicates "density" selected automatically • *Flashing* indicates Mini-library is in "density selection" mode
2.6	Tape drive activity is as follows: • *On* continuously indicates tape is recorded in 2.6 GB format • *Flashing* indicates the tape is recorded in another density. You have selected this density for a write from BOT
6	Tape drive activity is as follows: • *On* continuously indicates tape is recorded in 6 GB format • *Flashing* indicates the tape is recorded in another density. You have selected this density for a write from BOT
10	Tape drive activity is as follows: • *On* continuously indicates tape is recorded in 10 GB format • *Flashing* indicates the tape is recorded in another density. You have selected this density for a write from BOT
10C	Tape drive activity is as follows: • *On* indicates Compression mode enabled • *Off* indicates Compression mode disabled
20	Tape drive activity is as follows: • *On* continuously indicates tape is recorded in 20 GB format • *Flashing* indicates the tape is recorded in another density. You have selected this density for a write from BOT
20C	Tape drive activity is as follows: • *On* indicates Compression mode enabled • *Off* indicates Compression mode disabled

2.7 Key Lock

The key lock on the front panel of the Mini-library (Figure 2-2) 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 2-2). 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 push-buttons are disabled

2.9 Operator Control Panel Unlocked (Enabled)

When the operator control panel push-buttons are unlocked or enabled, it allows the operator to 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 2-3).
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 methods:

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 20 GB with compression (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

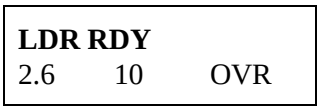
To select density via the front panel:

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:



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

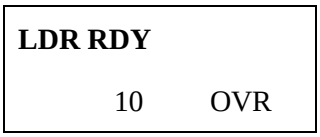


Table 2-10 shows the results.

Table 2–10 Results of Not Using or Using Density Select Mode

If . . .	Then . . .
You did not use the Density Select mode	The display shows the actual density when the tape is reading and writing.
You used the Density Select mode and the actual tape density is the same as the density you selected.	The display shows the actual density and OVR on continuously.
You used the Density Select mode and the actual tape density differs from the density you selected.	On operation before “Write from BOT”, the display shows: • Actual tape density on continuously • Selected density flashing • OVR flashing On operation after “Write from BOT”, the display shows: • Selected density on continuously • OVR on continuously

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 *TZ88/TZ885/TZ887 Cartridge Tape Subsystem (EK-TZN57-PM).*

2. Write data to the tape from BOT.

2.11.3 Native Default Density 20 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 20 GB, compression enabled.

2.12 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

If the display says . . .	It 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

If the display says . . .	It means the . . .
DNS SEL	Mini-library is in the Density Select 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

If the display says . . .	It means the . . .
SCSI ID SEL	Mini-library is in the SCSI ID Select 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.

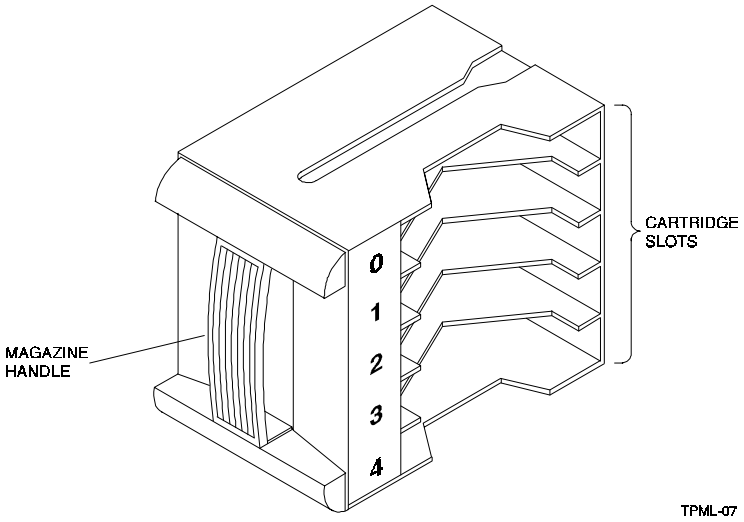
2.12.4 Code Update Mode

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

2.13 Inserting a Cartridge into the Front of the Magazine

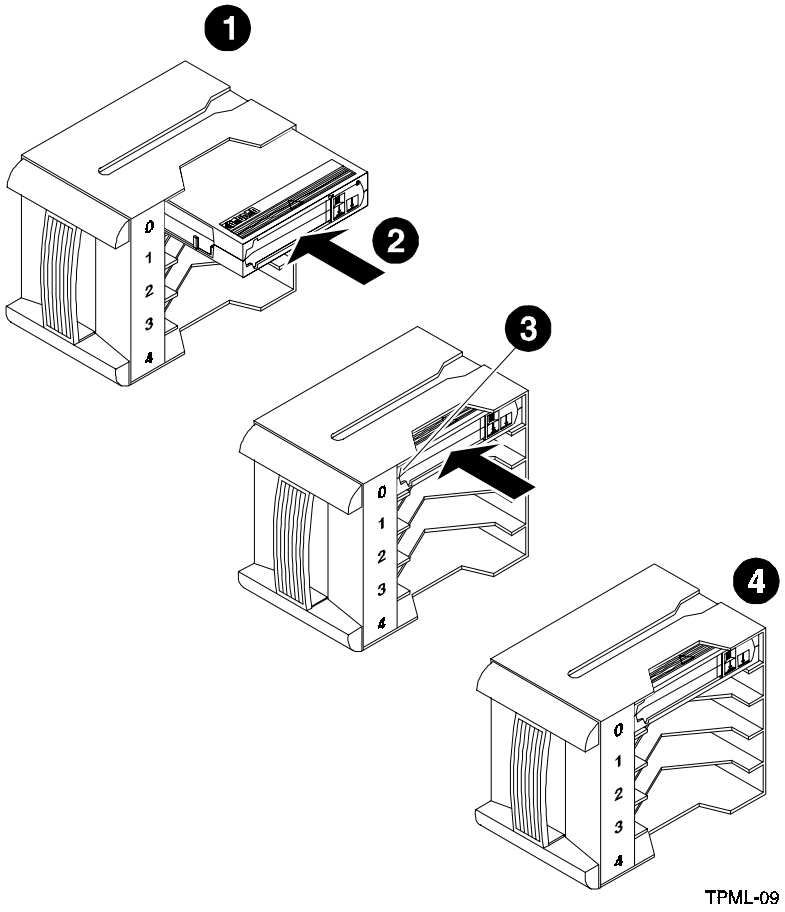
Up to 5 tape cartridges can be inserted into the magazine. The cartridge slots are numbered 0 through 4 on the front of the magazine (Figure 2-4). Cartridges can be inserted in the magazine only from the front.

Figure 2–4 Mini-library Magazine



1. Set the cartridge's write-protect switch to the desired position. To write to the tape cartridge, slide the switch to the right, or to the left to write protect it.
2. Place the magazine on a flat surface with the slots facing you (Figure 2-5). (Each slot is numbered to ensure you are inserting the cartridge correctly into the front of the magazine.)
3. Insert a cartridge into the magazine by pushing it into the slot until you hear a click and a small metal tab locks the cartridge in place.

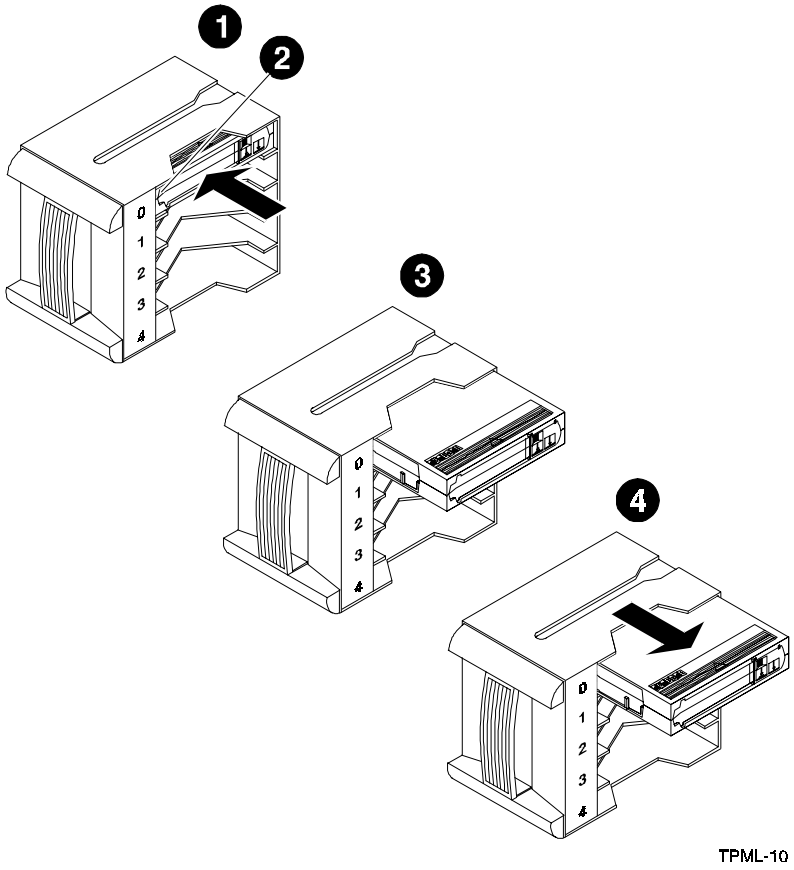
Figure 2–5 Inserting a Cartridge into the Magazine.



2.14 Removing a Cartridge from the Magazine

To remove a cartridge from the magazine (Figure 2-6) press in on the cartridge where you can see the metal tab next to the slot number until the cartridge stops and you hear a click, then release it. The slot has a spring-release action.

Figure 2–6 Removing a Cartridge from the Magazine



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.

2.15 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 2-2). 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 it 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.

2.16 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 2-5). 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 and flip the locking lever down.

2.17 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.

2.18 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 2-14.

Table 2–14 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.
4	The display reads LDR ACT until the tape has loaded to the beginning of the tape (BOT).
5	After the cartridge is loaded into the drive, the display reads DRV ACT.
6	After the cartridge is fully loaded and at BOT, the display reads DRV RDY.

2.19 Unloading the Cartridge

To unload the cartridge from the tape drive to the magazine, press the Load/Unload push-button and observe the unloading sequence as described in Table 2-15.

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 2-15. Unloading the Cartridge

If . . .	Then . . .
You want to unload the cartridge from the drive.	Press the Load/Unload push-button and observe the following: • The DRV REW message displays • The cartridge unloads from the drive and the display reads LDR ACT • When the cartridge returns to the magazine, the display reads LDR RDY
The ERR LDR message displays, showing a malfunction.	Press the Load/Unload push-button to reset the Mini-library and try to clear the error.

2.20 Opening the Magazine Door

The Open push-button opens the magazine door for insertion or removal of the magazine. (Before the magazine can be removed, the locking lever must be is the up position.) The push-button is disabled when the key lock is in the locked or disabled position. Table 2-16 describes magazine door operations.

Table 2–16 Opening the Magazine Door

When . . .	Then . . .	You should . . .
A cartridge is not in the drive	The LDR RDY message displays before any operation begins.	Press the Open push-button. The door opens.
A cartridge is in the drive.	The DRV RDY message displays before the operation begins.	Press the Open push-button so the cartridge unloads from the drive and moves back into the magazine. The door opens.

In both situations described in Table 2-16, 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.

2.21 When to Use the Cleaning Tape Cartridge

Use Table 2-17 to determine when to use the cleaning cartridge. The cleaning cartridge expires after approximately 20 uses.

Table 2–17 When to Use the Cleaning Cartridge

If . . .	It means . . .	And you should . . .
1. The HC 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 LDR RDY message displays.
2. A data cartridge causes the HC 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.
3. The HC message still displays after you clean the drive head.	Your data cartridge may be causing the problem.	Try another cartridge.
4. The HC message displays after you load the cleaning cartridge.	Cleaning has not been done and the cartridge is expired.	Replace the cleaning cartridge.

2.22 Preserving Cartridges

To maximize the life of recorded or unrecorded cartridges, store cartridges in a clean environment with the following conditions:

- Do not drop or bang the cartridge. Doing so can displace the tape leader, making the cartridge unusable and possibly damaging the drive.
- Keep tape cartridges out of direct sunlight and away from heaters and other heat sources.
- Store tape cartridges in temperatures between 10ºC and 40º C (50ºF to 104ºF). For longer cartridge life, always store the cartridge in its plastic container and in room temperature environment conditions, 22ºC ± 4ºC (72ºF ± 7ºF).
- If the tape cartridge has been exposed to heat or cold extremes, stabilize the cartridge at room temperature for the same amount of time it was exposed—up to 24 hours.
- Do not place cartridges near electromagnetic interference sources, such as terminal, motors, video, or X-ray equipment. (Data stored on the tape can be altered by the electromagnetic interference created by such sources.)
- Store tape cartridges in a dust-free environment where the relative humidity is between 20% and 60%.

3

Code Update (From Tape)

This chapter describes the process of updating the Mini-library's tape drive controller board firmware.

3.1 Code Update Overview

The 5-Cartridge Mini-library can automatically update the controller board firmware directly from a tape containing the updated code. The code is updated by placing the Mini-library into the code (firmware) update mode via the operator control panel and loading the tape cartridge containing the new code image file. The Mini-library automatically reads and verifies the tape information as a valid Mini-library code image. If the image data passes all the verifications, the image data is installed into the controller's non-volatile code memory.

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.

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, the bus must be properly terminated.

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, refer to the SCSI WRITE BUFFER command section in the *TZ88/TZ885/TZ887 Cartridge Tape Subsystem Manual (EK-TZN57-PM).*

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, move the locking level up and remove the magazine. Then close the door.
   - Remove all cartridges from the magazine and install the code update cartridge into magazine slot 0.
   - Press the Display Mode push-button until the SCSI ID SEL message is displayed (approximately 5 seconds).
   - Press and hold (for about 5 seconds) the Load/Unload push-button until the SCSI ID SEL message flashes. When the flashing starts, 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, close and lock 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 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.	The update failed. The drive may reset and the ERR UNK message may display. The Mini-library should still be usable, but this depends on why the update failed. The reasons for failure could be: • The code update cartridge contains a corrupted image file or the file is built improperly.	1. Press the Unload button to unload the tape cartridge from the drive. 2. Press the Open button to open the magazine door. 3. Unlock and remove the magazine, then close the door. The Mini-library does an elevator scan. 4. Open the door again. The message LDR RDY displays. 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. If you still cannot do the update, call your service representative.
	• The tape cartridge with the valid update image is not readable.	1. Press the Unload button to unload the tape cartridge from the drive. 2. Press the Open button to open the magazine door. 3. Unlock and remove the magazine, then close door. The Mini-library does an elevator scan. 4. Open the door again. The message LDR RDY displays. 5. Rebuild the valid image on a good cartridge. 6. Try the code update procedure again using the valid tape image. If you still cannot do the update, call your service representative.
A power failure occurs during the code update.	The drive may be unusable.	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.
A controller failure occurs.	The drive is most likely unusable and needs to be replaced.	Turn off Mini-library power and turn power back on again. If you still have a drive controller failure, call your service representative.

4

Troubleshooting

This chapter provides troubleshooting tips for the Mini-library. It defines common errors and provides information to help diagnose and correct common problems.

4.1 Mini-library Push-button Conditions

Review the information in the previous chapters to ensure you are correctly operating the 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	• Magazine contains at least two cartridges • LDR RDY displays	Select
Load the selected cartridge into the tape drive	• Magazine contains at least one cartridge • LDR RDY displays	Load/Unload
Return the selected cartridge to its original slot in the magazine.	DRV RDY displays	Load/Unload
Clear a magazine or loader error.	ERR MAG or ERR LDR displays	Load/Unload
Open the door or unload the cartridge from the drive.	LDR RDY displays	Open

4.2 Backup Operation Failures

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

Loading write-protected CompacTape IV 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.

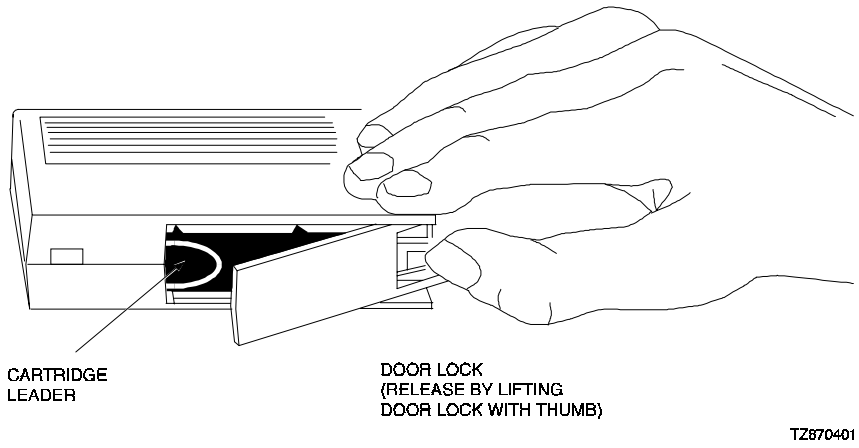
Use CompacTape IV cartridges

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



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 a 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.

4.4.8 Unknown Error Description

The ERR UNK message tells you the mini-library detected an error of unknown origin. In some unknown errors, the mini-library tries to correct the error three times before showing failure.

4.4.9 Clearing the Unknown 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. If you still cannot clear the error, call your service representative.

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

A

Specifications

This appendix contains the technical specifications for the mini-library and the internal TZ885 tape drive, and lists 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.
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)
Certification	
EMI	FCC class A, CE Mark Level 1 and VCCI Level 1
Safety (Qualified to:)	• UL 1950 Information Technology Inc., Electrical Business Systems • CSA C22.2 950-M89-Information Technology Inc. Electrical Business Systems • TUV EN60950, IEC 950, DIN VDE 0805 AS 05.92 DIN VDE 0805 AC 05.92
Non-operating altitude	0 to 12,000 ft. (0 to 3658 m)

Table A–2 TZ885 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	81,633 bits/in.
Number of tracks	128
Transfer rate, raw native	2.5 MB/sec.
Transfer rate, user native	1.5 MB/sec.
Transfer rate, user compressed[1]	3.0 MB/sec., maximum write 3.5 MB/sec., maximum read
Read/write tape speed	110 in./sec.
Track format	Two-track, parallel serpentine recording
CompacTape IV cartridge capacity	20.0 GB formatted, native 20.1 40.0 GB formatted, compressed
Total capacity	200 GB[1]
Backup time	Approximately 11 hrs. (200 GB, compressed)
Reliability	
Subsystem MTBF (10% duty cycle)	30,000 hrs.[2]
Mechanical	500,000 cycles

[1] Assumes a 2:1 compression ratio. However, actual compression ratio may vary as a function of data type.

[2] 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.

B

Product Notes for Windows NT, Novell, MS-DOS and Windows

This appendix provides information for the system administrator. It should be read before installing and using the TZ885 Model 100/200 GB DLT 5-Cartridge 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 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 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. 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.

C

Product Notes for Sun

This appendix describes using the TZ885 Model 100/200 GB DLT 5-cartridge Mini-library with a Sun™ SPARC system running Solaris™ 2.3 (0r later) and SunOS™ 4.1.x. The appendix contains two major topics: operating system modifications and Mini-library operation.

C.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 selection, the drive must be in automatic, the default state of the Mini-library. If you used the Density Select push-button to set density, before initiating host control of density selection, clear the front panel by pressing the Density Select push-button. The Mini-library defaults to the highest possible write density for the tape type loaded in the tape drive. For a CompacTape IV, this setting is 20C.

C.2 Modifications Required for SunOS 4.1.x

C.2.1 Installation Procedure

NOTE

In order to support the addition of this device, the 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.2.1.1 System Modification

Perform the following steps to modify the system for communication with the Mini-library:

1. From the command line, type:

```
cd /sys/scsi/targets
```

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

```
/* TZ885 200GB DLT Streaming /w Compression Cartridge tape drive */
{
   "DEC TZ885 200GB Cart. DLT Steaming /w Compression", 13 ,
   "DEC     TZ885",ST_TYPE_DEFAULT, 0,
   (ST_BSF | ST_VARIABLE | ST_LONG_ERASE | ST_KNOWS_EOD),
   5000, 5000,
   { 0x80, 0x81, 0x82, 0x83 },
   { 0, 0, 0, 0 }
},
```

3. Verify that the above entry is added to the `st_conf.c` file correctly.

Where,

- The first parameter (`DEC TZ885 200GB Cart. DLT Streaming /w Compression`) is the name given to the drive.
- The second parameter (`13`) is the length of the vendor ID provided by the "inquiry" command.
- The third parameter (`DEC  TZ885`) is the vendor ID. (Ensure that five spaces are included between "`DEC`" and "`TZ885`" elements.)
- The fourth parameter (`ST_TYPE_DEFAULT`) is the drive type for the driver.
- The fifth parameter (`0`) is the block size in bytes. Zero "0" means variable block size.
- 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 (`0x80, 0x81, 0x82, 0x83`) comprises the density codes (low-high) as defined below:

> **NOTE**
>
> In our example entry we choose to use TK87 native and compressed modes for the two lower densities and TK88 native and compressed modes for the two higher density drivers. Because your situation may demand something other than these settings, we have included Table C–1 which lists all other valid density values. Refer to Table C–1 for other density settings.

- 0x80 is the vendor-unique density code for the TK87 (10 GB).
- 0x81 is the vendor-unique density code for TK87 (20 GB).
- 0x82 is the vendor-unique density code for the TK88 native in the uncompressed mode (20 GB).
- 0x83 is the vendor unique code for the TK88 in the compressed mode (40 GB).
- The tenth parameter (0,0 . . .) is the speed code (not used).

Table C–1 Density Codes for Sun and Solaris

Density Code	Meaning
00h	Use default density
0Ah	TK50 – 6667 bpi MFM serial cartridge tape X3B5/86-199 (read-only)
16h	TK70 – 10000 bpi MFM serial cartridge tape X3.193-1990 (read-only)
17h	TK85 – 42500 bpi FMF serial cartridge tape X3B5/91-1174, 2.6 GB
18h	TK86 – Same as TK85 except with 56 track pairs versus 24, 6.0 GB
19h	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 10 GB
1Ah	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 20 GB (without compression)
7Fh	No change from previous density (Mode Select)
80h	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 10 GB (without compression)
81h	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 20 GB (with compression)
82h	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 20 GB (without compression)
83h	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 40 GB (with compression)

C.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.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 Mini-library. Verify that "`DEC TZ885 200 GB 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 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 0x80 density mode (TK87 format)
- ***rst12*** and ***nrst12*** correspond to the 0x81 density mode (TK87 compressed format)

- ***rst20*** and ***nrst20*** correspond to the 0x82 density mode (TK88 native format)
- ***rst28*** and ***nrst28*** correspond to the 0x83 density mode (TK88, *compressed* format)

C.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.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.2.2 Dump Parameters for the Tape Drive

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

- density = 81633 (BPI)
- size = 1800 (1800-foot tape)
- blocking factor = 128

Example 1

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

```
dump 0dsbf 81633 1800 128 /dev/rst28 /dev/sd0g
```

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

C.3 Modifications Required for Solaris 2.3 (or later)

C.3.1 Installation Procedure

NOTE

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.3.1.1 System Modification

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

From the command line, type:

```
cd /kernel/drv
```

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

```
# entry for TZ885 tape drive
tape-config-list = "DEC     TZ885",
"DEC 200GB Cart. DLT Streaming /w Compression", "TZ885-data";
TZ885-data = 1,0x36,0,0x1639,4,0x80,0x81,0x82,0x83,3;
```

where:

In the **"tape-config-list"** parameter:

- The first parameter (`DEC  TZ885`) is the parameter returned by the TZ885 Model 100/200 GB DLT Mini-library on a SCSI inquiry command. (There should be five spaces between "`DEC`" and "`TZ885`" elements.)
- The second parameter (`DEC 200GB Cart. DLT Streaming /w compression`) is a *nickname* for the drive.
- The third parameter is defined as follows:

  In the "TZ885-data" string:

  — The first parameter (1) is the revision level of the software and is set to 1. 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. Zero "0" means 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, which is a Sun Operating System limitation.

NOTE

In our example entry we choose to use TK87 native and compressed modes for the two lower densities and TK88 native and compressed modes for the two higher density drivers. Because your situation may demand something other than these settings, we have included Table C–1 which lists all other valid density values. Refer to Table C–1 for other density settings.

— The sixth parameter (`0x80`) is the vendor-unique density code for the TK87, 10 GB.

— The seventh parameter (`0x81`) is the vendor-unique density code for TK87, 20 GB *compressed* mode.

— The eighth parameter (`0x82`) is the vendor-unique density code for the TK88, 20 GB.

— The ninth parameter (`0x83`) is the vendor-unique density code for the TK88 40 GB *compressed* mode.

— The last parameter in the **SWXTL-data** parameter is the default density 3, TK88 in the 40 GB *compressed* mode.

C.3.1.2 System Shutdown

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

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

C.3.1.3 Installation of the Mini-library

Install the Mini-library and power on the workstation. We recommend that the TZ885 Model 100/200 GB DLT Mini-library 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.3.1.4 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 TZ885 Model 100/200 GB DLT Mini-library. Since you booted the system using the verbose switch, the system displays all of its SCSI targets. Verify that "`DEC 200GB 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***, ***x****l*, ***x****m*, ***x****h*, ***x****c*, and ***x****u*, where ***x*** is the **rmt** number).

- Options ***x***, ***x****u*, and ***x****c*, correspond to the 0x83, (TK88, *compressed*) density mode.
- Option ***x****l*, corresponds to the 0x80 (TK87) density mode.
- Option ***x****m* corresponds to 0x81 (TK87, compressed) density mode.
- Option ***x****h* corresponds to 0x82 (TK88, *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 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 0x80 density mode (TK87 *native* format)
- ***rst12*** and ***nrst12*** correspond to the 0x81 density mode (TK87 *compressed* format)
- ***rst20*** and ***nrst20*** correspond to the 0x82 density mode (TK88, *native* format)
- ***rst28*** and ***nrst28*** correspond to the 0x83 density mode (TK88, *compressed* format)

C.3.1.5 Test

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.3.1.6 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.3.2 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.3.3 Dump Parameters for the Mini-library

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

density (d) = 81633 (BPI)

blocking factor = 128

Example,

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

```
ufsdump 0dbf 81633 128 /dev/rmt/dev/rdsk/c0t3d0s6
```

C.4 Mini-library 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 1800 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.

C.4.1 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/sbin/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 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 0ulf /dev/rmt/0 /usr
```

where:

0 dump the entire file system

u update the dump file data

l wait up to two minutes for tape to unload and then load new tape

f specifies the file system to dump

C.4.2 SunOS 4.1.x and Solaris 2.x

Sun operating systems contain a magnetic tape control utility called mt that can be used with the `offline` switch to cause the Mini-library autoloader to unload and then load the next tape. For additional information refer to the "`man`"

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.

`offline, fewoffl` - loads and unloads the tape. Cycles autochanger to next tape. When used on the 7th tape, the autochanger stops and does not cycle to the first slot.

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

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
```

D

Product Notes for IBM RS/6000

This appendix provides information for the system administrator. It should be read before installing and using the Mini-library with a host system with the AIX 3.2.5 (or later) operating system.

D.1 Modifications Required to Operate the Mini-library with AIX 3.2.5 (or later)

After the Mini-library tape drive has been properly attached to the SCSI bus, install the device using "smit" or by executing specific commands while logged into the root account. Section D.1.1 below describes how to install the tape drive using the fast-path command `(smit dev)`. Section D.1.2 describes how to install the device using the command-line interface.

D.1.1 Installing the Mini-library Using the SMIT Command

While the Mini-library can operate with a variable block size (0, specified) or the conventional values of 512 or 1024, for best performance, use a block size of at least 10240.

1. From the command line, type:

   ```
   # smit dev
   ```

2. Select menu entry "Configure the devices you have added after the IPL".
3. Select menu entry "Change/show the characteristics".
   a) Select the entry that matches the controller and target ID of your installation.

   Example: rmt1 available 00–0**3**–00–**5**0 other SCSI tape drive

   where **3** is the SCSI controller number and **5** is the SCSI target ID

   b) On the menu, change the settings of the "BLOCK size", "DENSITY setting #1", and "DENSITY setting #2".

   Set “BLOCK size” to **10240**.

   Set “DENSITY setting #1” to **131**.

   Set “DENSITY setting #2” to **130**.

   Density codes are listed in Section D.1.2 below.

   c) Accept the changes.

D.1.2 Installing the Mini-library Using Command-Line Interface

1. From the command line, type:

```
# cfgmgr
```

2. To determine which *rmt* has been added, type:

```
# lsdev –Cc tape
```

Example:

```
# lsdev –Cc tape
```

Name	Status	Location	Description
rmt0	Available	00–03–00–50	Other SCSI Tape Drive

3. Next, type:

```
# chdev –l <rmt*> –a density_set_1=131 –a density_set_2=130
```

4. Finally, type the following:

```
# chdev –l <rmt*> –a block_size=<SIZE>
```

Example:

```
# chdev –l rmt0 –a block_size=10240
rmt0 changed
```

where,
<rmt*> is the tape drive added as shown by the lsdev command.
<SIZE> is the fixed block size (0 = variable, 10240 is suggested).

Density code “131” specifies compressed format while “130” specifies uncompressed format. In rare cases, other density codes may be useful. The legal values for the density code are listed in the following table:

Density Code	Meaning
10	TK50 – 6667 bpi FMF serial cartridge tape X3B5/86-199 (read-only)
22	TK70 – 10000 bpi FMF serial cartridge tape X3.193-1990 (read-only)
23	TK85 – 42500 bpi FMF serial cartridge tape X3B5/91-1174, 2.6 GB
24	TK86 – Same as TK85 except with 56 track pairs versus 24, 6.0 GB
25	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 10 GB
26	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 20 GB (without compression)
127	No change from previous density (Mode Select)
128	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 10 GB
129	TK87 – 62500 bpi, 64 track pairs, serial cartridge tape, 20 GB (with compression)
130	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 20 GB (without compression)
131	TK88 – 81633 bpi, 64 track pairs, serial cartridge tape, 40 GB (with compression)

The files that are created are:

Tape Drive Special File Characteristics			
Special File Name	**Rewind-on-Close**	**Retention-on Open**	**Bytes-per-Inch**
`/dev/rmt*`	Yes	No	Density Setting # 1
`/dev/rmt*.1`	No	No	Density Setting # 1
`/dev/rmt*.2`	Yes	Yes	Density Setting # 1
`/dev/rmt*.3`	No	Yes	Density Setting # 1
`/dev/rmt*.4`	Yes	No	Density Setting # 2
`/dev/rmt*.5`	No	No	Density Setting # 2
`/dev/rmt*.6`	Yes	Yes	Density Setting # 2
`/dev/rmt*.7`	No	Yes	Density Setting # 2

NOTES

1. The suggested values of *density setting #1* and *#2* are for compressed and uncompressed format respectively. The only use of uncompressed format is to determine the relative effectiveness of the compressed mode.

2. The *density value* can be useful in reading tapes on earlier TK50, TK70, TK85, TK86 and TK87 cartridges.

3. IBM-supplied tape drives default to a block size of 1024 while tape drives from other manufacturers default to a block size of 512. StorageWorks recommends changing the block size of the Mini-library to be compatible with the IBM-supplied drives. However, for some uses such as making bootable tapes or transferring tapes between host systems, a value of 512 or 0 (variable size) may be needed.

E

Product Notes for Hewlett-Packard

This appendix describes how to include the Mini-library in an HP 9000 Series 700 system running HP-UX 9.05, 10.01, 10.10 or 10.20 and an HP 9000 Series 800 running HP–UX 9.04, 10.01, 10.10 or 10.20. The information covers configuration of the host system to communicate with the Mini-library.

E.1 General Information

If the necessary tape and autochanger drivers are not already built into your existing kernel, you will need to rebuild your kernel. To see what drivers are currently installed, issue the `lsdev` command.

When using the `dump` utility, you must supply the correct density code and tape length size for `dump` to use in its calculations. Refer to Section E.6 for details.

For this device to be recognized and operational on the S800 servers, its product ID needs to be changed to that of a DLT4500. Refer to the HP 800 Series Support Kit Application (NOTE: Rev C01 or later) supplied with the 20/40 GB DLT HP 800 Series Support Kit for modification instructions.

Also refer to Section E.2 to determine if your particular configuration requires device modification.

E.1.1 Known Problems

- The UNIX utilities `fbackup` and `frecover` do not function with this device on operating system revision level 10.x using the current revision stape driver.
- The Mini-library will not write in compressed mode running operating system revision level 10.x using the default device special files and the current version of the HP stape driver. Use the front panel Density Select push-button to write in the compressed mode.

E.2 Modifications Required

Operating System Patches: There are several patches to be applied to the operating system for DLT support. All of them may be obtained directly from Hewlett-Packard. Before physically connecting the Mini-library to the system, install the appropriate patches and tape drivers and the associated device files will be created automatically for the device on reboot.

- For OS Release 9.04, install patches PHKL_7643, PHCO_3031, PHCO_2983.
- For OS Release 9.05, install patch PHCO_2983.
- For S700 workstations running OS Release 10.01, install patches PHKL_8502 and PHCO_8968.
- For S700 servers running OS Release 10.10, install patches PHKL_8504 and PHCO_8968.
- For S800 servers running OS Release 10.01, install patches PHKL_8503, PHKL_8124, PHKL_8613, PHCO_8968.
- For S800 servers running OS Release 10.10, install patches PHKL_8505, PHKL_8614, PHKL_8152 and PHCO_8968.
- For S800 servers running OS Release 10.20, install patches PHKL_8055, PHKL_8507, PHKL_9307 and PHCO_9228.
- For S700 workstations running OS release 10.20, install patches PHKL_8506 and PHCO_9228.

SCSI Bus Adapters: The HP S9000/S800 servers employing the HP Precision Bus (P-BUS or HP-PB) architecture use the “tape2” driver to communicate with tape devices. The adapter used for the single-ended narrow (SE) bus is P/N A1703-60003 and the adapter used for the fast, wide, differential (FWD) bus is P/N 28606-60001. Only certain specific tape devices will function with this driver. The TZ882DLT utility supplied in this kit will change the identity of the TZ885 to it’s equivalent DLT4500 counterpart. It will then be recognized and usable to the operating system.

The HP S9000/S800 servers employing the HP High Speed Channel Bus (HSC) and running HP-UX V10.x use the “stape” driver to communicate with tape devices. S700 workstations running V10.x also use this driver. The adapter used for the HSC fast, wide, differential (FWD) bus is P/N A2969A.

The mini-library drive is ready for use with the stape driver, and no identity change is necessary to communicate with the operating system. Simply connect the drive and perform the system administration tasks as outlined in this section of the appendix. Certain application programs, however, may not recognize the TZ885 device and will require the use of the TZ882DLT utility supplied with the HP Series 800 Support Kit to change it’s identity. Refer to the documentation supplied with your particular application to determine which tape devices it supports.

For those systems using the “stape” driver, no special kernel configurations are necessary to change the device identity. If your application requires a device identity of DLT4500, simply execute the utility as in the following, specifying the drive device file as the argument:

```
/TZ882DLT /dev/rmt/c0t1d0BEST
```

Tape Drivers: The following drivers are used by the accompanying operating system.

OS Version	BUS		
	SCSI BUS and EISA	P-BUS	HSC
S800 9.04	—	tape2	—
S700 9.05	scsitape	—	—
S700 10.x	stape	—	stape
S800 10.x	—	tape2	stape

Autochanger Drivers: Special autochanger drivers, such as the SCSI pass-through driver, may need to be built into the kernel to control the robotics functions of the Mini-library. Refer to the specific application administration manuals (e.g., OmniBack II Administrator's Guide) to determine which drivers are required to use the Mini-library with that application.

Adding Drivers to the Kernel: To add drivers to the kernel, enter the System Administration Manager (SAM) as superuser. From the first-level menu, choose `Kernel Configuration`. From the second-level menu, choose `Drivers`. Use the arrow key to move down the list of available drivers and highlight the desired one with the spacebar. Pull down the `Actions` menu and select the `Add` function. For additional information about autochangers, refer to `autochanger(7)` and `scsi-changer(7)` `man` pages. Also, refer to the `README.TXT` file supplied with the utility program.

S800 Server Modifications: For device modifications on S800 Servers, read and perform the steps outlined in the HP 800 Series Support Kit Application Note, Rev C01 or later, supplied with the 20/40 GB DLT HP 800 Support Kit.

Device modifications are necessary only if connecting to the HP P-BUS or if the application requires the device identity to be DLT4500.

E.2.1 Installation of the Mini-library

Install the Mini-library and power-on the system. Ensure that the address of the Mini-library does not conflict with the address of any other device on that SCSI bus.

Issue the `ioscan` command to determine if the kernel attached the tape driver to the Mini-library on boot. If `UNKNOWN` or `UNCLAIMED` is displayed in the class column, proceed to the next Section E.2.1.1, System Modification. If the driver is attached, skip that Section.

E.2.1.1 System Modification

Enter the System Administration Manager (SAM) as superuser. From the first-level menu, choose `Peripheral Devices`. From the second-level menu, choose `Tape Drives`. The system's hardware will be scanned, and the `Available Tape Drives` window will identify the tape drive as a `SCSI Tape Drive` (HP–UX 9.05, 9.04) or as a `Dec DLT4500` `or TZ885` (HP-UX 10.01) with the appropriate hardware path. Highlight that selection and then pull down the `Actions` menu and select the `Add` function. The program at this time will check the kernel to determine if the necessary drivers are built in, displaying the results.

If necessary, the program will rebuild the kernel. If this occurs, you will have to reboot the system in order to use the Mini-library. For further information on adding tape devices, refer to Hewlett-Packard's *Installing Peripherals* manual, P/N B2355-40041 and to *Configuring HP UX for Peripherals* manual, P/N B2355-90053.

E.3 Series 700 System Device Files

The System Administration Manager program automatically creates the appropriate device files and places them in the `/dev/rmt` directory, when adding the device through SAM. Additionally, if the appropriate drivers are built into the kernel, the device files are created automatically upon system initialization.

E.3.1 HP–UX 9.05

The following naming convention is used for the DLT-format Mini-library tape drive, as shown in the examples listed below:

```
/dev/rmt/c#d#[hlmc][n][b]
```

where:

c# specifies the controller designation, that may contain either two or three characters, specifies the following:
where **#** is **sc[f]**, in accordance with the following:

- **s** is the system bus module:
  - **2** = core I/O (the default)
  - **4** = EISA SCSI
- **c** is the slot number:
  - **0** for core I/O
  - **n** for EISA, the value is determined by the slot number as reported by the H/W path reported by `ioscan.`
- **f** is the function number. This value identifies the location on the core I/O bus. For the SCSI interface, the value is **1**. If you are using the EISA SCSI interface, the **f** value is 0.

d# designates the SCSI address of the Mini-library, where **#** here identifies a number value.

h/l/m/c specifies density, with **h** meaning high density, **l** meaning low density, **m** meaning standard DDS format, and **c** meaning data compression.[1]

n specifies no rewind on close.

b specifies Berkeley behavior.

For additional information about magnetic tape drive operation, refer to `mt(7)` of the *HP-UX Reference* manual (P/N B 2355-90033) or the `man` pages.

[1] The **h**, **l** , and **m** device designations all yield the same result. The **c** device designation enables compression.

Examples

For the Mini-library set to SCSI address 4 connected to the main (core) SCSI bus, the following would be output from the "ioscan -fb" command, and the following device files would be produced in the directory `/dev/rmt`:

Class	H/W Path	Driver	H/W Status	S/W Status	Description
SCSI	2.0.1	c700	ok(0x7071)	ok	
tape_drive	2.0.1.4.0	SCSItape	ok(0x1800202)	ok	DEC TZ885

```
c201d4c     c201d4l     c201d4cb     c201d4lb
c201d4cn    c201d4ln    c201d4cnb    c201d4lnb
c201d4h     c201d4m     c201d4hb     c201d4mb
c201d4hn    c201d4mn    c201d4hnb    c201d4mnb
```

For the Mini-library set to SCSI address 4 connected to a SCSI adapter in EISA slot 1, the following device files would be produced in the directory /dev/rmt:

```
c410d4c     c410d4l     c410d4cb     c410d4lb
c410d4cn    c410d4ln    c410d4cnb    c410d4lnb
c410d4h     c410d4m     c410d4hb     c410d4mb
c410d4hn    c410d4mn    c410d4hnb    c410d4mnb
```

E.3.2 HP–UX 10.*x*

The following naming convention is used on systems which support long filenames for the DLT format tape drive, as shown in the examples below:

```
/dev/rmt/c#t#d#BEST[n][b]
```

where:

c# specifies the instance number of the interface card

t# specifies the SCSI address of the tape drive

d# specifies the device unit number (LUN) at the SCSI address

BEST specifies the highest capacity density, which for this device is the TK88 uncompressed format (20 GB with a CompacTape IV cartridge; use Density Select push-button on front panel to write in compressed mode)

n specifies no rewind on close
b specifies Berkeley behavior

Examples

For the Mini-library set to SCSI address 4 connected to the main (core) SCSI bus, the following would be output from the "ioscan -fn" command and the following device files would be produced in the directory `/dev/rmt`:

Class	H/W Path	Driver	S/W State	H/W Type	Description
bc		root	CLAIMED	BUS_NEXUS	
ba	2	bus_adapter	CLAIMED	BUS_NEXUS	Core I/O Adapter
ext_bus	2/0/1	c700	CLAIMED	INTERFACE	Built-in SCSI
target	2/0/1.4	tgt	CLAIMED	DEVICE	
tape	2/0/1.4.0	stape	CLAIMED	DEVICE	DEC TZ885

```
c0t4d0BEST      c0t4d0BESTnb

c0t4d0BESTb           c0t4d0BESTnb
```

For systems which do not support long filenames, the following device naming convention is used:

```
#m    #mb   #mn   #mnb
```

where:

specifies an arbitrary number to distinguish this tape drive from others.

n specifies no rewind on close

b specifies Berkeley behavior

> **NOTE**
>
> The Mini-library will read TK85 (2.6 MB), TK86 (6.0 MB) and TK87 (10.0) densities but will not write these densities to the above device files using the supplied CompacTape IV cartridges. Use the front panel Density Select push-button to write these densities with a CompacTape IV or use a CompacTape III tape cartridge which will write these densities. Creation of special device files using lower densities will be required. Refer to mknod, mksf and mt man pages.

To list the device files associated with each device, issue the command:

```
ioscan -f -n|more
```

E.4 Series 800 System Device Files

The System Administration Manager program automatically creates the appropriate device files and places them in the `/dev/rmt` directory, when adding the device through SAM. Additionally, if the appropriate driver is built into the kernel, the device files are created automatically upon system initialization.

E.4.1 HP–UX 9.04

The following naming convention is used for the Mini-library tape drive, as shown in the examples listed below:

`/dev/rmt/`*`lu`*`[l|m|h][c][n][b]`

where:

lu specifies the logical unit as reported for the tape drive using the `ioscan -f` command:

h specifies optimal density, no compression (20 GB with CompacTape IV)

hc specifies optimal density, compression (40 GB using CompacTape IV)

m specifies nomod density, no compression (use pre-recorded tape density)

mc specifies nomod density, compression (use pre-recorded tape density)

l specifies density used via previous MT_SET_DLT_DENSITY `ioctl`

lc specifies density used via previous MT_SET_DLT_DENSITY `ioctl,` add compression

n specifies no rewind on close.

b specifies Berkeley behavior.

For additional information about DDS tapes, refer to `mt(7)` of the *HP-UX Reference* manual **(P/N B 2355-90033).**

For additonal density codes allowed with patch PHKL_7643, refer to file `/usr/include/sys/mtio.h.`

Example

If you connect a Mini-library set to SCSI address 4 to the HP P-BUS, the following would be output from the "ioscan -fn" command, and the following device files would be produced for the device having a logical unit number of 4 in the directory `/dev/rmt:`

Class	LU	H/W Path	Driver	H/W Status	S/W Status
SCSI	—	12	SCSI1	ok(0x3980)	ok
target	—	12.4	SCSI1.target	ok(0x1800202)	ok
tape_drive	4	12.4.0	SCSI1.target.tape2	ok(0x1800202)	ok
			/dev/rmt/4hnc	/dev/rmt/4hncb	
			/dev/rmt/4l	/dev/rmt/4lb	
			/dev/rmt/4ln	/dev/rmt/4lnb	
			/dev/rmt/4m	/dev/rmt/4mb	
			/dev/rmt/4mn	/dev/rmt/4mnb	
			/dev/rmt/4h	/dev/rmt/4hb	
			/dev/rmt/4hc	/dev/rmt/4hcb	
			/dev/rmt/4hn	/dev/rmt/4hnb	

The device files `4mc` and `4lc` will need to be created manually by using `mknod` or `mksf` commands.

Example

```
mknod/dev/rmt/4mc c 5 0X030400
mknod/dev/rmt/4lc c 5 0X010400
```

E.4.2 HP–UX 10.x

The following DLT naming convention is used on systems which support long file names, as shown in the examples below:

```
/dev/rmt/c#t#d#BEST[n][b]
```

where:

c# specifies the instance number of the interface card

t# specifies the SCSI address of the tape drive

d# specifies the device unit number (LUN) at the SCSI address

BEST specifies the highest capacity density, which for this device is the TK88 compressed format (40 GB with a CompacTape IV)

n specifies no rewind on close

b specifies Berkeley behavior

Examples

For a Mini-library set to SCSI address 4 connected to the main (core) SCSI bus, the following would be output from the "ioscan -fn" command, and the following device files would be produced in the directory `/dev/rmt`:

Class	I	H/W Path	Driver	S/W State	H/W Type	Description
bc	0		root	CLAIMED	BUS_NEXUS	
bc	1	8	ccio	CLAIMED	BUS_NEXUS	I/O Adapter
ext_bus	0	8/0	c720	CLAIMED	INTERFACE	GSC add-on Fast/Wide SCSI Interface
ba	0	8/16	bus_ adapter	CLAIMED	BUS_NEXUS	Core I/O Adapter
ext_bus	1	8/16/ 5	c700	CLAIMED	INTERFACE	Built-in SCSI
target	1	8/16/ 5.4	tgt	CLAIMED	DEVICE	
tape	0	8/16/ 5.4.0	stape	CLAIMED	DEVICE	DEC TZ885

```
c0t4d0BEST      c0t4d0BESTnb

      c0t4d0BESTb          c0t4d0BESTnb
```

For systems which do not support long filenames, the following device naming convention is used:

```
#m    #mb   #mn   #mnb
```

where:

specifies an arbitrary number to distinguish this tape drive from others.

n specifies no rewind on close

b specifies Berkeley behavior

> **NOTE**
>
> The Mini-library will read TK85 (2.6 MB), TK86 (6.0 MB) and TK87 (10.0) densities but will not write these densities to the above device files using the supplied CompacTape IV cartridge tapes. Use the front panel Density Select push-button to write these densities with a CompacTape IV cartridge or use a CompacTape III cartridge which will write these densities. Creation of special device files using lower densities will be required, as in the following table.

To create device files for other than `BEST` density, use the `mksf` command, as in the following:

```
mksf -H <hardware path> -d tape2* -b <density code>
```

where: <hardware path> is that displayed for the tape drive on SCSI LUN 0, as a result of the `ioscan` and `<density code>` is one of the following:

Density Code	Hex Value	Decimal Value	Result with CompacTape IV	Result with CompacTape III
DLT_42500-24	0X17	23	20 GB uncompressed	2.6 GB uncompressed
DLT_42500-56	0X18	24	20 GB uncompressed	6.0 GB uncompressed
DLT_62500-64	0X80	128	20 GB uncompressed	10 GB uncompressed
DLT_62500-64	0X81	129	20 GB uncompressed	10 GB compress
DLT_81633-64	0X82	130	20 GB uncompressed	undefined
DLT_81633-64C	0X83	131	20 GB compressed	undefined

* When using the stape driver, use the decimal values listed above for density codes.

To list the device files associated with each device, issue the command:

```
ioscan -f -n |more
```

E.5 Testing the Mini-library Tape Drive

To test the Mini-library, back up the `passwd` file to tape using the `tar` command, as follows (use the correct device filename for the platform and operating system in use):

```
tar  cvf  /dev/rmt/c201d4h /etc/passwd
```

The system responds with something similar to the following:

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

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

E.5.1 Verification

Use the following command to verify that the `passwd` file was written to tape (use the correct device filename for the platform and operating system in use):

```
tar  tvf  /dev/rmt/c201d4h
```

The system responds with something similar to the following:

```
rw-r--r-- 0/10 535 Mar 23 16:31 1994 /etc/passwd
```

The installation and verification procedure is now complete.

E.6 Dump Parameters for the Mini-library Tape Drive

The parameters that should be used when running the dump utility with the Mini-library and a CompacTape IV data tape are:

density = 81633 (BPI)

size = 1800 (1800 foot tape)

blocking factor = 128 (recommended)

Example

The following example shows the command for backing up an entire disk partition onto the Mini-library (use the correct device filename for the platform and operating system in use):

```
dump 0dsbf 81633 1800 128 /dev/rmt/c201d4h dev/dsk/c201d6S0
```

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

E.7 HP OmniBack II

The mini-library has been qualified with HP's OmniBack II backup application. This section explains the requirements and configuration of the system, mini-library, and OmniBack. Refer to HP's Omniback manuals for application specific usage of the product.

Requirements:

- HP-UX Version 10.01, 10.10 or 10.20
- OmniBack II Version A.01.30, A.02.00 or A.02.10
- Version V75 (CD4B) or greater SWXTL firmware for OmniBack V2.10
- OmniBack II Patch PHSS_6823 (OS Release 10.x) for OBII V1.3
- OmniBack II Patch PHSS_9047 (OS Release 10.x) for OBII V2.10
- HP-UX Patch PHKL_8869 (S800 V10.01) tape drive cumulative patch
- HP-UX Patch PHKL_8805 (S800 V10.10) tape drive cumulative patch
- HP-UX Patch PHKL_8188 (S800 V10.20) tape drive patch
- SCSI Pass-Thru driver (robotic control)
- SWXTL standalone drive or mini-library

NOTE

Since there are frequent changes and updates to Hewlett Packard patches, it is suggested that you verify with HP that you have the most current patches.

E.7.1 Operating System Modifications

The SCSI pass-thru driver (spt) must be installed to control the robotics of the mini-library. Refer to the 20/40 GB DLT HP 800 Series Support Kit (P/N QC-03MAA-HP) Rev C01 or later for instructions on installation of the spt driver. For this application however, attach the spt driver to LUN 1 of the tape device, not LUN 0. For S700 workstations and HSC architecture servers and S800 Servers utilizing the stape driver, the SCTL driver is used to control the robotics and is normally already built into the kernel. To check, issue the command "lsdev | grep sctl". If the driver is installed, you will see output similar to the following:

NOTE

The numbers in the first and second columns of the two boxes below are the major device numbers of the character, and block device drivers, respectively.

```
203   -1    sctl  pseudo
```

To check for the spt driver (S800), issue the command "lsdev | grep spt". If the driver is installed, you will see output similar to the following for P-BUS Architecture or the HP28696A adapter:

```
      75    -1    spt   spt
```

For the built-in HSC architecture adapter, the "lsdev | grep sctl" command will result in

```
      203   -1    sctl  spt
```

or

```
      203   -1    sctl  ctl
```

E.7.2 Special device files:

Refer to the HP *Openview OmniBack II Administrator's Guide (*P/N B1957-90015), section entitled " Configuring a SCSI-II Autochanger for use with OmniBack II".Create the special device file to access the mini-library robotics:

mknod /dev/scsi/DLT c <major #> <minor #>

where:

<major #> character major number (first column from the lsdev cmd as shown above)

<minor #> minor number in the format 0xIITL00

II 2 digit card instance number (from ioscan cmd; proper ext_bus entry)

T Target ID number (SCSI ID)

L Lun number (SCSI LUN) - use LUN 1 for the mini-library robotics

00 Reserved fields, must be zero

To test this file and verify that the robotics identifies itself correctly as an autochanger, use the OmniBack II V1.3 xcmd utility as follows:

```
# /opt/omni/sbin/utilns/xcmd /dev/scsi/DLT inq
```

For OmniBacks II V2.0 and later, use the uma utility as follows:

```
#echo “inq” | /opt/omni/lbin/uma -ioctl /dev/scsi/DLT
```

You should see output similar to the following:

Inquiry Data	Description
8	SCSI Device Type
DEC	Vendor ID
TZ Media Changer	Product ID
cc34	Revision

Device Type 8, specified above, is correct for an autochanger.

E.7.3 Device modifications:

The SWXTL drive needs to have its productid string changed by running the TZ882DLT utility supplied with the 20/40 GB DLT HP 800 Series Support Kit. For a S700 workstation or an S800 Server where the device is attached to the HSC bus, the utility can be executed without attaching the SCSI pass-thru driver to the robotics and generating a special kernel. Issue the command specifying the drive device file as the argument:

(./TZ882DLT /dev/rmt/c0td0BEST).

For an S800 server where the device is attached to the P-BUS, refer to the instructions supplied with the above kit.

E.7.4 Configuring the mini-library with OmniBack:

1. Install OmniBack II, associated patches and licenses.
2. Create the special files for the drive and the robotics.
3. Only if using V1.3, create the external control file to control the robotics operations. This file is to contain the following lines of code:

```
#!/bin/sh
SLOT=$4; CMD=$5
REPLOC=`expr ${SLOT} + 255`
DRVLOC=16
ROBOT="/dev/scsi/DLT"
XCMD="/opt/omni/sbin/utilns/xcmd"
DRVSTAT=`${XCMD} ${ROBOT} stat | grep "Data Drive" | awk ´{print $2´`
case $ {CMD} in
"-unload")
        if [ ${DRVSTAT} = "Full" ]; then
                ${xcmd} $ {ROBOT} move ${DRVLOC} $ {REPLOC}
                echo "move $ {DRVLOC} $ {REPLOC}
        else
                echo "drive is empty"
                fi
                ;;
"-load")
VALIDSLOT=`${XCMD} ${ROBOT} stat | grep ${REPLOC} | awk ´{print $2}´`
if [ ${VALIDSLOT} = "Empty" -a ${DRVSTAT} = "Empty" ]; then
        echo "Slot ${SLOT} is invalid"
        exit 1
        fi
if [ ${DRVSTAT} = "Empty" ]; then
        ${XCMD} ${ROBOT} move ${REPLOC} $ {DRVLOC}
        echo "move ${REPLOC} ${DRVLOC}"
else
        echo "drive is full, find free repository slot"
        FREE=`${XCMD} ${ROBOT} stat | grep "Repository" | grep "Empty" | awk
        ´{print $1}´`
        ${XCMD} ${ROBOT} move ${DRVLOC} ${Free}
        echo "move ${DRVLOC} ${Free}"
        echo "now move ${REPLOC} ${DRVLOC}"
        ${XCMD} ${ROBOT} move ${REPLOC} ${DRVLOC}
fi
;;
esac
exit 0
```

4. Configure a Media Pool.
5. Start the OmniBack GUI and click on the Devices icon from the main menu.
6. Configure the device
    a. If using V1.3, configure the device as an exchanger under external control. Refer to the HP "Openview OmniBack II Administrator's Guide" (P/N B1957-90015), section entitled "Configuring a Non-Standard Autochanger for Use with OmniBack II".
    b. If using V2.0 or V2.1, configure the device as a SCSI II exchanger. Refer to HP "Openview OmniBack II Administrator's Guide" (P/N B1957-90021), section entitled "Configuring a SCSI II Exchanger".
7. Select Edit ->Create Logical Device->External Control (V1.3) or SCSI II Exchanger (V2.0).
8. Specify DLT as the device type.
9. Select a Pool Name and Host Name.
10. Specify the full drive pathname e.g. (`/dev/rmt/c0t3d0BEST`) in the Autochanger Data Device field.
11. Specify Exchanger Control Script (name of file you created above – external control) for OmniBackII V1.3 only.
12. Specify Exchanger Repository Slots.
13. Select a SCSI II Control Device for V2.0 and V2.1. This will be the device file created in step E.7.2.
14. You may use the defaults suggested in the Advance Options, but will probably want to set the Mount prompt delay to 0.

Reader's Comments

Manual Order Number:
EK–SM1TG–UG. B01___

TZ885 Model 100/200 GB DLT 5-Cartridge Mini-library

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