StorageWorks™

TZ887 Model 140/280 GB DLT 7-Cartridge Mini-library (SWXTL-CO and -CR)

User's Guide

EK–SM1TH–UG. C01

**Digital Equipment Corporation
Maynard, Massachusetts**

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Revision Record

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

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 TZ887 Model 140/280 GB 7-Cartridge Mini-library (SWXTL-CO and -CR).

Revision Level	Date	Summary of Changes
EK–SM1TH–UG. A01	February 1996	Original release
EK–SM1TH–UG. B01	October 1996	Updated Appendix C– Product Notes for Sun
		Updated Appendix E– Product Notes for Hewlett-Packard
EK–SM1TH–UG. C01	April 1997	Updated Appendix E– Product Notes for Hewlett-Packard

About This Manual

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

Visit Our Web Site for the Latest Information

Check our web for the latest drivers , technical tips, and documentation. We can be found in the technical area of our web page, *http://www.storage.digital.com/*

Audience

This manual is intended for the Mini-library owner. It is for system managers, computer operators, or anyone who uses the Mini-library.

Document Structure

This manual contains the following chapters and appendices:

Chapter 1. Overview

Provides a basic product description of the 7-Cartridge Mini-library.

Chapter 2. Operation

Describes the power-on process, the keys and indicators on the Operator Control Panel (OCP), the operating modes of the Mode Select key, and the magazine and cartridge removal and replacement processes.

Chapter 3. Error Conditions and Problem Resolutions

Describes the necessary conditions to use the OCP push-buttons, backup operation failures, error indications, and power problems.

Chapter 4. Head Cleaning

Describes how to clean the tape drive read/write heads via the magazine.

Appendix A. Specifications

Appendix A lists the physical, electrical, and environmental specifications for the Mini-library, and defines the SCSI command signal set.

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

Appendix B provides information for the system administrator about interfacing the TZ887 Model 140/280 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 TZ887 Model 140/280 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 SWXTL tape drive hardware and configuring the system to communicate with the drive.

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
TZ887 Model 140/280 GB Mini-library Reference Card	EK–SM1TH-RC

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

Overview

This chapter gives an overview of the TZ887 Model 140/280 GB DLT 7-Cartridge Mini-library and its functions.

1.1 General Description

The 140/280 GB DLT 7-Cartridge Tape Mini-library (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 contains a high-capacity 20/40 GB DLT tape drive and a seven-cartridge SCSI-2 medium changer device (loader).

The 1/2-inch tape drive uses data compression and compaction. Using Compac-Tape IV cartridges, the drive features a formatted capacity of 40 GB per cartridge (compressed) and a sustained user data transfer rate of 3.0 Mbytes/second (assumes a 2:1 compression factor). The drive has a dual-channel read/write head and Digital Lempel-Ziv (DLZ) high-efficiency data compression. The drive tape directory maximizes data throughput and minimizes data access time.

The typical load/unload time for the Mini-library is 20 seconds, with a maximum time of 50 seconds. The Mini-library can provide unattended backup of 280 GB of data (compressed) at a rate of approximately 10.8 GB per hour.

The Mini-library is available in a tabletop enclosure (SWXTL-CO) or in a rack mount configuration (SWXTL-CR).

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.

Figure 1–1 Front View of the TZ887 Model 140/280 GB 7-Cartridge Mini-library
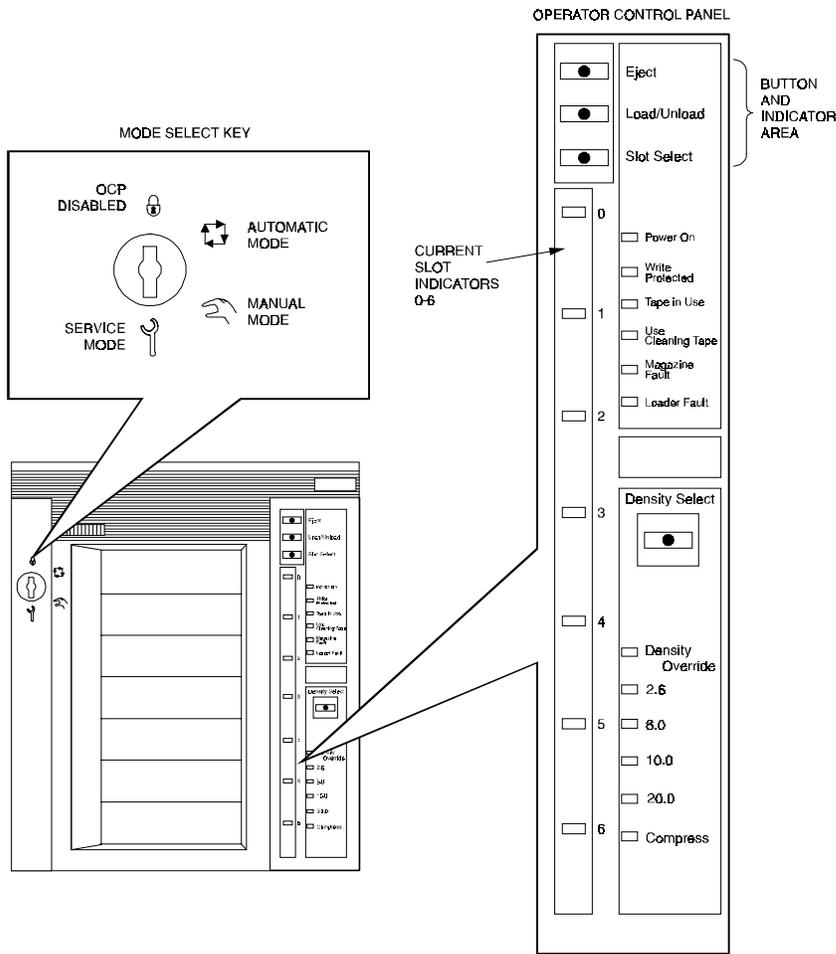
1.1.2 High Capacity

Using CompacTape IV tape cartridges, the Mini-library provides a total capacity of 140 Mbytes uncompressed or 280 Mbytes compressed. The magazine is removable and contains slots for 7 tape cartridges. Compression is selectable from the front panel or through the host by using software commands.

1.1.3 Compaction

The compaction feature of the DLT tape drive in the Mini-library provides efficient data storage. A read/write 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 drive's default recording density is 20 GB with compression enabled when using CompacTape IV tape cartridges.

The tape drive can also read CompacTape III cartridges at 2.6, 6.0 and 10 GB formats for backward compatibility with earlier DLT drives.

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

Cartridge Type/Format (Capacity)	Mini-library Read/Write Ability
CompacTape III/TK85 (2.6 GB format)	Read/write in 2.6 GB mode
CompacTape III/TK86 (6.0 GB format)	Read/write in 6.0 GB mode
CompacTape III/TK87 (10 GB format or 20 GB format compressed)	Read/write in 10 GB mode or 10 GB compression enabled
CompacTape IV/TK88 (blank)	Read/write 10, 10 compressed, 20 and 20 GB compressed modes

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 Cartridge

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.

A package of slide-in labels and a cartridge handling document are provided with
each CompacTape IV cartridge.

Figure 1–2 CompacTape IV Cartridge
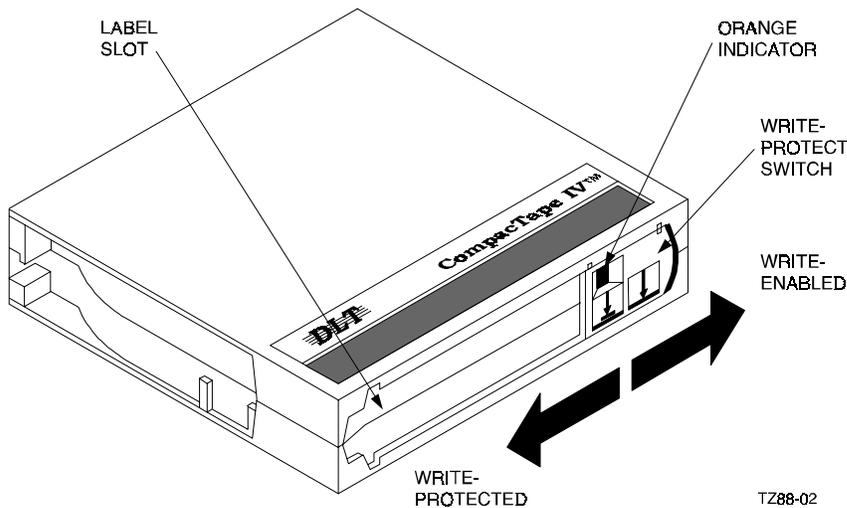
1.3   Reading and Writing Data

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 cartridge has a write-protect switch to prevent accidental erasure of data. When the switch is moved to the left, a small orange rectangle is visible, and data cannot be written to the tape. When you move the switch to the right, orange color covered, the tape is write-enabled and the drive can write to the tape.

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 Cartridge

The CleaningTape III Cartridge (see Figure 1-3) is a yellow plastic cartridge containing 1200 feet of 1/2-inch, magnetic particle cleaning tape.

Figure 1–3 CleaningTape III Cartridge
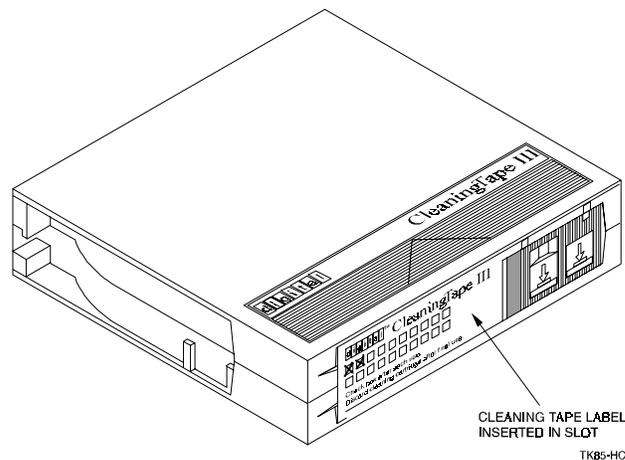
1.4.2 CleaningTape III Packaging

The CleaningTape III 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 Cleaning Tape 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.

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

You should not have to use the cleaning tape periodically. Use it only when the Mini-library indicates a problem. For example, the Use Cleaning Tape indicator lights, or a hard read/write error occurs.

1.4.4 Using the CleaningTape

To clean the read/write head:
1. Press the Load/Unload push-button to remove any cartridge that may be in the drive, and to return the cartridge to the magazine.
2. Press the Eject push-button to open the Mini-library door and remove the 7-cartridge magazine.
3. Insert the CleaningTape III cartridge into the first slot on the magazine.
4. Insert the magazine and close the Mini-library door.
5. Press the Load/Unload push-button to load the cleaning cartridge into the drive.

Once the cleaning cartridge is loaded, the drive begins the head cleaning procedure. When the cleaning procedure is complete, the cleaning cartridge automatically returns to the magazine.

NOTE

If the Use Cleaning Tape indicator remains on, the cleaning cycle was not successful probably due to an expired cleaning cartridge. Replace the cleaning cartridge and repeat the cleaning process.

If a particular cartridge causes the Use Cleaning Tape indicator to turn on frequently, Copy the tape to a new, good tape cartridge and discard the defective one. A damaged cartridge can cause unnecessary use of the CleaningTape III.

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6. Press the Eject push-button to remove the magazine.

7. Remove the cleaning cartridge from the magazine. Replace the original tape cartridge into the magazine as required.

CAUTION

Before returning to normal operation, remember to remove the CleaningTape and return the CompacTape IV data cartridges to their original slots.

1.5   Supplies and Related Documents

1.5.1 Cartridges Provided

Seven CompacTape IV cartridges and one CleaningTape III cartridge are packed with each TZ887 Model 140/280 GB DLT 7-Cartridge Mini-library.

1.5.2 How to Order Replacement Cartridges

You can order additional cartridges by contacting your Digital reseller.

Table 1–2 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)

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</div>

Installing and Operating the Mini-library

This chapter describes the unpacking, installation, general configuration, Power-On Self Test (POST), and operation of the Mini-Library.

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 components listed in Table 2–1.

Table 2–1 Mini-library Components

Item	Digital Part Number	Quantity
7-cartridge Mini-Library	SWXTL-CO or -CR	1
CompacTape IV tape cartridge	TK88K-01	7
Head Cleaning Cartridge	TK85-HC	1
Power Cord		1
SCSI terminator	12-30552-01	1
User's Guide	EK–SM1TH–UG	1
Reference Card	EK–SM1TH–RC	1
Tape handling Guide	EK–TZ88N–RC	1
Rack Mount Instructions (only SWXTL-CR)	EK–SM1TH–PN	1

You must provide a SCSI bus interface cable appropriate to your environment. Table 2–2 lists the SCSI cables corresponding to the type of SCSI interface mounted in your computer system, and the corresponding Digital part number.

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 in.) BC19J-06 (6.0 ft)
Low-Density to High-Density Cable[2]	Low-Density (50-pin)	High Density (50-pin)	BC23G-01 (3.0 ft) BC23G-02 (6.0 ft)

[1] The 50 pin low-to-low density cable is compatible with most ISA-type SCSI adapters.

[2] The 50-pin high density cable is compatible with either of:

      a. Most EISA & PCI bus adapters.

      b. Daisy chain connection to StorageWorks SCSI enclosures.

NOTE

The Mini-library is SCSI-2 Fast 10 compatible. The maximum allowed cable length is 3 meters.

2.2   Power and SCSI Bus Connections

Figure 2-1 shows the rear of the 7-cartridge Mini-library. On the rear of the Mini-library are the power connector, the 110/220V selection switch, two 50-pin low density SCSI connectors, and the SCSI ID selection switch.

2.2.1 Power Connector and 110/220 Selector Switch.

The Mini-Library is pre-configured for 220V operation. In order to change the mode of operation to 110V, remove the multi-lingual sticker which covers the power receptacle on the rear panel of the DLT Mini-library and move the voltage selector switch to the right of the receptacle to the 110V position.

CAUTION

Ensure the voltage selector switch is properly positioned before connecting the power cord to the DLT Mini-library, as explained above. An incorrect switch setting may cause damage to the equipment.

Figure 2–1 Mini-library's Rear Panel
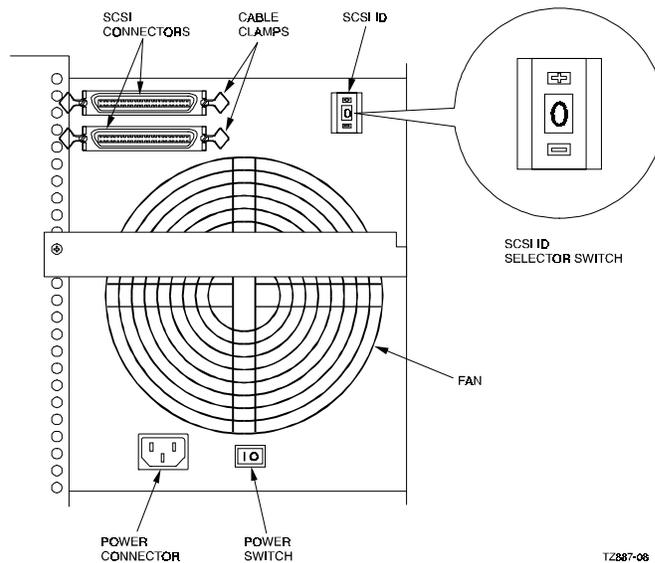
2.2.2 SCSI ID Selection Switch

The Mini-library's SCSI ID is pre-configured to 0. To change the SCSI ID, use the two push-buttons located on the rear panel (Figure 1-1) of the Mini-library. Press the top push-button to increase the SCSI ID or the bottom push-button to decrease the SCSI ID.

> **CAUTION**
>
> Ensure that the SCSI ID chosen is unique on the SCSI bus. Duplicate SCSI IDs on one SCSI bus are not allowed, and will disrupt data transfers.

2.2.3 SCSI Connectors

The Mini-library has two 50-pin low density SCSI connectors on the rear panel. The SCSI bus must be terminated at both ends.

If you are installing the Mini-Library as ...	Then ...
The last or only device on the SCSI bus	You must terminate the bus at the Mini-library by installing the SCSI terminator provided.
One of multiple devices, and not the last device on the SCSI bus	Be sure terminate the end of the bus with an appropriate SCSI terminator.

2.3   Power on Self Test (POST)

You have now configured and connected your Mini-library to a power source, set the desired non-conflicting SCSI ID, terminated the SCSI bus properly only at the two ends, and connected SCSI cables between the host and the Mini-library.

Power-up the Mini-library by pushing the power rocker switch on the rear of the unit to the ON position. The Mini-library will perform a Power on Self Test. Table 2–3 explains what happens during each phase of the Test.

Table 2–3 Loader Power-On Self-Test (POST)

Phase	What Happens
1	When you turn on the Mini-library, the Loader Fault and Power ON indicators on the loader Operator Control Panel light.
2	One second later, all Control Panel indicators light. Within 15 seconds, POST is complete.
	If the Magazine Fault and Loader Fault indicators turn off, loader POST passed.
	If the Magazine Fault and Loader Fault indicators stay on, loader POST failed.
3	A few seconds later, the drive controller resets the loader.
4	Loader POST starts again.
	If the Magazine Fault and Loader Fault indicators turn off and shortly after, all Control Panel indicators, except Power On, turn off – POST passed.
	If the Magazine Fault and Loader Fault indicators stay lit – POST failed
	(See Chapter 3 for error conditions).
5	The elevator scans the magazine to determine which slots contain cartridges.
6	If the subsystem magazine has a cartridge in slot 0, and no cartridge is in the drive, these indicators should be on: Power On, Eject, Load/Unload, Slot Select, and Slot 0.

2.4   Mini-library Operator Control Panel

The operator control panel contains 4 push-buttons and 23 indicators. Access to the Mini-library is controlled with the Mode Select Key. Refer to Figure 2–2.

Figure 2–2 TZ887 Model 140/280 GB DLT 7-cartridge Mini-library Operator Control Panel
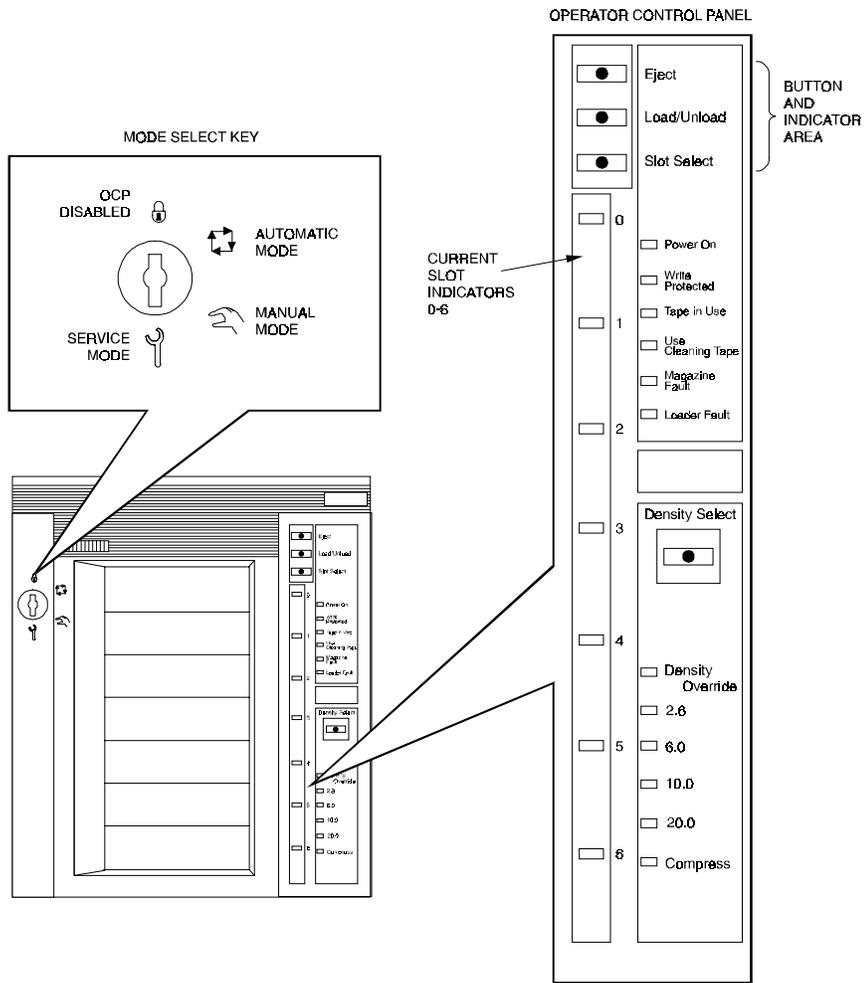
2.4.1 Control Panel Indicators and Controls

Table 2–4 describes the function of each control and indicator on the front panel of the Mini-library.

Table 2–4 Model TZ887 140/280 GB DLT Operator Control Panel

Push-button/Indicator	Color	State	Function
Eject push-button	-	-	Opens the Mini-library door, allowing access to the magazine for removal and insertion of cartridges. Also can be used to unload the tape from the drive to the magazine. Only enabled when its indicator is lighted.
Eject indicator	Green	On	Indicates that you can press the Eject push-button to unload cartridges from the drive to the magazine and to open the Mini-library door ... or ... indicates a magazine fault.
Load/Unload push-button	-	-	Loads or unloads a cartridge from the tape drive. Only enabled when its indicator is lighted. Resets the subsystem if there is a loader fault.
Load/Unload indicator	Green	On	You can press the Load/Unload push-button.
Slot Select push-button	-	-	Increments the current slot indicator to the next slot. Only enabled when its indicator is lighted.
Slot Select indicator	Green	On	You can press the Slot Select push-button. Pressing this push-button moves the current slot indicator to the next slot.
Power On indicator	Green	On	The Mini-library is in a known good power state (ac and dc voltages are within tolerance.

Table 2–4 Model TZ887 140/280 GB DLT Operator Control Panel (Continued)

Push-button/Indicator	Color	State	Function
Write Protected indicator	Orange	On	The cartridge currently in the drive is write-protected by one of these methods:
			Using software write-protect qualifiers.
		Off	The current cartridge is write-protected.
Tape In Use indicator	Yellow	Slowly blinking	The tape is rewinding.
		Rapidly blinking	The tape is reading or writing
		On	A cartridge is in the drive and the tape is moving.
		Off	No cartridge is in the drive or the tape is not moving.
Use Cleaning Tape indicator	Orange	On	The read/write head needs cleaning. See Chapter 4.
Magazine Fault indicator	Red	On	Indicates a magazine failure.
Loader Fault indicator	Red	On	Indicates a Loader transfer assembly error or drive error
Current slot indicators 0-6	Green	On	Identifies the current slot (see Slot Select push-button). Each current slotindicator blinks when it corresponding cartridge moves to or from the drive. Also used with the Magazine Fault or Loader Fault indicator to show the type of fault. (see Chapter 3)
Density Select Push-button	-	-	Use to manually select a density. Only enabled when its indicator is lighted.
Density Select Indicator	Green	On	Indicates you can choose a density on the from the Operator Control Panel.
Density Override	Yellow	On	A density selection has been set from the drive's front panel.
		Off	Default - Density selection is under host control, or automatic.
		Blinking	You are in density selection mode.

Table 2–4 Model TZ887 140/280 GB DLT Operator Control Panel (Continued)

Push-button/Indicator	Color	State	Function
2.6	Yellow	On	Tape was recorded in 2.6 GB format.
		Blinking	Indicates tape was recorded in another density. You selected this density for a write from Beginning Of Tape.
6.0	Yellow	On	Tape was recorded in 6.0 GB format.
		Blinking	Indicates tape was recorded in another density. You selected this density for a write from Beginning Of Tape.
10.0	Yellow	On	Tape was recorded in 10.0 GB format.
		Blinking	Indicates tape was recorded in another density. You selected this density for a write from Beginning Of Tape.
20.0	Yellow	On	Tape was recorded in 20.0 GB format
		Blinking	Indicates tape was recorded in another density. You selected this density to a write from BEGINNING OF TAPE.
Compress	Yellow	On	You selected Compression mode. (Available for 10.0 and 20.0 densities.)
		Off	Compression mode is disabled.

2.4.2 Mode Select Key

The Mode Select key (Figure 2–2) is used to select one of the Mini-library's three operating modes or the service mode. The modes are: OCP Disabled, Automatic, Manual and Service (for use by Digital service engineers only).

2.5   Mini-library Modes

2.5.1 OCP Disabled mode

- All controls are disabled. The Mini-library is controlled completely by the Host Operating System.
- When the magazine is inserted into the Mini-library and the door is closed, and the loader transfer assembly scans the magazine. The first cartridge in the magazine is automatically loaded into the drive.

- The mini-library responds at all times to the host medium changer commands. Automatic (not controlled by the host) loader operations stop if you are copying data to tape and one of the following happens:
  - The storage capacity of the last tape cartridge is exceeded
  - No tape cartridge is in the next sequential slot in the magazine
  - The Mini-library door cannot be opened in this mode. The Operator Control Panel push-buttons are disabled.

2.5.2 Automatic Mode

The automatic mode is the default mode of the Mini-library.

- All controls are enabled. The Mini-library can be controlled by the Host Operating System, or by the Operator Control Panel

- When the magazine is inserted into the Mini-library and the door is closed, the loader transfer assembly scans the magazine. The first cartridge in the magazine is automatically loaded into the drive.

- The mini-library responds at all times to the host medium changer commands. Automatic (not controlled by the host) loader operations stop if you are copying data to tape and one of the following happens:
  - The storage capacity of the last tape cartridge is exceeded
  - No tape cartridge is in the next sequential slot in the magazine

- The Mini-library door can be opened in this mode. The Operator Control Panel push-buttons are enabled.

2.5.3 Manual Mode

- Same as automatic mode, but the user or host operating system must intervene to change cartridges.

2.5.4 Service Mode

- Service mode is for use by a Digital Multivendor Customer Services engineer. When the Service mode is selected, the Mini-library is unlocked from its enclosure. The Mini-library door is also unlocked. Use this mode to upgrade firmware in the Mini-library.

2.6 Resetting the Mini-library

The Load/Unload push-button also functions as a reset push-button. If a loader fault has occurred and the Loader Fault indicator is on, to reset the Mini-library, press the Load/Unload push-button.

2.7   Selecting a Cartridge to be Loaded

After successful initialization, the Mini-library automatically selects the first slot that has a cartridge and the Slot Select push-button becomes active. The Load/Unload and Eject indicators remain lighted during slot selection. To select a cartridge, press the Slot Select push-button to advance the slot indicator light to the next available slot.

2.8   Loading a Cartridge into the Tape Drive

Press the Load/Unload push-button to load the cartridge into the drive. The elevator to moves to the selected slot, indicated by the light. The cartridge is then removed from the magazine and placed in the elevator. The elevator moves to the drive position and inserts the cartridge into the drive.

After the cartridge is loaded into the drive, the Eject and Load/Unload indicators light, and the corresponding push-buttons are enabled.

2.9   Selecting Density

NOTE

The only time you can change tape density is on a write from BEGINNING OF TAPE. You cannot change density on a read operation.

2.9.1 Density Selection Methods

You can select density through any of the following methods:

1. Use the front panel Density Select push-button. Using the Density Select push-button, overrides host software-controlled density selection.

2. Use a host selection – assuming operating system support. If you do not use the Density Select push-button, host density selection via software is used.

3. Use the native format (default), If you do not use the Density Select push-button or host selection, the Mini-library defaults to the 20.0 GB format with compression enabled.

2.9.2 How to Select Density

To select density using the Mini-library's front panel controls:

1. Press the Load/Unload push-button to load the cartridge into the drive. The yellow Tape in Use light blinks while the tape loads and calibrates.

2. After calibration completes, the yellow Tape in Use light remains lit.

3. The indicator showing the tape's prerecorded density lights, such as 2.6 or 6.0.

4. You can use the loader operator control panel at various times, not just after loading a tape. Density selection is inactive until the write from BEGINNING OF TAPE command is issued. The controller remembers the density selection state until you do one of the following:

    *   Change the density selection
    *   Eject the magazine from the loader

Table 2–5 shows the results of density selection.

Table 2–5 Results of Density Selection

IF . . .	Then . . .
You did not use the Density Select push-button:	The corresponding density indicator on the front panel lights steadily to show the actual density of the loaded tape.
You used the Density Select push-button, and if the actual tape density is the same as the density you selected:	Both the indicator for the actual density and the Density Override indicator light..
You used the Density Select push-button, and if the actual tape density differs from the density selected:	The following conditions should occur during the initial portion of the writing process: The Density Override indicator lights steadily. The indicator next to the designation of the actual (last-used) density designation lights steadily. If the actual/default density of the currently loaded tape is 6.0 GB, for example, and you have selected the 10.0 density option, the 6.0 indicator initially lights steadily to show the current format, the 10.0 indicator initially blinks to show that you have selected that format, and the Density Override indicator remains steadily lit until the BEGINNING OF TAPE signal is processed, marking the actual beginning of writing. After that actual writing begins, the Density Override indicator remains steadily lit during the writing process, but the 6.0 indicator goes out and the 10.0 indicator becomes steadily lit.

2.10 Unloading the Cartridge

CAUTION

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

When you press the Load/Unload push-button:

1. The Slot Select, Load/Unload, Eject, and Density Select indicators turn off

2. The cartridge unloads from the drive into the magazine

3. Automatic operation now stops and the Select Slot operation does not move in increments.

4. The indicators turn on once the cartridge is returned to the magazine.

The Load/Unload indicator must be on before you press the push-button to load or unload a cartridge. If the Loader Fault indicator is on, showing a malfunction, press the Load/Unload push-button to reset the subsystem and try to clear the error.

2.11 Opening the Mini-library Door

The Eject push-button opens the door for insertion or removal of the magazine. The Eject push-button is disabled when the Mode Select key is in the OCP Disabled position. (The Eject push-button can also be used to unload a tape from the drive.)

Table 2–6 Results of Pressing the Eject Push-button

When a cartridge is . . .	Then . . .
Not in the drive, the Slot Select, Load/Unload, Eject, and Density Select indicators are on before any operation begins.	Pressing the Eject push-button causes all indicators to turn off. The elevator then returns to its home position and the Mini-library door opens. Once you close the Mini-library door again, a magazine scan begins. When the scan completes, the indicators turn back on.
In the drive, the Eject and Load/Unload indicators are on before the operation begins.	Pressing the Eject push-button causes both indicators to turn off, and the cartridge unloads from the drive and moves back into the magazine. The Mini-library door then opens to allow access to the magazine. Once you close the Mini-library door again, a magazine scan begins. When the scan completes, the indicators turn back on.

Figure 2–3 Mini-library door Opened

TZ887-07

2.12 Inserting a Cartridge into the Magazine

To simplify cartridge insertion, place the magazine on a flat surface with the slots facing you. Each slot is numbered to ensure you are inserting the cartridge correctly into the front of the magazine. Usually, cartridges are inserted into consecutive slots.

> **NOTE**
>
> Never apply labels to the top or bottom of tape cartridges. Doing so can cause cartridge jams in the Mini-library. Use the space on the front of the cartridge for labels.

To insert a cartridge into the magazine:
1.   Grasp the cartridge with the CompacTape IV label facing up and the write-protect switch facing you (Figure 2–4).

---

2. Set the cartridge's write-protect switch to the desired position. If you want to:

3. Write on the tape, slide the switch to the right (orange indicator is not visible)

4. Write-protect the tape, slide the switch to the left (orange color visible).

5. Insert the cartridge (Figure 2–5) by pushing it into the slot until it stops and you hear a click. A small metal tab holds the cartridge in place.

Figure 2–4 Write-Protect Switch on a Cartridge
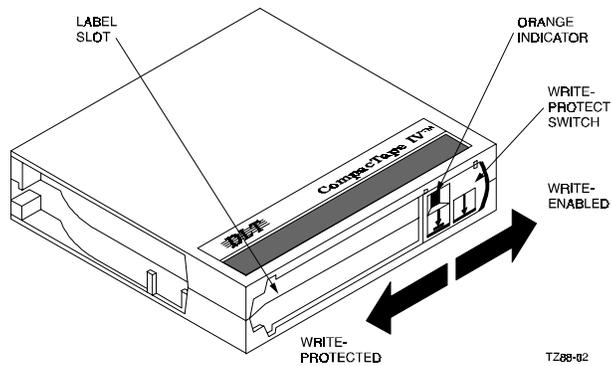
Figure 2–5 Inserting a Cartridge into the Magazine Slot
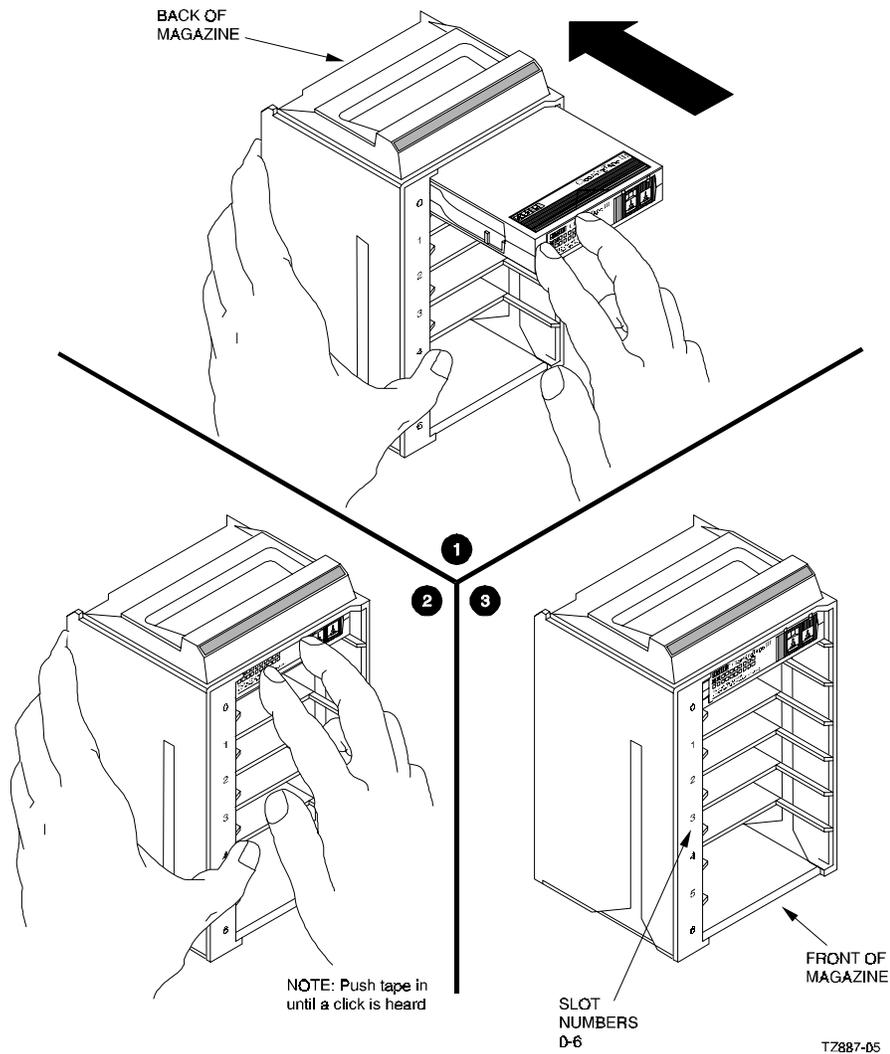
2.13 Inserting the Magazine into the Mini-library

1. Slide the magazine down into the Mini-library door while holding the magazine by the handle. Since the magazine is slotted, it can be inserted in the correct orientation only.
2. Push the door closed by applying a steady force in the top-center of the door until it is completely closed and latched.
3. Observe that the Mini-library door is fully closed and the media changer has successfully completed its inventory cycle before proceeding. The first cartridge in the magazine should be selected at this point.

If an error is encountered upon completion of the above, refer to Chapter 3, "Error Conditions and Problem Resolutions".

2.14 Removing the Magazine from the Mini-library

To remove the magazine from the Mini-library door, ensure:

- The Power On indicator is on.
- The tape drive is unloaded
- The Eject indicator is on. (It must be on before you can press the Eject push-button.

Then:

1. Press the Eject push-button (Figure 2–2) to open the Mini-library door.
2. Grasp the Mini-library door after it opens (Figure 2–3), and gently pull it forward to access the magazine.
3. Grasp magazine by the handle and lift it out of the Mini-library door.

2.15 Removing a Cartridge From the Magazine

To remove a cartridge from the magazine: At the front of the magazine, press the cartridge in until it stops and you hear a click (Figure 2–6). Then release the cartridge. The slot uses a spring-release action.

Figure 2–6 Removing a Cartridge from the Magazine

3
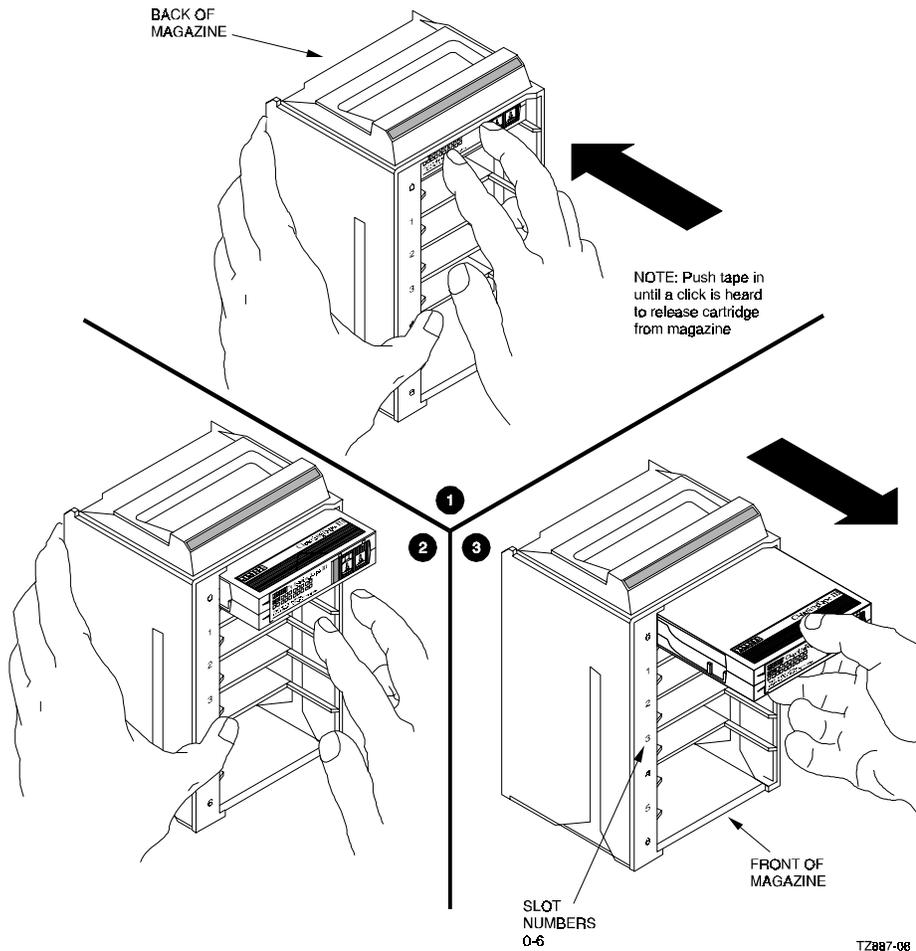
Error Conditions and Problem Resolutions

This chapter describes the conditions necessary for proper push-button operation and information on how to resolve backup operation failures, magazine and loader faults and power problems.

3.1   Conditions Necessary for Push-button Operation

Be sure to review information in the previous chapters to ensure you are correctly operating the Mini-library.

Before pressing the Slot Select, Load/Unload, Eject, or Density Select push-button on the Operator Control Panel, check for the conditions listed in Table 3–1 and ensure that the:

- Power On indicator is on
- Mini-library door is closed
- Mode Select key is not set to OCP Disabled

NOTE

Do not press the Load/Unload push-button to abort any function of the Mini-library.

See Chapter 2 for more information on Operator Control Panel push-button functions.

Table 3–1 TZ887 model 140/280 GB Mini-library Push-button Conditions

If you want to . . .	First make sure the . . .	Then press this push-button . . .
Select another slot in the magazine	Magazine contains at least two cartridges	Slot Select
Load the selected cartridge into the tape drive	Magazine contains at least one cartridge	Load/Unload
	Slot Select Indicator next to desired slot in on	
	Load/Unload indicator is on	
Return the selected cartridge to its original slot in the magazine	Load/Unload indicator is on	Load/Unload
Clear a magazine or loader fault	Load/Unload indicator is on	Load/Unload
	Magazine Fault or Loader Fault indicator is on	
Open the Mini-library door, or unload the cartridge from the drive and open the Mini-library door	Eject indicator is on	Eject

3.2   Backup Operation Failure

Some of the more common reasons backup operations fail are:.
- Loading write-protected cartridges when executing write operations.
- SCSI cable integrity problems. Make sure the bus is terminated at both ends, and only at both ends.

3.3   Avoiding Basic Problems

Follow these guidelines when operating the Mini-library to avoid basic problems:
- Use CompacTape III or CompacTape IV cartridges.
- Check the tape leader in the cartridge by lifting the cartridge latch that opens the door to expose the leader. Be sure the leader is in the same position as the one shown in Figure 3–1.

CAUTION

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

- Be sure that the Mini-library door is fully closed and the current slot indicator is on for the starting cartridge.
- Be sure that no slots in the magazine are empty between the starting cartridge and the expected completion cartridge.

Figure 3–1 Opening the Cartridge Door to Check the Tape Leader
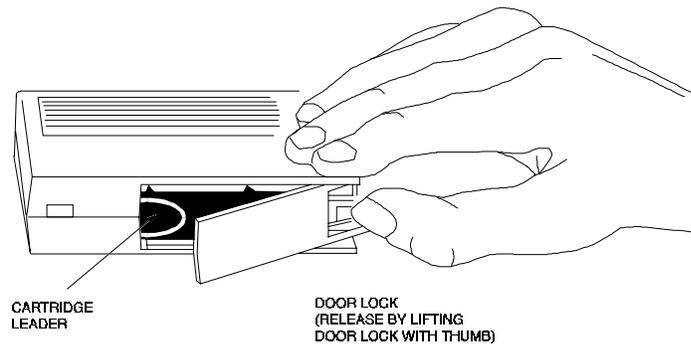
3.4   Error Conditions

Error indications fall into two main categories:
- Magazine Fault – in most cases, this an operator-correctable condition, indicated when the Magazine Fault indicator is on. If you cannot resolve the fault, call your Digital Customer Services representative.
- Loader Fault – This is a condition that most likely requires service from your Digital Customer Services representative. It is indicated when the Loader Fault indicator is on.

3.4.1 Magazine Fault Description

A magazine fault indicates an inconsistency between what the loader transfer assemble has done with a cartridge and the actual state detected by the subsystem.

Inconsistent magazine status occurs when:
- The magazine is full and an extra cartridge is in the drive.
- The magazine is full and an extra cartridge is in the elevator.
- The loader has loaded a cartridge into the drive, but the cartridge has been manually removed.
- The flag is set in the magazine, but no cartridge is present.
- An unrecognized cartridge is in the magazine.

When these conditions are present, the Magazine Fault indicator is on, indicating a situation that can be corrected by the operator. The Eject indicator is also on to inform you that this is the only function available at this time.

The Slot indicator lights only further define magazine faults as follows:
- Slots 6 and 0 light, indicating a cartridge in the drive was not loaded by the loader transfer assembly.
- Slots 5 and 0 light, indicating that you need to replace any missing cartridges in the magazine.

3.4.2 Clearing a Magazine Fault

To clear a magazine fault, first try pressing the Load/Unload push-button. If the fault does not clear, press the Eject push-button to open the Mini-library door and remove the magazine to locate the cartridge error. After you have cleared the error, try loading and unloading cartridges to verify operation.

3.4.3 Loader Fault Description

A loader fault indicates the Mini-library has detected a fatal error in either the loader transfer assembly or the tape drive. In some loader transfer assembly errors, the Mini-library retries the error three times before indicating failure. All loader faults generate an error log as well as light the Loader Fault indicator and an associated subcode.

The Loader Fault indicator lights to alert you to errors in the loader transfer assembly, controller module, or drive. The suspected location of a fault is indicated by the Slot indicators as follows:

- Slots 4 and 0 light, indicating a controller module fault.
- Slots 5 and 0 light, indicating a loader transfer assembly fault.
- Slots 6 and 0 light, indicating a drive fault.

3.4.4 Clearing a Loader Fault

When a loader fault occurs, the Load/Unload and Eject indicators are on. When you press the Load/Unload push-button, the Mini-library attempts to clear the error. When you press the Eject push-button, the Mini-library door opens and lets you access the magazine.

3.5 Power Problems

If the Power ON indicator is off, or your host system does not recognize the Mini-library:

- If rack or pedestal mounted, verify that the Mini-library is pushed completely into the enclosure. (Power to the loader transfer assembly is disable when it slides forward).
- Verify with your system manager that the Mini-library configuration is correct.
- Call your Digital Customer Services representative.

A

Specifications

This appendix contains the technical specifications for the Mini-library and the internal TZ887 tape drive, and lists the SCSI command signal set.

Table A–1 Mini-library Specifications.

Characteristic	Specification(s)
Height	Table top: 27.25 cm (10.73 in.) Rack mount: 26.47 cm (10.42 in)
Width	Table top: 22.54 cm (8.875 in.) Rack mount: 22.20 cm (8.74 in)
Depth	68.5 cm (27.0 in)
Weight	Table top: 29.54 kg (65 lbs.) Rack mount: 24.95 kg (55 lbs.)
Noise Level	52 dB
Maximum number of cartridges	Seven
Communications interface	SCSI-2 bus (single-ended or differential)
Mechanical load/unload cycle time	50 sec. (maximum)
Voltage	100 to 240 Vac (voltage selection switch)
Frequency	50 to 60 Hz
Power consumption	113 W, maximum
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)

Table A–1. Mini-Library Specifications (Continued)

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 TZ887 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; 64 pairs
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 per cartridge capacity	20.0 GB formatted, native 40.0 GB formatted, compressed
Total capacity	280 GB[1]
Backup time	Approximately 15.4 hrs. (280 GB, compressed)

Table A–2 TZ887 Tape Drive Specifications (Continued)

Reliability	
Subsystem MTBF (10% duty cycle)	80,000 hrs.[2]
Tape Life	500,000 passes

[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 TZ887 Model 140/280 GB DLT 7-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 TZ887 Model 140/280 GB DLT 7-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 will default 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 5 GB cartridge */":

```
/* TZ887 280GB DLT Streaming /w Compression Cartridge
tape drive */

{

  "DEC TZ887 280GB Cart. DLT Steaming /w Compression",
13 ,

  "DEC     TZ887",ST_TYPE_DEFAULT, 8192,
  (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 TZ887 280GB 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   TZ887) is the vendor ID. (Ensure that five spaces are included between "DEC" and "TZ887" elements.)

The fourth parameter (ST_TYPE_DEFAULT) is the drive type for the driver.

The fifth parameter (8192) is the block size in bytes.

The sixth parameter (ST_BSF | ST_VARIABLE | ST_BSR | ST_LONG_ERASE | ST_KNOWS_EOD) comprises the drive options.

The seventh parameter (`5000`) is the maximum number of read retries.

The eighth parameter (`5000`) is the maximum number of write retries.

The ninth parameter (`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 TZ887 280 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

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.

Appendix C. Product Notes for Sun

C.3.1.1 System Modification (Solaris 2.3)

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

1. From the command line, type:

   ```
   cd /kernel/drv
   ```

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

   ```
   # entry for TZ887 tape drive
   tape-config-list = "DEC     TZ887",
   ```
   ```
   "DEC 280GB Cart. DLT Streaming /w Compression",
   "TZ887-data";
   ```
   ```
   TZ887-data =
   1,0x36,0,0x1639,4,0x80,0x81,0x82,0x83,3;
   ```

where:

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

> The first parameter (`DEC     TZ887`) is the parameter returned by the TZ887 Model 140/280 GB DLT Mini-library on a SCSI inquiry command. (There should be five spaces between "`DEC`" and "`TZ887`" elements.)
>
> The second parameter (`DEC 280GB Cart. DLT Streaming /w compression`) is a *nickname* for the drive.
>
> The third parameter is defined as follows:
>> In the "TZ887-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 (0 = variable block size).

EK–SM1TH–UG. C01   C–7

– 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 Modification (Solaris 2.4 and up)

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

1. From the command line, type:

    ```
    cd /kernel/drv
    ```

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

```
# entry for TZ887 tape drive
tape-config-list = "DEC     TZ887",
"DEC 280GB Cart. DLT Streaming /w Compression",
"TZ887-data";
TZ887-data =
1,0x36,0,0x1639,4,0x80,0x81,0x82,0x83,3;
```

where:

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

The first parameter (`DEC     TZ887`) is the parameter returned by the TZ887 Model 140/280 GB DLT Mini-library on a SCSI inquiry command. (There should be five spaces between "`DEC`" and "`TZ887`" elements.)

The second parameter (`DEC 280GB Cart. DLT Streaming /w compression`) is a *nickname* for the drive.

The third parameter is defined as follows:

In the "TZ887-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 (0 = variable block size).

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

ST_VARIABLE   = 0x0001
ST_BSF   = 0x0008
ST_BSR   = 0x0010
ST_LONG_ERASE   = 0x0020
ST_KNOWS_EOD   = 0x0200
ST_UNLOADABLE   = 0x0400
ST_LONG TIMEOUTS   = 0x1000

– The fifth parameter (4) defines the number of densities. The maximum
definable number of densities is 4, 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 listsall 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.3.1.3 System Shutdown

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

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

C.3.1.4 Installation of the Mini-library

Install the Mini-library and power on the workstation. We recommend that the TZ887 Model 140/280 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.3.1.5 Rebooting of System

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

```
      >boot -rv
```

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

The system compiles the kernel and creates special files in **/dev** so that it can communicate with the TZ887 Model 140/280 GB DLT Mini-library. Since you booted the system using the verbose switch, the system displays all of its SCSI targets. Verify that "`DEC  280GB  Cart.  DLT  Streaming  /w Compression`" is displayed as a target when the system is booting.

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

"rmt" format

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

- Options *x, xu*, and *xc*, correspond to the 0x83, (TK88, *compressed*) density mode.

- Option *xl*, corresponds to the 0x80 (TK87) density mode.

- Option *xm* corresponds to 0x81 (TK87, compressed) density mode.

- Option *xh* 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 <u>and</u> 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.3.1.6 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.3.1.7 Verification

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

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

The system responds with

```
/etc/passwd
```

The installation and verification procedure is now complete.

C.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 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.

Table D–1 Density Code

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:

Table D–2 Tape Drive Special File Characteristics

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 DLT4700. 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 TZ887 to it's equivalent DLT4700 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 TZ887 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 DLT4700, 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 DLT4700.

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 DLT4700 or TZ887` (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, which 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 TZ887

```
        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 TZ887

```
  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 TZ887

```
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.

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