Educational Services

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Tx867 Series
Magazine Tape Subsystem

Owner's Manual

EK–TX867–OM–001

Digital Equipment Corporation

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Preface

Purpose

This manual introduces the Tx867 series of magazine tape subsystems and describes operating procedures.

Manual Structure

Chapter 1, Overview, provides a basic product description of and specifications for the Tx867 series magazine tape subsystem.

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, TF867 Local Programs, describes how to access local diagnostic programs on the TF867 subsystem using the SET HOST/DUP command.

Chapter 4, Error Conditions and Problem Resolutions, describes the necessary conditions to use OCP buttons, backup operation failures, error indications, and power problems.

Chapter 5, Head Cleaning, describes how to clean the read/write heads in the tape drive.

Appendix A, VMS Operating System Commands, describes VMS commands used with tape devices.

Appendix B, Using the TZ867 Subsystem with the ULTRIX Operating System, describes how to add the TZ867 subsystem to your ULTRIX operating system, how to get maximum capacity and performance from the TZ867 subsystem, using the TZ867 for unattended backups, and using various ULTRIX commands to save information on the TZ867 subsystem.

Appendix C, Service Offerings, describes maintenance plans offered by Digital Services.

Intended Audience

This manual is intended for the TF867 or TZ867 subsystem owner.

This manual is for use by system managers, computer operators, or anyone who uses magazine tape subsystems. Prior knowledge of and experience with the VMS operating system and commands and tape devices are required.

Conventions

The term *Tx867* refers to the TF867 and the TZ867 magazine tape subsystems.

The term *OCP pushbuttons* refers to the Eject, Load/Unload, and Slot Select buttons that are at the top of the operator control panel (OCP) on the Tx867 subsystem.

1
Overview

This chapter describes the Tx867 magazine tape subsystem and its functions.

1.1 General Description

The Tx867 magazine tape subsystem (Figure 1–1) is an electromechanical device that can store approximately 42.0 GB of data. Using CompacTape III cartridges, the Tx867 subsystem can store up to 6.0 GB of data per cartridge.

The Tx867 magazine tape subsystem can load and unload tape cartridges into and from a tape drive, providing a degree of unattended backup, as well as perform single cartridge operations. The Tx867 subsystem performs automatic, sequential tape operations.

In addition, the Tx867 subsystem executes operating system commands, qualifiers, and parameters to store data from user disk areas to the tape drive.

Figure 1–1   Front View of the Tx867 Magazine Tape Subsystem

SHR_X1025E_91
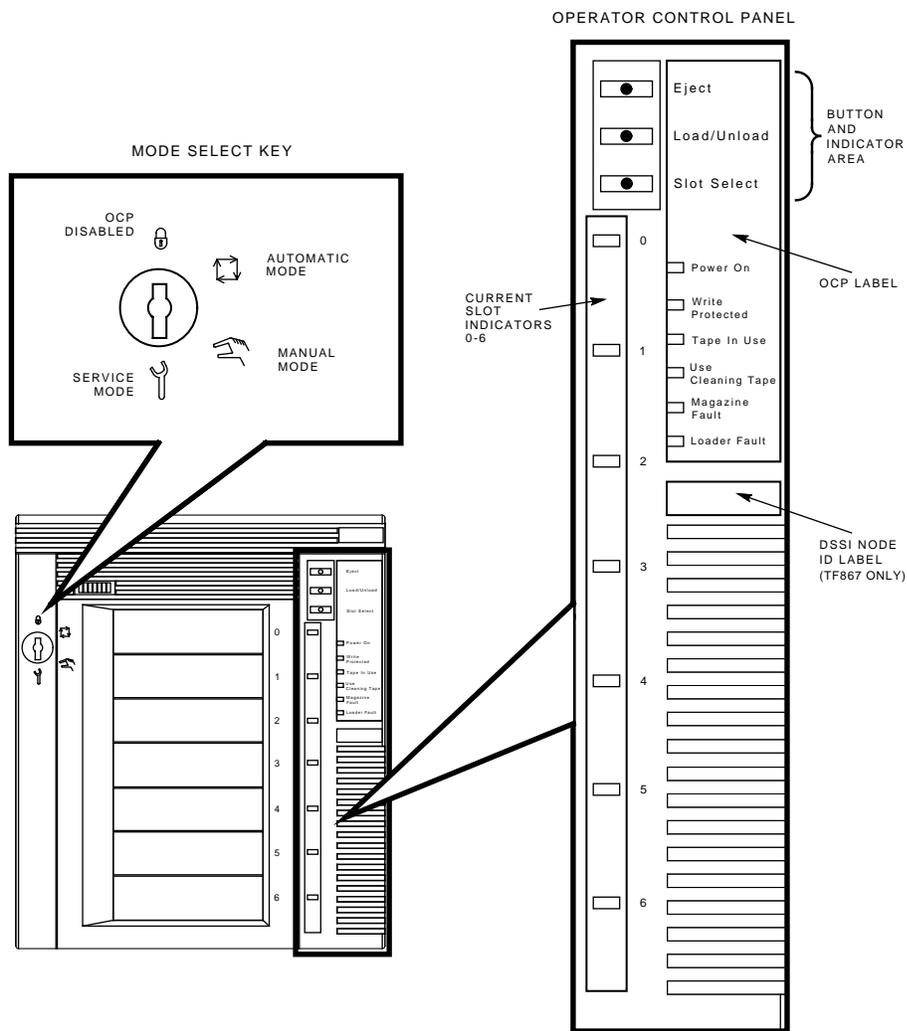
1.2 Configuration

The Tx867 magazine tape subsystem:

- Is configured on VAX and RISC systems

- Can serve two or more systems as a dual-*ported* subsystem in a DSSI cluster (TF867) or CI cluster (TA867 Cartridge Tape Subsystem)

The Tx867 subsystem is available in two variations for use on systems with a DSSI bus or a SCSI bus:

Subsystem Variation	System Bus
TF867	DSSI
TZ867	SCSI

The DSSI bus and the SCSI bus are electrical connections that allow the system's central processing unit (CPU) and main memory to communicate with devices such as the TF867 and TZ867 subsystem.

The TF867 and TZ867 options can be installed in a variety of storage cabinets. The options are also available in pedestals.

For example:

The TF867 subsystem installs in both the SF200 storage array and SF106 pedestal:

- The SF200 can contain a maximum of two TF867 subsystems (Figure 1–2). The first TF867 subsystem installs in position 5; a second TF867 subsystem installs in position 6.

- The SF106 (Figure 1–3) contains one factory-installed TF867 subsystem in the upper compartment; the lower compartment is optional storage space that can contain an SF72, SF73, or SF35 storage enclosure.

The TZ867 subsystem installs in the SZ106 pedestal (Figure 1–3). The SZ106 contains one factory-installed TZ867 subsystem in the upper compartment.

The TF867 is supported as a generic device (unknown device type) by version 5.4-2 or later of the VMS operating system.

The TZ867 is supported by various VMS versions with certain restrictions (Table 1–1):

Table 1–1   TZ867 VMS Restrictions

VMS Version	Restrictions[1]
<5.3	X
5.3	1,2,4
5.4	1,2,4
5.4-1	1,2,4
5.4-2	1,2,3,4
5.4-3	1,2,3,4
5.5	1,2,4
5.5-1	1,2,4

[1]KEY

X = Not Supported
1 = VMS SHOW DEVICE command indicates "generic SCSI tape" and ERROR LOGGING indicates "GENERIC MK SUBSYSTEM". This has little impact on most applications.
2 = Standalone BACKUP *not* supported. You cannot create a standalone BACKUP tape.
3 = Sequential tape cartridge autoloading NOT supported. For example, operator intervention is required for multivolume BACKUP.
4 = Writing COMPACTAPE III media with TK85 format is *not* supported, since VMS does not support density select on the TZ86.

PERFORMANCE CONSIDERATION

The VMS backup performance rate of your Tx867 subsystem can depend on your system processor. For example:

*   **Connecting directly to an embedded bus adapter on such systems as the VAX 4000, VAX 6000, MicroVAX 3100-80, or InfoServer 150 (TZ867 only) provides optimum performance.**

*   **Connecting to a MicroVAX/VAXserver 3xxx (Q–bus) system with a KZQSA adapter can reduce the rate of performance but does not limit the high capacity of data storage that your Tx867 has.**

REQUIRED LOAD DEVICE

The TF867, when connected to a KFQSA adapter installed in a MicroVAX II or MicroVAX/VAXserver 3xxx system, does not support booting of VMS or MicroVAX Diagnostic Monitor (MDM) software. An additional load device is needed to boot this software.

CAUTION

The Tx867 magazine tape subsystem is not customer-installable. Do not install it yourself or the product warranty will be void.

1.3   Node ID Label

The operator control panel on the TF867 subsystem has a space for a DSSI node ID label (Figure 1–1), which identifies the device bus ID number. (This label is in the label kit.) The DSSI node ID is preset during manufacturing to zero (0). The Digital Services engineer verifies this setting during installation at the site.

TZ867 users may wish to use this space on the operator control panel to place a label noting the device's SCSI ID.

Figure 1–2   SF200 Storage Array

POSITION 5

POSITION 6

CXO-2461B
SHR_X1106A_89
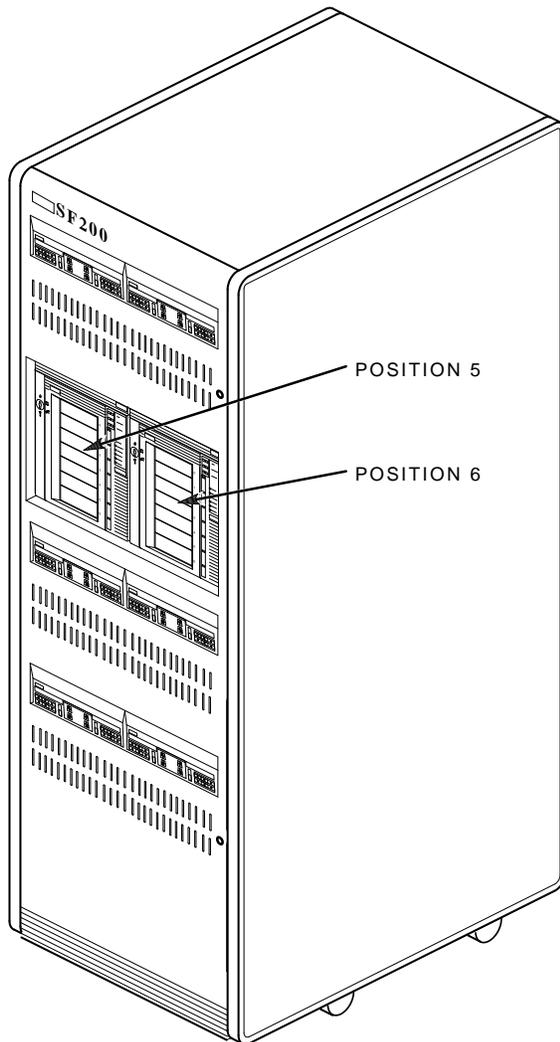
Figure 1–3   SF106/SZ106 Pedestal

TX867
Subsystem

Optional
Storage
Space

SHR-X0175_91-DG
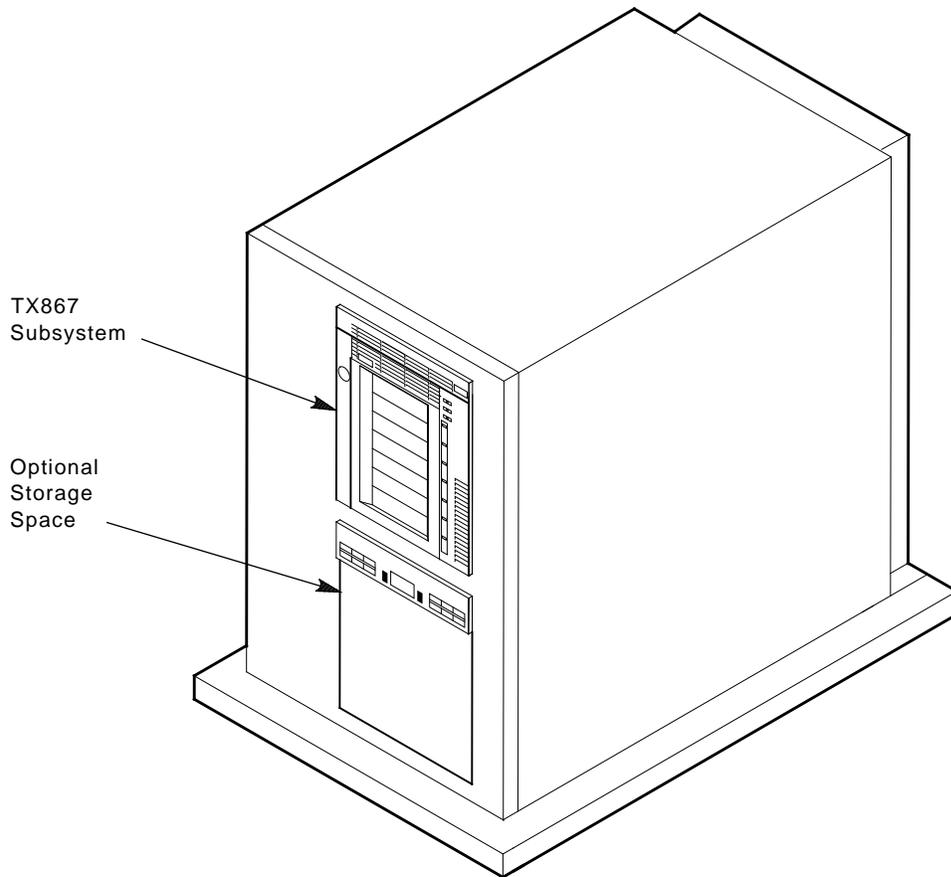
1.4 Operating Modes

The Tx867 subsystem operates in the following modes:

- **OCP Disabled mode** — Locks the subsystem into the enclosure and locks the receiver. The pushbuttons on the operator control panel (OCP)—Eject, Load/Unload, Slot Select—are disabled. This mode automatically loads the next tape cartridge into the drive after you issue the DISMOUNT command.

- **Automatic mode** — Is the subsystem's default or normal mode. It locks the subsystem into the enclosure but leaves the receiver unlocked. This mode automatically loads the next tape cartridge into the drive after you issue the DISMOUNT command. The OCP pushbuttons remain enabled.

- **Manual mode** — Locks the subsystem into the enclosure but leaves the receiver unlocked. This mode allows for single cartridge operations only. The OCP pushbuttons remain enabled. Loading and unloading of cartridges is *not* automatic; operator intervention is required to select the next cartridge.

- **Service mode** — Unlocks the subsystem from the enclosure; the subsystem is no longer in Automatic mode. This mode is for you to use when accessing the drive for head cleaning and for Digital Services engineers to use when performing servicing procedures.

You can select these modes through the Mode Select key (Figure 1–4) on the front of the Tx867 subsystem.

See Chapter 2 for information on using the modes and the Mode Select key.

Figure 1–4   Tx867 Subsystem Mode Select Key Symbols

MODE SELECT KEY

SHR_X1025D_89
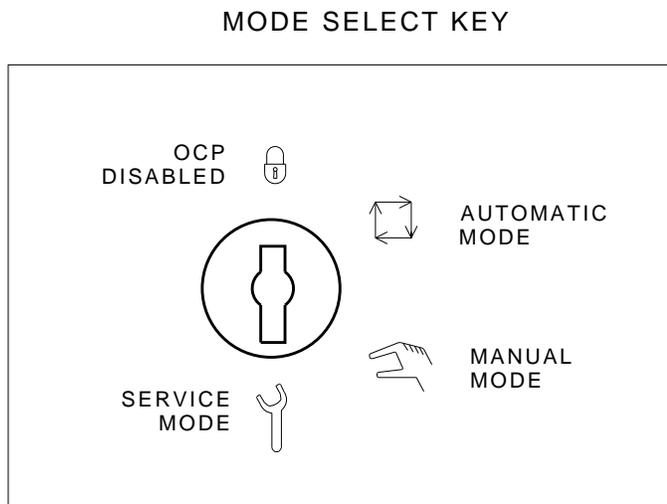
1.5   Hardware Components

The Tx867 magazine tape subsystem consists of the following major hardware components (Figure 1–5):

- Loader transfer assembly

- Magazine

- TK86 tape drive

- Controller module

- Rear chassis

1.5.1   Loader Transfer Assembly

The Tx867 subsystem has a loader transfer assembly that contains the electromechanical assemblies required to store and move cartridges for use by the TK86 tape drive.

You must insert cartridges into the magazine, then insert the magazine into the receiver. An internal elevator mechanism, in the loader transfer assembly, moves to each of the storage slots. The elevator loads and unloads cartridges into the drive, and returns the cartridges to their original storage slots in the magazine after they have been used.

The loader transfer assembly can:

- Scan the magazine for cartridges

- Unload cartridges from the magazine

- Load cartridges into the drive

- Unload cartridges from the drive

- Restore cartridges to their original slots in the magazine

NOTE
Do not press the Load/Unload button on the Tx867 OCP to abort functions of the loader transfer assembly. Type Ctrl/Y or Ctrl/C instead.

Figure 1–5   Tx867 Magazine Tape Subsystem Block Diagram

SHR_X1009C_89
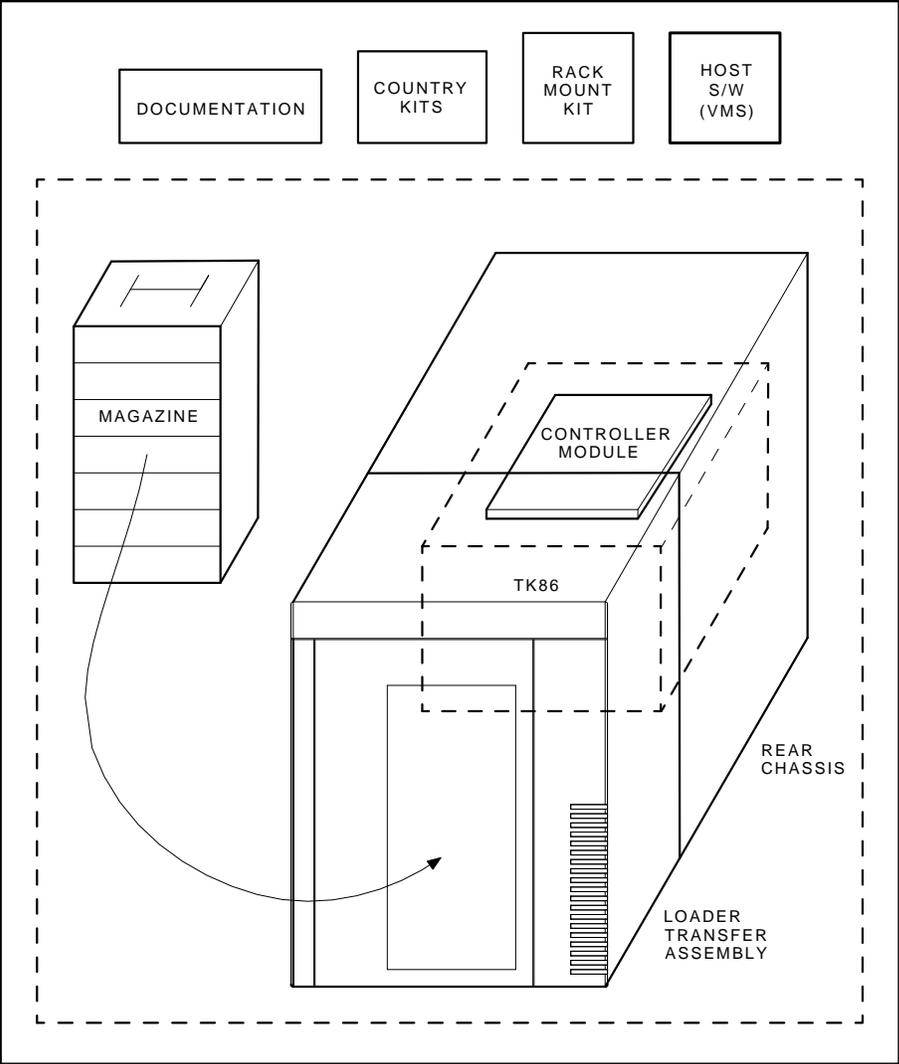
1.5.2 Magazine

The magazine is a removable storage rack that can store up to seven
CompacTape III cartridges. The magazine consists of seven slots in which
the cartridges are loaded; these slots are numbered from 0 to 6 on the
front of the magazine.

Use the OCP pushbuttons to open the receiver, insert or remove the
magazine, load or unload cartridges, or select a slot.

For more information, see Section 2.3.

1.5.3 TK86 Tape Drive

The TK86 tape drive, in the rear chassis of the Tx867 subsystem, is a
streaming tape drive that stores up to 6.0 GB of data on each of its tape
cartridges. The controller module connects the Tx867 subsystem to the
host system and initiates commands to the TK86 tape drive.

1.5.4 Controller Module

The controller module is the Tx867 subsystem's interface to the host
system through the bus. For systems with a DSSI bus and a TF867, the
module is a DSSI controller. For systems with a SCSI bus and the TZ867,
the module is a SCSI controller. The host system initiates commands to
the Tx867 subsystem and TK86 drive through the controller module.

1.5.5 Rear Chassis

The following lists the other components found in the rear chassis and
their functions:

- Power supply–provides power to the rear chassis components and to
  the loader transfer assembly

- Fan–cools the entire Tx867 subsystem

- Handle motor assembly–lifts and lowers the drive's handle when
  cartridges are ready for loading into, or unloading from, the drive

- Interlock switch–safety feature that interrupts voltage when you
  access the drive for head cleaning

1.6   CompacTape III Cartridge

The CompacTape III cartridge (Figure 1–6) is a 4 1/8-inch square, dark
gray, plastic cartridge containing 1200 feet of 1/2-inch magnetic, metal
particle (MP) tape. The cartridge has a write-protect switch to prevent
accidental erasure of data. When the switch is moved to the left and the
small orange rectangle is visible, data cannot be written to the tape. A
package of slide-in labels and a cartridge handling information sheet are
provided with each CompacTape III cartridge.

Figure 1–6   CompacTape III Cartridge

SHR_X1020C_89
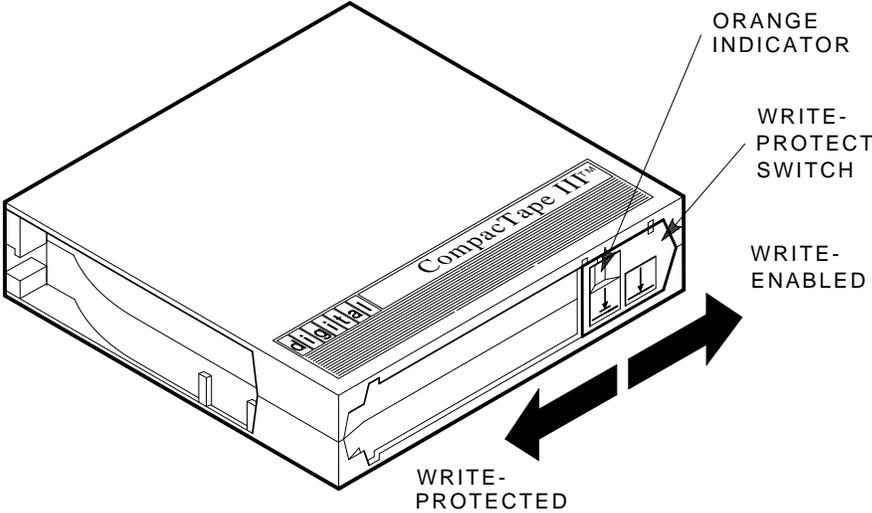
The TK86 tape drive writes 112 tracks (56 pairs) on the tape. The drive reads and writes data in a two-track parallel, serpentine fashion, traveling the entire length of tape on two tracks (at approximately 100 inches per second). The drive then steps the head and reverses tape direction, and continues to read/write on the next two tracks.

Use Table 1–2 to determine cartridge compatibility with the TK86 drive:

Table 1–2   Read/Write Cartridge Compatibility with the TK86 Drive

Cartridge Type	Read/Write Ability in the TK86
CompacTape III (TK85)	Read/write in 85 Mode (48 tracks, 2.6 GBF)
CompacTape III (TK86)	Read/write in 86 Mode (112 tracks, 6.0 GBF)
CompacTape III (Blank)	Read/write in 86 Mode (112 tracks, 6.0 GBF)

1.6.1 Selecting Density with the TF867

Operating system support of density selection is not yet available. The TK86 tape drive defaults to using TK86 format (high density) for all writes from Beginning of Tape (BOT). When you append data to the tape cartridge, the current media density is used.

For information on selecting density using the TZ867 subsystem with the ULTRIX operating system, see Appendix B.

To write in TK85 format (low density) on a TF867 subsystem, you can use the PARAMS utility on VMS systems to modify a new DUP Parameter named FORCEDENSITY, explained in Section 1.6.1.1.

1.6.1.1 Using the FORCEDENSITY Parameter

For explanation on starting PARAMS to use the FORCEDENSITY parameter, see Chapter 3.

The DUP parameter FORCEDENSITY controls how a TF867 subsystem determines what density to use when writing from BOT. FORCEDENSITY has the following possible values:

- 0 = automatic, as selected by the host

- 1 = low (TK85) density regardless of host selection

- 2 = high (TK86) density regardless of host selection

The factory setting is 2 for the FORCEDENSITY parameter. Under this setting, the TK86 tape drive will always reformat the tape to TK86 format on a WRITE-FROM-BOT.

Users wanting to write in TK85 format must:

- Load a tape written in TK85 format and do APPEND operations

  or

- Change the value of FORCEDENSITY to 1 and then WRITE from BOT.

CAUTION
Be sure to change the value of FORCEDENSITY back to 2 after you have finished desired tape operations.

1.6.2 Cartridge Reliability

To ensure the reliability of cartridges that:

- Contain recorded data and may be archived for a long time

- Do not contain recorded data

store the cartridges in a clean, controlled environment with the following conditions:

- Environmental temperature: 18.3°C to 26.1°C (65°F to 79°F)

- Relative humidity: 20% to 60%

1.7 Specifications

Table 1–3 lists the specifications for the Tx867 magazine tape subsystem, and Table 1–4 lists those for the TK86 tape drive.

Table 1–3   Tx867 Magazine Tape Subsystem Specifications

Characteristic	Specifications
Height	26.47 cm (10.42 in)
Width	22.20 cm (8.74 in)
Length	64.77 cm (25.5 in)
Weight	24.95 kg (55 lb)
Noise level	62 dB
Environmental temperature	
Operating	10°C to 40°C (50°F to 104°F)
Nonoperating	–40°C to 66°C (–40°F to 150.8°F)
Humidity	
Operating	20% to 80% noncondensing
Nonoperating	10% to 95%
Certification	
EMI	Meets applicable FCC, VDE, and FTZ standards for Class A devices
Safety	Meets UL, CSA, TUV "BG" MARK and IEC standards
Maximum number of cartridges	7
Electrical rating	100 to 120/220 to 240 VAC, 2/1 AMP
AC power consumption	110 W, typical 113 W, maximum
Communications interface	TF867: DSSI bus TZ867: SCSI bus (single-ended or differential)
Cycle time	50 s, maximum

Table 1–4   TK86 Tape Drive Specifications

Characteristic	Specification(s)
Mode of operation	Streaming
Media	12.77 mm (1/2 in) unformatted magnetic tape
Track density	224 tracks/in
Bit density	42,500 bits/in
Number of tracks	112
Maximum transfer rate (at tape)	800 KB/s, formatted
Tape speed	100 in/s
Track format	Two-track parallel, serpentine recording
Cartridge capacity	Up to 6.0 GB, formatted

1.8   Supplies and Related Documents

Use Table 1–5 to order additional cartridges or magazines. Contact your Digital sales representative, or call Digital's DECdirect ordering service at 1–800–DIGITAL.

Table 1–5   Supplies

Order Number	Description
TK85–HC	CleaningTape III Cartridge. One cartridge ships with the Tx867 subsystem.
TK85–M	Magazine. Ships with the Tx867 subsystem.
TK85K–01	CompacTape III Cartridge. Seven cartridges ship with the Tx867 subsystem.
TK85K–07	CompacTape III data cartridge (quantity, 7)
TK85K–A0	CompacTape III data cartridge (quantity, 1008)

Use the documents in Table 1–6 as supplements to this manual.

Table 1–6   Related Documents

Order Number	Title
AA–Z407B–TE	*VAX/VMS Backup Utility Reference Manual*
AI–Y506B–TE	*Guide to VAX/VMS Disk and Magnetic Tape Operations*
AA–Z424A–TE	*VAX/VMS Mount Utility Reference Manual*
EK–OTX86–OM	*Tx86 Series Cartridge Tape Subsystem Owner's Manual*
EK–OTK86–RC	*Tx86 Tape Drive Operator's Reference Card*

2
Operation

This chapter explains Tx867 subsystem operation:

- Power-on process

- Mode Select key modes

- Operator control panel (OCP) indicator functions

- Slot Select, Load/Unload, and Eject button functions

- Magazine cartridge insertion and removal

2.1 Power-On Process

When the Tx867 subsystem powers on, all of the indicators on the operator control panel (OCP) light, within 15 seconds. The power-on self-test, or POST, is initializing the subsystem. When POST completes successfully, all OCP indicators, including the Magazine Fault and Loader Fault indicators, turn off—except for Power On.

NOTE
If the Magazine Fault or Loader Fault indicator remains on, POST has detected an error. See Chapter 4 for error conditions.

The elevator scans the magazine to determine which slots contain cartridges. If the subsystem has a magazine with a cartridge in slot 0, and no cartridge is in the drive, these indicators should be on:

Power On
Eject
Load/Unload
Slot Select
Slot 0

2.2   Mode Select Key

The Mode Select key (Figure 2–1) can lock the loader transfer assembly
into the enclosure, as well as lock the receiver closed. It has four modes:
OCP Disabled, Automatic, Manual, and Service. The OCP Disabled,
Automatic, and Manual modes are for operational use; the Service mode
is for head cleaning and servicing procedures.

2.2.1   Operating Modes

The following modes for operational use:

*   **OCP Disabled mode** — When the magazine is inserted into the
    receiver and the receiver is closed, the loader transfer assembly scans
    the magazine. The first cartridge in the magazine automatically loads
    into the drive. Operations stop if you are copying data to tape and
    either the storage capacity of the last tape cartridge is exceeded, or no
    tape cartridge is in the next sequential slot in the magazine.

    To lock the Tx867 subsystem into the enclosure and lock the
    receiver, set the Mode Select key to **OCP Disabled** mode. The OCP
    pushbuttons are disabled.

*   **Automatic mode** — This mode is the default, or normal, mode of
    the Tx867 subsystem. It automatically loads and unloads cartridges
    as necessary during backup procedures. Operations stop if you are
    copying data to tape and either the storage capacity of the last tape
    cartridge is exceeded, or no tape cartridge is in the next sequential
    slot in the magazine.

    To lock the Tx867 subsystem into its normal operating position in the
    enclosure but leave the receiver unlocked, set the Mode Select key to
    Automatic mode. The receiver can be opened; all OCP pushbuttons
    are enabled.

*   **Manual mode** — Automatic loading and unloading of cartridges
    does not occur in this mode; rather, you must press the Load/Unload
    button to move each cartridge. This mode is most useful for, but not
    restricted to, copying specific files to or from tape.

    To lock the Tx867 subsystem into the enclosure, set the Mode Select
    key to **Manual** mode. The receiver is unlocked and can be opened; all
    OCP pushbuttons are on.

NOTE
During Manual mode, the cartridge returns to the magazine,
but the current Slot Select indicator does not advance forward
to the next available cartridge.

Figure 2–1   Tx867 Operator Control Panel

SHR_X1025E_91
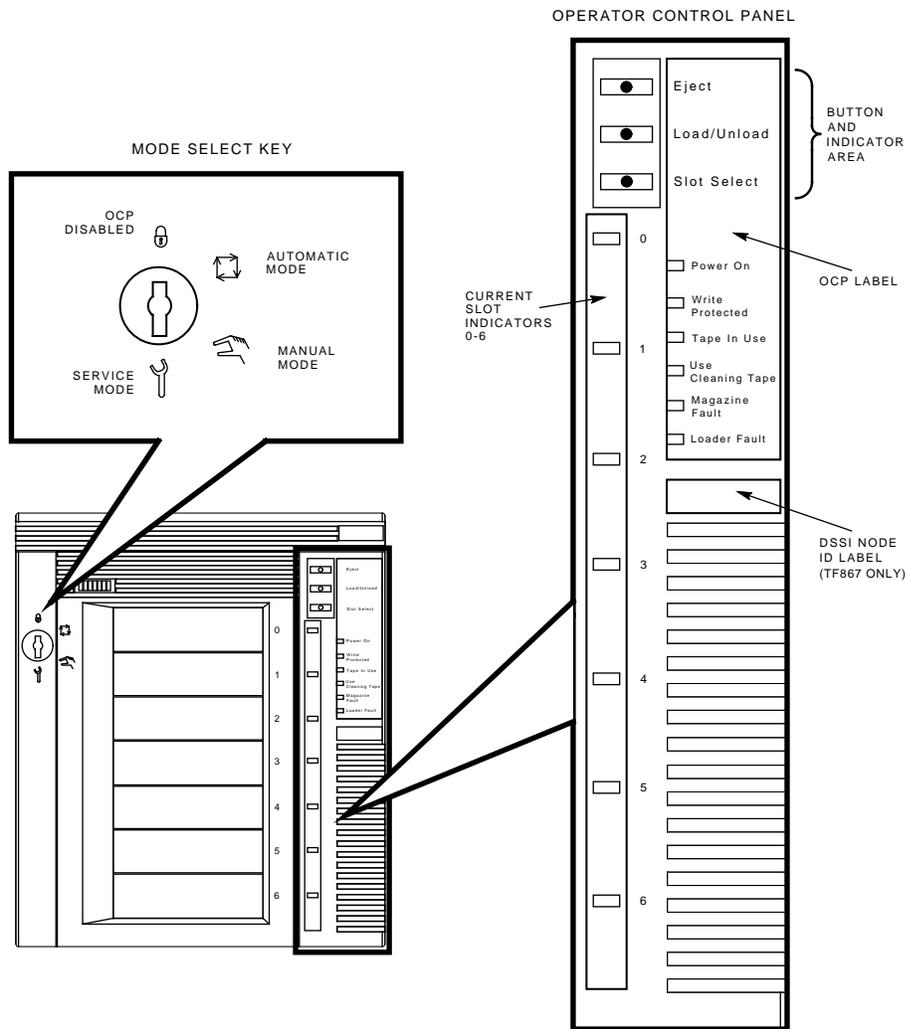
2.2.2 Service Mode

Service mode is for performing head cleaning by manually loading the CleaningTape III and for performing servicing procedures. See Chapter 5 for information on head cleaning.

To unlock the Tx867 subsystem from its enclosure and remove it from its normal operating position, set the Mode Select key to **Service** mode. The receiver is unlocked and can be opened.

2.3   Operator Control Panel

The Tx867 operator control panel (OCP) has 3 OCP pushbuttons and 16 indicators that are used with the Mode Select key (Table 2–1). See Section 2.2 for information on the Mode Select key and its functions. See Section 2.4 for more details on button and indicator operations.

Table 2–1   Tx867 Operator Control Panel

Button/Indicator	Color	Function
Eject button	–	Opens the receiver, 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.
Eject indicator	Green	Indicates a magazine fault, and that you can press the Eject button to unload cartridges from the drive to the magazine and to open the receiver.
Load/Unload button	–	Loads the currently selected cartridge into the tape drive. Unloads the cartridge currently in the tape drive. Resets the subsystem if there is a loader fault.
Load/Unload indicator	Green	Indicates that you can press the Load /Unload button.
Slot Select button	–	Increments the current slot indicator to the next slot.
Slot Select indicator	Green	Indicates that you can press the Slot Select button. Pressing this button moves the current slot indicator to the next slot.

Table 2–1   (Continued)   Tx867 Operator Control Panel

Button/Indicator	Color	Function
Power On indicator	Green	Indicates the Tx867 magazine tape subsystem is in a known good power state (ac and dc voltages are within tolerance).
Write Protected indicator	Orange	When on, indicates that the cartridge currently in the drive is write-protected by one of these methods:
		• Setting the write-protect switch to write-protect
		• Using software write-protect qualifiers
		When off, indicates that the current cartridge is write-enabled.
Tape In Use indicator	Yellow	Indicates tape drive activity as follows:
		• Slow blinking indicates tape is rewinding.
		• Rapid blinking indicates tape is reading or writing.
		• When on steadily, indicates that a cartridge is in the drive and the tape is not moving.
		• When off, indicates that no cartridge is in the drive.
Use Cleaning Tape indicator	Orange	Indicates that the read/write head needs cleaning. See Chapter 5.
Magazine Fault indicator	Red	Indicates a magazine failure.
Loader Fault indicator	Red	Indicates a loader transfer assembly error or drive error.

Table 2–1   (Continued)   Tx867 Operator Control Panel

Button/Indicator	Color	Function
Current slot indicators 0–6	Green	Identifies the current slot (see Slot Select button). Each current slot indicator blinks when its corresponding cartridge moves to or from the drive. Also used with the Magazine Fault or Loader Fault indicator to show the type of fault (Sections 4.4.1 and Section 4.4.2).

2.4   Slot Select, Load/Unload, and Eject Button Functions

The Slot Select, Load/Unload and Eject buttons are OCP pushbuttons. They contain a green indicator, and they are operable only when their corresponding indicators are on.

NOTE

The Load/Unload button has three functions: *load*, *unload*, **and** *reset*. **If there is a loader fault and the Loader Fault indicator is on, press the Load/Unload button to reset the Tx867 subsystem.**

2.4.1   Selecting a Cartridge

Use the **Slot Select** button to select a cartridge; press this button to advance the slot indicator light to the next available slot. After a successful initialization, the Tx867 subsystem automatically selects slot 0 and the Slot Select button becomes active. The Load/Unload and Eject indicators remain on during the slot selection.

2.4.2   Loading the Cartridge

Press the **Load/Unload** button to load the cartridge into the drive. This action causes the Select Slot, Load/Unload, and Eject indicators to turn off, and the elevator to move 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. The indicators remain off until the tape has loaded to the beginning of the tape (BOT). After the cartridge is loaded into the drive, the Eject and Load/Unload indicators turn on, and the corresponding buttons are enabled. The Slot Select indicator remains off.

2.4.3 Unloading the Cartridge

<div align="center">CAUTION</div>

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

When you press the Load/Unload button, the Select Slot, Load/Unload, and Eject indicators turn off, and the cartridge unloads from the drive into the magazine. However, automatic operation now stops and the Select Slot operation does not increment. The indicators turn on once the cartridge is returned to the magazine.

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

2.4.4 Opening the Receiver

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

<div align="center">NOTE</div>

When a cartridge is not in the drive, the Slot Select, Load/Unload, and Eject indicators are on before any operation begins. Pressing the Eject button causes all indicators to turn off. The elevator then returns to its home position and the receiver opens.

When a cartridge is in the drive, the Eject and Load/Unload indicators are on before the operation begins. When you press the Eject button, both indicators turn off, and the cartridge unloads from the drive and moves back into the magazine. The receiver then opens to allow access to the magazine.

In both situations, once the receiver is closed again, a magazine scan begins, and the indicators turn back on when the scan is complete.

2.5   Magazine

The front of the magazine has numbers, 0 through 6, that indicate the number of the slot.

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

2.5.1   Inserting a Cartridge into the Front of the Magazine

To simplify cartridge insertion, place the magazine on a flat surface with the slots facing you (Figure 2–3). Each slot is numbered—to ensure that you are inserting the cartridge correctly in the front of the magazine. Usually, cartridges are inserted into consecutive slots.

To insert a cartridge into the magazine:

1. Grasp the cartridge with the CompacTape III label facing up and the write-protect switch facing you (Figure 2–2).

2. Set the cartridge's write-protect switch to the desired position. If you want to write on the tape, slide the switch to the right (orange indicator is not visible). If you want to write-protect the tape, slide the switch to the left (orange indicator is visible).

3. Insert the cartridge (Figure 2–3) by pushing it into the slot until you hear a click. A small metal tab holds the cartridge in place.

Figure 2–2   Write-Protect Switch on a Cartridge

SHR_X1020C_89
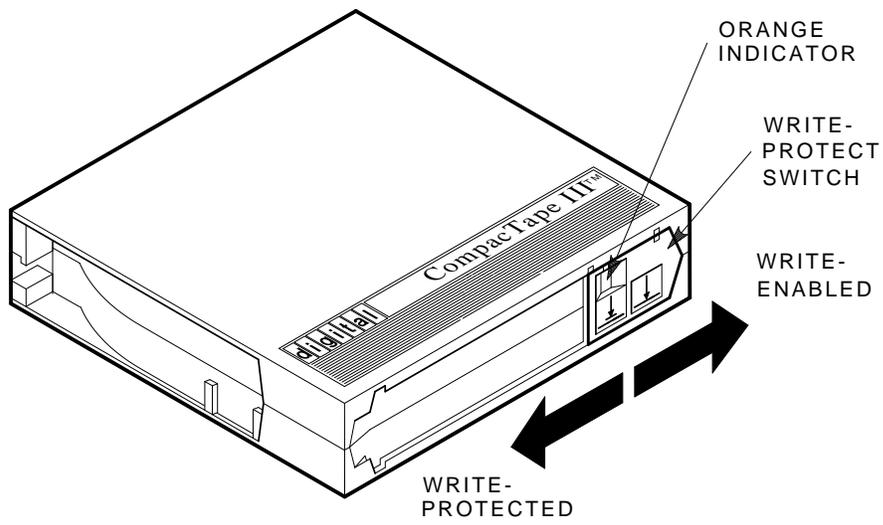
Figure 2–3 Inserting a Cartridge into the Magazine

BACK OF
MAGAZINE

1

2   **3**

NOTE: Push tape in
until a click is heard

SLOT
NUMBERS
0-6

FRONT OF
MAGAZINE

SHR_X1021_89
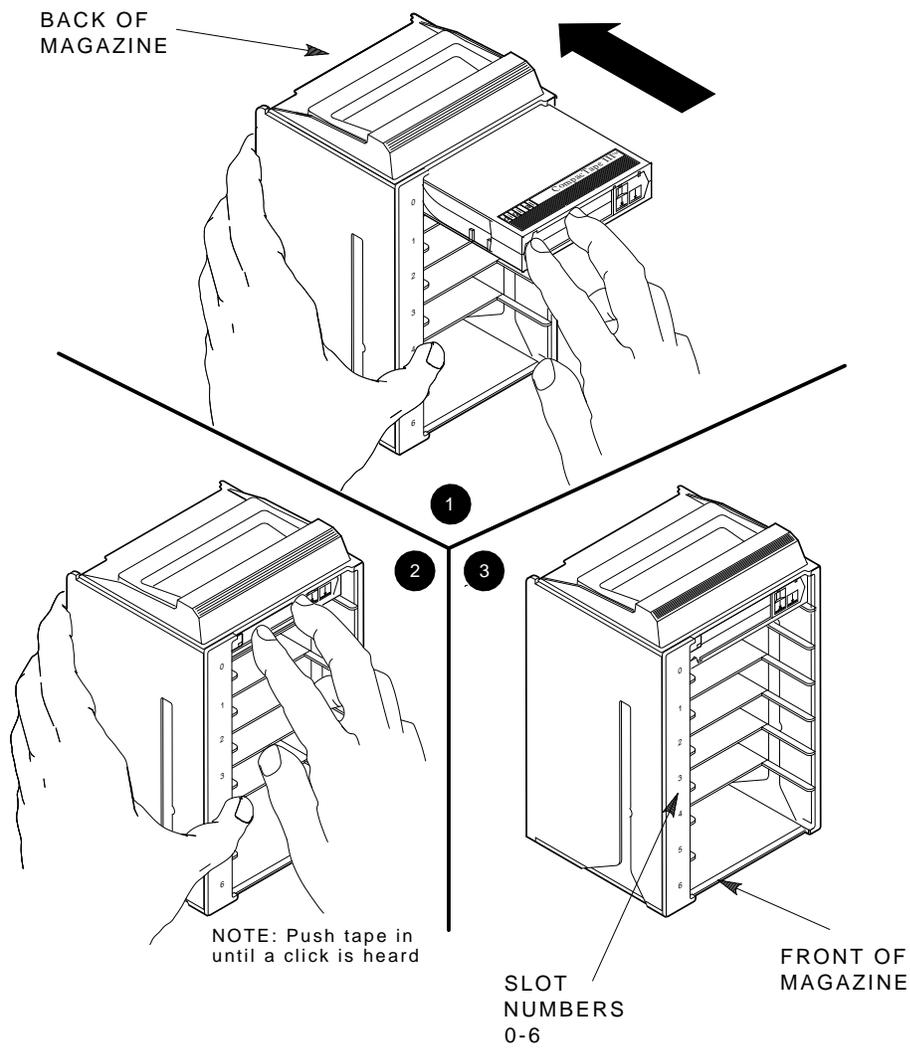
2.5.2 Removing a Cartridge from the Magazine

To remove a cartridge from the magazine, press the cartridge (Figure 2–4) at the front of the magazine until you hear a click; then, release. The slot uses a spring-release action. When you press the cartridge in all the way, it pops out.

NOTE
Never apply labels to the top or bottom of tape cartridges. Doing so can cause cartridge jams in the Tx867 subsystem. Use the space on the front of the cartridge for labels. If a jam occurs, call your Digital Services representative.

2.5.3 Removing the Magazine from the Receiver

To remove the magazine from the receiver, first be sure that:

1. The Power On indicator is on (Figure 2–1).

2. The tape drive is unloaded.

3. The Eject indicator is on. (It must be on before you can press the Eject button.)

Then:

1. Press the Eject button (Figure 2–1) to open the receiver.

2. Grasp the receiver after it opens (Figure 2–5), and gently pull it forward to access the magazine.

3. Grasp the magazine's handle only to lift the magazine out of the receiver.

2.5.4 Installing the Magazine into the Receiver

To install the magazine into the receiver:

1. Slide the magazine down into the receiver (Figure 2–5) while holding the magazine by the handle. Since the magazine is slotted, you can restore it in the correct orientation only.

2. Push the receiver closed.

3. Observe that the receiver is fully closed in the Tx867 subsystem before proceeding.

Figure 2–4   Removing a Cartridge from the Front of the Magazine

SHR_X1022_89

Figure 2–5   Receiver Opened

FRONT
BEZEL

Eject

Load/Unload

Slot Select

Power On

Write Protect

Tape in Use

Use
Cleaning Tape

Drive Fault

Load Fault

SHR-X0046-90
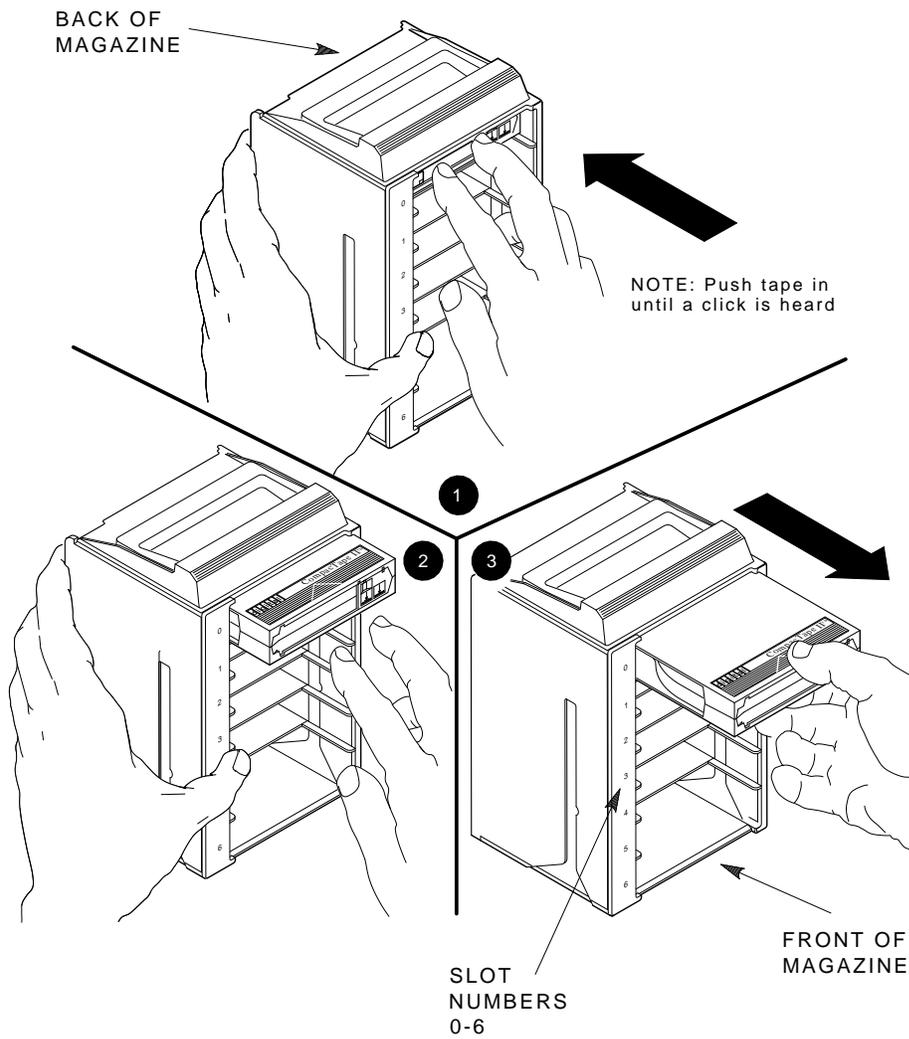
3
TF867 Local Programs

This chapter is for TF867 users only. It describes some of the local diagnostic programs and utilities that you can access with the TF867 magazine tape subsystem to test and verify that the subsystem is functioning correctly.

The programs and utilities, also called *task names*, described in this chapter are:

- **DIRECT** — Provides a directory of available local programs.

- **HISTRY** — Displays information about the TF867 subsystem.

- **PARAMS** — Allows you to observe and change subsystem parameters.

- **DRVEXR** — Exercises the tape drive and displays statistics after successful completion.

- **DRVTST** — Verifies the correct functioning of drive hardware.

- **LDRTST** — Exercises the internals of the loader transfer assembly.

NOTE

To abort a local program or utility, type Ctrl/Y **or** Ctrl/C **. Do *not* stop diagnostics by pressing the Load/Unload button on the TF867 operator control panel. Doing so can cause system failure.**

3.1   Accessing Local Programs

Access local programs with the VMS command:

```
$ SET HOST/DUP
```

You need certain VMS privileges to use the **SET HOST/DUP** command. (See your system manager.) This command allows you to access the local programs that reside in read-only memory (ROM) on the TF867 subsystem.

When you execute **SET HOST/DUP**, communications between the host system and the TF867 subsystem are through diagnostic utilities protocol (DUP). Drive operations under DUP are controlled through the local programs. When you exit the program, control returns to the operating system.

The following example shows the sequence of commands to access local programs. These commands are for the VMS operating system, version 5.4-2 or later:

```
$ SHOW CLUSTER
  (Shows the node name of the tape device.)

$ SET DEVICE/noavailable device-name
  (Makes the device unavailable to users.)

$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=PARAMS nodename
  (Allows you to access programs.)
```

TASK in the above example refers to one of the six programs listed at the beginning of this chapter. **PARAMS** is the program or task name. You can use any of the program names, depending on what task you want to accomplish.

Add the qualifier **/LOG** if you want a record, or log, of the results of the test run.

CAUTION

The node name is derived from the subsystem's serial number. If you change the node name, the host system does not recognize this name until you reboot the host system.

3.1.1 Error Message after Executing SET HOST/DUP Command

If you receive an error message when using the SET HOST/DUP command, you may need to load the FYDRIVER program.

To load the FYDRIVER program:

```
$ MCR SYSGEN
  (Accesses SYSGEN.)

$ SYSGEN> LOAD FYDRIVER
  (Loads FYDRIVER, a prerequisite to using diagnostics.)

$ SYSGEN> CON FYA0/NOADAP
  (Configures FYDRIVER.)

$ SYSGEN> EXIT
```

3.2 DIRECT Utility

The **DIRECT** utility provides a directory of the diagnostic and utility programs that are resident in the TF867 subsystem.

An example of a DIRECT display follows:

```
DIRECT V1.0  D
HISTRY V1.0  D
PARAMS V1.0  D
DRVEXR V1.0 SD
DRVTST V1.0 SD
LDRTST V1.0 SD
Completed
```

3.3 HISTRY Program

The **HISTRY** program displays information about the history of the
TF867 subsystem.

An example of the HISTRY display follows:

```
TF86
DSSI:  T8BBBB  /0 (DIPs)
Controller:
   S#: EN03000193
   HW: 000/PCB-rev:A000
   Bt: 123/A435BAC1 (25-NOV-1991 16:51:54)
   Cd: V004/5150C0EA (1-SEP-1992 20:33:02)
   EE: 086.016  TD: 002
Drive:
   S#: EN04500420
   HW: 000/A000
   Cd: 064/935C
   EE: 001/E826
Loader (S/H/M): 028/000/000
Power on Hours:  1286
Power Cycles:      17
Completed
```

3.4 PARAMS Program

The **PARAMS** program displays or changes internal parameters for the
TF867 magazine tape subsystem (Table 3–1). Parameters are preset
during manufacturing; however, your system manager may need to
change them with the PARAMS program to configure your system.

Table 3–1   TF867 Subsystem Parameters

Parameter	Definition
UNITNUM	TMSCP unit number.
SYSTEMID	Controller module's 48-bit system ID.
NODENAME	Node name for the TF867 subsystem.
FORCENAME	1 — Default node name in use. (Derived from the subsystem serial number.)
	0 — Uses value set in NODENAME.
FORCEUNI	Determines whether the TMSCP unit number or DSSI node ID is used.
	1 — Uses the DSSI node ID.
	0 — Uses the TMSCP unit number.

3.4.1 Displaying, Setting, and Saving Parameters

Use the **SET HOST/DUP** command to invoke the PARAMS program. The
terminal displays the following prompt:

```
PARAMS>
```

Once you invoke the PARAMS program, all interaction is through
commands and responses (Table 3–2).

Table 3–2   TF867 PARAMS Commands

Command	Definition
HELP	Shows all PARAMS commands and their syntax.
SHOW	Displays subsystem parameters.
SET	Sets a parameter to a value.
STATUS	Displays the status of subsystem operations.
WRITE	Records the device parameters changed with the SET command.
EXIT	Terminates the PARAMS local program.

3.4.2 HELP Command

Use the **HELP** command to display a list of available PARAMS
commands:

```
PARAMS> HELP
```

The PARAMS program responds:

```
EXIT
HELP
SET {parameter | .} value
SHOW {parameter | . | /class}
   /ALL   /DIF    /DSSI   /DUP
   /SYSTEM   /TDS  /TMSCP
STATUS DATALINK {Reset}
STATUS PATH node_number {Reset}
STATUS LOGS
STATUS DIRECTORY
WRITE
```

3.4.3 SHOW Command

Use the **SHOW** command to display TF867 subsystem parameters. The command syntax for displaying specific parameters is:

```
PARAMS> SHOW parameter
```

See Table 3–1 for the parameters you can display.

You can add qualifiers to the SHOW command to display classes of parameter information:

- SHOW /ALL

- SHOW /DIF

- SHOW /DSSI

- SHOW /DUP

- SHOW /SYSTEM

- SHOW /TDS

- SHOW /TMSCP

NOTE

Be sure to leave a space between the SHOW command and the /qualifier.

For example, to display the settings of all the TF867 subsystem parameters, use **SHOW /ALL**.

To display system parameters, type:

```
PARAMS> SHOW /SYSTEM
```

The system displays:

```
Parameter          Current        Default    Minimum  Maximum  Radix
--------------  --------------  --------------  --------  --------  -------
FORCEEEREBUILD            0              0         0         1 Decimal
CNTHWREV                  0              0         0       255 Decimal
HWREVSTRING     "PCB-rev:A000" "PCB-rev:????"                   Ascii
RGTTAG              "??????"       "??????"                     Ascii
UNITID          454E0044ABC4                                    Quad
exit
Completed
```

3.4.4 SET Command

Use the **SET** command to set, or change, internal TF867 subsystem parameters. The syntax for the SET command is:

```
PARAMS> SET parameter value
```

In the previous example, **parameter** is the name of the parameter to be set, and **value** is the value you want to assign to the parameter. If abbreviated, the first matching parameter is used without regard to uniqueness.

See Table 3–1 for a summary of TF867 subsystem parameters available when using the SET command.

CAUTION

If you type EXIT at the PARAMS> prompt without saving your modifications, the system displays the message:

```
Parameter modified but not written.  Still Exit? [Y/(N)]
```

If you answer YES, the system returns to the VMS prompt ($). Your modifications are not saved.

If you answer NO, the system returns to the PARAMS> prompt. To save your modifications, enter WRITE at the prompt, and then EXIT. See Section 3.4.6 for more information on the WRITE command.

3.4.5 STATUS Command

The **STATUS** command provides status about the operation of the subsystem.

3.4.6 WRITE Command

Use the **WRITE** command to save, in nonvolatile memory, the changes you made using PARAMS and its SET command. The WRITE command is similar to the VMS SYSGEN WRITE command. Syntax is as follows (no parameters are available):

```
PARAMS> WRITE
```

The program responds:

```
PARAMS> SET NODENAME TAPE1
PARAMS> SET UNITNUM 18
PARAMS> WRITE

Changes require controller initialization, ok? [Y/(N)] Y
```

This sets the TF867 subsystem's node name to TAPE1, and the TMSCP unit number to 18. Executing WRITE, and answering Y(es) to the question saves the node name and unit number in EEPROM.

NOTE
When you answer Y(es) to the controller initialization prompt, your changes take effect immediately and program control returns to the VMS command prompt ($).

3.4.7 EXIT Command

The **EXIT** command ends the PARAMS program. The word `Completed` appears on the screen.

NOTE
To exit from questions in the local program, type EXIT. Do *not* stop local programs by pressing the Load/Unload button on the TF867 OCP. Doing so can cause the current operation to fail.

3.5 DRVEXR Program

The **DRVEXR** program exercises the tape drive. It is an intensive data
transfer test and indicates the overall integrity of the drive. An example
of a DRVEXR display follows:

```
Write/read anywhere on medium? [1=Yes/(0=No)] 1
User Data will be corrupted. Proceed? [1=Yes/(0=No)] 1
Test Time in Minutes [(10) - 100] 10
Minutes to Complete: 10

Data Compares enabled. DIAGNOSTIC TAG parameters used.

Stat Report

 Test Name: DRVEXR, Pass 1
 Random Seed:           1528813760
 Byte Count:                     0
 Pattern Number:                 9
 Data Errors:      Read     Write
     Retries:         0         1
         ECC:        13
        Hard:         0         0
 Data Compare Errors:            0
 Mispositions:                   0
 Kbytes Written:            189591  Read:     94379


Test Passed
```

NOTE

**The DRVEXR program prompts you for an execution time; the
DRVTST program displays a specific execution time.**

3.6 DRVTST Utility

The **DRVTST** utility is a pass/fail test that invokes a comprehensive test
of the drive hardware. A `Test Complete` message or a fatal error message
appears when the test is complete. An example of a DRVTST display
follows:

```
Write/read anywhere on medium? [1=Yes/(0=No)] 1
User Data will be corrupted. Proceed? [1=Yes/(0=No)] 1
Minutes to Complete: 5

Data Compares enabled. DIAGNOSTIC TAG parameters used.
Tape Mark Enc.
At LEOT

Tape Mark Enc.
```

```
Long Gap Found
Test Passed
```

3.7 LDRTST Program

The **LDRTST** program sends commands to the loader electronics module,
which exercises the mechanics of the loader transfer assembly. In
addition, this test checks the status of each cartridge in the magazine. An
example of a LDRTST display follows:

```
Passes [(0) - 65535]: 1
Loader Exerciser
Loopback Test:
Passed
Self Test

ROM:
Passed
RAM:
Passed
EEPROM:
Passed
CTC:
Passed
UART:
Passed
Movement Test

Picker Arm:
Passed
Cartridge Motor:
Passed
Handle Motor:
Passed
Elevator:
Passed
Unit Avail

 Cartridge loads:  1
Unit Avail

 Cartridge loads:  2
Unit Avail

 Cartridge loads:  3
Unit Avail

 Cartridge loads:  4
Unit Avail

 Cartridge loads:  5
Unit Avail

 Cartridge loads:  6
Unit Avail

 Cartridge loads:  7
Test Passed
```

4

Error Conditions and Problem Resolutions

This chapter describes the conditions that must be present to ensure that the OCP pushbuttons (**Slot Select**, **Load/Unload**, and **Eject**) operate effectively.

This chapter includes instructions on resolving BACKUP operation failures, descriptions of magazine and loader faults and how to clear them, and what to check in the event of a power problem.

4.1 Conditions Necessary for Button Operation

Be sure to review information in the previous chapters to ensure that you are correctly operating the Tx867 magazine tape subsystem.

Before pressing the Slot Select, Load/Unload, or Eject button on the Tx867 OCP, check for the conditions listed in Table 4–1 and be sure that the:

- Power On indicator is on

- Receiver is closed

- Mode Select key is *not* set to OCP Disabled

Pressing these buttons has no effect if their indicators are off.

NOTE

Do not press the Load/Unload button to abort any function of the Tx867 subsystem. Type `Ctrl/Y` **or** `Ctrl/C` **instead.**

See Section 2.4 for more information on the functions of the Tx867 OCP buttons.

Table 4–1   Tx867 OCP Button Conditions

If you want to. . .	First make sure that the. . .	Then you can press this button. . .
Select another slot in the magazine	Magazine contains at least two cartridges	Slot Select
	Slot Select indicator is on	
Load the selected cartridge into the tape drive	Magazine contains at least one cartridge	Load/Unload
	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 receiver, or unload the cartridge from the drive and open the receiver	Eject indicator is on	Eject

4.2   Backup Operation Failure

Some manual operations, if not performed correctly, may cause backup operations to fail during BACKUP:

- Loading write-protected CompacTape III cartridges when executing write operations

- Selecting the incorrect cartridge slot from which to initialize operations

4.3   Avoiding Basic Problems

Follow these guidelines when operating the Tx867 subsystem to avoid basic problems:

- Use CompacTape III 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 4–1.

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 receiver 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.

NOTE
The Tx867 subsystem unloads and loads the next cartridge when the subsystem receives a DISMOUNT command from the system.

Figure 4–1 Opening the Cartridge Door to Check the Tape Leader

CARTRIDGE
LEADER

DOOR LOCK
(RELEASE BY LIFTING
DOOR LOCK WITH THUMB)
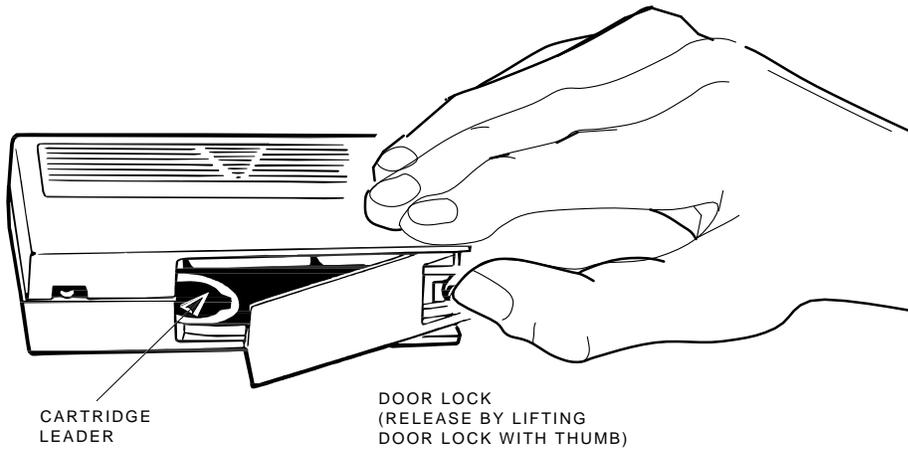
SHR-0002-86
SHR_X1027_89_CPG

4.4 Error Conditions

Error indications fall into two main categories:

- **Magazine Fault** — In most cases, this fault is an operator-
  correctable condition, and is indicated by the Magazine Fault indicator
  being on. If you cannot resolve the fault, call your Digital Services
  representative.

- **Loader Fault** — This is a condition that most likely requires service
  from a Digital Services representative. It is indicated by the Loader
  Fault indicator being on.

4.4.1 Magazine Fault Description

A magazine fault indicates an inconsistency between what the loader transfer assembly 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.

Slot indicators are 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 you need to replace any missing cartridges in the magazine.

NOTE
The Slot 0 indicator is on in all error conditions to indicate that an error occurred. It is not a Slot Select indicator in this case.

4.4.1.1 Clearing a Magazine Fault

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

4.4.2 Loader Fault Description

A loader fault indicates that the Tx867 subsystem has detected a fatal error in either the loader transfer assembly or the tape drive. In the case of some loader transfer assembly errors, the subsystem 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 indicates errors in the loader transfer assembly, controller module, and drive. The suspected location of a fault is indicated by the following slot indicators:

- 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.

NOTE
Error indicators do not blink. During hardware failures, the controller module determines action.

4.4.2.1 Clearing a Loader Fault

When a loader fault occurs, the Load/Unload and Eject indicators are on. When you press the Load/Unload button, the Tx867 subsystem attempts to clear the error. When you press the Eject button, the receiver opens to let you access the magazine.

4.5 Power Problems

If the Power On indicator is not on, or your system does not recognize the Tx867 subsystem:

- Verify that the subsystem is pushed completely into the enclosure. (Power to the loader transfer assembly is disabled when it slides forward.)

- Verify with your system manager that the subsystem configuration is correct.

- Call your Digital Services representative.

5
Head Cleaning

The Tx867 magazine tape subsystem uses the CleaningTape III cartridge (Figure 5–1) for cleaning the read/write head in the tape drive.

The CleaningTape III cartridge is a yellow plastic cartridge containing 1200 feet of 1/2-inch, magnetic particle (MP) cleaning tape. You can use the CleaningTape III cartridge approximately 20 times before it expires.

Figure 5–1   CleaningTape III Cartridge
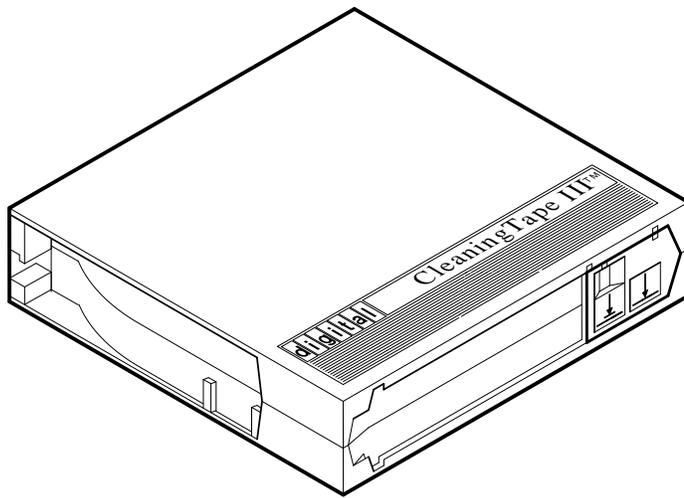
SHR_X1020E_89

You can use two procedures to clean the read/write head:

1. Access the tape drive and load the CleaningTape III cartridge directly into the drive (Section 5.1).

2. Insert the CleaningTape III cartridge into the magazine, where it then loads into the drive (Section 5.2).
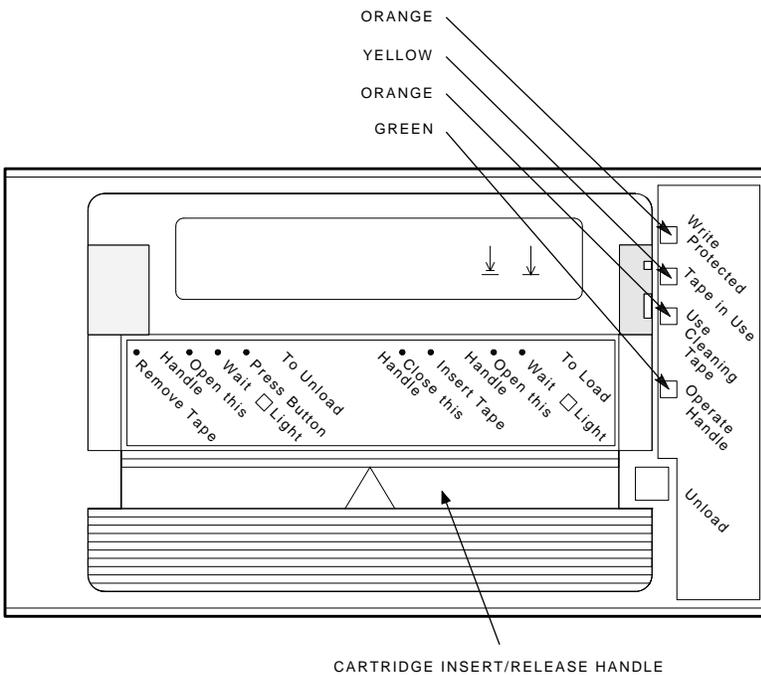
NOTES

Perform the head cleaning procedure only when the orange Use Cleaning Tape (Figures 5–2 and 5–3) indicator is on.

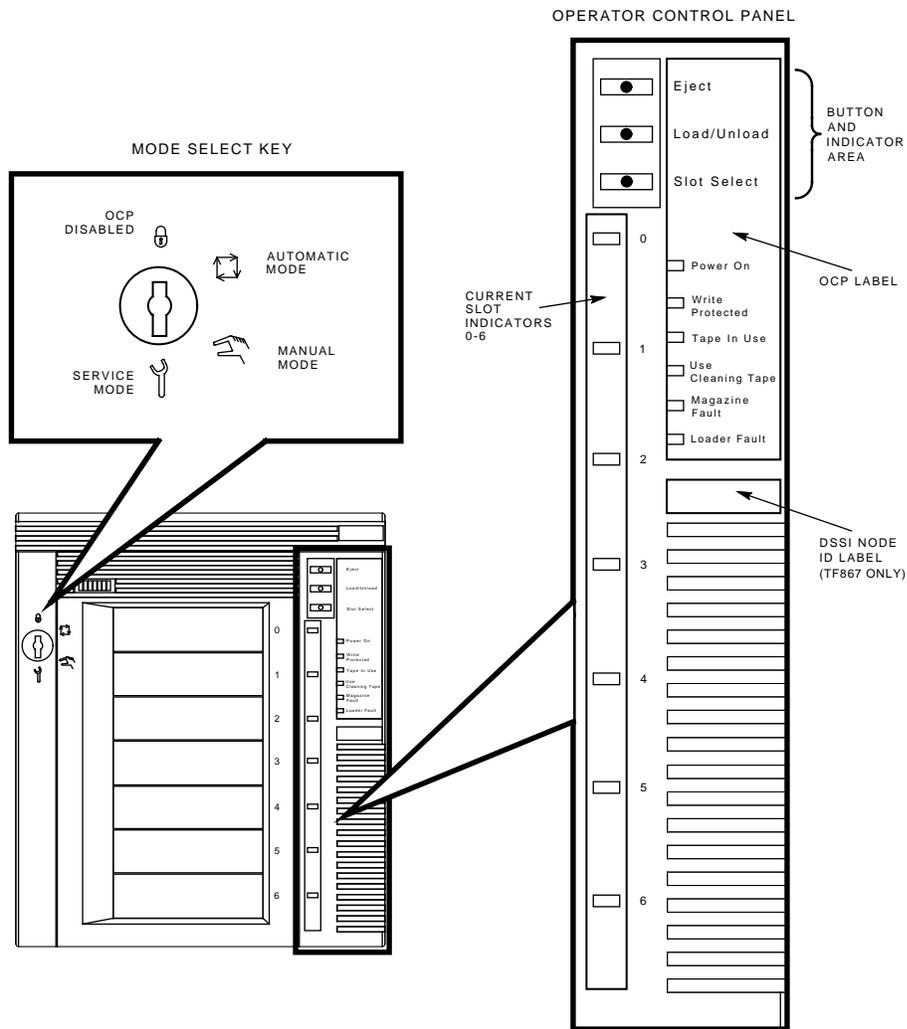**If the Loader Fault indicator is on, clear the fault before proceding with head cleaning.**

Figure 5–2   Drive Front Panel

CARTRIDGE INSERT/RELEASE HANDLE

SHR-X0056H-91

Figure 5–3   Tx867 Operator Control Panel

SHR_X1025E_91

5.1   Accessing the Tape Drive

Unless otherwise instructed by a Digital Services representative, open the Tx867 subsystem to access the tape drive *for head cleaning only*.

To access the tape drive:

1. Be sure that all Tx867 subsystem operations are stopped.

2. Ensure that the Eject indicator is on (Figure 5–3).

3. Set the Mode Select key to Service mode (Figure 5–3).

4. Press the Eject button and remove the magazine, if present.

5. Pull the Tx867 subsystem out of the storage array and toward you by placing your hand under the top of the Tx867 subsystem's front bezel (Figure 5–4).

> **WARNING**
>
> **If, after pulling the subsystem forward, the Power On indicator does not turn off, do not attempt the head cleaning procedure.**

6. Lift the loader open latch (Figure 5–5) (to the right of the unit).

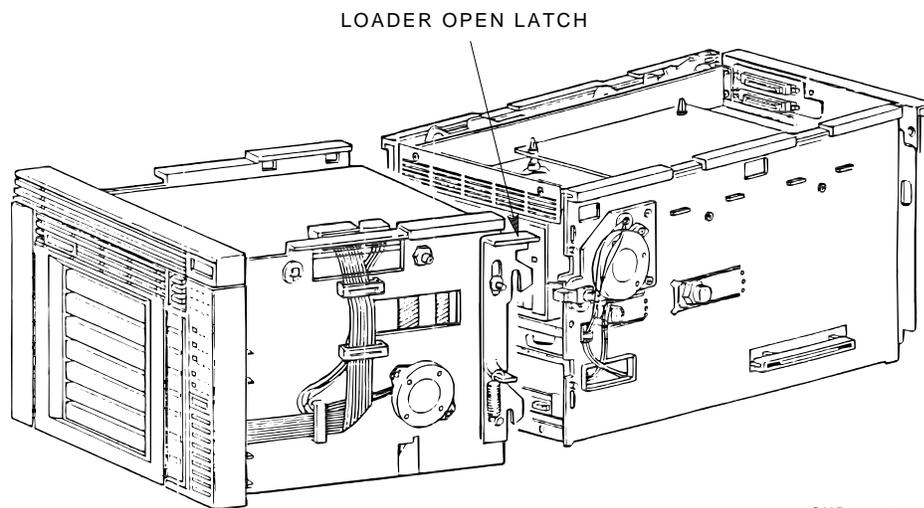7. Move the loader transfer assembly to the left, taking care not to hit the storage array.

You now have access to the drive's cartridge entrance (Figure 5–2).

Figure 5–4   Sliding the Tx867 Subsystem Toward You

CXO-2461B
SHR_X1106B_89
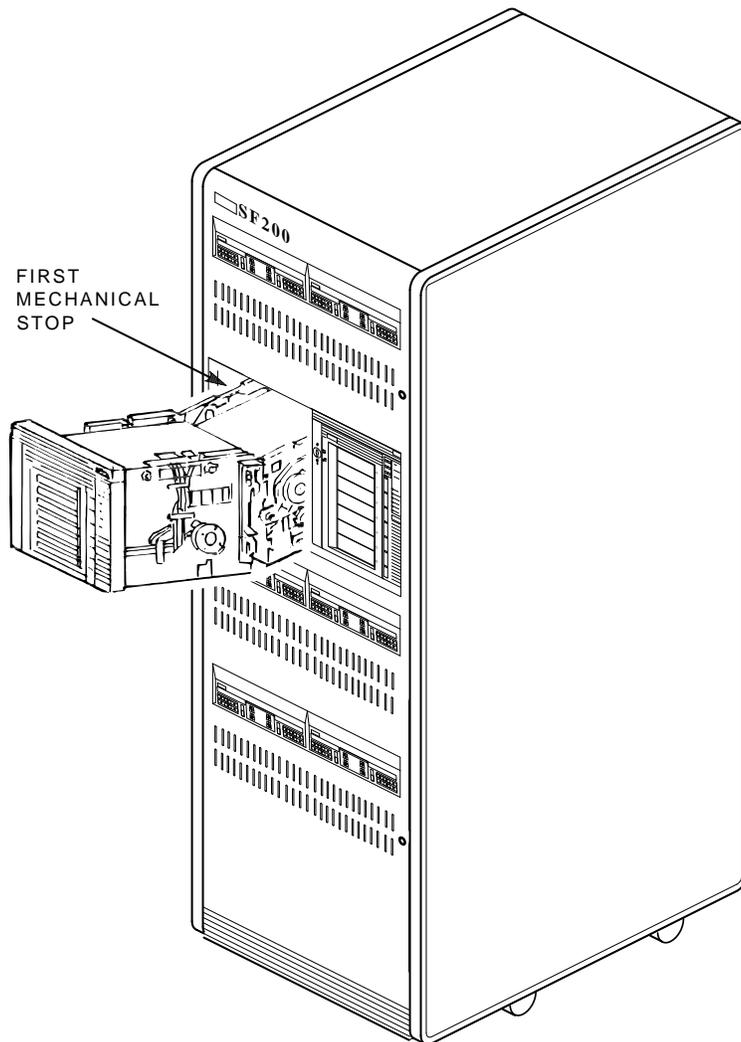
Figure 5–5   Loader Open Latch

LOADER OPEN LATCH

SHR-0007-90
SHR-X0140-90-CPG

5.1.1 Loading the CleaningTape III Cartridge into the Drive

Be sure to use a CleaningTape III cartridge. Instructions for loading the CleaningTape III cartridge follow:

1. Pull the handle to the open position when the green indicator steadily lights (Figure 5–6).

2. Load the cartridge.

3. Push the handle closed. The green indicator turns off and the yellow Tape In Use indicator begins to flash, indicating the tape is loading.

When the cleaning process is finished, a beep sounds, indicating that you can unload the CleaningTape III cartridge.

NOTE

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

If a particular cartridge causes the Use Cleaning Tape indicator to turn on frequently, it is suggested this cartridge be backed up on another, and then discarded. A damaged cartridge may cause unnecessary use of the CleaningTape III.

5.1.2 Securing the Tx867 Magazine Tape Subsystem

After cleaning the head, secure the Tx867 subsystem as follows:

1. Close the loader transfer assembly.

2. Press the Tx867 loader open latch to secure the Tx867 subsystem (Figure 5–5).

3. Push the Tx867 subsystem back into the storage array.

4. Be sure that the Power On indicator is on.

5. Set the Mode Select key to a position other than Service mode.

Figure 5–6   Loading the Cartridge

SHR-0256-87
SHR_X1093_89_CPG
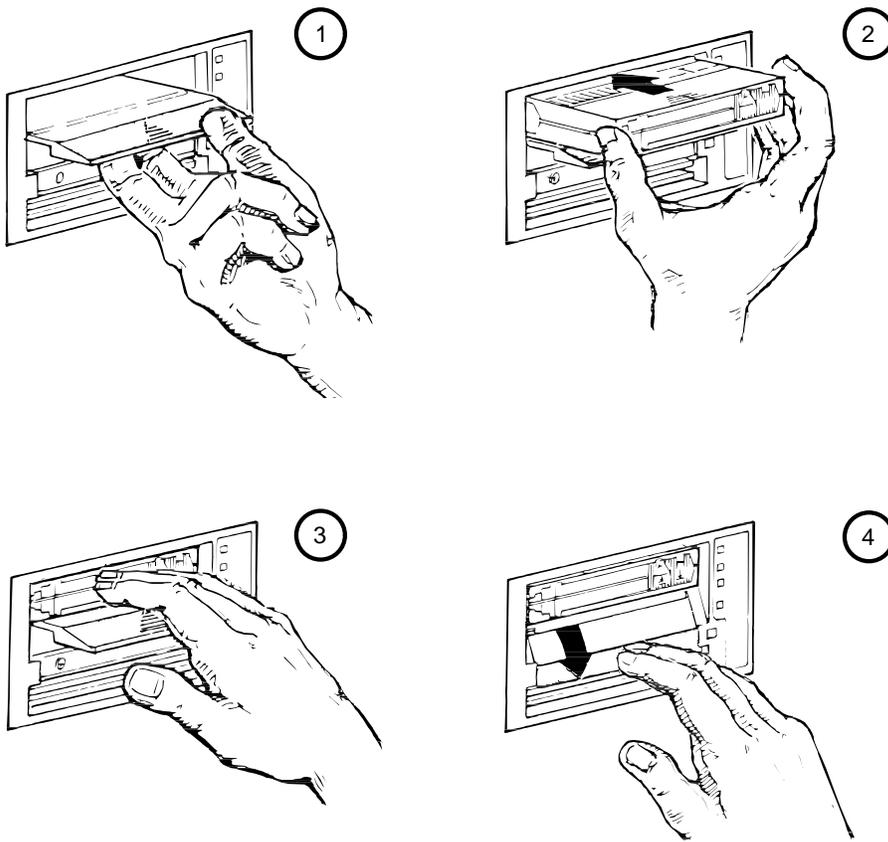
5.2   Inserting the CleaningTape III Cartridge into the Magazine

CAUTION

If you choose to use this cleaning procedure, you must return the CompacTape III cartridges to their *original* slots, and remove the cleaning cartridge from the magazine after the cleaning procedure is done.

To clean the read/write head by inserting the CleaningTape III into the magazine rather than the drive, use the following steps (Figure 5–3):

1. Press the Load/Unload button to remove any cartridge that may be in the drive, and to return the cartridge to the magazine.

2. Press the Eject button to open the receiver and remove the magazine.

3. Insert the CleaningTape III cartridge into the first slot of the magazine.

4. Insert the magazine into the receiver; close the receiver.

5. Press the Load/Unload 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.

6. Press the Eject button to remove the magazine.

7. Remove the cleaning cartridge from the magazine and replace the CompacTape III cartridge in the magazine.

A
VMS Operating System Commands

The Tx867 magazine tape subsystem uses most of the standard magnetic tape commands that can be invoked under VMS operating system version 5.4-2 or later.

This appendix is a reference only; it does not include all the details that may be involved in using VMS commands.

For more information about VMS commands and command files, see the *VAX/VMS Guide to Using Command Procedures* (AA–H782B–TE), *VAX/VMS Command Language User's Guide* (AA–DO23C–TE), or the *VMS System Manager's Manual* (AA–LA00B–TE).

A.1 Tape Device Specific Commands

Use the following commands to operate the Tx867 magazine tape subsystem:

- ALLOCATE

- BACKUP

     MOUNT/FOREIGN
     BACKUP
     DISMOUNT

- COPY

     MOUNT
     COPY
     DISMOUNT
     INITIALIZE

A.1.1 ALLOCATE Command

The **ALLOCATE** command provides exclusive access to a device and optionally establishes a logical name for that device. Once you have allocated a device, other users cannot access that device until you explicitly DEALLOCATE it, or until you log out. Use the following format to allocate the Tx867 subsystem:

```
$ ALLOCATE device name: [logical name]
```

For example, to allocate the Tx867 subsystem for your use and assign it to the logical name *TAPE1*, do the following:

```
$ ALLOCATE MIA0:TAPE1
```

The Tx867 subsystem's physical device name is assigned by your system manager after it is installed.

A.1.2 DEALLOCATE Command

The **DEALLOCATE** command cancels the exclusive access you assign to a device with the ALLOCATE command.

```
$ DEALLOCATE device name: [logical name]
```

A.1.3 BACKUP Command

The **BACKUP** command provides protection against file volume corruption by creating functionally equivalent backup copies.

Use the following format to back up a file:

```
$ BACKUP/NOCRC/GROUP=0/BLOCK=65534/label=[volume label]
filename.ext [device-name or logical name]:filename.bck
```

In addition to backing up single files, you can back up lists of files and entire volumes.

NOTE
**By selecting the /NOCRC and /GROUP=0 qualifiers and a large
block size with the /BLOCK qualifier (65534 is the largest possible
block size), you can achieve better performance from the Tx867
subsystem. The previous command line excludes the use of
the host-available CRC error detection/correction capability,
and depends on the embedded error checking and correction
capabilities of the Tx867 subsystem. Tx867 error correction
capabilities relate specifically to the Tx867 subsystem—not to
the entire system.**

**Use of the /NOCRC qualifier requires a systems management
decision relative to the incremental difference in data integrity
versus a performance tradeoff. In most cases, Tx867 internal error
detection and correction capabilities are sufficient to ensure data
integrity and recovery. The host-level CRC provides another level
of error detection and correction, which may be important under
some conditions.**

Refer to your system manuals before deciding on qualifiers for use with
the **BACKUP** command. For detailed information about **BACKUP** and
other VMS tape commands, see the *VAX/VMS Backup Utility Reference
Manual* (AA–Z407B–TE).

A.1.4 MOUNT Command

The **MOUNT** commands lets you make a magnetic tape volume available
for processing. Note that it loads the tape with the protection set
according to the write-protect switch on the cartridge.

Use the following format to mount a tape with the Tx867 subsystem:

$ **MOUNT**/FOREIGN [device name] [volume label] [logical name]

As an example, to make TAPE1 available for processing, type the
following:

$ **MOUNT**/FOREIGN MIA0

The console displays a message:

TAPE1 MOUNTED ON MIA0:

Note that you must use the /FOREIGN qualifier when you are performing
BACKUP commands. Do not use it when you are performing **COPY**
commands.

NOTE

For improved performance, you can also use the following command:

$ **MOUNT**/CACHE=TAPE_DATA

For more information, see the *VAX/VMS Mount Utility Reference Manual* (AA–Z424A–TE).

A.1.5 COPY Command

Use the **COPY** command, with the Tx867 subsystem, to copy files from cassette tape.

In the following example, the **MOUNT** command requests that the volume labeled *GMB001* be mounted on the tape drive at *MIA0* and assigns the logical name *TAPE1*.

The **COPY** command uses the logical name *TAPE1* for the input file specification. All files on *MIA0* are copied to the current default disk and directory. The files keep their original file names and file types.

$ **MOUNT** MIA0: GMB001 TAPE1:
$ **COPY** TAPE1:*.* *.*

NOTE

Using the COPY command to move multiple files may not achieve optimum performance. Check with your system manager for more information.

A.1.6 DISMOUNT Command

The **DISMOUNT** command cancels the **MOUNT** command, makes the unit unavailable for processing, and rewinds the tape.

To eject a tape cassette from the tape drive, you must rewind and unload the tape. Use the following format:

$ **DISMOUNT** logical name or device name:

To rewind to the beginning of the tape (BOT) without unloading it, use the following format:

$ **DISMOUNT**/NOUNLOAD logical name or device name:

A.1.7 INITIALIZE Command

CAUTION
Be sure that you are using a scratch tape before initializing; otherwise, any existing data on the tape will be destroyed.

Use the **INITIALIZE** command to specify the device name, and write a volume name to the magnetic tape volume loaded into the TF86 subsystem. Note that the tape must be write-enabled for the initializing operation.

Use the following format:

```
$ INITIALIZE device name: [volume label]
```

As an example, to initialize the device *TAPE1* and assign the volume name *GMB001*, type the following:

```
$ INITIALIZE TAPE1: GMB001
```

For detailed information regarding volume names and magnetic tape operations, see the *Guide to VAX/VMS Disk and Magnetic Tape Operations* (AA–M539A–TE).

B

Using the TZ867 Subsystem with the ULTRIX Operating System

This appendix is intended for those using the TZ867 tape subsystem with the ULTRIX operating system.

This section includes:

- Adding the TZ867 subsystem to your ULTRIX system

- Tips on getting maximum capacity and performance

- Using the TZ867 subsystem for unattended backups

- Using various ULTRIX commands to save information on the TZ867 subsystem

B.1   Adding the TZ867 to the ULTRIX System

Before connecting the TZ867 subsystem to the SCSI bus:

1. Locate the SCSI ID switches at the rear of the TZ867 subsystem.

2. Ensure the SCSI ID (target ID) number for the TZ867 is unique. The recommended ID is 5. Use SCSI ID 5 only if no other device on the bus has SCSI ID 5.

3. Ensure all other devices on the SCSI bus have unique SCSI IDs.

B.1.1   Connecting the TZ867 to ULTRIX

To connect the TZ867 subsystem to the ULTRIX system:

1. Physically connect the TZ867 cable(s) to the ULTRIX system.

2. Ensure an entry for the TZ867 subsystem is specified in the ULTRIX system configuration file. If you have to modify your configuration file by adding an entry, then you must build a new kernel and reboot the system. This is explained in Section B.1.3 and Section B.1.4.

3. Create logical device names for your TZ867 subsystem, explained in Section B.1.5.

B.1.2   Checking the ULTRIX System Configuration File

Locate the ULTRIX system's configuration file. It should be in the **/usr/sys/conf** directory under the mips or VAX system subdirectory.

The configuration file name is the same as the system name and must contain an entry for the TZ867 subsystem.

If...	Then...
An entry does not exist,	You need to create an entry in the configuration file.
An entry already exists,	You do not need to change the configuration file.

B.1.3   Creating an Entry

An entry has the following format:

    tape name at controller device#

An example entry for Bus 0, SCSI ID 5:

    tape tz5 at sii0 drive 5

To create an entry in the configuration file:

1. Refer to Table B–1 to determine the name according to your SCSI target ID and your bus number. Usually, users have one bus, Bus 0. Find the name, listed under the Bus 0 or Bus 1 columns.

    For example: The name for SCSI Target ID 5, Bus 0 is tz5.

Table B–1   Determining the Tape Name

SCSI Target ID	Bus 0	Bus 1
0	tz0	tz8
1	tz1	tz9
2	tz2	tz10
3	tz3	tz11
4	tz4	tz12
5	tz5	tz13
6	tz6	tz14
7	tz7	tz15

2. Determine the name of the controller to which the TZ867 subsystem is connected.

3. Include the word tape, name, controller, and the device# in the entry.

B.1.4 Building the Kernel, Rebooting the System

If you added an entry to your configuration file, you must rebuild the kernel and reboot the system. Be sure to save the original kernel before rebooting the system.

For example:

```
$ /etc/doconfig               (this creates a new kernel)
$ mv /vmunix /vmunix.old      (save the old kernel)
$ mv new_kernel_name /vmunix  (move the new kernel to the root directory)
$ /etc/shutdown -r now        (reboot the system)
```

B.1.5 Creating Logical Device Names for the TZ867 Subsystem

Use the MAKEDEV command located in the **/dev** directory to create logical device names.

For example:

```
$ cd /dev
$ MAKEDEV tz5
```

leads to some or all of the following logical device names:

    /dev/nrmt0l
    /dev/nrmt0h
    /dev/rmt0l
    /dev/rmt0h
    /dev/rmt0m
    /dev/nrmt0m
    /dev/rmt0a
    /dev/nrmt0a

- *mt* (in the middle of the logical name) means *magnetic tape* device.

- *nr* means *no rewind* when the utility completes. Use the no rewind option when more than one operation is being performed to the same tape.

- *r* means *rewind* when the utility completes.

- *0* is the logical unit number.

- *l* means *low* density.

- *h* means *high* density.

- *m* means *medium* density.

- *a* means *auxiliary* density.

NOTE

Since the TZ867 is a high density tape subsystem, be sure to use the logical device names including *h*. The only exception is if modifications are made to allow selection of TK85 density for writing via the low density device entry (Section B.4).

B.2   Getting Maximum Capacity and Performance

The TZ867 subsystem:

- Can store up to 6.0 GB of data per tape cartridge for a total subsystem capacity of 42.0 GB

- Run at peak streaming rates of 800 KB/s

This section explains how to maximize the functions of the TZ867 subsystem.

B.2.1 Getting Maximum Storage Capacity

To get maximum storage capacity:

Use block sizes that are integral multiples of 4,096 bytes, such as 4k, 8k, 12k, 16k, and so forth. It is recommended you use larger block sizes of 16k, 24k, or 32k, which:

- Allow more efficient data processing by the host and on the SCSI bus
- Maximize capacity

Some utilities and commands default to using block sizes that cause lower capacity and I/O rates. For example:

- If you use a 512 byte block size (this is the **dd** command's default), you will be able to fit only about 320 MB of data on the tape.

- If you use the recommended block sizes, this tape has a potential of 6.0 GB capacity.

Most utilities used for tape I/O let you select the block size through command line switches.

NOTE

If you are not using ULTRIX V4.2a or later, with the latest Common Access Method (CAM) software kit installed, you have a tape file length limit of 2.1 GB.

With striping or disk array techniques or when running the tar command to backup multiple file systems, you need to note the 2.1 GB limit. Plan backups so that a tar or dump set does not exceed the 2.1 GB limit. However, you can store multiple save sets on the same cartridge.

B.2.2 Maximizing Performance

To handle bursts of data, the TZ867 subsystem has 512 KB of cache memory. This minimizes repositioning and keeps I/O rates as high as the host can handle, up to 800 KB/s.

If a non-optimal block size is used, the possible average I/O rate is limited. The recommended block sizes are: 16k, 24k, or 32k. You can use larger block sizes of 36k, 40k, and so forth, but performance increase is unlikely.

Other factors that can limit performance:

- Data fragmentation on disks
- Overusing the I/O channel bandwidth

- Processing speed and host CPU loads

- Memory size

B.3   Doing Unattended Backups

This section explains how to use the TZ867 subsystem as an unattended backup device.

Unattended backups require some extra planning, since the **dump** and **restore** utilities do not support automatic cycling of tape cartridges at this time on the TZ867 subsystem. Therefore, the backups must complete before reaching the end of the cartridge to avoid having the utility unload the cartridge and require user input to continue.

When the utility you are using completes, the command, **mt**, with the **offline** option, can be used to cause the loaded cartridge to unload and the next cartridge to load. Then the **tar** or **dump** utility or whatever utility you are using can be used to backup the next set of files to be saved. This can be automated by writing a shell script.

To do an unload operation:

1. Position the Mode Select key switch located on the TZ867 subsystem front panel to the **Automatic** mode or locked position. This enables the automatic loading and unloading function.

2. Issue the **mt offline** command.

B.3.0.1 Developing Unattended Backup Shell Scripts

To develop a shell script for doing unattended backups onto a TZ867 subsystem:

1. Choose a backup utility that can control the blocking factor on tape. This will help you fully use the capacity and I/O rates of the TZ867 subsystem.

2. Plan what file systems are to be saved on each tape cartridge. Ensure that the total amount of data to be written on each cartridge is less than 6.0 GB.

3. Use **mt offline** commands at the appropriate points to cause automatic cycling to the next cartridge as needed.

4. Test the script to verify it operates as intended.

The following is an example of a script:

```
#
#***********************************************************************
#
# Nightly backup script for system DEVSYS
#
# Note: Setup loader to have cartridge #0 loaded before starting
#
#***********************************************************************
#
# Cartridge 0: backup user directories
#
mt  -f /dev/rmt2h rewind
tar -b 32k -cf /dev/rmt2h /usr/users/gimli
tar -b 32k -rf /dev/nrmt2h /usr/users/legolas
tar -b 32k -rf /dev/nrmt2h /usr/users/pippin
tar -b 32k -rf /dev/nrmt2h /usr/users/merry
mt  -f /dev/rmt2h offline
#
# Cartridge 1: backup project disk A
#
dd  if=/dev/rz1a of=/dev/rmt2h bs=32768
mt -f /dev/rmt2h offline
#
# Cartridge 2: backup project disk B
#
dd if=/dev/rz2a of=/dev/rmt2h bs=32768
mt -f /dev/rmt2h offline
#
# Cartridge 3: backup some filesystems
#
dump 0dsf 42500 57600 /dev/nrmt2h /dev/rrz0a
dump 0dsf 42500 57600 /dev/nrmt2h /dev/rrz0b
mt -f /dev/rmt2h offline
#
```

B.4   Selecting Density

As explained in Chapter 1, density selection for write operations is not supported by ULTRIX at the time of this printing. However, if the CAM software is installed, you can:

*   Modify the /sys/data/cam_data.c file to recognize the TZ867

*   Assign the write densities selected by the host

The TK85 density is SEQ_42500_BPI (17h) and the TK86 density is 18h (no symbol is defined for this new media format). Changing the cam_data.c file should only be done by experienced users. You must rebuild the kernel to incorporate the changes. (See the configuration guidelines earlier in this appendix. Check the CAM software documentation for information about adding new devices.)

To allow density selection from the shell level:

1.   Edit the /sys/data/cam_data.c file. Ensure a copy of the original is preserved and can be restored if necessary.

2.   Make a copy of the TZ857's density table (tz857_dens) found in /sys/data/cam_data.c. In this copy:

     *   Change the TZ857 references to TZ867

     *   Change the density code from `SEQ_42500_BPI` to `0x18` for all the subentries in the new density table, except for the `minor 00` (`rmtxl`) subentry.

         This allows device rmtxl entries to select TK85 format and the others (rmtxm, rmtxh, rmtxa) to select TK86 format.

3.   Make a copy of the entry in the device descriptor information table for the TZ857 (search for `DEV_TZ857`) and change:

     *   TZ857 to TZ867 in the comment and in the `"DEC_ _ _ _ _TZ857"` string (underscores indicate five spaces)

     *   `DEV_TZ857` to the string: `"TZ867"`

     *   `&tz857_dens` to `&tz867_dens`

4.   Save the current kernel, build a new kernel, and reboot with the new kernel.

B.5   Using ULTRIX Tape Commands

This section describes ULTRIX commands used to operate the TZ867 subsystem.

The TZ867 subsystem uses standard magnetic tape commands to do backup and restore operations. The **tar** and **dump/restore** commands are used most often.

B.5.1   Using the tar Command

The **tar** command, which operates on files and directories, writes and reads tapes. The **tar** utility uses the specified block size or defaults to 10k byte block sizes. The default block size results in a 16% decrease of maximum capacity and I/O rates.

Table B–2 lists the options you can use with the **tar** command.

Table B–2   Common tar Options

Option	Meaning
b	Block size in bytes (n)
	Block size in kilobytes (nk)
	nb = n x 512 bytes in a block
c	Create tape, writes from beginning
f	Tape device argument to follow
r	Append to the end of the tape
t	Table of contents of tape
u	Backup all new or modified files from last backup
v	Verbose
x	Extract from tape (read)

The following examples show command lines with the **tar** command to:

- Write a file to tape:

  ```
  $ tar -cf /dev/rmt0h  filename  -b 64k
  ```

- Read a file from tape to your current directory:

  ```
  $ tar -fx /dev/rmt1h  filename
  ```

B.5.2 Using the dump Command

To use the **dump** command, you need system privileges. This command lets you write an entire file system to tape. Ensure that the current directory is not within the file system being backed up, except when backing up from the root directory.

The **dump** command uses 10k byte block sizes. A 16% reduction in capacity and I/O rates can result from using these block sizes.

Table B–3 lists the options you can use with the **dump** command.

Table B–3   Common dump Options

Option	Meaning	Recommended Value
d	Tape density in bits per inch	42500
f	Tape device	
n	Notify all privileged accounts, the status of dump	
s	Size of tape in feet	57600
u	Update the /etc/dumpdates file with the date	
0-9	Dump level	

The following examples show command lines with the **dump** command:

```
$ dump 0dsf 42500 57600 /dev/rmt0h /dev/rrz1a
$ dump unsf 42500 57600 /dev/rmt0h /usr/users
```

Dump level 0 is the highest and dumps the whole file system.
Dump level 9 is the lowest. All files, modified since the last dump of the same or lower dump level, are dumped.

B.5.3 Using the restore Command

The **restore** command reads a tape that is backed up with the **dump** command. The **restore** command can read a file, a directory, or the entire tape.

The **restore** command uses 10k byte block sizes. A 16% reduction in capacity and I/O rates can result from using these block sizes.

Table B–4 lists the options you can use with the **restore** command.

Table B–4   Common restore Options

Option	Meaning
f	Tape device
r	Read everything from tape
i	Interactive
v	Verbose
x	Extract

The following example shows a command line with the **restore** command:

```
$ restore -xvf filename
```

B.5.4 Using the dd Command

Use the **dd** command to perform a device-to-device copy. The copy is done by file or by image, depending on the specification of the input or output device files.

Disks have two types of device files, image and block:

- If the disk image file (/dev/rrxxx) is used, performance is faster.

- If the disk block file (/dev/rxxx) is used, it is easier to retrieve a single file later.

The **dd** command uses the specified block size, or if none is given, a default of 512 bytes. An 87% reduction in capacity and performance can result from using the default block size. It is important to specify a more optimal block size.

Table B–5 lists the options you can use with the **dd** command.

Table B–5   Common dd Options

Option	Meaning	Recommended Value
if	Input file	
of	Output file	
bs	Input and output block size (bytes)	32768
ibs	Input block size (bytes)	32768 for tape
obs	Output block size (bytes)	32768 for tape

The following examples show command lines with the
dd command to:

- Write to tape with the block device file:

  ```
  $ dd if=/dev/rz1a of=/dev/rmt1h bs=32768
  ```

- Write to tape with the image device file:

  ```
  $ dd if=/dev/rrz1a of=/dev/rmt1h bs=32768
  ```

- Read a tape:

  ```
  $ dd if=/dev/rmt1h of=/dev/rz1a ibs=32768
  ```

B.5.5   Using the ltf Command

Use the **ltf** command to write and read ANSI tapes. This command
operates on files and directories and uses the specified block size.
Otherwise, the command defaults to 2,048 byte blocks, resulting in a
50% decrease of capacity and I/O rates.

Table B–6 lists the options you can use with the **ltf** command.

Table B–6   Common ltf Options

Option	Meaning
B	Specify a block size to use
c	Create tape, writes from beginning
f	Tape device argument to follow
u	Backup all new or modified files from last backup
t	Table of contents of tape
v	Verbose
x	Extract from tape (read)

The following examples show command lines with the **ltf** command to:

- Write a file to tape:

  ```
  $ ltf -cf /dev/rmt0h  filename  -B 16k
  ```

- Read a file from tape to your current directory:

  ```
  $ ltf -fx /dev/rmt1h  filename
  ```

B.5.6 Using the mt Command

The **mt** (magnetic tape) command allows you to give certain commands to the tape drive.

Table B–7 lists the options you can use with the **mt** command.

Table B–7   Common mt Options

Option	Meaning
eof	Write file mark(s)
bsf	Backward space file(s)
bsr	Backward space record(s)
fsf	Forward space file(s)
fsr	Forward space record(s)
offline	Unload the tape
rewind	Rewind to the beginning of medium
status	Obtain information from the drive

The following examples show command lines with the **mt** command to:

- Get the status of a drive:

  ```
  $ mt -f /dev/rmt0h status
  ```

- Rewind the default drive:

  ```
  $ mt rewind
  ```

- Write two file marks to the default drive:

  ```
  $ mt eof 2
  ```

B.5.7 Using the cpio Command

The **cpio** command allows you to save files and directories on tape and other media and retrieve these files.

Table B–8 lists the options you can use with the **cpio** command.

Table B–8   Common cpio Options

Option	Meaning
c	Write or read header information in ASCII character form
d	Create directories as needed
i	Copy in
o	Copy out
t	Table of contents of tape
v	Verbose

The following examples show command lines with the **cpio** command to:

- Write to tape all files and subdirectories from your current directory:

  ```
  $ find . -print | cpio  -ocv >  /dev/rmt0h
  ```

- List all files and subdirectories that are on the tape:

  ```
  $ cpio -ictv <  /dev/rmt0h
  ```

- Retrieve all files and subdirectories from the tape:

  ```
  $ cpio -icdv < /dev/rmt0h
  ```

- Retrieve selective files from the tape:

  ```
  $ cpio -icv <  'filename' < /dev/rmt0h
  ```

C
Service Offerings

Digital Equipment Corporation offers a range of flexible service plans.

C.1 On-Site Service

On-site service offers the convenience of service at your site and insurance against unplanned repair bills. For a monthly fee, you receive personal service from our service specialists. Within a few hours, the specialist is dispatched to your site with equipment and parts to give you fast and dependable maintenance.

C.2 BASIC Service

BASIC service offers full coverage from 8 a.m. to 5 p.m., Monday through Friday. Options are available to extend your coverage to 12-, 16-, or 24-hour periods, and to include Saturdays, Sundays, and holidays. Under the BASIC service plan, all parts, materials, and labor are covered in full.

C.3 DECservice Plan

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C.5 DECmailer Service

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C.6 Per Call Service

Per call service offers a maintenance program on a noncontractual, time-and-materials-cost basis. It is appropriate for customers who have to perform first-line maintenance, but may occasionally need in-depth support from Digital Services.

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