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TF/TZ 800-Series
Magazine and Cartridge Tape Subsystem
Service Manual
EK–TF857–SM–004

Digital Equipment Corporation

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Preface

This manual describes how to service the following tape subsystems:

- TF857/TF867 DSSI magazine

- TZ857/TZ867 SCSI magazine

- TF85/TF86 DSSI tabletop cartridge

- TZ85/TZ86 SCSI tabletop cartridge

Manual Structure

Chapter 1, Overview, provides a basic product description of the hardware components and specifications of the TF/TZ 800-series magazine tape subsystems.

Chapter 2, Operating Procedures , describes the operating features of the operator control panel (OCP) buttons and indicators, the magazine and cartridge removal and replacement processes, and the mode select key operating modes. Chapter 2 also describes the TF/TZ 800 subsystem initialization process and loader transfer assembly, TK85 tape drive, and controller module activities during power-on self-test (POST).

Chapter 3, Local Programs and Utilities, describes troubleshooting procedures using local diagnostic programs and utilities and the SET HOST/DUP command.

Chapter 4, Troubleshooting Procedures, describes error conditions in the TF/TZ 800 subsystem, magazine and loader faults, cartridge motion faults, and problem resolutions.

Chapter 5, FRU Removal and Replacement Procedures, describes the TF /TZ 800 subsystem FRU removal and replacement procedures. Included is a warm swap procedure for replacing the controller module.

Chapter 6, TF85/TF86 Diagnostic Utilities and Tests, describes the TF85 POST procedure, functional microdiagnostic test, and test descriptions.

Chapter 7, TZ85/TZ86 Diagnostic Utilities and Tests, describes compatibility restrictions and requirements, installation, firmware update procedures, and more.

Chapter 8, Firmware Update Procedures, describes the firmware update procedures for both TF and TZ-series of products.

Appendix A, EVMDA Tape Drive Exerciser Tests, describes how to run the EVMDA test under the VAX Diagnostic Supervisor (VDS).

Appendix B, Head Cleaning Procedure, describes how to use the CleaningTape III cartridge to clean the read/write head.

Appendix C, Error Logs, lists the device-dependent error and status codes, and the error reporting format.

Appendix D, TF/TZ 85/86 Removal and Replacement Procedure , describes the TF/TZ 85/86 removal and replacement procedure.

An index is included in this service guide.

Intended Audience

This manual is for use by Digital Services engineers.

Conventions

The terms *TF/TZ 800* or *TF85x* and *TZ85x* refer to the *TF/TZ 800-series of magazine tape subsystems*; in particular, the TF857 and TZ857 magazine tape subsystems.

The Eject, Load/Unload, and Slot Select buttons on the TF857 operator control panel (OCP) are referred to as the *OCP pushbuttons*.

Related Documentation

Table 1 lists references that supplement this manual.

Table 1   Related Documents

Title	Audience	Order Number
TF/TZ 800 Magazine Tape Subsystem Owner's Manual	Customers	EK–TF857–OM
SF200 Storage Array Installation Guide	Digital Customer Services personnel	EK–SF200–IG
KFMSA Module Installation and User Manual	Digital Customer Services personnel	EK–KFMSA–IM
VAX/VMS Backup Utility Reference Manual	System managers and operators	AA–Z407B–TE

Table 1   (Continued)   Related Documents

Title	Audience	Order Number
Guide to VAX/VMS Disk and Magnetic Tape Operations	System managers and operators	AI–Y506B–TE
VAX/VMS Mount Utility Reference Manual	System managers and operators	AA–Z424A–TE
VMS System Manager's Manual	System managers	AA–LA00B–TE
TK85 Tape Drive Operator's Reference Card	Customers	EK–OTK85–RC

1
Overview

1.1 Overview

The TF/TZ 800-series magazine tape subsystems are electromechanical devices that can store approximatly 18.2 gigabytes of data on a TZ857 and 42 gigabytes on a TZ867. Using CompacTape III cartridges, these subsystems can store up to 2.6 gigabytes of data per cartridge on the TZ85, and 6.0 gigabytes of data per cartridge on the TZ86.

The TF/TZ 800-series magazine tape subsystems 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 TF/TZ 800-series subsystems perform automatic, sequential tape operations.

In addition, these subsystems execute operating system commands, qualifiers, and parameters to store data from user disk areas to the tape drive.

1.2 Operating Modes

The TF/TZ 800-series subsystems operate 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) 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 are 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 are enabled. Loading and unloading of one cartridge to the next is *not* automatic; operator intervention is required to select the next, or any other, cartridge.

- **Service mode** — Unlocks the subsystem from the enclosure and removes it from its normal operating position. Use this mode when performing the head cleaning, jam recovery, and servicing procedures.

You can select these modes through the Mode Select key (Figure 1–1). See Section 2.4 for more information.

1.3   Node ID Label

The operator control panel on the TF857 subsystem has a space for a DSSI node ID label that identifies the device bus ID number (Figure 1–1). The DSSI node ID number is preset during manufacturing to its normal setting of zero (0) and should be verified during installation at the customer site. You may want to place a label noting the device SCSI ID number in this space.

Figure 1–1   Front View of the TF/TZ 800-Series Operator Control Panel

SHR_X1025E_91
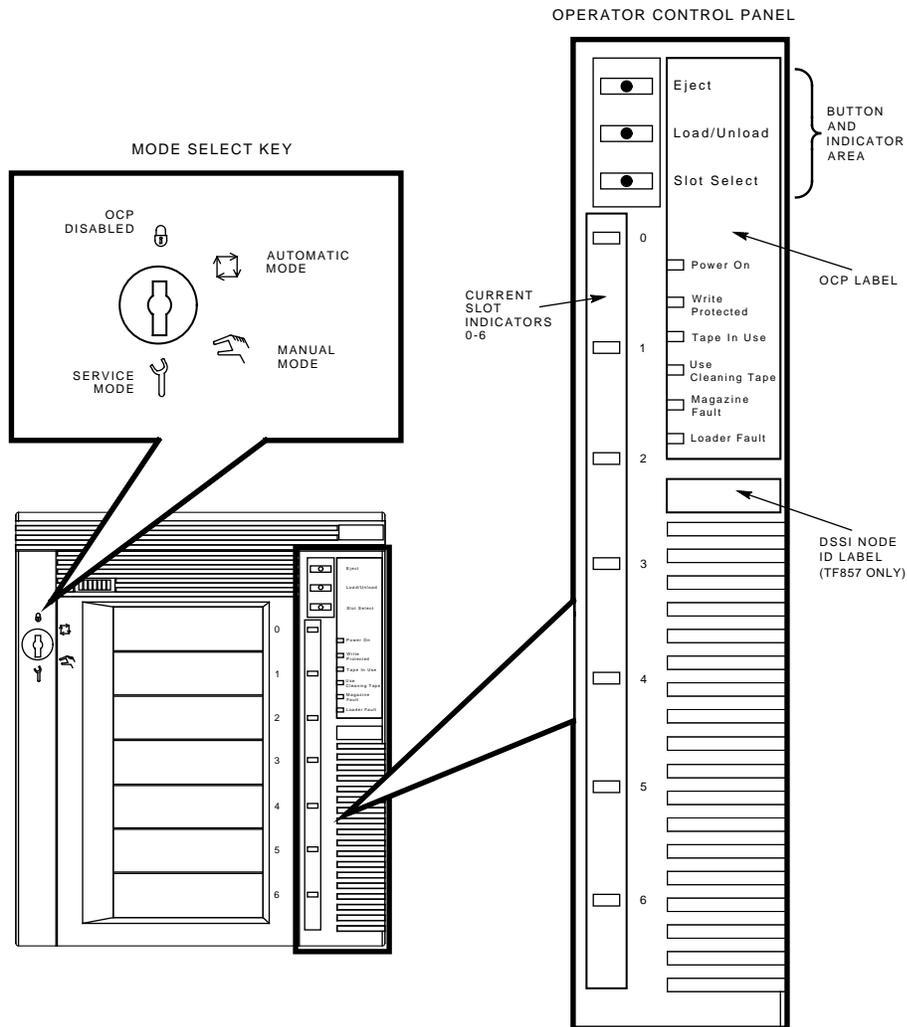
1.4   Hardware Components

The TF/TZ 800-series magazine tape subsystem consists of the following major hardware components (Figure 1–2):

- **Loader Transfer Assembly**
  - Operator control panel (OCP)
  - Magazine

- **Rear Chassis**
  - TK85 tape drive
  - Power supply assembly
  - Handle motor assembly
  - Fan
  - Interlock switch
  - Controller module

1.4.1 Loader Transfer Assembly

The loader transfer assembly contains an elevator that moves to each of the storage slots in the magazine, as well as to the cartridge opening in the tape drive. This mechanism inserts and extracts the tape cartridges into and from the magazine and drive. (The signals that drive the elevator mechanics originate at the loader transfer assembly electronics module.)

1.4.1.1 Operator Control Panel

The TF/TZ 800-Series operator control panel contains three OCP pushbuttons—Eject, Load/Unload, and Slot Select—as well as indicators that are used with the Mode Select key and tape drive status (Section 2.4).

Figure 1–2   TF/TZ 800-Series Magazine Tape Subsystem Hardware Components

LOADER TRANSFER ASSEMBLY

BUS CONNECTOR

INTERLOCK SWITCH

OCP CABLE

CONTROLLER MODULE

RIGHT CAPTIVE SCREWS

OPERATOR CONTROL PANEL (OCP)

MECHANICAL EJECTION LEVER

LATCH

TK85 TAPE DRIVE

POWER SUPPLY ASSEMBLY

HANDLE MOTOR ASSEMBLY

FAN (LOCATED ON OUTSIDE REAR OF UNIT)

HOME POSITION OF ELEVATOR

SHR-X0147H-92-CPG
ZKO-1285-01-DG
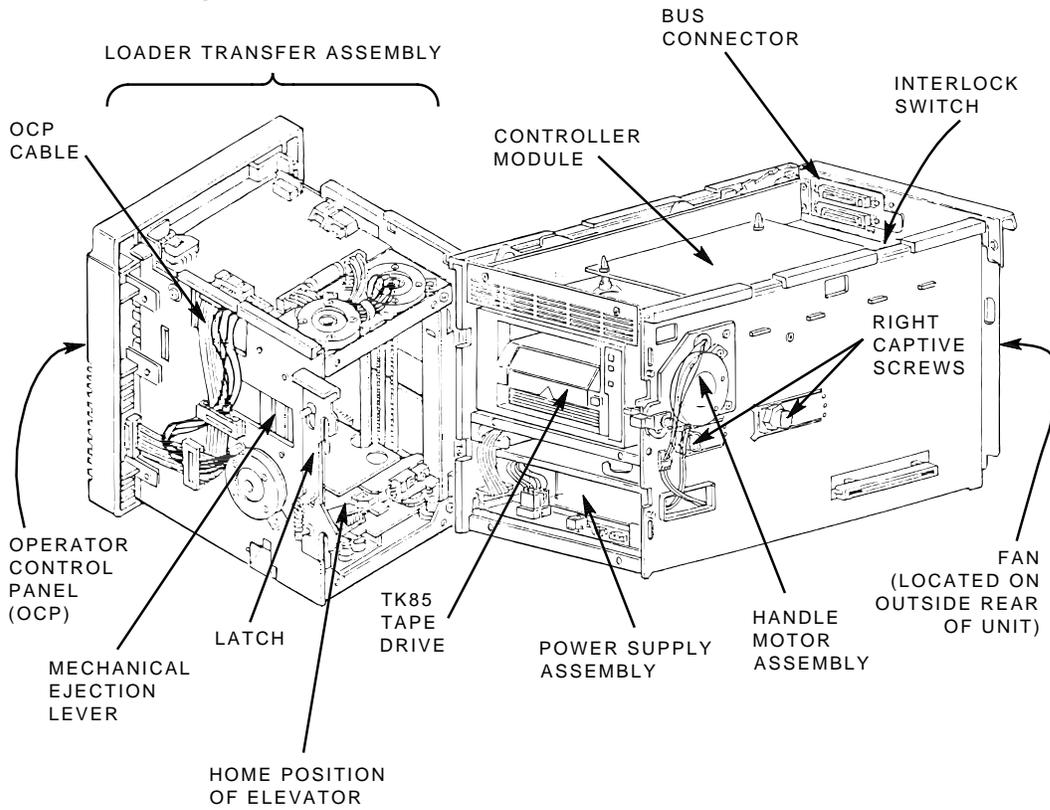
1.4.1.2 Magazine

The TF/TZ 800-Series subsystem's magazine (Figure 1–3) serves as
a removable cartridge container. The magazine stores up to seven
CompacTape III cartridges.

Figure 1–3   Front View of the TF/TZ 800-Series Magazine
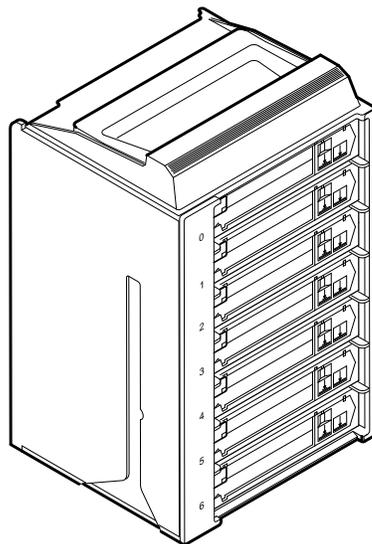
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1.4.2 Rear Chassis

The rear chassis contains the TK85 tape drive, power supply assembly, handle motor assembly, fan, interlock switch, and controller module.

1.4.2.1 TK85/TK86 Tape Drive

The tape drive is a streaming tape drive that stores up to 2.6 gigabytes for the TK85 and 6.0 gigabytes for the TK86 of data on each of its tape cartridges. The TK85 and TK86 drives receive commands from the controller module that connects the TF/TZ 800-series subsystem to the host system.

1.4.2.2 Power Supply Assembly

The power supply assembly provides power to the rear chassis components and to the loader transfer assembly.

1.4.2.3 Handle Motor Assembly

The handle motor assembly lifts and lowers the drive's handle when cartridges are ready for insertion into, or removal from, the tape drive.

1.4.2.4 Fan

The fan cools the entire TF/TZ 800-series subsystem.

1.4.2.5 Interlock Switch

The interlock switch disables 24 Vdc to the operator control panel and loader transfer assembly when the subsystem is moved forward from the storage array. Newer models do not have this interlock switch.

1.4.2.6 Controller Module

The TF/TZ 800-series magazine tape subsystem connects to the host system through either a DSSI or SCSI bus. The physical interface is a controller module that resides in the rear chassis of the TF/TZ 800-series subsystem.

The subsystem uses a serial communications path to pass commands, messages, data, and error information between the controller module and the loader transfer assembly. A second serial communications path exists between the controller module and the TK85 tape drive.

1.5   CompacTape III Cartridge

The CompacTape III cartridge (Figure 1–4) is a 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.

The TK85 tape drive writes 48 tracks (24 pairs) on the tape; the TK86 has 112 tracks (56 pairs) on the tape. It 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.

Table 1–1 shows cartridge compatibility.

Table 1–1   Read/Write Cartridge Compatibility

Cartridge	TK85	TK86
CompacTape	Read	Read
CompacTape	Read	Read
CompacTape III TK85 Format	Read/Write	Read/Write
CompacTape III TK86 Format	None	Read/Write

NOTE

For read-only purposes, you can load older CompacTape cartridges into the TK85 tape drive. Any cartridges recorded by the TK50, TK70, or TZ30 tape drives can be read by the TK85 drive.

To ensure the reliability of cartridges that contain recorded data and that may be archived for a long time, 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%

The above environmental conditions are also recommended for shelf storage of cartridges that do not contain recorded data.

NOTE
**Degaussing tools for erasing tapes do not work with the
CompacTape III cartridge.**

Figure 1–4   CompacTape III Cartridge

SHR_X1020C_89
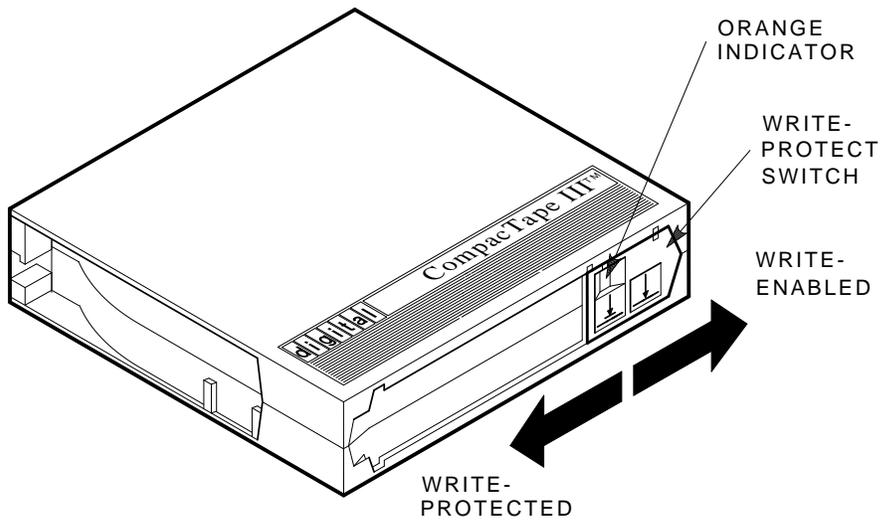
1.6 Service Features

The TF/TZ 800-series magazine tape subsystem has these service features:

- Power-on self-testing (POST) for the electronics and mechanics associated with the loader transfer assembly, the tape drive, and the controller module

- Automatic calibrating of the tape drive

- Automatic home positioning of the elevator

- Mechanical design that allows access to most field replaceable units (FRUs)

- Local diagnostic programs for troubleshooting

1.7 Diagnostics Listing

Table 1–2 lists the TF/TZ 800-series magazine tape subsystem diagnostics.

Table 1–2   TF/TZ 800-series Magazine Tape Subsystem Diagnostics

Diagnostic	Component Tested	Reference
POST	Controller module	Chapter 2
POST	Loader transfer assembly	Chapter 2
POST	TK85/TK86 tape drive	Chapter 2
Local diagnostic programs	TF/TZ 800-series magazine tape subsystem	Chapter 4
EVMDA (under VDS)	TF/TZ 800-series magazine tape subsystem	Appendix A

1.8 Specifications

Table 1–3 lists the specifications for the TF/TZ 800-series magazine tape
subsystem, and Table 1–4 lists those for the TK85 and TK86 tape drive.

Table 1–3   TF/TZ 800-series Magazine Tape Subsystem Specifications

Characteristic	Specification(s)
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, GS mark, VDE, and IEC standards
Maximum number of cartridges	7
Electrical rating	100 Vac to 120 Vac/220 Vac to 240 Vac 2 amperes/1 ampere
AC power consumption	110 W, typical 113 W, maximum
Communications interface	DSSI/SCSI bus
Cycle time	50 s, maximum

Table 1–4   TK85/TK86 Tape Drive Specifications

Characteristic	Specification(s)
Mode of operation	Streaming
Media	12.77 mm (1/2 in) unformatted magnetic tape
Track density	96 tracks/in (48 tracks) TK85
Track density	112 tracks/in (56 tracks) TK86
Bit density	42,500 bits/in
Number of tracks	48 TK85
Number of tracks	56 TK86
Maximum transfer rate (at tape)	800 kilobytes/s
Tape speed	100 in/s
Track format	Two-track parallel, serpentine recording
Cartridge capacity	Up to 2.6 gigabytes, formatted TK85
Cartridge capacity	Up to 6.0 gigabytes, formatted TK86

2
Operating Procedures

This chapter describes the operator control panel (OCP), and the OCP pushbutton and indicator functions. It describes how to use the magazine and the mode select key, and the TF/TZ 800-series initialization and power-on self-test (POST) procedures.

2.1 Operator Control Panel

The OCP pushbuttons and indicators on the TF/TZ 800-series operator control panel (Figure 2–1) activate or deactivate depending on which mode you select with the mode select key (Section 2.4).

Table 2–1 lists the OCP pushbuttons and indicators, and briefly describes their functions.

Table 2–1   TF/TZ 800-series OCP Pushbutton and Indicator Functions

Button/Indicator	Color	Function
Eject button	–	Opens the receiver, allowing access to the magazine for removal and insertion of cartridges.
		If Eject is pressed and a cartridge is loaded into the drive, the cartridge will be unloaded into the magazine from the drive before the receiver opens allowing access to the magazine.

**Table 2–1   (Continued)   TF/TZ 800-series OCP Pushbutton and
                            Indicator Functions**

Button/Indicator	Color	Function
Eject indicator	Green	When a magazine fault occurs, this indicator will light to indicate 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 TK85 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.
Power On indicator	Green	Indicates the TF/TZ 800-series 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 • Using a CompacTape or CompacTape II cartridge previously written by another drive When off, indicates that the current cartridge is write-enabled.

Table 2–1   (Continued)   TF/TZ 800-series OCP Pushbutton and Indicator Functions

Button/Indicator	Color	Function
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 (Appendix B).
Magazine Fault indicator	Red	Indicates a magazine fault.
Loader Fault indicator	Red	Indicates a loader transfer assembly error or drive error.
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 (Chapter 5).

NOTE

A magazine fault is a condition where the *contents* of the magazine are not what the subsystem had expected.

2.1.1 Disabling the Operator Control Panel

To disable the operator control panel, set the mode select key to OCP Disabled mode. This mode prevents unwanted manual intervention when the TF/TZ 800-series subsystem is running unattended.

Figure 2–1   TF/TZ 800-series Operator Control Panel

SHR_X1025E_91
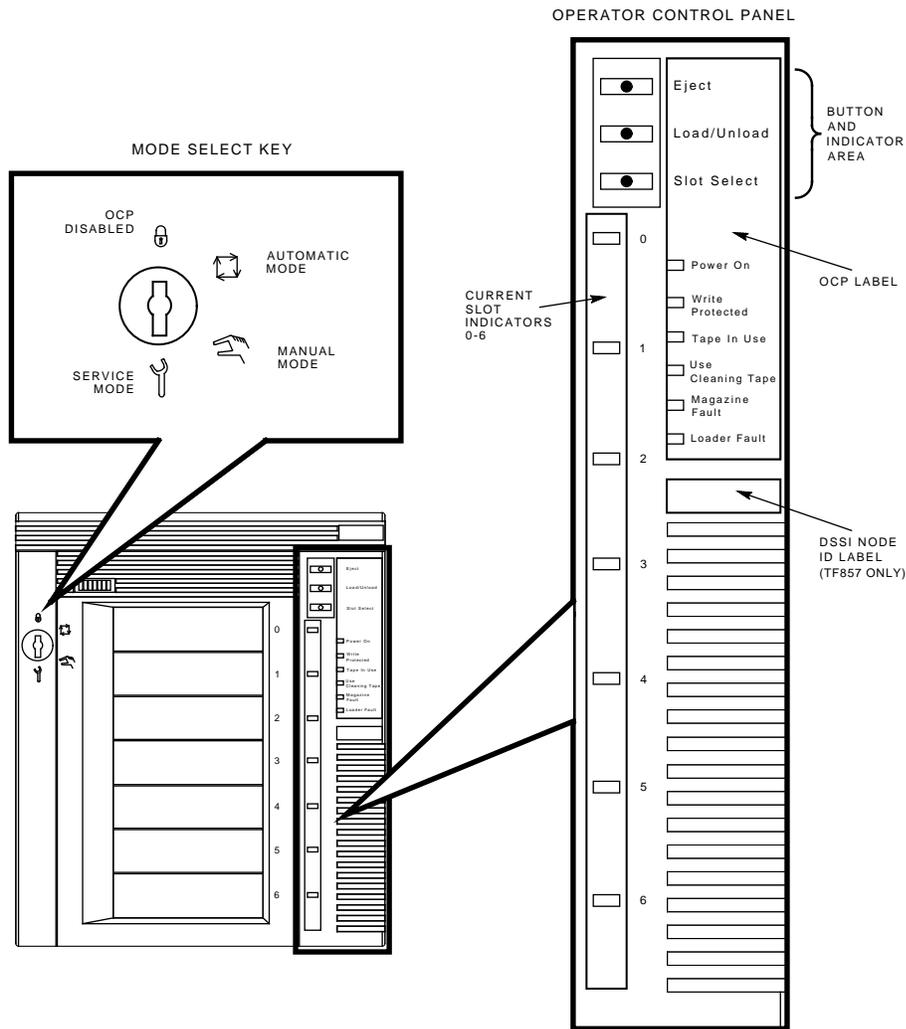
2.2   Using the Slot Select, Load/Unload, and Eject Buttons

Use these TF/TZ 800-series OCP pushbuttons to perform the functions described in the following sections.

NOTE
The Slot Select, Load/Unload, and Eject buttons contain green indicators and are operable only when their indicators are on.

2.2.1   Selecting a Cartridge

Press the **Slot Select** button to select a cartridge and advance the current slot indicator to the next available slot. After a successful initialization, the TF/TZ 800-series subsystem automatically selects slot 0 and the Slot Select button becomes active. The Load/Unload and Eject indicators remain on during the slot selection.

2.2.2   Loading the Cartridge

Press the **Load/Unload** button to load the cartridge into the drive. The Select Slot, Load/Unload, and Eject indicators turn off, and the elevator moves to the selected slot as 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 loads 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.

2.2.3   Unloading the Cartridge

CAUTION
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.

Press the Load/Unload button to unload the cartridge from the drive into the magazine. The Select Slot, Load/Unload, and Eject indicators turn off. Automatic operation stops and the Select Slot operation does not increment. The indicators turn on once the cartridge returns 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.

2.2.3.1 Manually Unloading a Cartridge from the Drive

If a cartridge does not unload from the tape drive when you press the Load/Unload or Eject button on the operator control panel, you can remove the cartridge manually by first pressing the Unload button on the drive. If this step fails, manually rewind the tape to unload the cartridge.

To manually rewind the tape, refer to the following procedure (this procedure assumes that you have already removed the drive from its enclosure):

1. Turn the drive on its side; note the hole in the circuit board toward the front of the drive.

2. Turn the screw inside the hole counterclockwise, using a Phillips screwdriver.

3. Rewind the tape until it unloads into the cartridge.

4. Pull the solenoid out and lift the handle to eject the cartridge.

Return the cartridge to its original storage position in the magazine. You can determine the original position by looking at the front of the magazine (Figure 2–2). The first empty slot that has a metal flag showing is the slot from which the cartridge should have originated. Insert the cartridge from the rear of the magazine. Be sure the write-protect switch is adjacent to the slot number on the front of the magazine to ensure that its position is the same as those of the other cartridges.

NOTE
Be sure to check the cartridge for any damage that may have occurred.

Figure 2–2   Front View of the TF/TZ 800-series Magazine
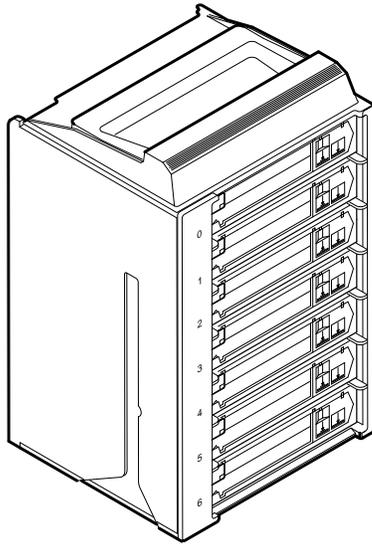
SHR_X1023A_89

2.2.4 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 cartridge from the drive.

NOTE
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 returns to 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.

2.3 Magazine

This section describes how to remove the TF/TZ 800-series magazine from the receiver, load and unload cartridges into and from the magazine, and restore a magazine to the receiver.

2.3.1 Removing the Magazine from the Receiver

To remove the magazine from the TF/TZ 800-series subsystem, first be sure that:

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

- The Eject indicator is on before you press the Eject button.

Then:

1. Press the Eject button to open the receiver.

2. Grasp the receiver and gently pull it forward to access the magazine.

3. Grasp the magazine's handle and lift the magazine out of the receiver
    (Figure 2–3).

Figure 2–3   Removing the Magazine from the Open Receiver

SHR-X0045-90
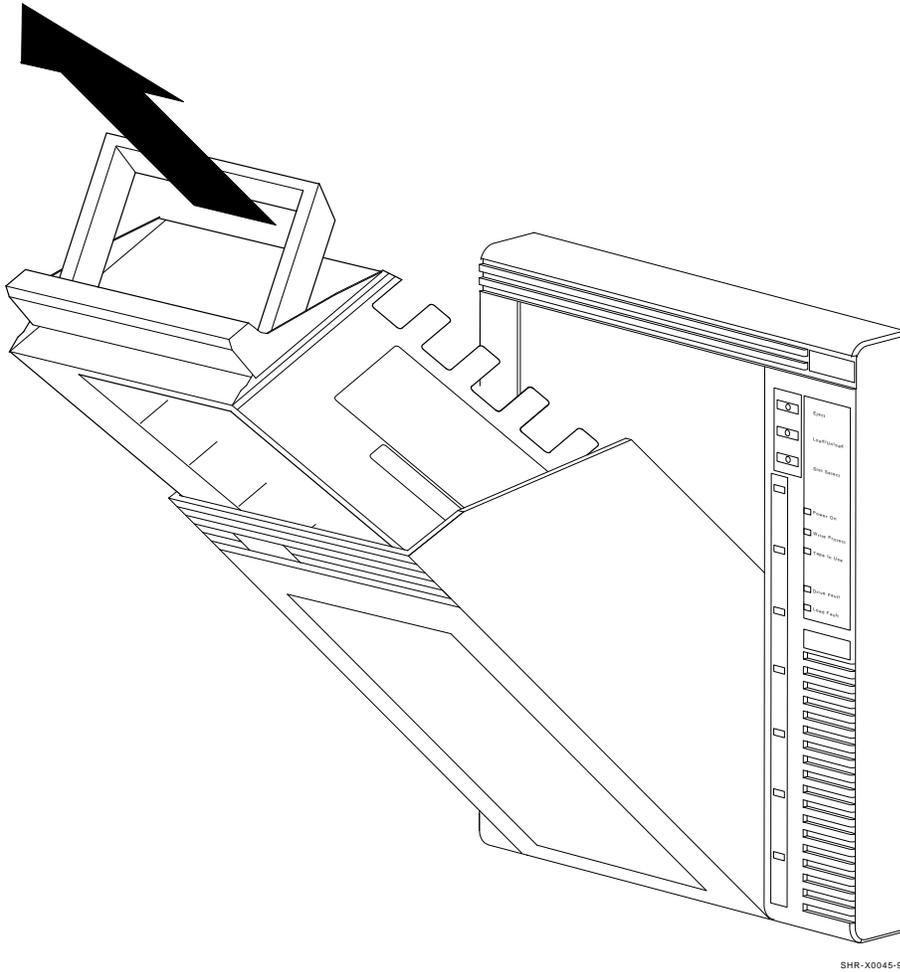
2.3.2 Inserting Cartridges into the Magazine

To insert a cartridge use the following steps:

1. Grasp the cartridge with the CompacTape III label up and the write-protect switch toward you (Figure 2–4).

2. Set the cartridge's write-protect switch to the appropriate position.

3. Push the cartridge into the slot until it stops and you hear a click. (Figure 2–5).

Figure 2–4   Write-Protect Switch on the CompacTape III
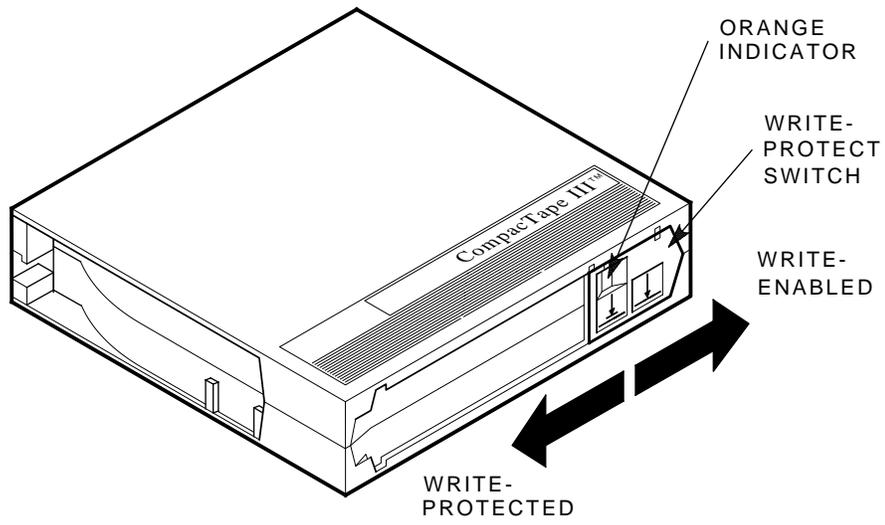
SHR_X1020C_89

ZKO-1285-03-DG

Figure 2–5   Inserting a Cartridge into the Front of the Magazine

BACK OF
MAGAZINE

NOTE: Push tape in
until a click is heard

SLOT
NUMBERS
0-6

FRONT OF
MAGAZINE

ZKO-1217-05-DG
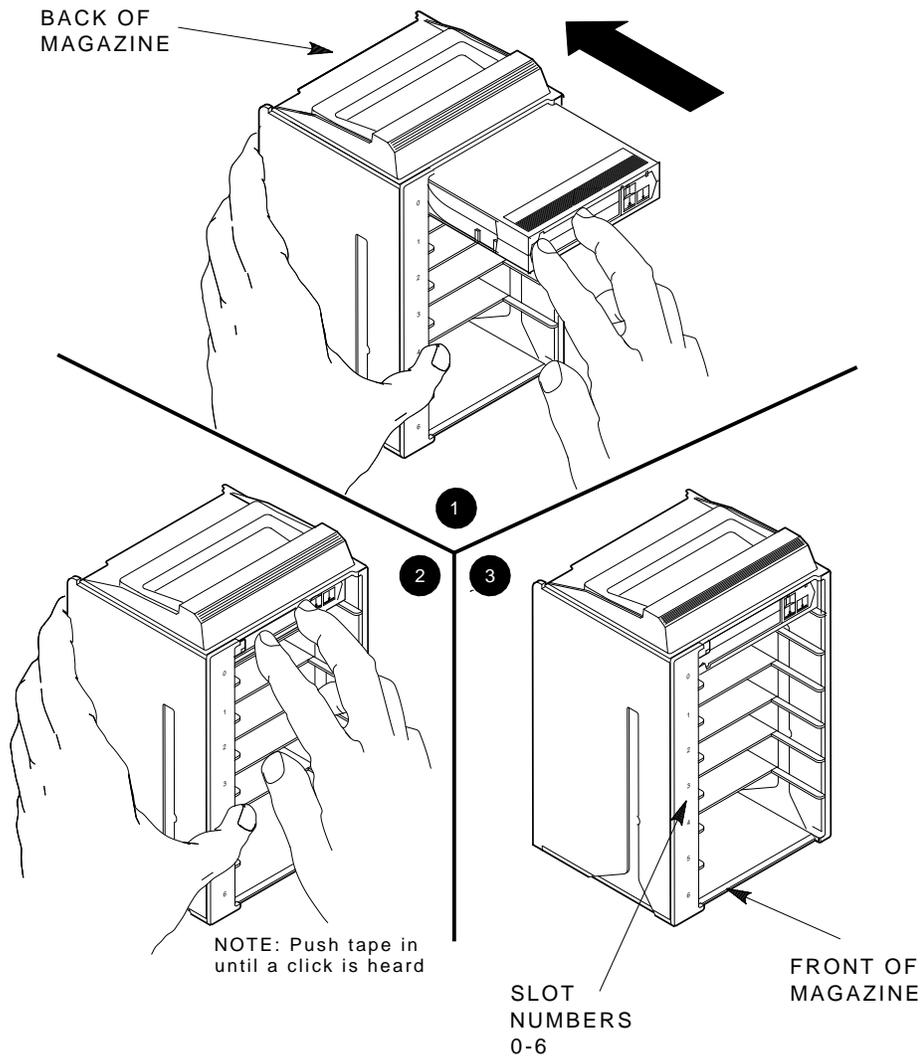
2.3.3 Removing a Cartridge from the Magazine

To remove a cartridge from the magazine, push the cartridge farther into the slot; then release. This releases the cartridge from the magazine (Figure 2–6).

NOTE

Never apply labels to the top or bottom of tape cartridges. Doing so can cause the cartridge to jam in the magazine.

NOTE

Never move the metal tab on the left side of the magazine slot in an attempt to remove the cartridge. This will cause a magazine fault.

2.3.4 Restoring the Magazine to the Receiver

To restore the magazine to the receiver:

1. Slide the magazine into the receiver. (Since the magazine is slotted, you can restore it only in the correct orientation.)

2. Push the receiver closed, ensuring that it is fully closed before proceeding.

Figure 2–6   Removing a Cartridge from the Front of the Magazine

BACK OF
MAGAZINE

NOTE: Push tape in
until a click is heard

SLOT
NUMBERS
0-6

FRONT OF
MAGAZINE

ZKO-1217-06-DG
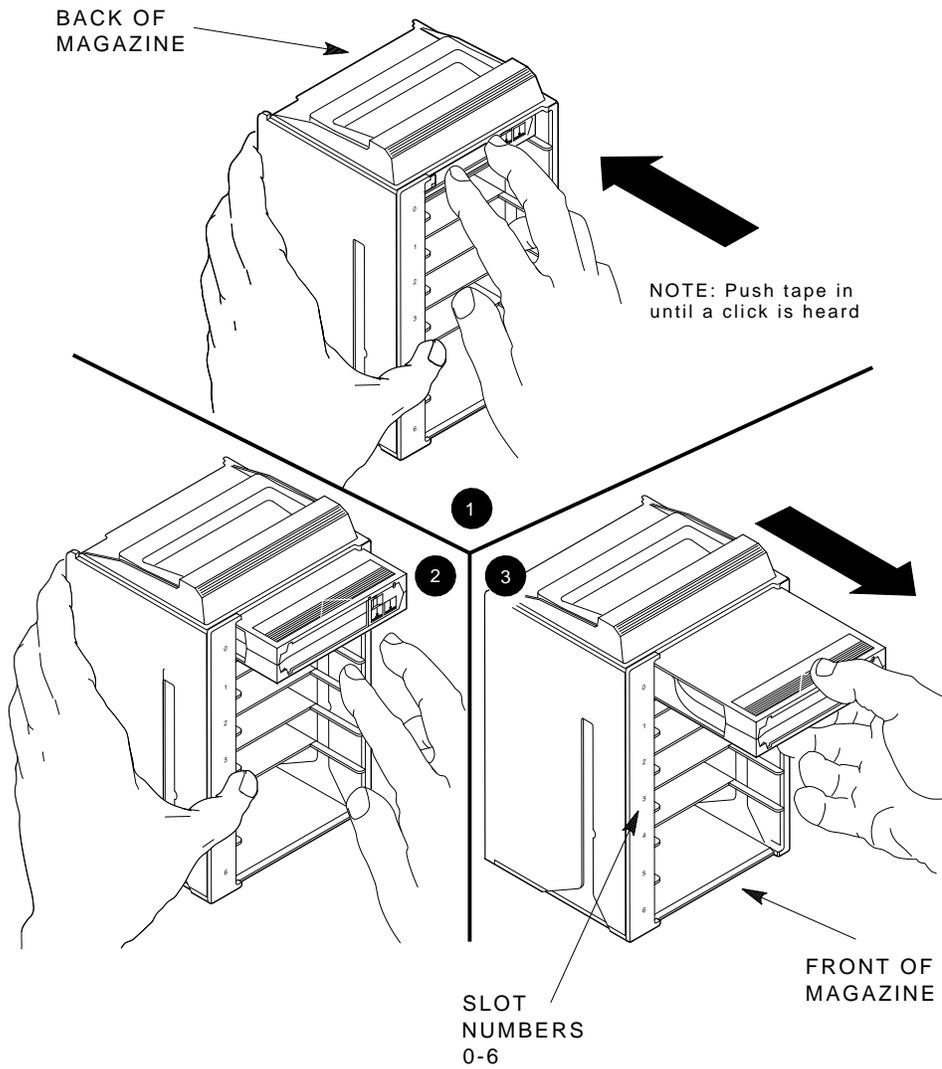
2.4 Mode Select Key

The mode select key (Figure 2–1) locks the loader transfer assembly into the enclosure and also locks the magazine into the receiver.

2.4.1 Operating Modes

The following modes are for operational use:

- **OCP Disabled mode** — Automatically loads and unloads cartridges as necessary during backup procedures. When you insert the magazine into the receiver and close the receiver, the loader 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 cartridge is exceeded, or no cartridge is in the next sequential slot in the magazine.

  To lock the TF/TZ 800-series subsystem into the enclosure and lock the receiver, set the mode select key to **OCP Disabled** mode. The OCP pushbuttons are disabled.

- **Automatic mode** — Is the default, or "normal," mode of the TF /TZ 800-series magazine tape subsystem. This mode 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 cartridge is exceeded, or no cartridge is in the next sequential slot in the magazine.

  To lock the TF/TZ 800-series 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 and the OCP pushbuttons are enabled.

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

  To lock the TF/TZ 800-series subsystem into the enclosure, set the mode select key to **Manual** mode. The receiver is unlocked and can be opened; the OCP pushbuttons are enabled.

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

2.4.2 Service Mode

Use Service mode to perform head cleaning and servicing procedures.

To unlock the TF/TZ 800-series 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. On newer models, the
rear ship lock must be unscrewed first.

Newer models have one mechanical stop associated with Service Mode
(Figure 2–7), while other models have two mechanical stops associated
with Service mode (Figure 2–8).

**Figure 2–7   Mechanical Stops Associated with Service Mode (Newer
            Models)**
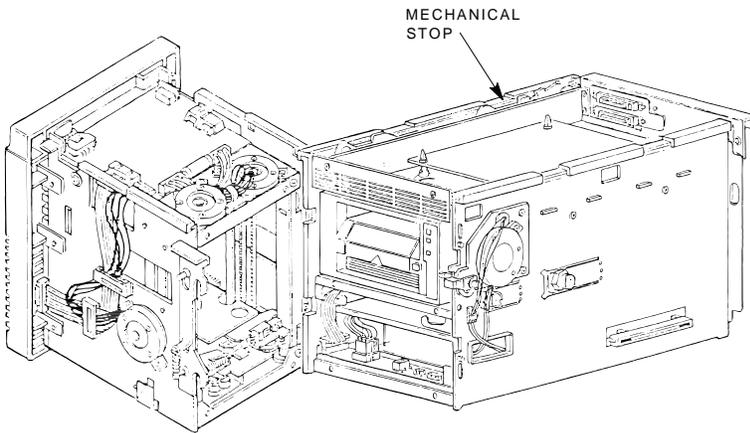
MECHANICAL
STOP

SHR-X0147C-90-CPG

ZKO-1285-04-DG

On models with two mechanical stops, the first stop lets you pull the front
chassis forward from the enclosure to:

- Remove a faulty loader transfer assembly

Figure 2–8   Mechanical Stops Associated with Service Mode (Older Modes)
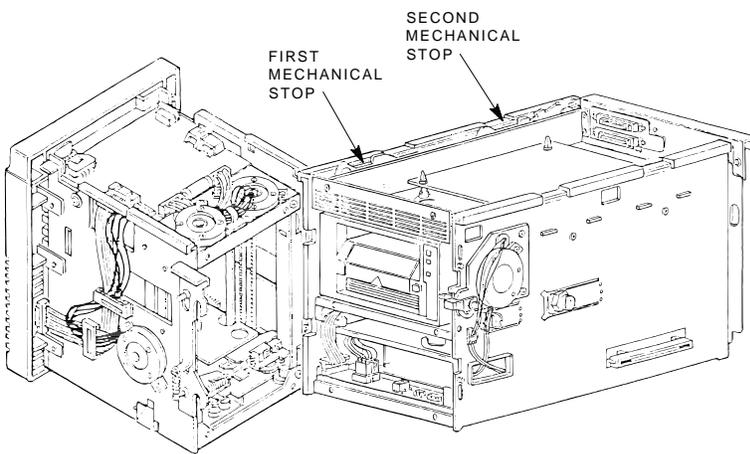
SHR-X0147C-90-CPG

ZKO-1285-05-DG

- Remove a faulty operator control panel

- Remove a faulty power supply assembly

- Perform the head cleaning procedure

Press the first stop to access the second stop. You can then pull the rear chassis forward from the cabinet. This position provides access to the following field replaceable units (FRUs):

- Tape drive

- Handle motor assembly

- Controller module

For specific instructions on how to access the internal assemblies of the TF/TZ 800-series subsystem, see Chapter 6.

2.5   Initialization and Power-On Self-Testing

This section describes the initialization of the subsystem, and the
component power-on self-tests (POSTs) that occur when you power on
the TF/TZ 800-series subsystem.

At power-on, the following components run simultaneous, but separate,
self-tests:

• Loader transfer assembly

• TK85 tape drive

• Controller module

The following subsections show the sequence in which the initialization
occurs.

2.5.1   Power-On Self-Test

At power-on, the loader transfer assembly runs its own self-test. All
operator control panel (OCP) indicators are on. After a successful
completion of the self-test, the Loader Fault and Magazine Fault
indicators turn off while all others remain on. This self-test completes
in about five seconds.

2.5.2   Initialization of the Loader Transfer Assembly

When the controller module completes its self-test successfully, it
initializes the loader transfer assembly, and all OCP indicators turn
on. This occurs about 10 seconds after power-up.

If no errors occur, the controller module turns off the OCP indicators
(except for Power On) and initiates a magazine scan.

The magazine scan causes the elevator to move to each cartridge slot,
moving each cartridge slightly in its position. The associated slot
indicator then turns on. This process completes in about 60 seconds,
depending on the number of cartridges in the magazine.

2.5.3 Completion of Controller Initialization

Upon successful execution of loader transfer assembly initialization by
the controller module, and assuming the TF857/TF867 subsystem has a
magazine with a cartridge in slot 0, the following indicators turn on:

- Power On

- Eject

- Load/Unload

- Slot Select

- Slot 0[1]

If the mode select key is not in the OCP Disabled mode, the Slot Select,
Load/Unload, and Eject buttons are enabled.

If the controller module detects a loader transfer assembly or tape drive
error during its initialization, the OCP Loader Fault and current slot
indicators display the device in error.

NOTE

**If the above initialization sequence does not complete
successfully, check the results of the controller module and
tape drive self-tests. If the controller module self-test completed
successfully, you can diagnose failures in the drive or subsystem
by using the DUP diagnostic programs in Chapter 6.**

2.5.4 Controller Module Self-Test

A successful self-test is verified by the eight indicators on the controller
module. (You must open the loader transfer assembly to observe these
indicators.) The indicator on the far left is on; the remaining indicators
blink in a rotating pattern.

If the self-test is not successful, some or all of the indicators are on
steadily in a fixed pattern. The error indicators reflect the last self-test
error detected.

Once the controller module completes a successful self-test, it connects to
the host system, during initialization, through a DSSI or SCSI bus.

---

[1] Or the indicator of the first available slot turns on.

2.5.5 TK85 Tape Drive Power-On Self-Test

The TK85 drive runs its self-test during power-on or during a reset process. A successful self-test is indicated by the **Operate Handle** indicator being on if no cartridge is installed or by the **Tape in Use** indicator being on if a cartridge is installed (Figure 2–9).

If the self-test is not successful, all indicators on the TK85 front panel blink. (You must open the loader transfer assembly to observe the TK85 front panel indicators.)

Figure 2–9   TK85 Front Panel

CARTRIDGE INSERT/RELEASE HANDLE

SHR-X0056B-90
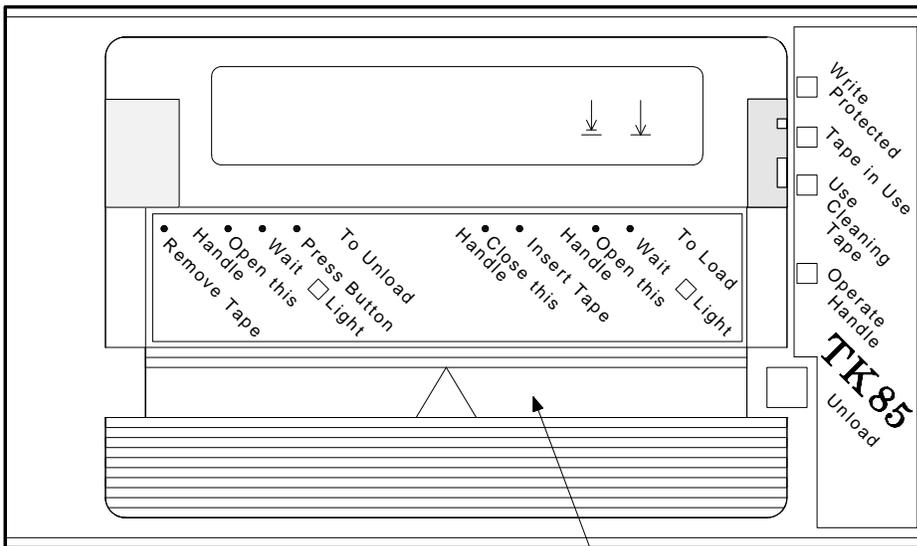
3
Local Programs and Utilities

This chapter describes how to access local programs and utilities using the SET HOST/DUP command.

NOTE
The system manager can provide you with the specific privileges needed to access these programs and utilities.

The local programs and utilities described in this chapter are:

- **DIRECT** (Directory) — Lists the available local programs (Section 3.2).

- **HISTRY** (Historical Statistical Data) — Displays information about the TF857 subsystem (Section 3.3).

- **PARAMS** (Parameter Configuration Utility) — Displays or changes subsystem parameters (Section 3.4).

- **DRVEXR** (Drive Exerciser) — Exercises the tape drive (Section 3.5).

- **DRVTST** (Drive Test) — Verifies the correct functioning of subsystem hardware (Section 3.6).

- **LDRTST** — Exercises the internal mechanism of the loader transfer assembly and the drive (Section 3.7).

NOTE
To abort from a local program or utility, enter Ctrl/Y , Ctrl/C , or CTRL \ . Do *not* stop diagnostics by pressing the Load/Unload button. Doing so can cause system failure.

3.1   Accessing Local Programs

Access local programs with the VMS command:

```
$ SET HOST/DUP
```

This command allows access to local programs that reside in read-only memory (ROM) on the TF857/TF867 subsystem. Communications between the host system and the TF857/TF867 subsystem are through the 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 used with the VMS operating system, version 5.4.2 or later:

```
$ SHOW CLUSTER                       ; To learn the node name
                                     ; of the tape device.

$ SET DEVICE/noavailable device-name ; To make the device
                                     ; unavailable to users.

$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=PARAMS nodename
```

You can add the /LOG qualifier to the above commands to generate a log file.

You can substitute any of the previously listed programs and utilities after the /TASK qualifier.

NOTE

A typical example of a device node name is T7X3MA. This default node name is derived from the module serial number. You can change this node name by using the PARAMS utility; however, if you change the node name, you need to reboot the host system.

3.1.1 Error Message after Executing SET HOST/DUP

You may receive the following error message after issuing the SET HOST
/DUP command:

```
Unit Offline
 Data Pattern:                    0
 Record Byte Count:           24732
 Program Object Count:        13988
 Tape Object Count:           13987

End Message
 000A036E 00040000 A1000023 00000000 00000000 00000000 00000000 00000000
 00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000

Statistical Report

 Test Name: FTST03, Pass 16
 Random Seed:            1242755630
 Byte Count:                      0
 Pattern Number:                  9
 Data Errors:      Read     Write
     Retries:         4         0
         ECC:         0
        Hard:         0         0
 Data Compare Errors:             0
 Mispositions:                    0
 Kbytes Written:           10380731  Read: 10182195

0023 - Unit read/write test failed.
```

If you receive an error message, you may need to load the FYDRIVER
program, as follows:

```
$ MCR SYSGEN              ; To access SYSGEN.

$ SYSGEN> LOAD FYDRIVER   ; To load FYDRIVER, prerequisite
                          ; to using diagnostics.

$ SYSGEN> CON FYA0/NOADAP ; To configure FYDRIVER.

$ SYSGEN> EXIT
```

3.2   DIRECT Program

The **DIRECT** program provides a directory of the diagnostic and utility
programs that are resident in the TF857/TF867 subsystem. The following
examples were taken from a TK857.

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 TF857
/TF867 subsystem.

An example of the HISTRY display follows:

```
TF85
DSSI:  T8992Q  /2 (DIPs)
Controller:
   S: EN03000159
   HW: 000/PCB-rev:A000
   Bt: 120/42DA8D6A (23-JAN-1991 15:00:47)
   Cd: 129/AF19579E ( 7-FEB-1991 15:24:43)
   EE: 085  TD: 002
Drive:
   S: EN02900321
   HW: 004/A00
   Cd: 030/4AEC
   EE: 015/42CA
Loader (S/H/M): 023/000/000
Power on Hours:     1
Power Cycles:       3
Completed
```

3.4 PARAMS Utility

Use the **PARAMS** utility to display or change internal parameters. The TF857 subsystem's parameters are preset during manufacturing but can be changed by a system manager or operator.

Table 3–1 lists some subsystem parameters used with the PARAMS utility.

Table 3–1   Summary of TF857/TF867 Subsystem Parameters

Parameter	Definition
UNITNUM	TMSCP unit number.
SYSTEMID	Controller module's 48-bit system ID.
NODENAME	Node name for the TF857 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.
FORCEDENSITY	Determines what the tape density will be.
	0 — Automatic, as selected by the host.
	1 — Low (TK85) density regardless of host selection.
	2 — High (TK86) density regardless of host selection.

3.4.1 Selecting Density with the TF867

To write in TK85 format (low density) on a TF867 subsystem, you can use the PARAMS utility on a VMS system, To modify the density use the DUP parameter FORCEDENSITY.

The DUP parameter FORCEDENSITY controls how a TF867 subsystem determines what density to use when writing from BOT. See Table 3–1 for parameter settings.

NOTE
**When using the FORCEDENSITY parameter be sure to change the
value back to 2 after you have finished using the TK85 format tape
operation.**

3.4.2 Displaying, Setting, and Saving Parameters

At the PARAMS> prompt, use the following command to display, set, or
save parameters:

- **SHOW parameter** — Displays a specific parameter. You can
  add qualifiers to the SHOW command to list specific subsystem
  parameters, such as:

      SHOW /ALL
      SHOW /DIF
      SHOW /DSSI
      SHOW /DUP
      SHOW /TDS
      SHOW /TMSCP
      SHOW /SYSTEM

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

- **SET parameter** — Sets a parameter.

- **WRITE** — Saves parameter modifications.

- **STATUS** — Displays the status of the subsystem.

- **HELP** — Lists available PARAMS commands.

- **EXIT** — Ends the PARAMS session.

3.4.2.1 SHOW command

To display specific parameters, in this example, system parameters:

```
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:????"  "PCB-rev:????"                     Ascii
RGTTAG                 "??????"        "??????"                     Ascii
UNITID           454E0044ABD7                                       Quad
```

3.4.2.2 SET Command

Use the **SET** command to set, or change, internal TF857 subsystem parameters.

To use the SET command, enter:

```
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 assigned to the parameter. See Section 5.4.4 for more information.

3.4.2.3 WRITE Command

Use the **WRITE** command to save, in nonvolatile memory, the changes you made using the PARAMS utility and its commands. The WRITE command is similar to the VMS SYSGEN WRITE command.

3.4.2.4 STATUS Command

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

3.4.2.5 HELP Command

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

```
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
WRITE
```

3.4.2.6 EXIT Command

Enter EXIT to end the PARAMS session.

NOTE
**If you change the parameters, the system displays the following
message after you type EXIT at the PARAMS> prompt.**

```
Parameter modified but not written. Still Exit?
```

**If you answer YES, the system returns to the VMS prompt and
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 3.4.2.3 for
more information on the WRITE command.**

3.5   DRVEXR Progam

The **DRVEXR** program exercises the TK85 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

Statistical Report

 Test Name: DRVEXR, Pass 1
 Random Seed:           1111227776
 Byte Count:                     0
 Pattern Number:                 0
 Data Errors:     Read      Write
    Retries:        0          0
        ECC:        0
       Hard:        0          0
 Data Compare Errors:            0
 Mispositions:                   0
 Kbytes Written:            228461  Read:          0

 Test Passed
```

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

3.6 DRVTST Program

The **DRVTST** program is a pass/fail test that invokes a comprehensive test of the TK85 tape drive hardware. No statistics are sent to the host upon completion of this test. Testing terminates with either a `Test Passed` message or a fatal error message. 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: 25

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 and the read/write ability of the drive. This test also 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
Illegal Command Test: Passed
Internal Self Test
ROM Test: Passed
RAM Test: Passed
EEPROM Test: Passed
CTC Test: Passed
UART Test: Passed
Movement Test
Picker Arm Test: Passed
Cartridge Motor Test: Passed
Handle Motor Test: Passed
Elevator Test: Passed
Unit Available

 Cartridge loads:  1
Unit Available

 Cartridge loads:  2
Unit Available

 Cartridge loads:  3
Unit Available

 Cartridge loads:  4
Unit Available

 Cartridge loads:  5
Unit Available

 Cartridge loads:  6
Unit Available

Statistical Report
```

```
Test Name: LDRTST, Pass 1
Random Seed:                    0
Byte Count:                     0
Pattern Number:                 0
Data Errors:      Read     Write
    Retries:        0        0
        ECC:        0
       Hard:        0        0
Data Compare Errors:            0
Mispositions:                   0
Kbytes Written:                 0  Read:        0

Test Passed
```

4
Troubleshooting Procedures

This chapter describes failures that are not detectable through diagnostics, error conditions, magazine and loader faults, power problems, and cartridge motion faults.

4.1 Avoiding Basic Problems

Follow these guidelines when operating the TF/TZ 800-series subsystem to avoid basic problems:

- Use CompacTape III cartridges or for read-only operations, use CompacTape or CompacTape II 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 exposed portions of the 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 TF/TZ 800-series subsystem unloads and loads the next cartridge when the subsystem receives a DISMOUNT command from the host system.

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

CARTRIDGE
LEADER

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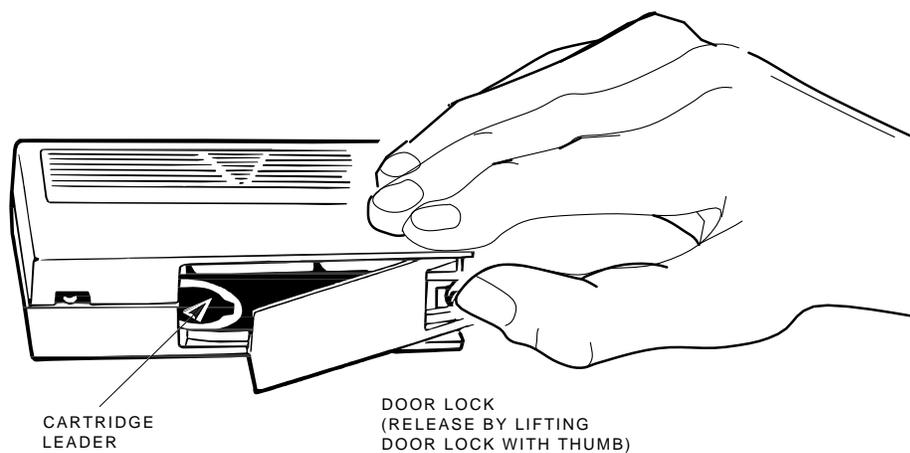
SHR-0002-86
SHR_X1027_89_CPG

4.2 Backup Operation Failure

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

- Loading CompacTape or CompacTape II cartridges when executing write operations

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

- Selecting the incorrect cartridge slot.

4.3 Nondetectable FRU Failure

Table 4–1 describes situations that can occur with field replaceable unit (FRU) failures not detectable through diagnostics. These failures may cause subsystem failure.

Table 4–1   Nondetectable FRU Failures

FRU	Possible Failure
Interlock switch [1]	After you slide the TF/TZ 800-series subsystem forward for head cleaning or service, the Power On indicator remains on.
Tape drive communications cable	After you replace either a faulty drive or a loader transfer assembly, the power is on, but the subsystem still fails.
Handle motor assembly	Same as above. Characterized by subsystem retry errors.
Power supply assembly	When connected to a known good source of power, and the power switch is set to 1 (on), the subsystem does not power up and the Power On indicator remains off.
Operator control panel	After you replace either a faulty controller module or other FRU, the OCP pushbuttons or the indicators do not function. (All indicators turn off briefly at power-on.)
Fan	Inspection required.

[1]Applies only to older models

See Chapter 6 for information on removing and replacing faulty FRUs.

4.4 Error Conditions

This section describes error conditions, failure influences, and soft error rates. In addition, it includes information on magazine and loader faults. See Table 4–2 for a list of common failures, causes, and corrections.

4.4.1 Detecting Common Failure Influences

Many factors may influence failures, for example:

- Defective media

- Operator or user errors

- Incorrect backup commands

- Poor power or grounding

NOTE
The tape drive may appear to be the failing unit due to the operation being performed at the time of failure (such as backup). However, before you replace the drive, ensure that any problems you find are not due to the above factors.

4.4.2 Soft Errors

Soft errors are normally considered to be *events* rather than errors. In the case of soft errors, **no data is lost**. For a write operation, the data is rewritten. For a read operation, retries are performed.

Some of the variables that create soft errors are as follows:

- Media dropouts

- Temperature of media (not acclimatized)

- System bus activity

- Applications

- Head wear

- Contamination

- Foreign debris in tape path

Changes in soft error rates for any particular drive and cartridge are more significant than an absolute number of soft errors. This is due to the variables described in table Table 4–2.

When examining the drive error count, you can detect soft and hard errors. For example, an error occurs if you give the wrong label name during a mount. Be sure the errors indicate a real hardware problem before replacing the drive.

NOTE

All tapes contain a number of dropouts. Although these are imperfections in the tape, the tape is not considered to be defective. The hardware and software are designed to deal with these known imperfections. Dropout testing is performed on samples of media by Digital's vendors and meet all of the specifications of Digital Equipment Corporation.

4.4.3 Common Failures

Refer to Table 4–2 for a list of common failures, their probable causes and possible corrections.

Table 4–2   Common Failures, Causes, and Corrections

Symptom	Probable Cause	Possible Fix
Failure to mount or initialize with new media	Bad media or dirty head	Clean the head and retry with another cartridge.
OCP pushbutton indicators blinking	Drive failed POST or detected a hard error during operation	Attempt to clear the error by pressing the Unload button on the drive. If the error does not clear, you have a drive hardware failure or a power problem.

Table 4–2 (Continued)   Common Failures, Causes, and Corrections

Symptom	Probable Cause	Possible Fix
Green indicator on drive blinking	Drive leader unhooked in drive	Clear the error by pressing the Unload button on the drive or the Load/Unload button on the OCP.
	Calibration error	
	Mispositioned cartridge leader	Inspect the cartridge leader for correct position. Do not use the cartridge if you cannot reposition the leader (Figure 4–1).
		Try another cartridge. If the error repeats, you have a drive hardware failure or more than one bad cartridge (physically damaged or bad calibration tracks).
Cartridge stuck in drive with tape on takeup reel	Hard drive error	Attempt recovery by pressing the Unload button on the drive, or manually remove cartridge from the drive (Section 2.2.3.1).

4.5 Magazine and Loader Faults

Error indications fall into two main categories:

- **Magazine Fault** — An operator-correctable condition in most cases, and is indicated by the Magazine Fault indicator being on.

- **Loader Fault** — A condition that is indicated by the Loader Fault indicator being on, and most likely requires service from Customer Services.

4.5.1 Magazine Fault Description

A magazine fault is indicated by the Magazine Faults LED on and Eject LED on. A magazine fault can occur when:

1. A cartridge has been removed from the magazine incorrectly.

2. A cartridge was manually unloaded from the drive.

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

4. A cartridge was manually inserted into the drive.

NOTE
This can only occur if the loader has been opened, requiring service intervention. This cannot occur under normal operation

Detecting case 1, 2, 3. These can be detected by the Magazine Fault LED on and slot LEDs 0 and 5 on.

First a cartridge should never be removed from the magazine by moving the metal tab in front of the cartridge. This is the main source of magazine faults. Use the proper cartridge insertion/removal procedure (reference section 2.3.2, 2.3.3) to clear a magazine fault caused by case 1, 2, and 3:

• Press the Eject button to open the receiver.

• Remove the magazine and check for a metal tab over an open slot. This is the slot from which the cartridge was removed.

    If a metal tab is found over a open slot then:

        Reinsert the missing cartridge properly, pushing the cartridge in until it snaps in place. If no cartridge is needed in this slot, push a cartridge into the slot and then remove it according to the normal cartridge insertion/removal procedure. This setp is critical to avoid additional magazine faults.

        Insert the magazine into the receiver.

        Close the receiver.

• If no metal tab is covering and empty slot, then the cartridge loaded into the drive was manually removed and re-inserted into the magazine.

    To clear this case simply close the receiver.

Detecting case 4, the cartridge was manually loaded into the drive. This can be detected by the Magazine Fault LED on and slot LEDs 0 and 6 on. This is the only time LEDs 0 and 6 will be on.

To clear the Magazine Fault caused by case 4:

• Press the Eject button to open the receiver

• Remove the magazine

- Reach in and manually unload the tape from the drive by pressing the unload button.

- When the drive beeps and the green operate handle LED comes on the cartridge can be manually removed by lifting the drive handle.

- Remove the cartridge.

- Reinsert the magazine and close the receiver.

4.5.1.1 Clearing a Magazine Fault

To clear a magazine fault, press the Eject button to open the receiver and remove the magazine. Remove the cartridge from the drive or elevator if present. Close the receiver, and the drive controller clears the magazine fault. While the magazine is out, make sure there are no retention flags showing in a empty slots. After the fault has cleared, try loading and unloading cartridges to verify operation.

4.5.2 Loader Fault Description

A loader fault indicates that the TF/TZ 800-series 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 attempts three retries before declaring a fatal error. All loader faults generate an error log, cause the Loader Fault indicator to light, and generate an associated subcode.

The Loader Fault indicator displays both loader and drive errors. The presence of a fault is indicated by the following slot indicators:

- Slots 4 and 0 light to indicate a controller module fault.

- Slots 5 and 0 light to indicate the loader detected a fault.

- Slots 6 and 0 light to indicate a drive fault.

NOTE

Error indicators do not blink. During hardware failures, action is determined by the controller module.

4.5.2.1 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 TF/TZ 800-series subsystem attempts to clear the error. When you press the Eject button, the receiver opens to let you access the magazine.

4.6 Power Problems

If the Power On indicator is not on, or the host system does not recognize the TF/TZ 800-series subsystem:

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

- Verify that the subsystem configuration is correct.

4.7 Cartridge Motion Faults

Occasionally, a cartridge motion fault can occur in the elevator or drive mechanism. A cartridge motion fault is indicated when:

- The Magazine Fault indicator on the operator control panel is on.

- A cartridge cannot be loaded or unloaded.

- An unusual sound is in the motor.

This section describes how to remove cartridges from a loader transfer assembly without harming the loader or data. It does not provide information on fault-finding, repair, or maintenance of the loader.

4.7.1 Isolating Cartridge Motion Faults

Most cartridge motion problems result from worn or damaged magazines or cartridges.

To isolate cartridge motion faults:

1. Set the Mode Select key to Automatic mode, returning the subsystem to its "normal" mode.

2. Attempt to reproduce the error.

3. Open the loader transfer assembly (Figure 4–2) to locate or remove
    the cartridge in question.

Figure 4–2   Loader Open Latch

LOADER OPEN LATCH
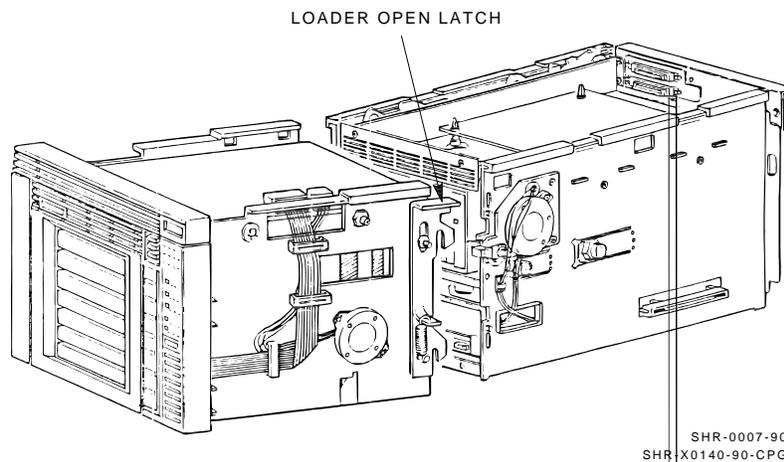
SHR-0007-90
SHR-X0140-90-CPG

4. Open the receiver by squeezing the mechanical ejection lever
    (Figure 4–3) to remove the magazine.

Figure 4–3   Mechanical Ejection Lever

DRIVE COMMUNICATIONS
CABLE

SECOND
MECHANICAL
STOP

SHIPPING
RESTRAINT

FIRST
MECHANICAL
STOP

MECHANICAL
EJECTION LEVER

SHR-0012-90
SHR-X0147C-90-CPG
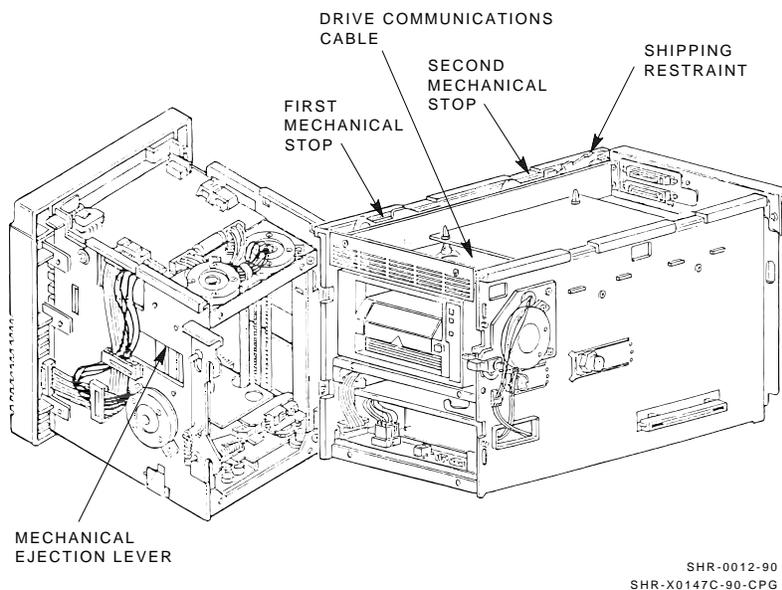
5. Insert the cartridge into the magazine from the rear, replacing the
    cartridge in its *original slot* (the metal tab next to the slot number
    indicates the original slot).

NOTE
**The subsystem may indicate a magazine fault due to reinserting
the cartridge into the magazine as described in the preceding
process. To clear this magazine fault, remove the magazine from
the receiver and close the receiver. When the Eject indicator
turns on, insert the magazine back into the subsystem.**

The OCP indicators signal when you can cycle cartridges into and out of
the drive. Concentrate on the cartridge in question, but be sure to test
the others as well. There should be no difference in the action taken by
the mechanics due to an OCP or system command.

4.7.2 Recovering Cartridges

Cartridge motion problems may be caused by a fault in one of the following components. Suggestions for recovering cartridges follow:

- **Magazine** — Cartridge motion problems that are caused by faulty magazines are usually indicated by problems occurring during the attempt by the elevator to return the cartridge to the magazine. Replace the magazine and see if the problem persists. Note that you may not be able to find a magazine problem by inspection alone. For example, a damaged surface finish in or near a slot, causing excessive friction, may not be obvious.

- **Cartridge** — Cartridge motion problems that occur with one cartridge only are likely to be caused by that particular cartridge. Move the cartridge to another slot and note if the problem occurs there as well. In addition, faulty cartridges can cause problems in the drive area. Check the leader positioning in both drive and cartridge, and the operation of the cartridge door.

- **Tape drive or handle motor assembly** — Cartridge motion problems caused by a faulty or misaligned tape drive occur when the tape is loaded into or unloaded from the drive. Check for problems in the tape drive door or tape drive alignment. See Chapter 6 to ensure that the handle motor assembly is correctly assembled and in the correct position.

- **Loader transfer assembly** — Faults caused by the loader transfer assembly are usually not field repairable. Replacement of the loader transfer assembly is required.

5
FRU Removal and Replacement Procedures

This chapter describes how to remove and replace the field replaceable units (FRUs) of the TF/TZ 800 subsystem. The chapter also provides lists of recommended spares and service aids.

The TF857/TF867 subsystem FRUs can be removed without interrupting the host system or breaking the DSSI bus. You can power down the subsystem and take it off-line without interfering with the host or any other DSSI device.

The TZ857/TZ867 subsystem FRUs cannot be removed unless the system is powered down.

For a list of the FRUs and references to their removal and replacement procedures, see Table 5–1. For guidelines to removing and replacing the FRUs, see Section 5.2.

Table 5–1   Field Replaceable Units and Related Procedures

FRU	Procedure Section
Controller module	5.4
Loader transfer assembly	5.5
Tape drive	5.6
Tape drive takeup leader	5.7
Operator control panel	5.8
Fan	5.9
Interlock switch	5.10
Power supply assembly	5.11
Handle motor assembly	5.12
Key lock switch	5.13

5.1 Recommended Spares and Service Aids

Table 5–2 lists the part numbers of the recommended spares. It includes a description of each spare with a reference to a figure showing the spare.

Table 5–2 Recommended Spares List

Part Number	Description	Figure
TK85–AX	TK85 cartridge tape drive, 2.6 gigabytes	5–1
TK86–AX	TK86 cartridge tape drive, 6.0 gigabytes	5–1
54–19089–01	Controller module (DSSI)	5–1
54–19122–01	Controller module (SCSI)	5–1
70–28824–01	Takeup leader kit	5–14
17–02613–01	Drive communications cable	5–3
29–28102–01	Loader transfer assembly	5–1
29–28103–01	Power supply 110 Vac, 50/60 Hz	5–1
29–28103–02	Power supply 220 Vac, 50/60 Hz	5–1
29–28104–01	Operator control panel	5–1
29–28106–01	Handle motor assembly	5–1
29–28105–01	Interlock switch (older models only)	5–1
29–28972–01	Loader transfer assembly communications cable — 10-pin cable connecting to drive controller	5–7
29–28974–01	Loader power harness — provides the dc power for the drive, controller, and fan	–
29–28975–01	Internal DSSI cable — 50-pin controller module cable connecting to the loader bulkhead	5–5
17–01249–02	Internal SCSI cable — 50-pin controller module cable connecting to the loader bulkhead	5–5
29–28976–01	Loader transfer assembly power cable — 10-pin cable connecting to power supply	5–7

Table 5–2 (Continued) Recommended Spares List

Part Number	Description	Figure
29–28977–01	Loader transfer assembly OCP cable — 16-pin cable connecting to loader transfer assembly	5–1
29–28978–01	Interlock switch cable — 2-pin cable connecting to power supply	5–11
29–28979–01	Transfer assembly key switch cable — 3-pin cable connecting to loader transfer assembly	5–7
29–28980–01	Handle open sensor cable — 3-pin cable connecting to power supply	5–11
29–28981–01	Key lock assembly	5–7
12–23374–13	Fan	5–1

Figure 5–1   TF/TZ 800 Magazine Tape Subsystem FRUs
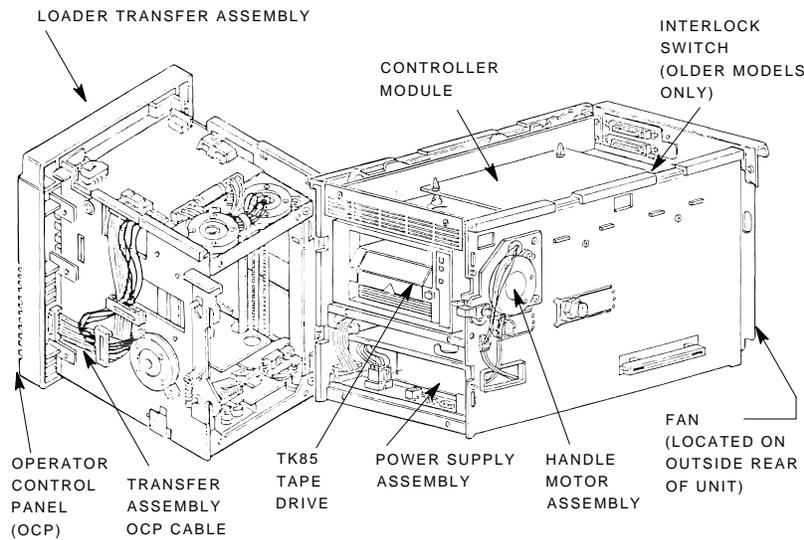
LOADER TRANSFER ASSEMBLY

INTERLOCK
SWITCH
(OLDER MODELS
ONLY)

CONTROLLER
MODULE

OPERATOR
CONTROL
PANEL
(OCP)

TRANSFER
ASSEMBLY
OCP CABLE

TK85
TAPE
DRIVE

POWER SUPPLY
ASSEMBLY

HANDLE
MOTOR
ASSEMBLY

FAN
(LOCATED ON
OUTSIDE REAR
OF UNIT)

SHR-X0147C-90-CPG

ZKO-1285-02-DG

Table 5–3 lists service aids for use by Digital's Field Personnal only.
These service aids are *not* for replenishing customer supplies.

Table 5–3   Service Aids

Part Number	Description
30–32447–01	Magazine
29–28982–01	Loader transfer assembly key — universal key that fits loader transfer assembly key lock
TK85–HC	CleaningTape III cartridge (also used for the TK86)
70–27592–02	Field test cartridge
29–26246–00	Static discharge protective field service kit
29–28008–01	DSSI bus meter (DBM) — Device that looks at bus signals in real-time, verifies DSSI ID numbers, and locates faulty cables or duplicate DSSI ID numbers on a DSSI bus

5.2   Removal and Replacement Guidelines

Always follow these guidelines when performing any FRU removal and
replacement procedure in this chapter.

1. **Observe all electrostatic discharge (ESD) precautions.**

2. Always use the static discharge protective field service kit (antistatic
   mat and wristbands).

3. Set the Mode Select key to **Service** mode.

4. Be sure that a tape is not in the drive. If a tape is present, dismount
   the tape by using a console command. Then press the Eject button to
   open the receiver and remove the magazine. If the receiver does not
   open, see Section 5.3, Manually Opening the Receiver.

5. To power down the TF/TZ 800 subsystem, set the power switch to 0
   (off) and disconnect the power cord.

6. Do not disconnect the *external* DSSI or SCSI cable unless the system
   is powered down. Doing so while the system is running can cause
   system failure and possible loss of customer data.

7. Do not open the front door of the SF200 storage array; it can hinder servicing the TF/TZ 800 subsystem from the front.

8. To maintain stability, slide only *one* TF/TZ 800 subsystem at a time from the storage array. On newer models the screws in the back of the subsystem must be removed before the subsystem can slide out.

NOTE
During shipment, the subsystem is locked into the enclosure by a shipping restraint. Be sure to disengage this restraint (Figure 5–3) before removing the subsystem.

9. When sliding the subsystem in or out of the enclosure, be sure that the connector wires and cables are not tangled or snagged.

10. Do not misplace the screws that are not captive. They are metric and not readily available.

11. Use the power-on self-test (POST) and local diagnostic programs to diagnose most FRUs. (For nondiagnostic-detectable failures, see the subsystem- and drive-specific problem resolution sections).

12. Use the *field test* cartridge when verifying the TF/TZ 800 subsystem after the removal and replacement procedures are complete.

5.3 Manually Opening the Receiver

If the receiver does not open when you press the Eject button during a removal or replacement procedure, follow these steps:

1. Access the rear of the TF/TZ 800 subsystem by opening the rear door of the enclosure.

2. From the rear of the enclosure, slide the TF/TZ 800 subsystem forward to the first mechanical stop (Figure 5–2).

3. Squeeze the mechanical ejection lever (Figure 5–3) to open the receiver.

Figure 5–2   First Mechanical Stop

FIRST
MECHANICAL
STOP

SF200

CXO-2461B
SHR_X1106B_89

Figure 5–3   Manually Opening the Receiver

DRIVE COMMUNICATIONS
CABLE

SECOND
MECHANICAL
STOP

SHIPPING
RESTRAINT

FIRST
MECHANICAL
STOP

MECHANICAL
EJECTION LEVER

SHR-0012-90
SHR-X0147C-90-CPG
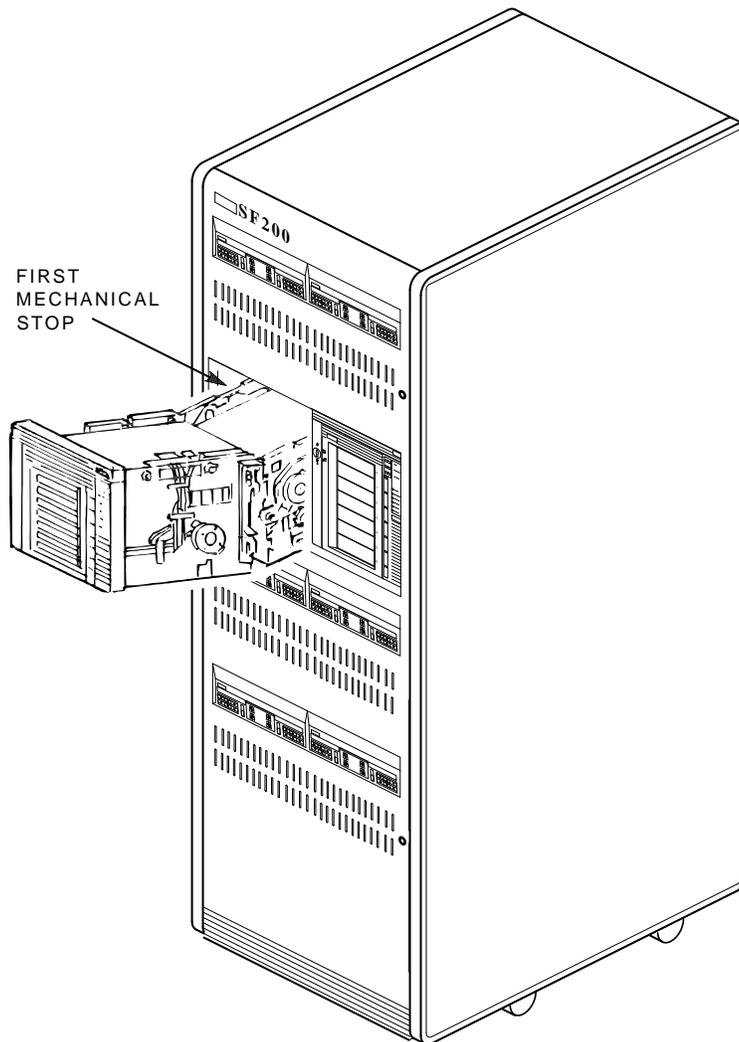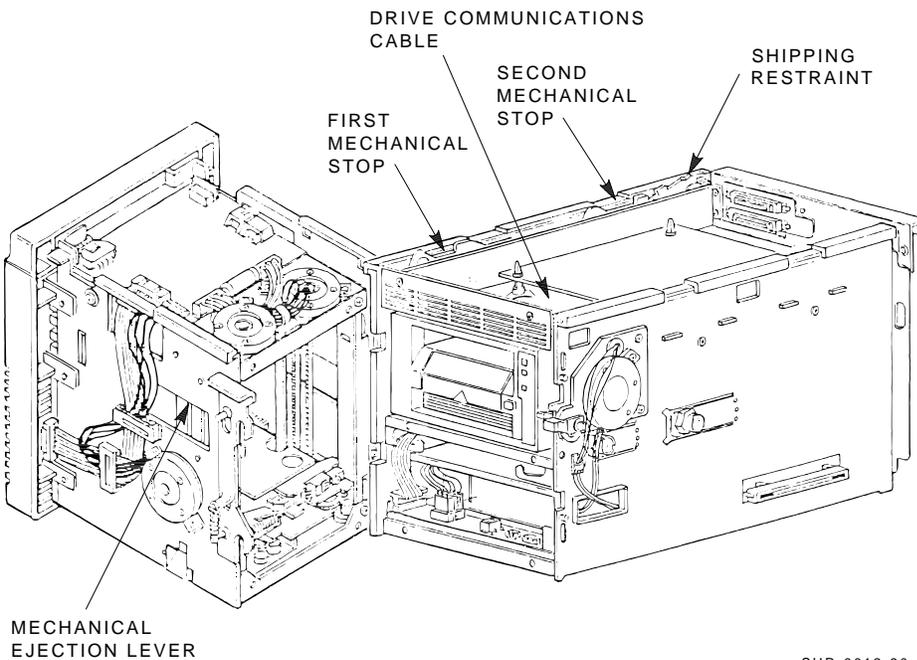
5.4   Removing and Replacing the Controller Module

Each controller module comes from the manufacturer with a unique node
name and system ID number. When you power up a TF/TZ 800 subsystem
with a newly installed controller module, the new parameters transfer to
the host, and are added to the device list seen by the host. (The previous
parameters remain, although no physical device is present.) This list is
updated only during a reboot; therefore, you may see the "ghost name and
ID" of a controller module that you have removed. You can prevent this
with the warm swap procedure. The following section describes removal
of the controller module using the warm swap procedure.

5.4.1 Beginning the Warm Swap Procedure

NOTE
This procedure is for the TF857/TF867 only.

The warm swap procedure lets you remove and replace a controller module while the host system is operating. The procedure also lets you replace the new controller module parameters with the original controller module parameters, preventing multiple device names and images from being listed.

NOTE
You need to refer to the current node name during the warm swap procedure. To list all node names, use the VMS command, SHOW CLUSTER.

```
$ SHOW CLUSTER
```

The node name and unit number may appear as either T7SXJ9$MIA1 or TAPE1$MIA2.

5.4.2 Collecting and Recording Original Controller Module Parameters

Before performing the warm swap procedure, you must collect and record the original controller module parameters. In particular, you must note the following information:

- **Current node name** — The parameter known as NODENAME.

- **Unit number** — The parameter known as UNITNUM.

- **System ID number** — The parameter known as SYSTEMID.

You can obtain these parameters in three ways:

1. Refer to the system site guide in which the parameters may have been recorded during installation.

2. Use the **ANALYZE/SYSTEM** command to obtain information from the system.

3. Use the **SET HOST/DUP** command to read the parameters from EEPROM (if the controller module is accessible).

5.4.2.1 Using the ANALYZE/SYSTEM Command

At the DCL prompt, enter the following VMS command:

```
$ ANALYZE/SYSTEM
```

The system displays the system analyzer prompt. At this prompt, enter
the command:

```
SDA> SHOW DEVICE MI
```

to list the node name, system ID number, and unit number.

The following is an example output screen showing the node name, unit
number, and system ID. The node name is TAPE1. The unit number is
the final digit in the MIA0 portion of the node name. In this case, the
unit number is 0. The system ID is 3C3643CABC35.

```
VAX/VMS System Analyzer

SDA> SHO DEV MI

I/O data structures
-------------------
                          DDB list
                          --------

Address    Controller   ACP       Driver     DPT        DPT size
-------    ----------   ---       ------     ---        --------

804D8230   TAPE1$MIA0   MTAACP    TUDRIVER   8030D330   4070

            --- TAPE1 System Block (SB) 804DB170 ---

System ID            3C3643CABC35   Local software type       TFXX
Max message size               64   Local software vers.      T2.4
Max datagram size              64   Local software incarn. 00010000
Local hardware type          TF85                           00010000
Local hardware vers. 202020202020   SCS poller timeout        001A
                     303041202020   SCS poller enable mask      01

Press RETURN for more.
```

To exit the system analyzer, type the entire word EXIT at the SDA>
prompt. When you have the needed information, proceed with the warm
swap procedure.

5.4.2.2 Using the SET HOST/DUP Command

Use the **SET HOST/DUP** command to read the parameters from
EEPROM as well as access the PARAMS> prompt to set parameters.

NOTE
**Before executing the SET HOST/DUP command, use the following
command to load the FYDRIVER local program:**

```
$ MCR SYSGEN CONN FYA0/NOADAP
```

The following is an example output screen showing information collected
with the **SET HOST/DUP** command. The SHOW /ALL command lists the
current parameters; be sure to use the parameters listed under Current.

```
$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=PARAMS TAPE1

%HSCPAD-I-LOCPROGEXE, Local program executing - type ^\ to exit
            Copyright © 1990  Digital Equipment Corporation

PARAMS> SHOW /ALL

Parameter          Current          Default        Type    Radix
---------       -------------     ------------    --------  -----
UNITNUM                     0                0      Word     Dec
FORCEUNI                    0                1    Boolean    0/1
NODENAME         TAPE1            T7D0J9         String   Ascii
FORCENAM                    0                0    Boolean    0/1
SYSTEMID      3C3643CABC35     3C3643CABC35    Quadword    Hex
```

NOTE
**When using the SHOW /ALL command, be sure to leave a space
after the word SHOW.**

To exit the PARAMS utility, type:

```
PARAMS> EXIT
```

Once you have found the parameters, proceed with the hardware removal
and replacement procedures. If you proceed without these parameters,
the operating system continues to recognize the *old* controller module
parameters as well as the *new* ones until you reboot the system.

5.4.3 Swapping the Controller Module

Removal Procedure TF Models Only

1. Open the rear door of the storage array.

2. Power down the TF/TZ 800 subsystem and unplug the power card.

3. Release the two captive screws holding the controller module tray (Figure 5–4).

4. Slide the tray from the rear chassis.

5. Disconnect the internal DSSI cable from the controller module (Figure 5–5).

6. Disconnect the power cables.

7. Press the locking tabs to release the module.

8. Disconnect the remaining cables and remove the module.

NOTE
The controller module is on a card carrier, which is part of the FRU.

Removal Procedure TZ Models Only

1. Remove the subsystem from the cabinet.

2. Remove the controller module from the plastic locking tabs.

3. Disconnect the internal SCSI cable from the controller module (Figure 5–5).

4. Disconnect the power cables.

5. Press the locking tabs to release the module.

6. Disconnect the remaining cables and remove the module.

Replacement Procedure TF Models Only

1. Set the node ID switches (Figure 5–6) on the replacement module so that they are identical to the node ID switch settings on the faulty module.

2. Set TMSCP to disabled (SW1 = on position (1)).

3. Connect the loader transfer assembly communications cable
   (Figure 5–7) and the drive communications cable before setting the
   controller module into the module tray.

4. Seat the controller module into the tray.

5. Connect the power cable.

6. Connect the internal DSSI cable from the controller module
   (Figure 5–5).

7. Slide the module tray into the rear chassis.

CAUTION
**Be careful not to damage cables or module components when
sliding the tray back into the rear chassis. If the tray does not
slide easily into the rear chassis, check the cables for snags.**

Replacement Procedure TZ Models Only

1. Connect the loader transfer assembly communications cable
   (Figure 5–7) and the drive communications cable before setting the
   controller module into the module tray.

2. Seat the controller on the plastic locking tabs.

3. Connect the power cable.

4. Connect the internal SCSI cable from the controller module
   (Figure 5–5).

NOTE
**The SCSI ID is set by a switch that is mounted on the rear
plate of the loader.**

Verification Procedure

Power up the TF/TZ 800 subsystem.

Proceed to Section 5.4.4 to change the parameters of the module you
installed to those of the one you removed. Follow each step carefully to
ensure a successful swap.

Figure 5–4   Captive Screws Securing the Controller Module Tray
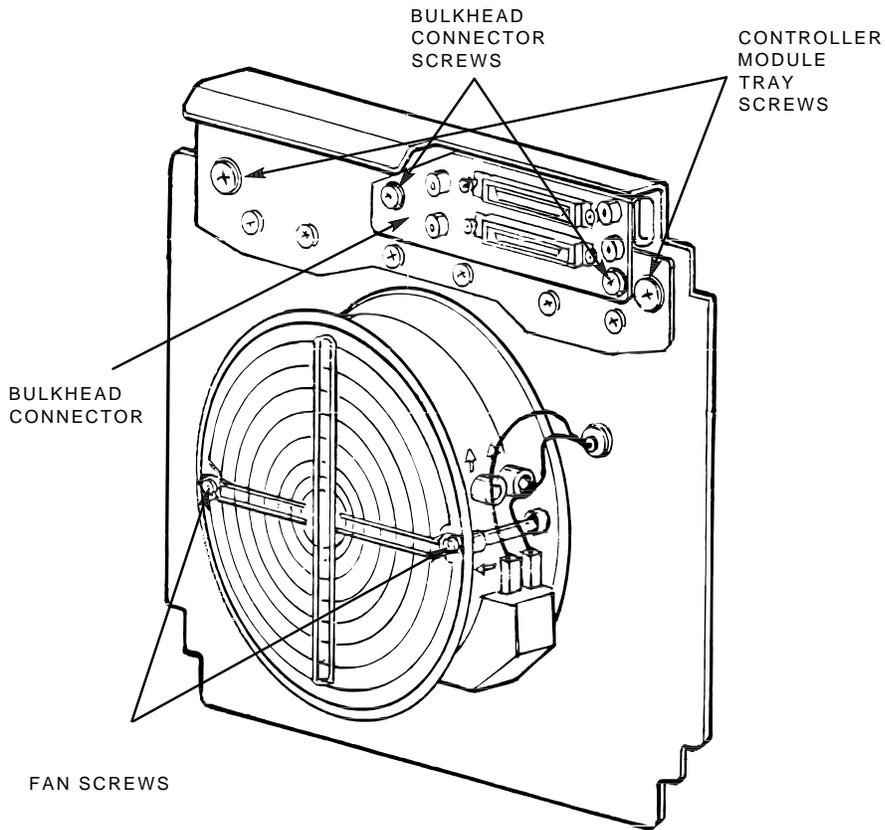
BULKHEAD
CONNECTOR
SCREWS

CONTROLLER
MODULE
TRAY
SCREWS

BULKHEAD
CONNECTOR

FAN SCREWS

SHR-X0145A-92-CPG

Figure 5–5   Rear Chassis with Components and Cables

SHR-X0141C-92-CPG
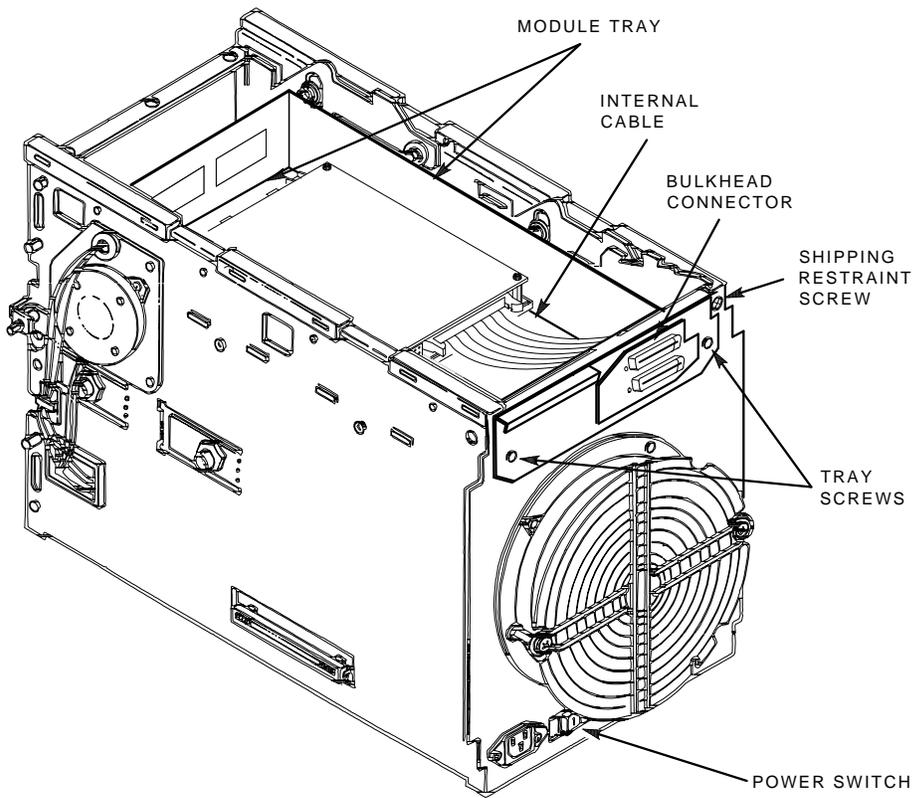
Figure 5–6   Node ID Switches (TF Only)
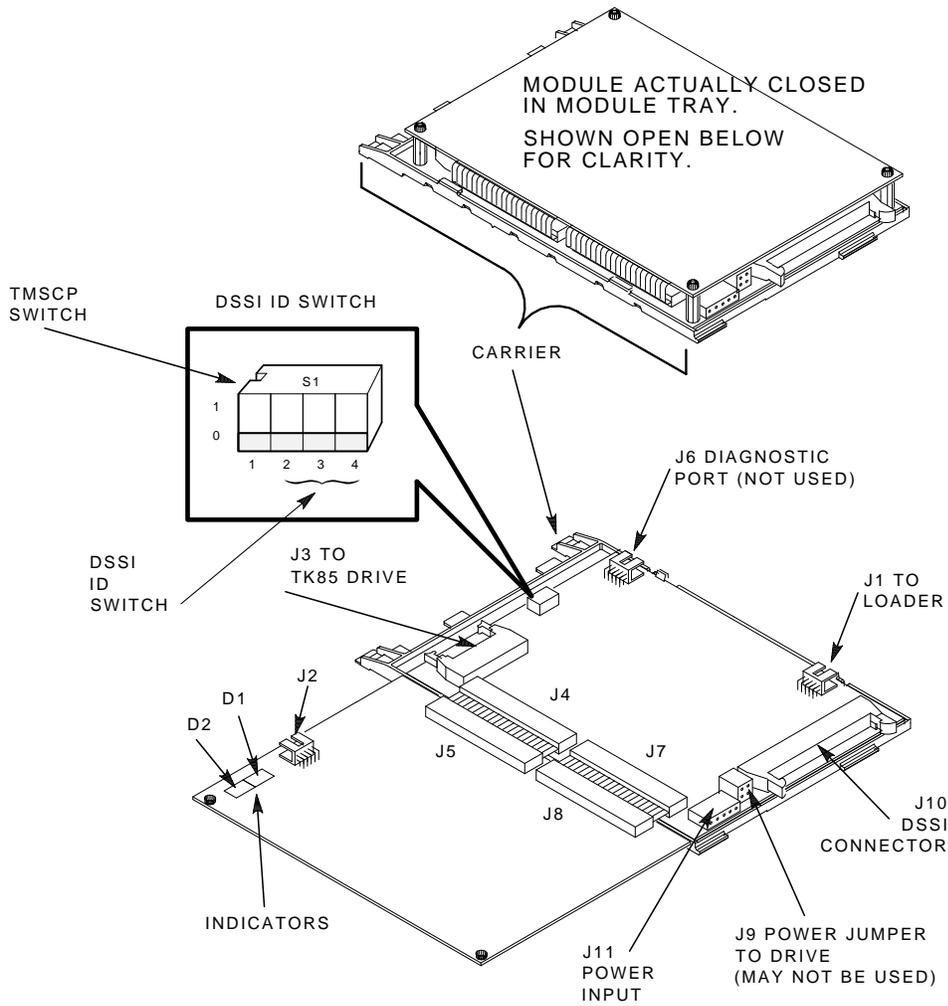
MODULE ACTUALLY CLOSED
IN MODULE TRAY.

SHOWN OPEN BELOW
FOR CLARITY.

TMSCP
SWITCH

DSSI ID SWITCH

S1

1
0

1   2   3   4

CARRIER

DSSI
ID
SWITCH

J3 TO
TK85 DRIVE

J6 DIAGNOSTIC
PORT (NOT USED)

J1 TO
LOADER

J2

D1

D2

J4

J5

J7

J8

J10
DSSI
CONNECTOR

INDICATORS

J11
POWER
INPUT

J9 POWER JUMPER
TO DRIVE
(MAY NOT BE USED)

MKV-X3101-91

Figure 5–7   Left Side View of the TF/TZ 800 Subsystem

HINGE LOCKING LEVER

LOADER
TRANSFER ASSEMBLY
COMMUNICATIONS CABLE

LOADER
TRANSFER ASSEMBLY
POWER CABLE

LEFT
CAPTIVE
SCREWS

GROUND
STRAP

CABLE CLAMPS

KEY LOCK
ASSEMBLY

TRANSFER ASSEMBLY
KEY SWITCH CABLE
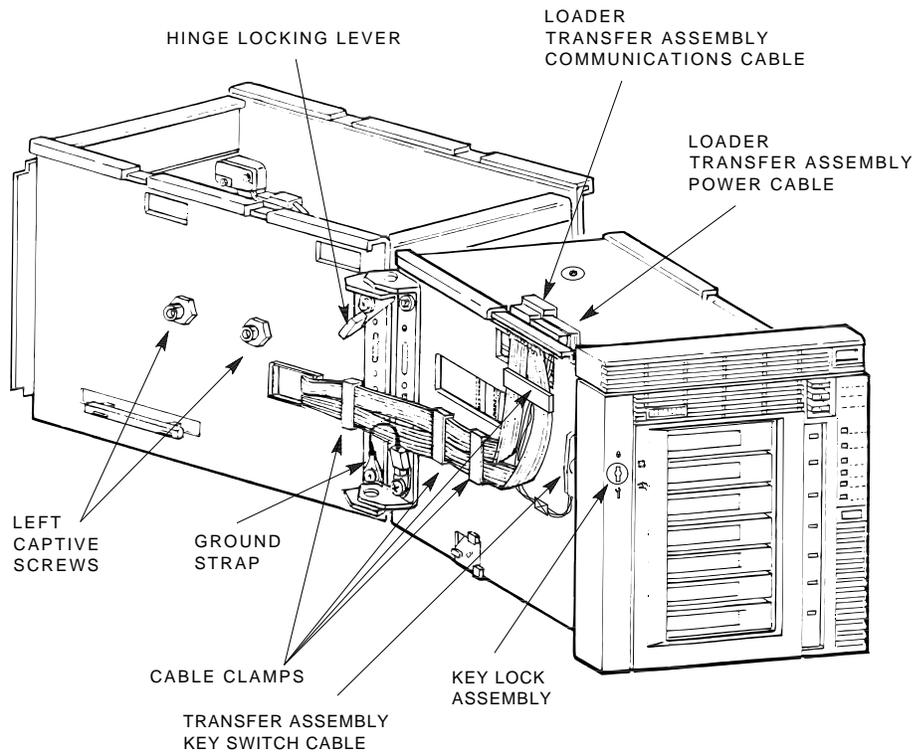
SHR-X0143-90-CPG

5.4.4 Restoring Parameters

NOTE
This section is for the TF857 only.

Follow these steps to restore the parameters collected in Section 5.4.2:

1. Enter the **SHOW CLUSTER** command, which now lists a new
   node name. This command also verifies that the controller module
   is functioning correctly.

2. Enter the **SET HOST/DUP** command to invoke the PARAMS>
   prompt. For example:

   ```
   $ SET HOST/DUP/SERVER=DUP/TASK=PARAMS T7F0J9
   ```

   The new node name of the replacement module in this example is
   T7F0J9.

3. Set the new parameters to those of the original controller module. For
   example:

   - Set the node name.

     ```
     PARAMS> SET NODENAME TAPE01
     ```

   - Set the unit number.

     ```
     PARAMS> SET UNITNUM 0
     ```

   - Set the force unit number.

     ```
     PARAMS> SET FORCEUNI 0
     ```

   - Set the force node name.

     ```
     PARAMS> SET FORCENAM 0
     ```

   - Set the system ID number.

     ```
     PARAMS> SET SYSID 3C3643CABC35
     ```

NOTE
**You must enter the system ID number accurately; otherwise, a
reboot of the system is necessary to recover.**

4. Enter the **SHOW /ALL** command to confirm the resetting of
   parameters:

   ```
   PARAMS> SHOW /ALL
   ```

5. Enter the **WRITE** command to complete the procedure. This step
   saves the new parameters in nonvolatile memory.

   ```
   PARAMS> WRITE
   ```

   The system prompts:

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

   To save changes made using PARAMS, you must answer YES. When
   you answer YES to the controller initialization prompt, your changes
   take effect immediately and program control returns to the DCL
   command prompt.

5.4.5 Completing the Warm Swap Procedure

NOTE
This section is for the TF857 and TF867 only.

To complete the warm swap procedure:

1. Power down the TF857 subsystem.

2. Slide the module tray from the rear chassis to access the controller
   module.

3. Set the TMSCP to enabled (SW1 = off position (0)).

4. Slide the module tray back into the rear chassis and secure it with
   the captive screws.

5. Power up the subsystem.

6. Secure the rear door of the SF200 storage array.

7. Execute the **SHOW DEVICE** command to display the original name
   of the replaced controller module.

NOTE
**The TF857/TF867 subsystem may take several minutes to appear
on-line.**

5.5   Removing and Replacing the Loader Transfer Assembly

Removal Procedure

1. Open the rear door of the SF200, SX100 or SX300 storage array.

2. Power down the TF/TZ 800 subsystem.

3. After opening the receiver, grasp under the top of the front bezel and slide the subsystem to the first mechanical stop.

4. Close the receiver.

5. Open the loader transfer assembly. Flip the hinge/locking lever to the release position. Lift the transfer assembly from the two hinge pins.

6. Place the loader transfer assembly on an antistatic mat.

7. Note the number on the node ID label on the OCP.

8. Remove the OCP from the loader transfer assembly. Place the OCP on an antistatic mat.

9. Package the loader transfer assembly in the box that contained the new loader transfer assembly, and return it to the repair depot.

Replacement Procedure

1. Remove the empty OCP bezel from the new loader transfer assembly.

2. Install the original OCP into the new loader transfer assembly.

3. Place the new loader transfer assembly on the rear chassis hinge pins. The loader transfer assembly must be open.

4. Press the bottom part of the hinge locking lever to clamp the top hinge pin.

5. Reconnect the ground strap.

6. Reconnect the loader transfer assembly communications cables to the electronics module. Secure the cable clamps.

7. Close the loader transfer assembly. Be sure that the latch is closed.

8. Slide the TF/TZ 800 subsystem into the enclosure.

9. Complete and install a new node ID label. The label should contain the same information as the label on the faulty unit.

Figure 5–8   Loader Transfer Assembly Latch Position
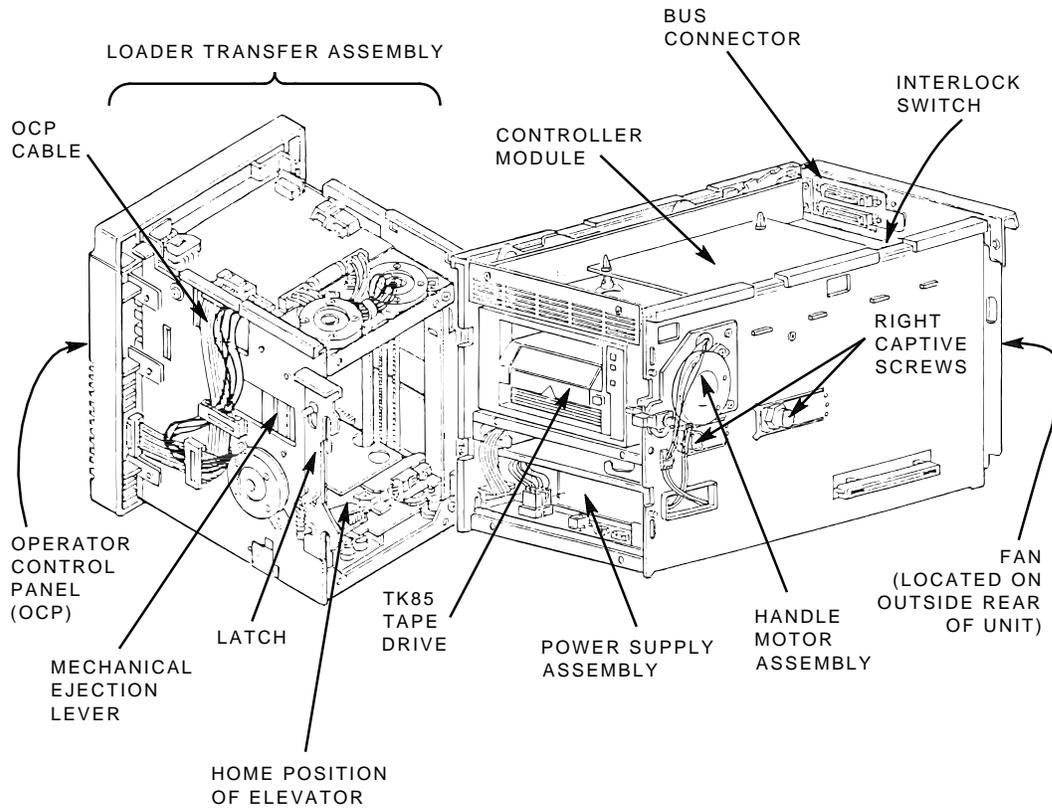
SHR-X0147H-92-CPG
ZKO-1285-01-DG

10. Secure the rear door of the SF200, SX100, or SX300 storage array.

Verification Procedure

1. Power up the TF/TZ 800 subsystem. Be sure that all OCP indicators are on. (If the Power On indicator is not on, slide the subsystem fully into the enclosure to enable the 24 Vdc interlock switch.) The power-on self-test executes successfully in about 15 seconds. Except for the Loader Fault indicator, all indicators are on until the host system initializes the TF/TZ 800 subsystem.

2. Press the Eject button to open the receiver.

3. Insert a field test cartridge into slot 0 at the front of a spare magazine (Figure 5–9). Be sure the cartridge is write-enabled.

4. Insert the magazine into the receiver.

5. Close the receiver. The elevator performs a magazine scan.

   When the receiver is closed after a power-up, a full extended scan is performed. Each cartridge is pulled into the elevator and put back into the slot. This takes longer than the normal scan of 15 seconds.

6. Press the Load/Unload button to verify load operation. Be sure the Load/Unload and Tape In Use indicators are on after the cartridge loads into the drive.

7. Press the Load/Unload button again to unload the cartridge.

8. Be sure the Load/Unload, Eject, and Slot Select indicators are on after the cartridge unloads.

9. Press the Eject button to remove the magazine from the receiver.

10. Close the receiver.

Figure 5–9   Front of the Magazine Showing Cartridge Slot Numbers
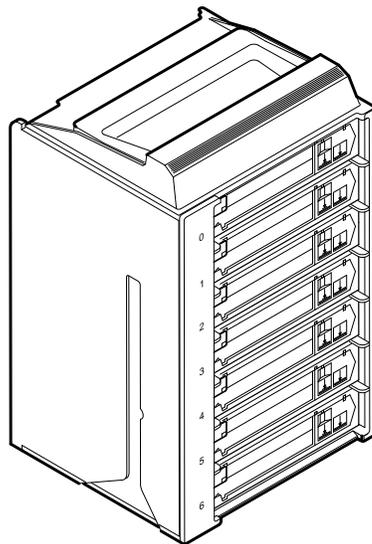
SHR_X1023A_89

5.6 Removing and Replacing the TK85/TZ86 Tape Drive

Removal Procedure

1. Power down the TF/TZ 800 subsystem.

2. After opening the receiver, grasp the top of the front bezel and slide the subsystem to the first mechanical stop.

3. Close the receiver.

4. Open the rear door of the SF200 storage array.

5. Release the two captive screws that secure the controller module tray (Figure 5–4).

6. Release and slowly pull the tray approximately three-fourths from the rear chassis. Proceed carefully as the tray can be removed fully from the rear chassis.

    The TZ does not have the tray.

7. Disconnect the internal DSSI or SCSI cable (Figure 5–5) from the controller module.

8. Loosen the screws that secure the bulkhead connector (Figure 5–4).

9. Remove the cable assembly from the rear of the tray.

10. Press the first mechanical stop to access the second mechanical stop (Figure 5–10).

11. Lift the latch to open the loader transfer assembly.

12. Loosen the four captive screws that secure the drive at the right (Figure 5–8) and left (Figure 5–7) sides of the rear chassis. Each screw is recessed inside a nut. Do not try to loosen these nuts.

13. Slide the plastic tab on the handle motor assembly about one inch to the right (Figure 5–11). (You may have to move the drive slightly to release the plastic tab.)

14. Rotate the plastic tab toward the handle motor assembly.

15. Pull the drive toward you almost fully out of the rear chassis.

16. Disconnect the power cable and the drive communications cable (Figure 5–3) from the rear of the drive.

Figure 5–10   Second Mechanical Stop

SECOND
MECHANICAL
STOP

CXO-2461B
SHR_X1106C_89
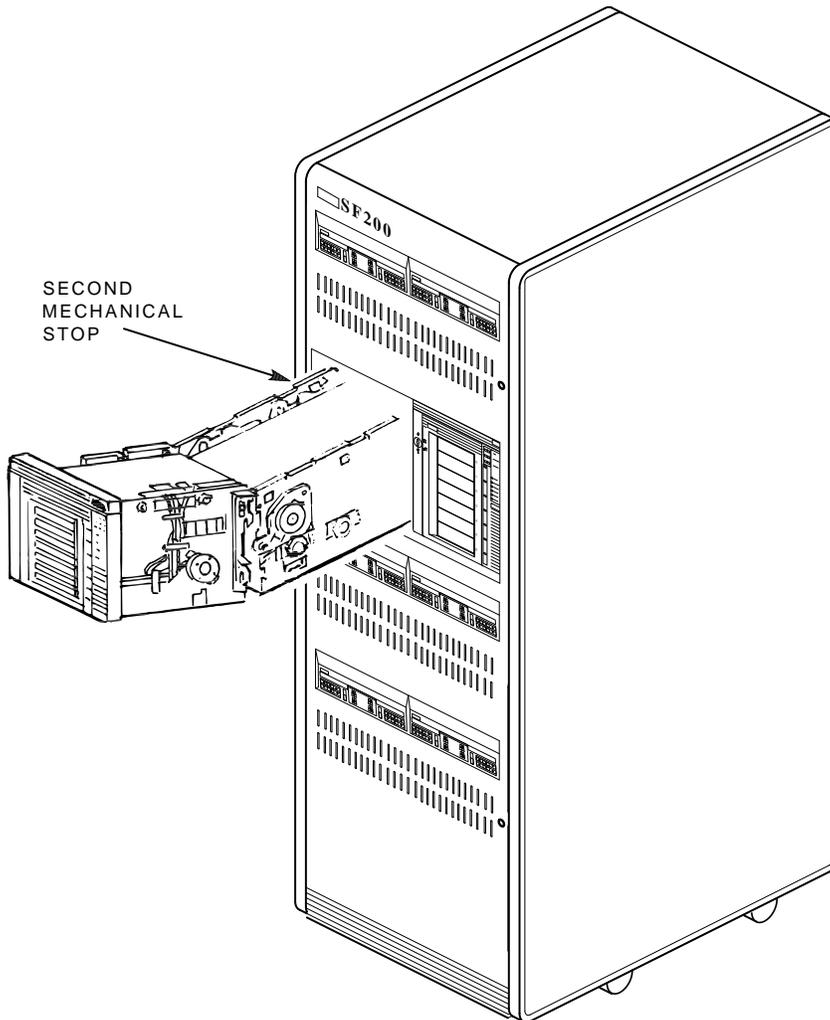
Figure 5–11   TF/TZ 800 Subsystem Cables and Components

PLASTIC
TAB

HANDLE
MOTOR
ASSEMBLY

CUTOUT

INTERMEDIATE
BEZEL

2-PIN INTERLOCK
SWITCH CABLE

4-PIN HANDLE
MOTOR ASSEMBLY
CABLE

CABLE
CLAMP

3-PIN OPEN HANDLE
SENSOR CABLE

SHR-X0147D-90-CPG
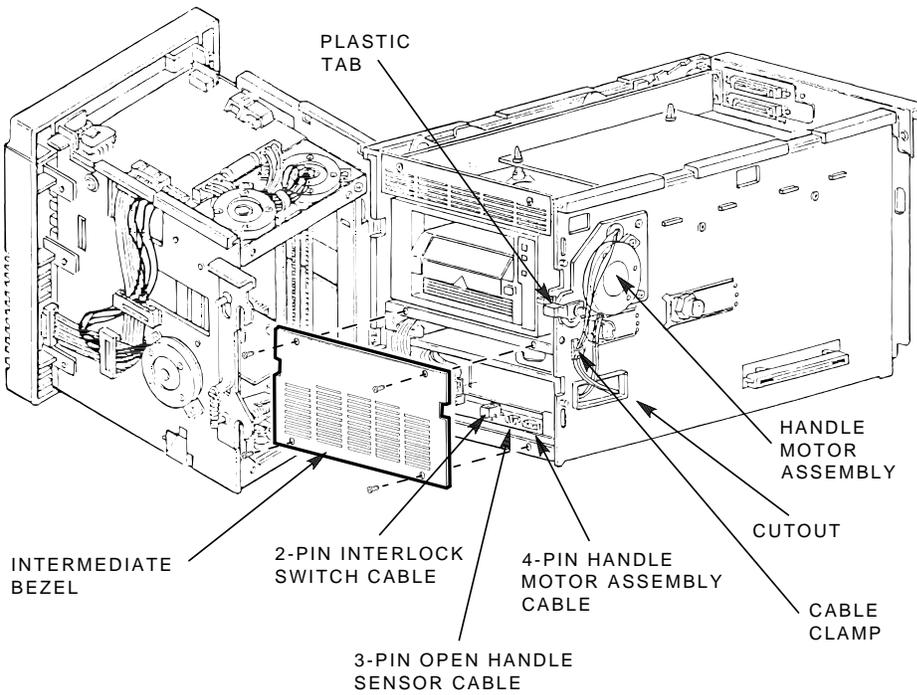
Replacement Procedure

1. Slide the replacement drive halfway into the rear chassis.

2. Connect the power cable and drive communications cables to the rear
    of the drive.

3. Slide the drive into the rear chassis.

4. Align the drive handle shaft with the handle motor coupling shaft
    (Figure 5–12). Carefully position cables when sliding the drive into
    the chassis to ensure no damage occurs from snagging.

Figure 5–12   Handle Motor Assembly and Coupling Shaft
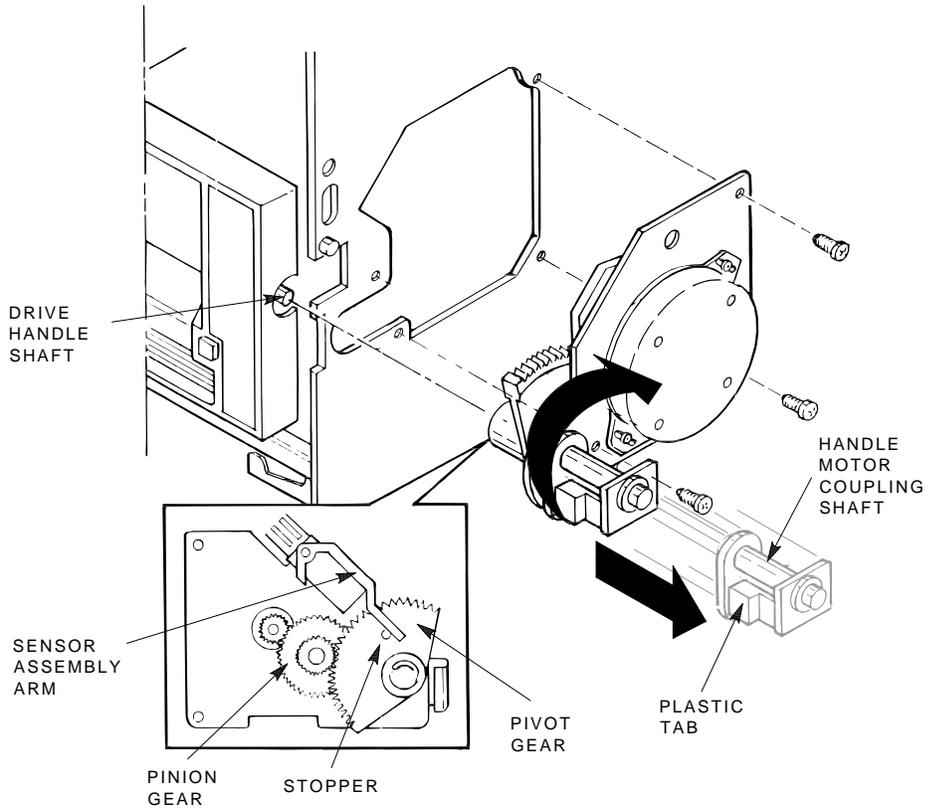
DRIVE
HANDLE
SHAFT

HANDLE
MOTOR
COUPLING
SHAFT

SENSOR
ASSEMBLY
ARM

PIVOT
GEAR

PLASTIC
TAB

PINION
GEAR

STOPPER

SHR-0067-89
SHR-X0146A-90-CPG

5.   Engage the drive shaft with the handle motor coupling shaft.

6.   Push the handle motor coupling shaft toward the drive; it partially slips onto the handle shaft. Place the rotated plastic tab into a horizontal position. Position the pivot gear of the handle coupling shaft so that the top flat edge is perpendicular to the floor of the unit.

7.   Locate the plastic tab on the drive. This tab and the small metal tab (write-protect switch) are inside the cartridge opening next to the Tape In Use indicator on the bezel. This assembly locks the drive handle and must be pushed to the right to lift the handle.

NOTE
Failure to release the plastic tab before lifting the handle could cause damage; do not force the handle against the locking mechanism.

8.   With the handle in the open position, apply pressure to the handle coupling shaft and slowly rotate the drive handle downward. You may have to move the drive slightly to seat the shaft firmly.

9.   Engage the mounting screws of the chassis to the drive. Tighten the screws in the following order; left front, left rear, right front, and the right rear last.

NOTE
If you have difficulty seating the handle motor coupling shaft, repeat the above steps.

10.   Slide the TF/TZ 800 subsystem into the enclosure.

NOTE
Carefully guide the cables while sliding the tray in or out. Because the cables are loose, they could interfere with the handle down optic sensor.

11.   Tighten the two captive screws that secure the controller module tray (Figure 5–4).

12.   Redress the external DSSI or SCSI communications cables into the rear chassis' cable restraints.

13.   Redress the power cable into the cable restraints.

14.   Verify a secure power connection at both ends of the power cable.

Verification Procedure

1. Power up the TF/TZ 800 subsystem. If the Power On indicator does not light, slide the subsystem farther into the enclosure to engage the interlock switch.

2. Press the Eject button to open the receiver.

3. Install a field test cartridge tape in slot 0 at the front of a spare magazine. Be sure that the cartridge's write-protect tab is next to the slot number on the front of the magazine.

4. Install the spare magazine into the receiver.

5. Execute LDRTST.

6. Secure the rear door of the SF100, SF200, or SF300 storage array.

5.7 Removing and Replacing the TK/TZ Takeup Leader

Removal Procedure

1. Remove the TK/TZ drive from the enclosure. See Section 5.6.

CAUTION

Contamination from hands could cause increased error rates. Put on cloth gloves to prevent oils and grease from contaminating the tape path.

2. At the rear of the drive, loosen the two screws that secure the metal module clip, and remove the clip that holds the controller in place from the top of the drive dust cover.

NOTE

In the TF/TZ 800 subsystem, the controller is not mounted on the drive. The metal module clip may or may not be present.
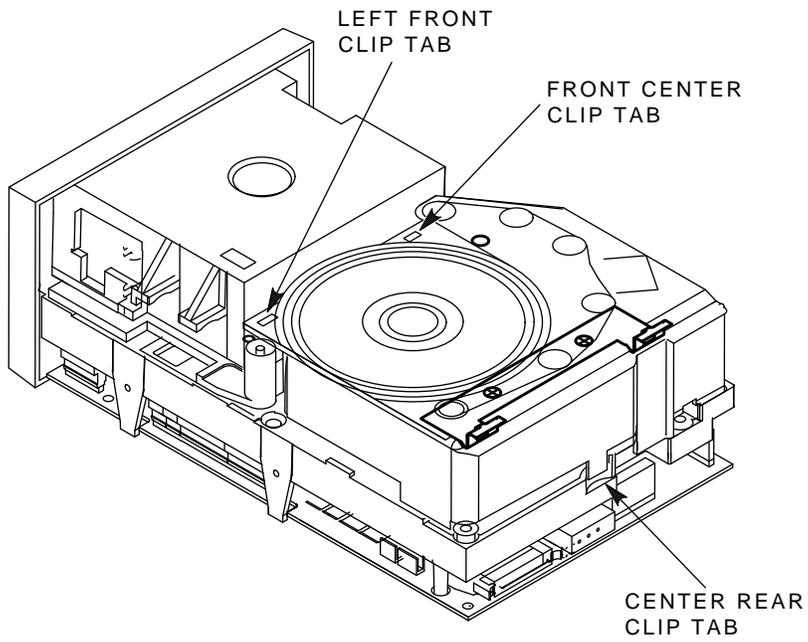
3. Remove the dust cover (Figure 5–13) first by pulling on the tab of the center rear clip and undoing the clip. Undo the left front clip and the front center clip. You can use a finger or screwdriver to undo the clips. Each clip is next to a small slot that fits a screwdriver.

4. If the drive leader is connected to the hook, push on the hook's back end (Figure 5–14). Pull out the leader.

5. Use needlenose pliers to unhook the leader from the retaining hook in the center hub of the takeup reel (Figure 5–14).

Replacement Procedure

1. Slide the leader end into the takeup reel slot (make sure the leader's orientation is correct), grab the leader end with the needlenose pliers, and push the leader hole around the retaining hook in the reel.

2. Form the drive leader around the top of the tape path and push the leader down into the rollers, between the rollers and plastic shield. You cannot push the leader through the tape path. Make sure the leader is not over the top flanges of the rollers.

3. Push the drive leader out so it is in front of the hook that slips into the rectangular hole of the leader end.

4. Make sure the new leader is installed correctly (Figure 5–14).

5. Replace the dust cover and metal module clip.

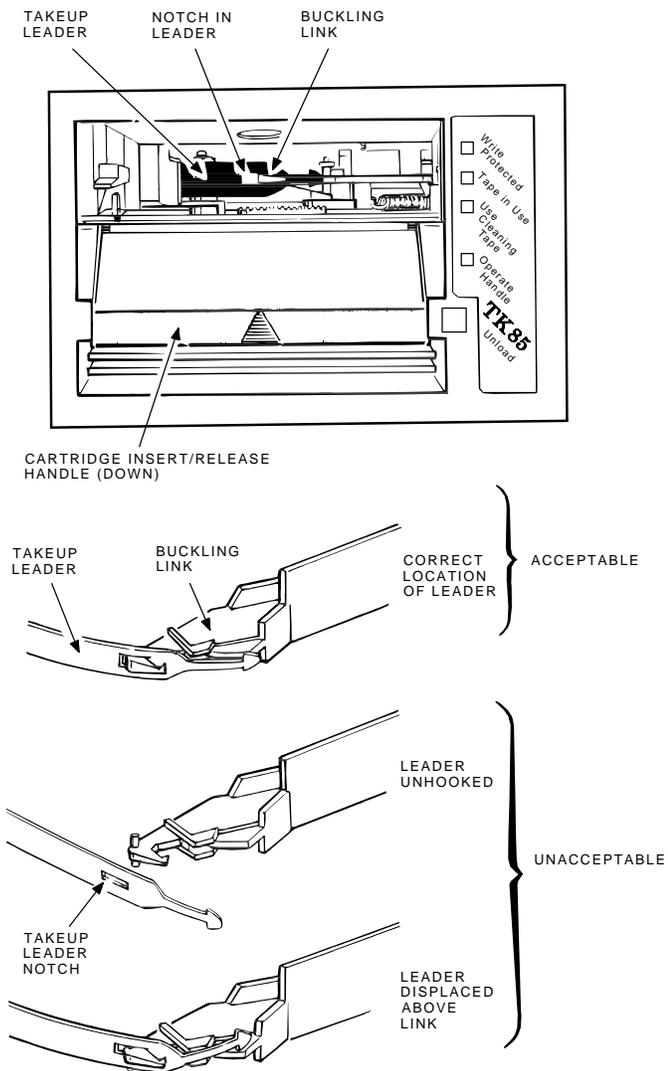6. Replace the TK85 drive into the enclosure. See Section 5.6.

Figure 5–13   Dust Cover

LEFT FRONT
CLIP TAB

FRONT CENTER
CLIP TAB

CENTER REAR
CLIP TAB

MKV-X3102-91

Figure 5–14   TK85 Tape Path (Takeup Leader Replaced)

TAKEUP
LEADER

NOTCH IN
LEADER

BUCKLING
LINK

Write
Protected

Tape in Use

Use
Cleaning
Tape

Operate
Handle

TK85

Unload

CARTRIDGE INSERT/RELEASE
HANDLE (DOWN)

TAKEUP
LEADER

BUCKLING
LINK

CORRECT
LOCATION
OF LEADER

ACCEPTABLE

LEADER
UNHOOKED

UNACCEPTABLE

TAKEUP
LEADER
NOTCH

LEADER
DISPLACED
ABOVE
LINK

SHR-0249-87
SHR_X1028A_89_CPG

5.8 Removing and Replacing the Operator Control Panel

Removal Procedure

1. Open the rear door of the SF200 storage array.

2. Power down the TF/TZ 800 subsystem.

3. Close the rear door of the SF200 storage array.

4. After opening the receiver, grasp the top front bezel and slide the subsystem to its first mechanical stop.

5. Remove the three screws (Figure 5–15) that secure the operator control panel assembly to the loader transfer assembly.

6. Disconnect the cable from the OCP (Figure 5–7).

7. Remove the operator control panel.

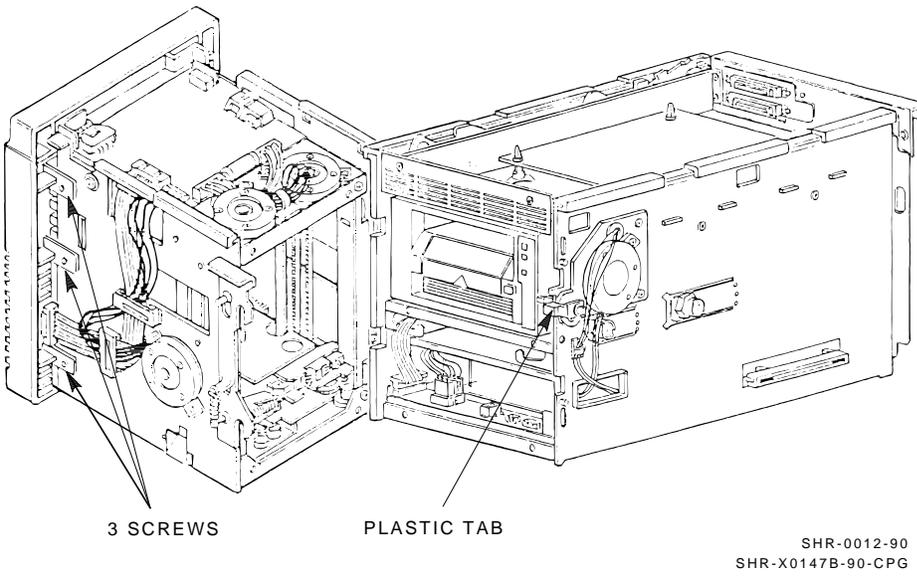**Replacement Procedure**

Reverse the preceding steps.

Verification Procedure

Execute the power-on self-test (POST).

All OCP indicators, except for the Loader Fault indicator, are on until the host system initializes the subsystem.

Figure 5–15   Removing the Operator Control Panel

3 SCREWS   PLASTIC TAB

SHR-0012-90
SHR-X0147B-90-CPG

5.9   Removing and Replacing the Fan

Removal Procedure

1. Open the rear door of the SF200 storage array.

2. Power down the TF/TZ 800 subsystem.

3. At the TF/TZ 800 rear chassis, remove the two screws (Figure 5–4) that secure the fan. Remove and set aside the fan's grill.

NOTE

For reinstallation, note the airflow toward the rear and the orientation of the fan's power wires before disconnecting the wires.

4. Remove the fan.

Replacement Procedure

Reverse the preceding steps.

To ensure correct airflow, be sure to reconnect the fan's power wires in their original orientation.

Verification Procedure

1. Power up the TF/TZ 800 subsystem.

2. Observe counterclockwise rotation of the fan.

5.10   Removing and Replacing the Interlock Switch (Older Models Only)

Removal Procedure

NOTE
Not all susbsystems have an interlock switch.

1. Open the rear door of the SF200 storage array and power down the TF/TZ 800 subsystem.

2. Release the two captive screws that secure the controller module tray (Figure 5–4).

3. Pull the tray several inches from the rear chassis.

4. Disconnect the internal DSSI or communications cable from the controller module (Figure 5–5).

5. Remove the screws that secure the bulkhead connector (Figure 5–4).

6. Remove the internal communications cable through the rear of the module tray.

7. Slide the tray back into the rear chassis. Secure the two captive screws. Be careful not to damage cabling or module components when performing this step. Check the cable management scheme.

8. From the rear of the enclosure, slide the TF/TZ 800 subsystem forward to the first mechanical stop.

9. From the front, press the first mechanical stop to access the second mechanical stop.

10. Slide the TF/TZ 800 subsystem slightly beyond the second mechanical stop.

11. After opening the receiver, grasp the subsystem's front bezel and rear chassis. Carefully slide the subsystem fully out of the enclosure.

12. Place the subsystem on an antistatic mat.

13. Release the two captive screws that secure the controller module tray.

14. Slide the tray fully out of the rear chassis.

15. Note the color scheme of the two interlock switch cable connections. Remove the cables.

16. Remove the two screws that secure the interlock switch (Figure 5–16). (The hardware is not captive; prepare to catch both the switch and mounting hardware.)
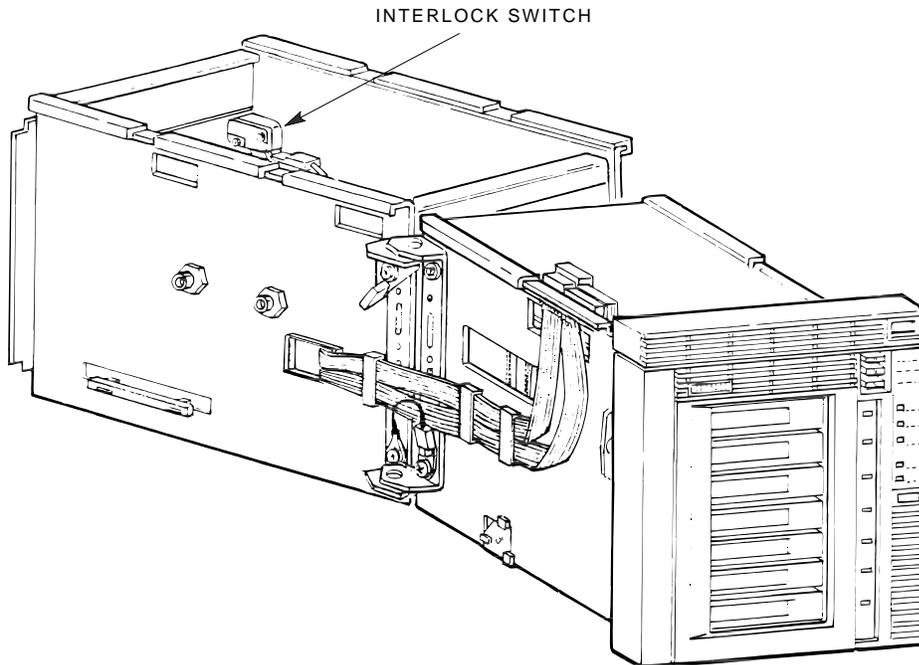
17. Remove the interlock switch.

Replacement Procedure

Reverse the preceding steps.

NOTE
When sliding the tray back into the enclosure, pull the power cable taut to avoid snagging it behind the rail that supports the tray.

Figure 5–16   Interlock Switch

SHR-0009-90
SHR-X0143A-90-CPG

5.11 Removing and Replacing the Power Supply Assembly

Removal Procedure

1. Open the rear door of the SF200 storage array.

2. Power down the TF/TZ 800 subsystem.

3. From the rear of the enclosure, push the TF/TZ 800 subsystem to the first mechanical stop.

4. From the side, lift the latch to open the loader transfer assembly.

5. Remove the intermediate bezel by loosening the captive screws that secure it (Figure 5–11).

6. Disconnect the cable connections at the front of the power supply assembly (Figure 5–17).

7. Thread the cables into the cutouts.

8. Grasp the top cover of the power supply assembly to lift it. You can push up on the power supply assembly through the small opening in the bottom of the rear chassis, then pull the assembly forward.

9. Remove the assembly.

Replacement Procedure

Reverse the preceding steps.

Verification Procedure

1. Power up the TF/TZ 800 subsystem. If the Power On indicator fails to light, slide the subsystem farther into the enclosure to activate the interlock switch.

2. Press the Load/Unload button to return the cartridge to the magazine if a cartridge is in the drive.

Figure 5–17   Removing the Power Supply Assembly from the Rear Chassis

POWER SUPPLY
ASSEMBLY
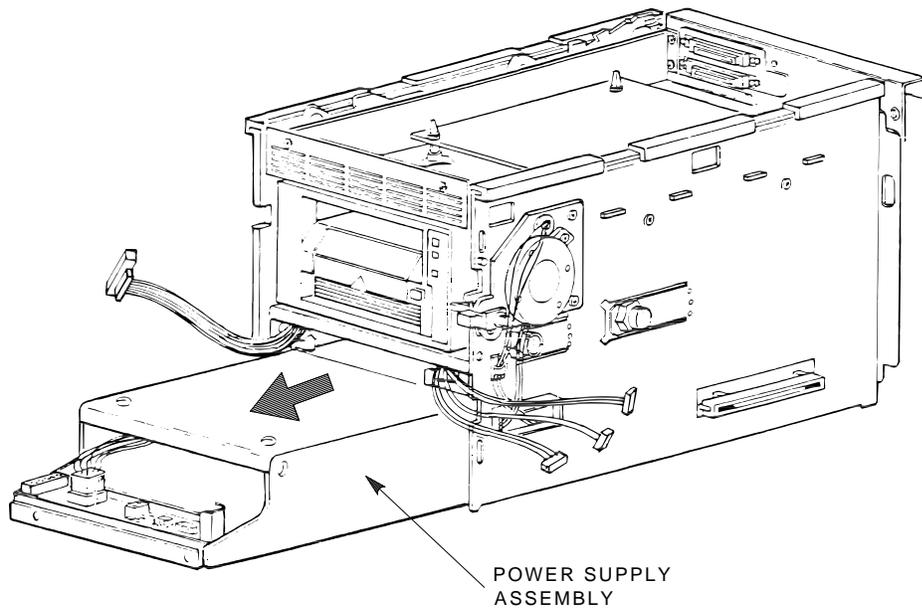
SHR-0013-90
SHR-X0142-90-CPG

5.12 Removing and Replacing the Handle Motor Assembly

Removal Procedure

1. Open the rear door of the SF200 storage array and power down the TF/TZ 800 subsystem.

NOTE

If the OCP Tape in Use indicator is on, a cartridge is in the drive. Set the Mode Select key to the Manual position. Press the Load/Unload button to return the cartridge to the magazine or, if this fails to work, manually unload the cartridge after opening the loader transfer assembly.

2. From the rear of the enclosure, push the TF/TZ 800 subsystem to the first mechanical stop.

3. From the side, lift the latch to open the loader transfer assembly.

4. Release the two captive screws that secure the controller module tray (Figure 5–4). Slide the tray several inches from the TF/TZ 800 subsystem's rear chassis.

5. Press the first mechanical stop to access the second mechanical stop.

6. Remove the intermediate bezel (Figure 5–11).

7. Remove the two right-hand connector plugs from the power distribution panel. (The left is a 3-pin connector attached to the handle down sensor assembly; the right is a 4-pin connector attached to the handle motor assembly.) Thread these connectors through the side metal cutout (Figure 5–11).

8. Release the cable clamp (Figure 5–11).

9. Slide the plastic tab (Figure 5–11) on the handle motor coupling shaft to the right; rotate the tab upward.

10. Loosen the three captive screws (Figure 5–12) located at the outer corners of the handle motor assembly.

11. Grasp the handle motor assembly, and slide it slightly upward and to the right to remove it from the subsystem.

NOTE

You do not have to remove the motor screws or disconnect the shaft coupling mechanism.

Replacement Procedure

Before replacing the handle motor assembly, be sure that the sensor assembly arm rests on the plastic stopper located on the pivot gear (Figure 5–12). You may have to move the gears slightly in order to seat the sensor assembly arm correctly.

1. Align the three corner screws over the mounting holes; insert the handle motor assembly back into the side of the rear chassis.

2. Place the handle motor coupling shaft back into its opening. Be sure to fully seat it to ensure that the subsystem closes properly.

3. Carefully place the connector wires inside the cable clamp; thread the connectors through the metal cutout.

4. Align and connect the connector plugs to the power distribution panel.

5. Replace the intermediate bezel, and fasten the captive screws.

6. Close the magazine tape subsystem.

5.13 Removing and Replacing the Mode Select Keylock

Removal Procedure

1. Open the rear door of the SF200 storage array and power down the TF/TZ 800 subsystem.

2. From the rear, push the TF/TZ 800 to the first mechanical stop.

3. Open the cable clamp on the left side (Figure 5–7) of the loader transfer assembly to release the cable wires.

4. Loosen the captive screw of the top protective panel and remove the panel (Figure 5–18).

5. Detach the 3-pin plug by sliding it from the 3-pin connector.

NOTE
To avoid breaking connections, detach the plug from the top rather than pulling the wires from the bottom of the connector.

6. Set the Mode Select key to the OCP Disabled position and remove the key from the key lock switch.

7. Loosen the two mounting screws (Figure 5–18) of the key lock switch bracket.

NOTE
The key lock switch bracket does not include captive screws and washers; prepare to catch them after they are loosened.

8. Slide the key lock switch bracket out of position.

Replacement Procedure

1. With the subsystem still at the first mechanical stop, align the new key lock switch bracket over the mounting holes.

2. Place the Mode Select key back in the key lock switch to hold the lock in the Service mode position.

3. Fasten screws and washers (Figure 5–18) of the bracket.

4. Connect the 3-pin plug (Figure 5–18) into the controller module.

5. Place the connector wires in the cable clamp and close the clamp.

6. Replace the top protective cover by aligning and tightening the captive screw to the standoff nut (Figure 5–18).

7. Slide the subsystem back into the enclosure.

Figure 5–18   Key Lock Assembly

3-Pin
Cable

3-Pin
Connector

Screw

Protective
Panel

Key Lock
Switch
Mounting
Screws

Mode
Select
Key

MKV-X3100-91

6
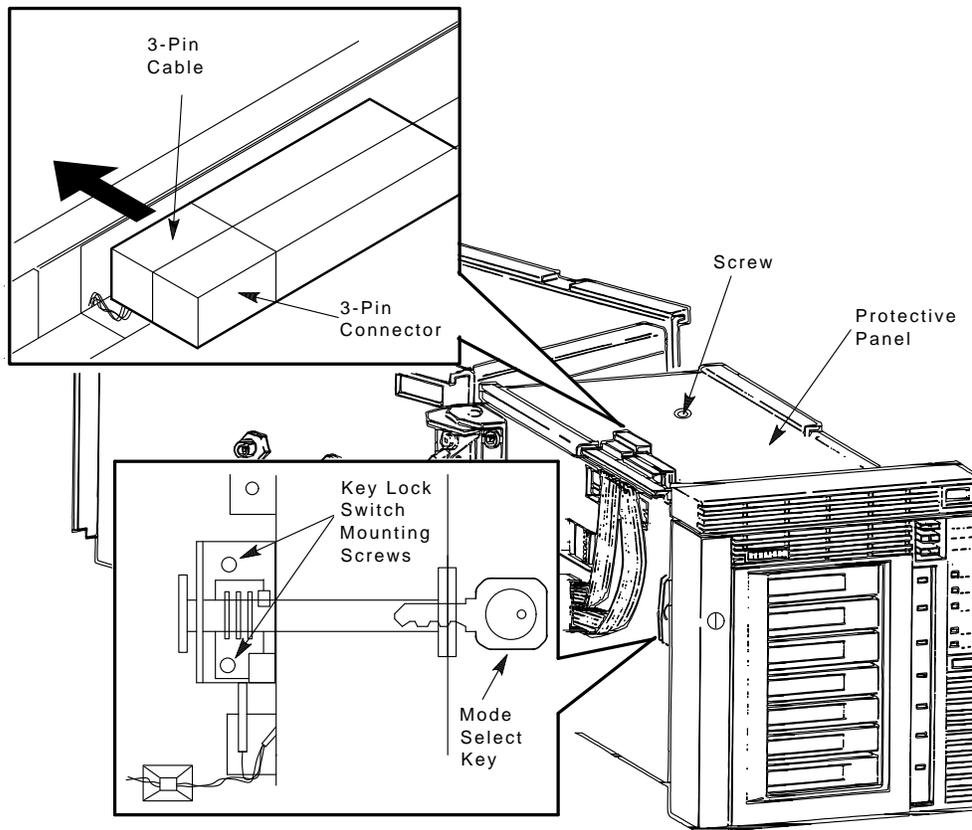
TF85/TF86 Diagnostic Utilities and Tests

This chapter contains an overview of the POST procedure, and host-level diagnostic tests.

6.1 TF85/TF86 POST Procedure

The controller POST procedure runs whenever the controller module is reset. It is reset either through a power cycle or a software reset command received from the host through DSSI or from the terminal server.

The controller LEDs indicate a reset situation by performing a sequence of patterns. All the LEDs flash on and off five times, followed by a scan of a single LED through the field.

6.1.1 Burn-in Loopback Mode

The POST diagnostic tests signal to start the controller operating system. However, a loopback feature is available. At the start of testing, the state of the burn-in pin is saved. At the end of testing, before the executive is notified, the diagnostics test the saved state, and if burn-in is true, POST loops. This process continues until the burn-in jumper is removed.

NOTE
Detailed test information is printed if the TMSCP enable switch is on at the start of testing and the burn-in connector is present. If the switch is not set, only the main test categories are displayed.

6.1.2 POST Terminal Server

The diagnostic terminal server that is attached to the controller prints pertinent information concerning the run of the tests. During normal operation, the test currently running is the last test printed.

Any failures detected may be due to the last test running except for one instance; when an unexpected interrupt is generated, the error lists the cause of the interrupt, and the header displays that it was unexpected.

The POST terminal server supports the following commands:

1. **Control/C: C**lears the POST pass count.

2. **Control/H: H**alts POST and resets the controller to start again. Use this command only after an error is detected, without disconnecting or cycling the power supply.

3. **Control/P: P**rints the POST pass count.

6.1.3 Lastfail Information

In some cases, there is additional information about the failure. This information is displayed on the terminal, and may be useful for diagnosing the failure. There is additional failure information for:

1. RAM March II pattern test on all three RAM buffers (microprocessor, TPRC, and FECC).
   The expected and actual data patterns, as well as the physical hardware address of the miscompare is displayed.

2. ROM EDC test.
   The expected and calculated EDC are displayed.

3. Register initialization.
   The expected and actual values, as well as the physical hardware address of the register is displayed.

6.1.4 Break Operation

During POST, the [Break] key causes the POST kernel to list information about the last error detected. This includes any last fail information.

CAUTION
Using the [break] key during the local RAM testing may cause a miscompare error. It is recommended that you do not use the [break] key while POST is running.

6.2 Functional Microdiagnostic Tests

The functional microdiagnostic tests provide a comprehensive test of the subsystem's functionality without depending on the host. This set of tests is composed of a series of hierarchically-structured diagnostic subtests, or local programs.

You have the option (under host control) to:

- Sequence through all the subtests automatically

- Allow the execution of an individual subtest and specify the number of test runs.

These programs test the controller (with the exception of the DSSI interface), the drive, and the optional media loader.

6.2.1 Microdiagnostic Test Functions

The functional microdiagnostics perform extensive read, write, and reposition testing of the drive, as well as verify the subsystem's data and functional reliability. Included in the functional microdiagnostics are utilities that let you:

- Change drive parameters

- Update the controller and drive hardware revision levels

- Determine what diagnostics are available

- Check the history of the drives, performance

You can invoke these diagnostics by using a host DUP program. When using DUP, the local programs compile the statistics and the host displays the statistical and error information.

6.2.2 Product Users and Uses

These functional microdiagnostics can be used by:

- Engineering personnel for the debug, DVT, RGT, RQT development stages

- Manufacturing personnel for module, subsystem, and system verification

- Customer Services personnel for:

  — Subsystem installation verification

  — Fault detection, isolation, and repair at the customer site

- — Customer Services depot repair verification
- Customers for:
  - — Self-installation verification
  - — Digital customers who are licensed to provide their own maintenance

6.3   Microdiagnostic Test Descriptions

The TF85/TF86 controller microdiagnostic package consists of the tests and utilities described in the following sections.

NOTE
This is subject to change depending on test coverage needs.

6.3.1   FTST02 - Simple Write/Read Test

This test performs a simple read and write test. It starts by first writing three files to tape with a rotating data pattern. The first file consists of 100 records of 4K bytes; the second file has 50 records of 8K bytes; and the third file has 150 records of 2K bytes. The tape then rewinds. Each file is read back and a data compare operation is performed.

6.3.2   FTST03 - Positioning Test

This test checks the repeatability of the drive's repositioning ability. It writes 10 files to tape of random record and byte counts. You determine the starting data pattern at the time you invoke the test. The tape is then repositioned throughout the area that has been written using SKIP TAPE MARK, SKIP RECORD, and SPACE OBJECT commands, both in forward and reverse directions. After each reposition, a record is read and a software data compare is performed.

This test also writes a special diagnostic field at the beginning of tape enabling other diagnostic tests to recognize it. By reading the diagnostic field, other tests can recreate the data that is written to the tape and perform read operations with data compare.

6.3.3   FTST04 - Short Read Test

Use this test when you must run the drive in a read only manner for a short period of time. This test uses maximum byte counts for the read commands so that any unknown tape can be read. This test ends if a fatal error occurs, EOT is encountered, LEOT is encountered, or the 3-minute time limit runs out.

6.3.4 FTST05 - Streaming Write Test

This test verifies the drive's ability to write data in a streaming manner. Unless otherwise specified, a random number of records of random byte counts is written to tape. The default amount of data used in this test is set to assure a track turn around and a head step operation.

You can specify the data pattern; if no data pattern is specified, the data pattern defaults to a rotating pattern. This test also writes a diagnostic field on the tape so that other tests can recreate the data that is written to the tape, and performs read operations with data compare.

6.3.5 FTST06 - Streaming Read Test

Use this test to verify the accuracy of the drive while reading data in a streaming manner. This test uses the seeds left from a previous write or positioning test to create the data used for software data compares.

Software data compare operations are performed on pseudo randomly-chosen records of data. You can also use this test to read an unknown tape. If the first records on tape do not contain the diagnostic field, the byte and record counts used with the read command are the maximum allowed.

If a diagnostic field read using this test is written by FTST03, this test performs exactly as an FTST03 test with the exception of the write function.

6.3.6 FTST07 - Thrashing Write Test

This test verifies the drive's ability to write data in a start/stop manner. To start/stop the tape, you must issue some TMSCP write commands without using the Immediate Completion Modifier.

Other TMSCP write commands are issued with the Immediate Completion Modifier so that the test execution time does not become too lengthy. Unless you specify otherwise, a random number of records of varying byte counts is written to tape. The default amount of data is set to assure a track turn around and a head step operation.

You can also specify the data pattern used in this test. If you do not specify a data pattern, the data pattern defaults to a rotating pattern. This test also writes a diagnostic field on the tape so that other tests can recreate the data that is written to the tape and perform read operations with data compare.

6.3.7 FTST08 - Thrashing Read Test

This test verifies the drive's ability to read data in a start/stop manner.
To start/stop the tape, you must use the TMSCP Suppressed Caching
Modifier on some of the TMSCP read commands.

Other TMSCP read commands are performed without the Suppressed
Caching Modifier so that the test execution time does not become too long.
This test uses the seeds left from a previous write or positioning test to
create the data used for software data compares. Software data compare
operations are performed on pseudo randomly-chosen records of data.

You can also use this test to read an unknown tape, but the Suppressed
Caching Modifier is not used in this instance. Because the first records on
tape do not contain the diagnostic field, the byte and record counts used
with the read command are the maximum allowed.

If a diagnostic field read is written by FTST03, this test performs exactly
as an FTST03 with the exception of the write function.

6.3.8 FTST09 - Append Test

This test writes one file of a pseudo random number of record and byte
counts; writes two tape marks; and rewinds the tape. It then reads the
just-written data using software data compares, moves to the next-to-the-
last tape mark, and then writes another file and two more tape marks.
The tape rewinds; the previously-read file is ignored, and the last written
data is read using software data compares. This procedure is repeated
eight times.

6.3.9 FTST10 - Overwrite Test

This test verifies the drive's ability to overwrite previously-recorded data.
Unless you specify otherwise, one file of 100 records of 4K bytes are
written to tape, using a random data pattern. The tape then rewinds and
rewrites using a different data pattern. The tape once again rewinds and
the data is read back using software data compares.

6.3.10 DRVTST - Drive Test

This test is for Customer Services personnel, and provides a pass/fail
mechanism to verify the tape drive's functionality. This test is executed
either in a read-only mode, or a read/write mode. In read-only mode, the
tape is continuously read and rewound until the test time expires, or an
error occurs. In read/write mode, data is written to tape and then read
using software data compares. A test of the drive's ability to reposition is
also performed.

6.3.11 DRVEXR - Drive Exerciser

This test is for Customer Services personnel to exercise the tape drive
for a specified amount of time. This test is executed either in a read-only
mode, or a read/write mode. In read-only mode, the tape is continuously
read and rewound until the test time expires, or an error occurs. In
read/write mode, data is written and read from tape using software data
compares until the test time expires, or an error occurs. This test also
provides a statistcal report when it is completed.

6.3.12 STREAM

This test calls FTST05 and FTST06.

6.4 Utilities for Changing Parameters

This section describes the utilities to use for changing parameters.

6.4.1 Utility 1 - PARAMS

This utility provides the option of changing parameters in the DSSI
subsystem. (It is similar to the PARAMS utility that is currently in place
in the RF products.)

6.4.1.1 WRITE Command

The PARAMS utility changes and displays information that is stored in
the nonvolatile RAM of the subsystem. It functions much as the VMS
SYSGEN utility in that changes are not made to the nonvolatile RAM
unless you specifically request a WRITE function. If you do not issue
the WRITE command before exiting the program, nonvolatile RAM is not
altered.

6.4.1.2 STATUS Command

The STATUS command (combined with its subcommands) lets you
inspect the last ten controller errors, the communication counters for
this subsystem, or the counters for all subsystems on the DSSI bus.

Subcommands used with the STATUS command are:

- LOGS
  Inspects up to the last 14 firmware logable events.

- DATALINK
  Inspects the node's communication counters.

- PATH
  Allows you to inspect the entire DSSI bus status.

- DIRECTORY
  Allows you to display the current status of the tape directory.

6.4.2 Utility 2 - HISTRY

This utility displays information about the subsystem. (Its user interface is similar to that present on the RF product set.) The HISTRY utility conforms to the DUP specification:

- Controller and Drive Hardware Revisions

- Controller and Drive Software Revisions

- Controller and Drive Serial Numbers

- DSSI Node Name and Number

- DSSI Device Name

- Power Cycles and Power On Hours

- Loader Revisions when applicable.

6.4.3 Utility 3 - DIRECT

This utility lists a partial directory of the local diagnostic and utility programs that can be run by a DUP program, allowing you to choose which local program you want to run. (Since not all the local diagnostic programs can be executed by the typical user, most are not listed in the directory.) The DIRECT utility has a user interface similar to that present on the RF product set, and conforms to the DUP specification for the DIRECT utility.

6.5 Loader Procedures

The following sections describe loader procedures and tests.

6.5.1 LDRTST - Loader Exerciser

This procedure executes either the default tests or their subset tests. Use the LCHANG utility to select the tests you want to run, change the default loader test list.

The default set of tests in the order they are executed are:

- LTST01 - Loader Loopback Test

- LTST02 - Loader Illegal Commands Test

- LTST03 - Loader Internal Self-Test

- LTST04 - Loader Movement Test
- LTST05 - Loader Cartridge Access Test

6.5.1.1 LTST01 - Loader Loopback Test

This test verifies the communications path between the loader and the controller. The input buffer is loaded with a data pattern and sent to the loader. The loader loops back the data and it is placed in the output buffer. The input and output buffers are then checked to ensure the data is correct.

6.5.1.2 LTST02 - Loader Illegal Command Test

This test verifies that the loader rejects any illegal commands that might get sent by the controller.

6.5.1.3 LTST03 - Loader Internal Self-Test

This test causes the loader to execute its internal self-test.

The loader has five internal self-tests: ROM test, RAM test, EEPROM test, CTC test, and UART test. The loader executes each of these tests and reports their success or failure. All tests are attempted unless there is a fatal error; for example, if it is unable to communicate with the loader.

6.5.1.4 LTST04 - Loader Movement Test

This test verifies the loader mechanism without accessing any of the cartridges. It activates the picker motor, cartridge motor, and drive handle motor in turn. Initially, each motor is activated for five seconds.

Because the diagnostic movement commands do not end automatically and only one command is issued at a time, the subsystem will time out the command and stop loader motion.

6.5.2 LTST05 - Cartridge Access Test

This test attempts to access the cartridges in the magazine and write 100 records of 4096 bytes to tape. The pattern used in the write operation is a variation of the slot from which the tape came. After the write pass, the cartridges are accessed again and the data is read from tape. A software data compare is performed.

6.5.3 LTST06 - Loader Commands Test

This test is for engineering or other experienced users who want to test the loader without using the predefined tests. It is an interactive session that allows you to enter loader commands one at a time. These commands are executed and the results are displayed on the terminal.

6.5.4 LTST07 - Change Test Parameters

By default, all tests run when the LDRTST test is run.

6.5.5 LTST08 - Change Loader Cycle Count

This utility lets you change the loader cycle count when mechanics are replaced. The cycle count is stored in EEPROM.

6.5.6 LTST09 - Loader Streaming Write/Read Test

This test performs a streaming write and read test using every cartridge in the loader. Each tape is loaded and written using the FTST05 test, and then read using the FTST06 test.

6.5.7 LTST10 - Loader Thrashing Write/Read Test

This test performs a thrashing write and read test using every cartridge in the loader. Each tape is loaded, and written using the FTST07 test, then read using the FTST08 test.

6.5.8 LTST11 - Loader Streaming Read Test

This test performs a streaming read test on each cartridge in the loader using the FTST06 test.

6.5.9 HCART0 — HCART6 - Load Cartridge Utility

These utilities load the cartridge specified by the utility name into the drive from the loader magazine. If a cartridge is already loaded in the drive, it is first unloaded and returned to its proper slot in the magazine before the specified tape is loaded.

6.5.10 HSTATS - Loader Status Utility

This utility lets you verify the status of each slot in the loader magazine.

6.5.11 Failure Action

Report the failure to the host using the DUP interface.

6.6 Host Level Diagnostics

Host level diagnostics support all DSSI devices. These diagnostics initiate the device-level diagnostics and let the device test itself. From these diagnostics, DUP commands are issued so that subsystem-resident diagnostics are executed by the controller.

Microdiagnostics that are resident on the controller can:

- Avoid the difficulties of supporting down-line loadable diagnostic files in various run-time environments.

- Allow greater flexibility in hardware design by avoiding the need for executing code out of RAM.

- Aid in supporting product. With device specific tests embedded in the device, the host-based programs support the generic DUP interface only.

6.6.1 System Verification Test

This program tests up to seven DSSI devices:

- Basic DSSI and TMSCP comand verification

- Quick-verify write/read test

- Data reliability test

You can control various aspects of the program such as record size, data patterns, disabling controller error recovery (rereads, overwrites), and so forth.

6.6.2 Diagnostic Supervisor

This program lets you run the functional microdiagnostics. It also has a tape exerciser test that runs in the host.

7

TZ85/TZ86 Diagnostic Utilities and Tests

This chapter contains descriptions of the TZ85 and TZ86 diagnostic utilities and tests.

7.1 POST

The controller power-on self-test (POST) program runs whenever the controller module is reset. It is reset through a power cycle, or from the terminal server.

A reset situation is indicated on the controller LEDs by the absence of the green LED on the controller. The yellow LED flashes during the tests, and if POST completes successfully and the operational firmware initializes properly, the green LED lights.

7.1.1 Burn-in Loopback Mode

The POST diagnostics normally notify the executive that starts the rest of the controller operating system. However, a loopback feature is available. At the start of testing, the state of the burn-in pin is saved. At the end of testing, and before the executive is notified, the diagnostics test the saved state. If the burn-in is true, POST loops.

Detailed test information is printed at the start of testing if the burn-in connector is present. (The jumper is removed while POST is executing.)

7.1.2 SCSI Bus Termination

POST requires that the SCSI bus be properly terminated and powered. If the device is not connected to a SCSI bus, the internal terminating resistors must be installed in the terminator position, and the terminator power jumper must be installed in the PWR position. If the device is connected to a SCSI bus, the bus must be terminated according to SCSI termination requirements.

If the SCSI bus is not terminated, POST will not execute. This is indicated by the status of the controller LEDs. The green (OK) LED flashes, and the yellow (ACTIVE) LED is on continuously. If the LEDs are as indicated above, terminate the SCSI bus to allow POST to execute and start the operational firmware (if no other errors are detected).

7.1.3 POST Terminal Server

The diagnostic terminal attached to the controller prints information concerning the run of the tests. During normal operation, the test currently running is the last test printed.

Any failures detected may be due to the last test running, except for one instance–when an unexpected interrupt is generated, the error lists the cause of the interrupt. The header displays that it was an unexpected interrupt.

The POST terminal server supports the following commands:

- **Control/C: C**lears the POST pass count.

- **Control/H: H**alts POST and resets the controller to start again. Use this command only after an error is detected. Do not disconnect or cycle the power supply.

- **Control/P: P**rints the POST pass count.

7.1.4 Lastfail Information

There may be additional information about the failure. This information is displayed on the terminal, and may be useful for diagnosing the cause of the failure. Currently, there is additional failure information displayed on the diagnostic terminal for:

1. RAM Mach II pattern testing on the RAM buffers (microprocessor, and EZ). The expected and actual data patterns as well as the physical hardware address of the miscompare is displayed.

2. ROM EDC test: The expected and calculated EDC are displayed.

3. Register initialization: The expected and actual values as well as the physical hardware address of the register are displayed.

7.2 Break Key Operation

During POST testing, the ⌷Break⌷ key causes the POST kernel to list information about the last error detected including the last fail information if any. Currently there is one limitation—using the ⌷break⌷ key during the local RAM testing may cause a miscompare error. It is recommended that the ⌷break⌷ key not be used while POST is running.

7.3 Test Descriptions

The tests that are described in the following sections test the functionality of the TZ85 subsystem. These tests return statistical information to the originating process. Unique error codes are returned to help determine the FRU that caused the error. If the program can determine the FRU error, it is included; otherwise, you must either run more tests or determine the error from the data returned in the statistical information.

7.3.1 Diagnostic Server

The control portion of the microdiagnostics is known as the diagnostic server. The server interfaces with the diagnostic terminal server and SCSI port. The diagnostic server creates SCSI packets and interprets responses from the SCSI server. The diagnostic server also acts as the interface for the tests with the remainder of the TZ85/TZ86 firmware. The gathering and computing of statistics is also done by the diagnostic server. The diagnostic server handles all communication within the controller.

When a test is complete, the diagnostic server compiles statistics and then either sends them to the Diagnostic Terminal Server for transmission to the diagnostic terminal, or to the SCSI port for retrieval by the host.

7.3.2 Diagnostic Terminal Server

The Diagnostic Terminal Server is a separate task that verifies all diagnostic terminal communication. The SCSI port is also a separate task and verifies all communications with the host.

When you issue a **ds** command to the Diagnostic Terminal Server or when the SCSI port receives a Send Diagnostic command from the host, it prompts the diagnostic server to search the diagnostic test directory. If the program is found, the diagnostic server attempts to gain exclusive access to the subsystem by issuing an online command with exclusive access requested. If this is successful, the program starts. All programs run to completion or until you issue a **dk** command.

7.3.2.1 Data Patterns

The following table displays program data patterns:

Table 7–1   Program Data Patterns

Pattern	Name	Data in Hex
0	Rotate	Use different pattern for each file
1	All 0s	00 00 00 00 00
2	2F	FF FF FF FF FF
3	Alternating 1s and 0s	55 5A AA A5 55 5A AA A5
4	Marching 1	01 02 04 08 10 20 40 80
5	Marching 0	FE FD FB F7 EF DF BF 7F
6	MW	0E 0E 0E 0E 0E 0E 0E 0E
7	MFM	DE AD DE AD DE AD DE AD
8	1F	AA AA AA AA AA AA AA AA
9	Random Data	

7.3.3   FTST03 - Positioning Test

This test checks the repeatability of the drive's repositioning ability. It writes 10 blocks of records to tape of random record and byte counts. You determine the starting data when you invoke the test. The tape then is repositioned throughout the area that has been written using the SKIP TAPE MARK, SKIP RECORD, and SPACE OBJECT commands, both in the forward and reverse directions.

After each reposition, a record is read and a software data compare is performed. This test also writes a special diagnostic field at the beginning of tape so that other diagnostic tests can recognize it. By reading the diagnostic field, other tests can recreate the data that is written to the tape and perform read operations with data compare.

NOTE
Depending on the RAM parameters, DIAGTRACE and DIAGMASKRECSZ limitations are placed on the maximum number of records and byte counts for each block of records. If DIAGTRACE is 1, the maximum number of records a block of records can have is 3966. If it is 0, the maximum number of

**records a block of records can have is 1023. If DIAGMASKRECSZ
is 1, the maximum byte count of a record is 32767. If it is 0, the
maximum byte count of a record is 65535.**

The runtime parameter that you can change is the data pattern. This test
executes in approximately 40 minutes.

7.3.4 FTST05 - Streaming Write Test

This test verifies the drive's ability to write data in a streaming manner.
Unless you specify otherwise, a random number of blocks of records are
written to tape of varying record and byte counts. The default amount of
data is set to assure a track turn around and a head step operation. You
specify the data pattern as well; if no data pattern is specified, the data
pattern defaults to a rotating pattern. This test also writes a diagnostic
field on the tape so that other tests can recreate the data that is written
to the tape and perform read operations with data compare.

The runtime parameters that you can change are the record count, byte
count, and data pattern.

7.3.5 FTST06 - Streaming Read Test

This test checks the accuracy of the drive while reading data in a
streaming manner. It uses the seeds left from a previous write or
positioning test to create the data used for software data compares.
Software data compare operations are performed on pseudo randomly-
chosen records of data.

If a diagnostic field read using this test is written by FTST03, this test
performs in the same manner as the FTST03, with the exception of the
write procedure.

The runtime parameters that you can change are the byte count and data
pattern.

7.3.6 FTST13 - Write/Read Test

This test writes data to the tape in a streaming manner. Data buffers are
reused rather than being refilled with new data. Any data patterns can
be used. The data buffers are filled once, when starting a write from BOT;
therefore the tape does not stream for the first few records. Once all the
buffers are accessed, the tape streams for the remaining time.

Read operation is as previously described, except that no data compares
are done. This ensures that the tape streams continuously while reading.

The runtime parameters that you can change are the record count, byte count, and data pattern. This test executes in approximately two hours when writing and reading the entire tape.

7.3.7 STREAM Test

This test calls the FTST05 and FTST06 tests, and executes in approximately nine hours.

7.4   SCSI Level Tests

The following sections describe the SCSI level test.

7.4.1 TEST01 - SCSI Level 1 Test

Because a full power-up is not necessary, be sure that the controller hardware and software is functioning properly before invoking this diagnostic test.

This test is an extension of the power-up self-tests. The EDC is calculated for the whole ROM and compared with the last long word of ROM. Two queues that the controller software uses is checked by dequeuing and enqueuing items. If there is a loader attached, a software reset is done. When complete, errors are passed to the extended sense bytes of the REQUEST SENSE data.

This test executes in approximately five seconds.

7.4.2 TEST02 - SCSI Level 2 Test

This test has two modes of operation: default and non default. Default mode writes, then reads fifty 32,768 byte records. Non default mode has the host providing runtime parameters. A statistical report and any errors are passed on in the REQUEST SENSE data. Default mode executes in approximately five minutes.

7.4.3 LTST09 - Loader Streaming Write/Read Test

This test cycles and loads all cartridges that are in sequence in the magazine. It writes and then reads until EOT is done on all cartridges.

7.4.4 LTST11 - Loader Read All Test

This test cycles and loads all cartridges that are in sequence in the magazine. It reads until LEOT is done on all cartridges.

7.4.5 Retry Algorithm

The diagnostics utilize the subsystem's retry algorithms as implemented by the drive and controller firmware. All hard write errors and undetected read errors are considered to be fatal.

8
Firmware Update Procedures

This chapter describes how to install firmware updates on the TF857, TF85, and the TZ8xx-series of products.

8.1   TF85x Subsystem Firmware Update Procedure

The TF85x-series of products (DSSI) use the **Firmware Update Program** (FUP) utility to perform firmware updates. The firmware updates are performed from a host, and require your input and interaction. (A sample dialog is located at the end of this section.)

8.1.1   Running the VMSINSTAL Procedure

Note the following requirements and restrictions before you run the VMSINSTAL procedure needed to install the FUP utility:

- VMS version 5.4-2 or higher is installed.

- The SYSGEN parameter, SCSMAXDG, is set to the default value.

- The user account has privilege PHY_IO.

To install the FUP utility, use the standard VMSINSTAL procedure. You must also obtain an installation kit; for example, DSSIFW008.A. This kit is available through the network or on a distribution tape.

The initial kit contains the images for released versions of firmware (V1.0, V2.0, V3.0, and so forth) and all necessary utility programs. It is recommended that you use the latest code. (The older versions of code are only provided to allow a backward migration if necessary.)

NOTE
**The FUP utility does not work on KFQSA-based systems. These
devices can be updated by temporarily moving them to a non-
KFQSA based system, or replacing the controller printed circuit
board (PCB).**

8.1.2 Beginning the TF85x Firmware Update

Once the FUP utility is installed, refer to the following steps to begin the
firmware update procedure:

1. Enter the device type, region number, and version number at the FUP
    utility prompt. The device type is *TF85* for *both* TF85 and TF857
    products. The region number is 1. The version number is the letter V
    followed by a number; for example, V3.

2. Enter the selection of devices you want to update and which image
    files to use for each.

3. Press Return after entering device types.
    The FUP utility begins updating the selected units, prompting you to
    place each unit into update mode as needed.

4. Enter the current device into update mode (refer to Section 8.1.2.1
    and Section 8.1.2.2).

The FUP utility notifies you once a device is successfully updated, and
proceeds to the next device that is to be updated. If the utility indicates
that a error has occurred, repeat the procedure on that unit. When it is
done, FUP causes the subsystem to re initialize.

8.1.2.1 TF857 Subsystem Firmware Update Mode
NOTE
Be sure to read this section completely before beginning a firmware update procedure.

Refer to Figure 8–1 for a description of the front panel.

To invoke **TF857** firmware update mode:

1. Press the Eject button on the front panel to open the receiver and remove the magazine. (The magazine must be empty before you begin the firmware update procedure.) Close the receiver.

2. Place the key position switch in **service** mode.

3. Press and *continue pressing* the Load/Unload Button for approximately 4 to 8 seconds until the Write Protected LED begins to blink. This LED indicates that the subsystem has recognized your request, and is waiting for completion of the sequence.

4. Press the Load/Unload button again within 4 seconds; release it immediately.

    The Tape In Use and Write Protected LEDs begin to blink (they are not generally synchronized) indicating that you have selected update mode correctly.

    There is then a 15-second delay before the actual firmware update begins while the subsystem runs POST.

NOTE
If the process is not successful, the Write Protected LED stops blinking within several seconds. You can then begin the procedure again.

Update mode is now in effect until:

*   The firmware update procedure completes, or

*   The controller remains idle for 5 or more minutes, or

*   Any loader front panel activity occurs (user abort), or

*   A power down occurs.

Figure 8–1 Front View of the TF/TZ 85x-series Operator Control Panel

OPERATOR CONTROL PANEL

MODE SELECT KEY

OCP DISABLED

AUTOMATIC MODE

SERVICE MODE

MANUAL MODE

Eject

Load/Unload

Slot Select

BUTTON AND INDICATOR AREA

CURRENT SLOT INDICATORS 0-6

OCP LABEL

Power On

Write Protected

Tape In Use

Use Cleaning Tape

Magazine Fault

Loader Fault

DSSI NODE ID LABEL (TF857 ONLY)

0
1
2
3
4
5
6

SHR_X1025E_91
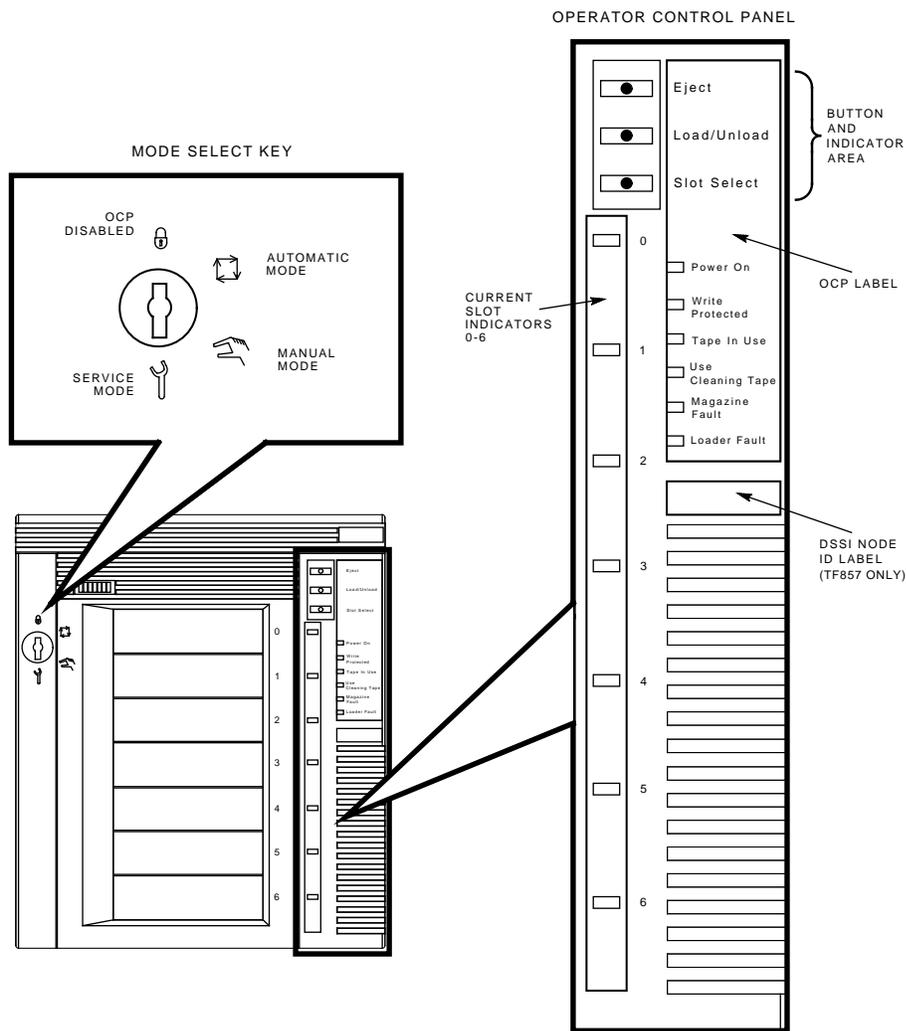
8.1.2.2 TF85 Firmware Update Mode

To invoke the **TF85** firmware update mode:

1. Lift the handle to open the tape drive (Figure 8–2) and remove all cartridges from the drive (the Operate Handle LED is on). Close the drive.

2. Press the Unload button and *continue pressing* until the Write Protected LED begins to blink (4 to 8 seconds). This indicates that the subsystem recognizes your request and is waiting for completion of the sequence.

3. Release the Unload Button.

4. Press it again within 4 seconds, and release it immediately.

The Tape in Use and Write Protected LEDs begin to blink indicating that you have selected update mode correctly. There is a 15-second delay while the subsystem runs POST before the firmware update begins.

NOTE
If the process is not successful, the Write Protected LED stops blinking within several seconds. You can then begin the procedure again.

Figure 8–2   Tape Drive Controls and Indicators
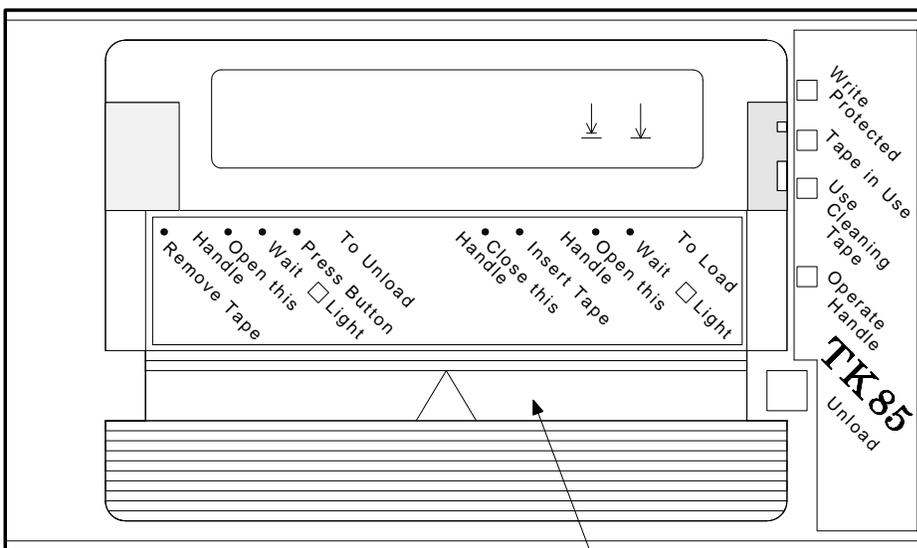
CARTRIDGE INSERT/RELEASE HANDLE

SHR-X0056B-90

Update mode is now in effect until:

- The firmware update procedure completes, or
- The controller remains idle for 5 or more minutes, or
- The drive handle is raised (user abort), or
- A power down occurs.

Sample Installation Procedure/FUP dialog

```
$
$ @sys$update:vmsinstal dssifw

 VAX/VMS Software Product Installation Procedure T5.4-2

 It is 15-MAY-1991 at 12:55.

 Enter a question mark (?) at any time for help.

%VMSINSTAL-W-ACTIVE, The following processes are still active:
 BATCH_158
 Larry
* Do you want to continue anyway [NO]? y
* Are you satisfied with the backup of your system disk [YES]? y
* Where will the distribution volumes be mounted: user1:[kaplan.fup.kit]

* Enter installation options you wish to use (none):
The following products will be processed:
  DSSIFW V0.8

 Beginning installation of DSSIFW V0.8 at 12:56

%VMSINSTAL-I-RESTORE, Restoring product save set A ...
Firmware Update Program FUP VMS T0.8
Firmware Update Program FUP VMS T0.8
Reading FUP Index file $100$DUA3:[SYS12.SYSUPD.DSSIFW008]FUP.FUP_INDEX;
Configuring bus 1 PIA.

  Bus Location               Device Hardware

PIA node 1      RF30
PIA node 3      TF85 016200420AE41600 PCB-rev:A000
  Image 1 V0         [V2]           Available: V1 V2
PIA node 4      TF85 016200420100F000 PCB-rev:????
  Image 1 V003                      Available: V1 V2
PIA node 6     KFQSA         (another host)
PIA node 7      SII          (this host)

Device type to update [TF85]:
Region to update [1]:
Version to install [V2]:
Install image 1 V2 into the TF85 at PIA node 3 [Yes]?
A copy of the currently installed image version is not available to this
program.  If you discover a problem with the new version, you cannot return
to the current version using this program.
Do you want to install the new version anyway [Yes]?
Install image 1 V2 into the TF85 at PIA node 4 [No]?

  Bus Location               Device Hardware
```

```
PIA node 1       RF30
PIA node 3       TF85 016200420AE41600 PCB-rev:A000
  Image 1 V0        Install V2       Available: V1 V2
PIA node 4       TF85 016200420100F000 PCB-rev:????
  Image 1 V003                       Available: V1 V2
PIA node 6     KFQSA        (another host)
PIA node 7        SII          (this host)

Device type to update []:

* Install the images selected above [Yes]?
%VMSINSTAL-I-MOVEFILES, Files will now be moved to their target directories...
Firmware Update Program FUP VMS T0.8
Configuring bus 1 PIA.
Reading FUP Image file $100$DUA3:[SYS12.SYSUPD.DSSIFW008]TF85_1_V2.FUP_IMAGE;
Beginning installation of image 1 V2 into the TF85 at PIA node 3.
Please place the TF85 at PIA node 3 into Update mode.
TK drive front panel instructions to be supplied.
Copying image 1 V2 to the TF85 at PIA node 3.
        20% copied.
        40% copied.
        60% copied.
        80% copied.
       100% copied.

We are ready to store image 1 V2 within the TF85 at PIA node 3.
If a power failure occurs during this process, the device will
probably be unusable until the image is re-installed.

Storing image 1 V2 within TF85 at PIA node 3.
        15 seconds.
        10 seconds.
         5 seconds.
Successfull installation of 1 V2 on TF85 at PIA node 3.
      1571 Valid FUP Commands Sent
      1564 Valid FUP Responses Received
         7 Receive Timeouts
 Installation of DSSIFW V0.8 completed at 12:58

 VMSINSTAL procedure done at 12:58

$
```

8.2   TZ85x Subsystem Firmware Update Procedure

Firmware updates on TZ8xx products (SCSI) are performed directly from a cartridge that contains the new firmware image.

Before you can perform a TZ8xx-product firmware update, you must copy the firmware image to tape (TK50, TK70, or TK85 media).

<div align="center">

CAUTION
</div>

During the firmware update when the new image is being programmed into the FLASH EEPROMs, a powerfail (but not BUS RESET) may cause the controller module to be unusable. When performing a firmware update, take precautions that a powerfail will not occur.

Copying the Firmware Image on a VMS System

To copy the firmware image on a VMS system, initialize (INIT or label) the tape with an ANSI label, and copy the TZ85 firmware image file to the tape. Be sure to specify a 4K block size.

For example:

```
(get a copy of the firmware image file)
INIT SYS01$MKA500: "TZFWU"
MOUNT/Block=4096 SYS01$MKA500: "TZFWU"
COPY/log TZ85_v5.TZ_IMAGE SYS01$MKA500:*
DISMOUNT SYS01$MKA500:
```

Copying the Firmware Image on an ULTRIX System

If you are using the **ftp** utility to transfer the binary firmware image file onto the ULTRIX system, be sure to specify the type image before issuing the **get** or **put** command. Otherwise, extra characters may be added to the file causing the image file to be invalid. The image file should be exactly 1024*256 bytes in size.

Use the **ltf** command with the **-cfB** options to copy the image file to the TK media.

For example:

```
#ltf -cfB /dev/rmt0h 4096 tz85_v5.tz_image
```

8.2.1 Installing TZ85x Subsystem Firmware

Firmware updates are supported on both the TZ85 and TZ857 products.

8.2.1.1 TZ85 (Drive-Only) Configuration Update

To update the firmware for drive-only configurations:

1. Obtain a TK85 (or TK50, TK70, TKZ50, or TZ30) tape containing the new firmware image.

   Selecting Firmware Update Mode

   - Remove any cartridge that is in the TZ85 tape drive and close the handle (down position). The Operate Handle LED is on. (Refer to Figure 8–2.)

   - Press and *continue pressing* the Unload button on the drive's front panel until the Write Protected LED begins blinking (about 8 seconds). This indicates that the TZ85 drive recognizes a request for firmware update mode, and is waiting for completion of the sequence.

     If the Write Protected LED does not begin blinking, check that the device is in the proper state; for example, be sure there are no POST failures, no cartridges in the drive, and the drive handle is in proper position.

   - Release the Unload button.

   - Press the Unload button again within 4 seconds, and release it immediately.

     The Tape in Use and Write Protect LEDs blink indicating that the tape drive recognizes that you have selected firmware update mode.

     If the procedure is not successful, the Write Protected LED stops blinking within several seconds. You can then begin the procedure again. (If the drive and controller are not properly communicating, you cannot select firmware update mode.)

2. Lift the handle to open the drive.

3. Insert the tape cartridge containing the new firmware image.

4. Close the drive.

   The firmware update automatically begins, and firmware update mode is now in effect.

The automatic process continues as follows:

- The next cartridge that is inserted into the drive (which temporarily clears the two LEDs) is automatically read.

- The data is examined and verified to ensure a valid TZ85 firmware image. (This takes several minutes to complete.)

  Firmware update mode is automatically cleared at this point.

- If the image is validated, the subsystem is automatically updated with the new firmware image.

8.2.1.2 TZ857 Loader Configuration Update

NOTE

Be sure to read this section completely before beginning a firmware update procedure.

To update TZ857 loader configuration firmware:

1. Obtain a TK85 (or TK50, TK70, TKZ50, or TZ30) tape containing the new firmware image.

   Refer to Figure 8–1 for a description of the front panel.

   Selecting Firmware Update Mode

   To select **TZ8xx** firmware update mode:

   - Press the Eject button on the front panel to remove the magazine. (The magazine must be empty before you begin the firmware update procedure.) Close the receiver.

   - Place the select key in **service** mode.

   - Press and *continue pressing* the Load/Unload Button for approximately 4 to 8 seconds until the Write Protected LED begins to blink. This LED indicates that the subsystem has recognized your request, and is waiting for completion of the sequence.

   - Press the Load/Unload button again within 4 seconds; release it immediately.

     The Tape In Use and Write Protected LEDs begin to blink (they are not generally synchronized), indicating that you have selected update mode correctly.

     If the procedure is not successful, the Write Protected LED stops blinking within several seconds. You can then begin the procedure again. (If the drive and controller are not properly communicating, you cannot select firmware update mode.)

2. Press the Eject button **twice** to open the receiver door. (The Write Protected and Tape In Use LEDs stop blinking although the subsystem is still in update mode).

3. Insert the magazine containing a firmware update cartridge (in the first empty slot) into the receiver. (The update procedure takes less time if the magazine has only the firmware update cartridge in it.)

4. Close the receiver.

NOTE
Wait until the loader scans the magazine and the Load/Unload LED is green before you proceed to the next step.

5. Press the Load/Unload button to load the firmware update tape into the drive.

   The drive automatically reads the tape, examines, and verifies that the data is a valid TZ85 firmware image. (This takes a few minutes of tape movement.) Firmware update mode is automatically cleared.

   If the procedure is validated, the subsystem is automatically updated with the new firmware image.

   When the update is complete, the subsystem resets. A full extended scan of the loader magazine begins.

6. Press the Eject button once, when the magazine scan completes, to remove the firmware update cartridge from the magazine.

Update mode is now in effect until:

- The firmware update procedure completes, or

- The controller remains idle for 5 or more minutes, or

- Any loader front panel activity occurs (user abort), or

- A power down occurs.

8.2.2 Installing Firmware into a Standalone Drive

The subsystem's firmware can be updated even if it is not attached to a SCSI bus. However, since the power-on self-test (POST) must pass before an update is possible, and POST needs a properly terminated bus to pass you should refer to the following when updating the firmware of a standalone system drive:

- Ensure that the termination packs on the controller board are in the TERM position

• Ensure that the termination power jumper is in the PWR position

These positions are labeled on the PCB etch (as are the NO TERM and
NO PWR positions.)

8.2.3 Firmware Update Results

There are two possible results:

1. The firmware update cartridge automatically unloads indicating a
   successful update.

   On the TZ85 (non-loader version), the media is placed into the
   cartridge, the door is unlocked, and the green Operate Handle LED is
   on.

   On the TZ857, the cartridge unloads from the drive into the magazine
   slot from which it came, and the next cartridge is loaded.

2. The firmware update cartridge is not unloaded indicating an
   unsuccessful update.

   The subsystem should still be usable depending on why the update
   failed (power failure, bad image on the tape, no +12V supplied to the
   controller PCB, broken Flash EEPROMs, and so forth.)

In addition,

• If the image is valid, the flash EEPROM containing the current
  firmware is erased and the new image is installed. The subsystem
  completes the update in about two minutes.

  When the update is complete, the subsystem resets and completes a
  power-on self-test (POST).

• If the tape is not a valid firmware update tape, or does not contain a
  valid image, no update is attempted. The Write Protected and Tape
  In Use LEDs do not blink. To verify that the firmware update tape is
  valid, you can get a new copy of the firmware image, and/or rebuild
  the firmware update tape. The unit resets, and the tape is left loaded.

• If the tape contains a valid image but the reprogramming of the
  flash memory fails, the controller is probably unusable and needs
  replacement. The subsystem resets and runs POST (which fails if the
  flash memory does not contain a valid image). LEDs on the controller
  indicate the POST failure, and the subsystem needs servicing.

A

EVMDA Tape Drive Exerciser Tests

This appendix describes how to run the EVMDA tape drive exerciser under the VAX Diagnostic Supervisor (VDS). It includes examples of the EVMDA tests.

The EVMDA program is a data reliability exerciser for tape devices. It can test up to four tape devices concurrently. The EVMDA program is designed to run in a VDS level 2R environment. It uses predetermined sequences to test read and write compatibility and data reliability.

EVMDA detects functional faults, but it does not provide diagnostic isolation to the FRU level. EVMDA automatically calculates whether the unit(s) under test have met acceptable error rates. If not, a failure message prints with the statistics matrix for that unit.

If less than the required data has been transferred (that is, the program is run in a quick verify mode), the confidence that the unit has met the error rate is diminished. EVMDA identifies this case with a message stating that an insufficient amount of data has been transferred to establish error rate compliance.

To use EVMDA, make sure the following conditions are met:

- All magazine tape subsystems to be tested must be on-line and must have scratch media loaded in the tape drive.

- The user account must have physical I/O privilege under the VMS operating system.

A.1 EVMDA Tests

EVMDA consists of five separate tests. Tests 1, 2, 4, and 5 execute sequentially on all units selected for testing. Test 3 performs parallel testing on all selected units.

A.1.1 Test 1 — Acceptance Test

This test executes all legal commands on the unit under test. It serves as a quick verify test to ascertain that the unit can move tape and write/read predictably, without error. The test sequence is as follows:

1. Execute on-line (With Clear Serious Exception Modifier Set), sets the unit characteristics and resets any residual errors. The response packet is saved for later comparison.

2. Rewind to ensure that tape is at BOT.

3. Write two tape marks, just after BOT.

4. Backspace two tape marks.

5. Space forward to LEOT.

6. Rewind.

7. Write, using increasing byte counts, rotating through all data patterns, using increasing file lengths (number of records/file increases). Files are separated by file marks. Minimum tape length used for this sequence is at least 100 feet.

8. Write LEOT after previous sequence.

9. Rewind.

10. Access the just written data.

11. Rewind.

12. Read records of the first file.

13. Space record forward/reverse, and ensure correct position by reading data (first two words of each record contains record number and file number). This sequence spaces over some records in each direction, then reads the next subsequent record to check the unit's integrity.

14. Rewind.

15. Space forward to LEOT.

16. Rewind tape.

17. Get unit characteristics and compare the packet with that received from the *on-line* packet response (there should be *no* change).

A.1.2 Test 2 — Qualification Test

This test rewinds the tape, then executes the following sequence:

1. Write record set.

2. Reposition over just written record set.

3. Then read the current record set.

4. Write a tape mark.

This test executes in a sequential manner (that is, it selects unit 0 then unit 1, and so on). The default operation of this test continues writing /spacing/reading records until EOT is encountered on each unit under test. The pass time for test 2 can be reduced by setting Event Flag 8 or the QUICK flag. EF 8 allows you to specify a byte count on which to terminate the test; QUICK flag causes the test to terminate after a minimum of 10 Mbytes has been transferred.

While these reduced runtime options cannot be used meaningfully to determine error rate compliance, they can be helpful in reducing test time to verify installations.

A.1.3 Test 3 — Multi Unit Test

This test rewinds the tape, and executes the following sequence:

1. Write *n* records.

2. Reposition (reverse) *n* records.

3. Read (forward) *n* records.

4. Write a file mark.

Data pattern, number of records (*n*), unit under test, and record size are all randomly selected. This sequence permits hardware retries, if not user disabled. This test runs until EOT, LEOT, or a fatal error is detected. As described in test 2, you may use EF 8 or the QUICK flag to reduce the runtime of this test. Test 3 is the only test that supports parallel testing on multiple units; that is, all units are tested concurrently.

NOTE
In test 2 and 3, the first two words in the buffer locations used in any operation contain a file and record number for position

**verification. In addition, as a user option, data comparisons can
be performed one of three ways: all, < 15%, or none.**

A.1.4 Test 4 — Read Unknown Tape

This test rewinds a tape, then reads until EOT, LEOT, or a fatal error is
encountered, keeping track of the number of records/file read. If a fatal
error is encountered, a message is reported, the tape is rewound, and the
unit is prevented from executing further read operations. Test 4 is the
only test in section MEDIA.

A.1.5 Test 5 — Conversation Mode

Conversation mode runs with or without error reports. You can create
a sequence of commands to emulate a known failure mode. An iteration
count is specified for each command, indicating how many times the
command should be issued consecutively, before issuing the next command
in the sequence. The test does not declare an end of pass until EOT
is reached. You can force end of pass after a single execution cycle of
the command sequence by placing an exclamation point (!) after each
command mnemonic in the function table. Note, however, that a test
sequence that does not progressively use tape never achieves an end of
pass.

Also note that this test does not check for logically correct sequences
of commands before their execution. Test 5 is the only test in section
CONVERSATION.

A.2   Invoking EVMDA

Use the following procedure to invoke the EVMDA program:

1. Load and start the VAX Diagnostic Supervisor. See the appropriate
    user documentation for more information.

    NOTE
    **Be sure scratch media is loaded in all magazine tape
    subsystems to be tested. This program does not issue any
    warning messages before writing on the tape.**

2. Use the ATTACH command at the DS> prompt to attach the KFMSA
    module.

```
DS> ATTACH
DS> Device type? KFMSA
DS> Device link? HUB
DS> Device name? PAA0
DS> XMI node number (1 to E)? 4
DS> Port number (1,2)? 1
```

In this example, the command sequence attaches the KFMSA module in slot 4 of the XMI backplane to the HUB. Since the KFMSA provides two separate DSSI buses, each with its own host port, two ATTACH commands must be issued for each KFMSA.

```
DS> ATTACH
DS> Device type? KFMSA
DS> Device link? HUB
DS> Device name? PAB0
DS> XMI node number (1 to E)? 4
DS> Port number (1 or 2)? 2
```

3. Attach the TF857 through the KFMSA, as shown in the following example:

```
DS> ATTACH
DS> Device type? TF85
DS> Device link? PAA0
DS> Device name? T8ET34$MIA4
DS> DSSI node # (1 to 7)? 6
```

The above example attaches a TF857 magazine tape subsystem to the KFMSA. The TF857 is attached to bus 1 of the KFMSA module. The device name of the TF857 is T8ET34$MIA4. The DSSI node ID for the TF857 is 6.

4. Issue the SELECT command at the DS> prompt:

```
DS> SELECT ALL
```

5. Set the QUICK (verify) flag to reduce passtime to approximately 12 to 15 minutes.

```
DS> SET FLAG QUICK
```

6. Run EVMDA. The following example shows how to run test 3, which is the recommended nominal quick verification test for the TF857 subsystem.

```
DS> RUN EVMDA/TEST:3
```

NOTE
**The default passtime (no QUICK flag set and no tests specified)
is approximately 4 to 5 hours for a single TF857 subsystem.**

A.3   User Dialogue

User dialogue is applicable only in the "conversational" mode of operation.
The dialogue is as follows:

```
_.. PROGRAM: XXXXX DATA RELIABILITY DIAGNOSTIC, REV 3.1, 5 TESTS, AT
11:19:24, TESTING: __XXXX


PLEASE ANSWER THE FOLLOWING QUESTIONS FOR __XXXX
NEW PARAMETERS WANTED? [(YES), NO, SHOW, HELP]
RANDOM BYTE COUNT [(YES),NO]
BYTE COUNT []
SELECT DATA PATTERN [(0), 0 - 9 (D)] 0
DATA []
TYPE FUNCTIONS WANTED - TERMINATE WITH AN "END"
FUNC>RRRDD
NO SUCH FUNCTION DO YOU WANT HELP [(NO), YES] Y
TYPE ONE FUNCTION PER LINE, FUNCTIONS MAY BE FOLLOWED BY AN ITERATION
COUNT (OPTIONAL).  FUNCTIONS MAY BE SEPARATED BY A DELAY. (1-250 MS)
(OPTIONAL).  ANY CODE FOLLOWED BY A "!" WILL BE EXECUTED ONLY ONCE

EXAMPLE:  REW!    (REWIND ONCE)
            1     (ITERATION COUNT FOR REWIND COMMAND)
          WRT     (WRITE)
           20     (ITERATION COUNT)
          RPR     (REPOSITION RECORD COMMAND)
          -20     (REVERSE DIRECTION 20 RECORDS)
          RED     (READ)
           20     (ITERATION COUNT)
          REW     (REWIND)
          END     (END OF USER SEQUENCE)

FUNCTION CODES ARE LISTED BELOW:

ACS (ACCESS), AVL (AVAILABLE), CHD (COMPARE HOST DATA),
ERA (ERASE), GUS (GET UNIT STATUS), ONL (ONLINE), ABO (ABORT),
RPR (REPOSITION-RECORD), RPF (REPOSITION-FILE), REW (REWIND),
SUC (SET UNIT CHARACTERISTICS), WRT (WRITE), WTM (WRITE TAPE MARK),
RED (READ), END, RDC (READ COMPARE), GCS (GET COMMAND STATUS).

FUNC>
```

Definitions of the prompts in the previous example are as follows:

- NEW PARAMETERS WANTED [(YES), NO, SHOW, HELP]

  This question allows you to enter new parameters if you answer YES (default), or it saves and reuses parameters entered from a previous run if you answer NO. If you answer SHOW, it displays the currently entered parameters. If you answer HELP, the program produces a help file that explains the meaning and affect of each question in the conversational mode of program operation.

- RANDOM BYTE COUNT [(YES),NO]

  This question allows you to select a random or selected byte count /record. If you answer YES (default), the program generates a random byte count to be used for each record. If you answer NO, the program accepts user input as the specified byte count.

- BYTE COUNT [(2048), 18 – 16383 (D)]

  This question is asked only if you answered NO to the previous question, indicating that you wanted a fixed byte count. Your input is then used as the byte count supplied to the program. If you answered YES to the previous question, this question is not asked.

- SELECT DATA PATTERN [(0), 0 – 9 (D)]

  This question allows you to select a data pattern. Pattern 0 (default) randomly selects all patterns. Table A–1 lists the available patterns.

- DATA [ ]

  This prompt allows you to input 16 unique data words that can be used to fill the write buffer, but only when you have specified pattern 7 in response to the previous question. If the write buffer to be used in any particular write operation is longer than 32 bytes, then user input data is replicated as many times as required to fill the buffer.

- TYPE FUNCTIONS WANTED – TERMINATE WITH AN "END"

  This prompt allows you to state the functions that comprise the user selected operating sequence no default allowed.

Table A–1   Data Patterns

Pattern	Description
0	All data patterns, selected sequentially
1	All zeros pattern
2	All ones pattern
3	Alternating zeros and ones pattern
4	2 bytes ones, two bytes zeros — peak shift pattern
5	4 bytes ones, four bytes zeros
6	3 bytes zeros, one byte ones
7	16 words of user selected data (Conversation Mode Test)
8	256 bytes of incrementing data from 0 through 255
9	256 bytes of random data
10	10 bytes — worst case flux reversal
11	32 bytes — worst case flux reversal 2
12	4 bytes — peak shift (hex 6c, ff, 43, 0)
13	32 bytes — floating ones pattern
14	32 bytes — floating zeros pattern
15	2 bytes — alternating bit pattern
16	2 bytes — square pattern (hex ca, 35)
17	32 bytes — individual peak shift pattern

NOTE

All patterns are used by default, and are reproduced the required number of times to fill a large buffer. For example, if pattern 8 is selected for use in a buffer of 1024 bytes in length, it is reproduced 4 times.

A.4 Error Messages

Error messages have the following format:

```
Pass 1  Test 5  Subtest 0  Error 6  21-AUG-1990 11:23:26.14
Device fatal error while testing XXXX:
UNIT FAILED TO CORRECTLY EXECUTE A COMMAND
FAILING COMMAND: READ
REASON FOR FAILURE: DRIVE ERROR, DETECTING PROCESS: VMS
PRVIOUS COMMAND: REPOSITION RECORD,  PATTERN NUMBER:16
BYTE/ACTION COUNT 31727, 420 RECORDS/FILE
LAST RECORD COMPLETE: 1, CURRENT FILE NUMBER: 1
Item Count Completed: 0

        PACKET SENT:
        0000003F
        00000001
        00000021
        00001000
        00023FE0
        00000000
        00000000

        PACKET RECEIVED:
        0000003F
        00000001
        000B1008
        00001000
        00000000
        0000001F
```

NOTE
**All packet data is hexadecimal. Data in each packet is not
"indexed" for specific definition. For example, byte 6 is not keyed
into a specific ASCII message. Rather, if you request extended
error message information, you need to understand the meaning
of each field in the display.**

A.5   Event Flags

Flag definition is as follows:

- EF 4 — Enable Data Comparisons on All Read Operations

  When this flag is set, data comparisons are performed 100 percent of the time. When this flag is reset (default), data comparisons are performed n percent of all read operations. N percent is system-tuned to permit all units to stream most of the time.

- EF 5 — Disable All Data Comparisons

  This flag, when set, overrides the aforementioned flag and consequently inhibits all data comparisons. With this flag reset (default), the previous flag (EF 4) controls the program operation.

- EF 6 — Inhibit Autodrop

  This flag, when set, prohibits the program from dropping any unit that has exceeded the specified failure rate. When this flag is reset, the program drops any unit that has exceeded the specified failure rate.

- EF 7 — Inhibit Auto-Add

  This flag, when user-set, inhibits the program from picking up units that were dropped from testing during a previous test cycle. When set, and the program drops a unit due to an excessive failure rate, the unit stays deselected until you change the event flag or restart the program. If reset, the program attempts to pick up all units previously dropped at the start of a new pass of the test cycle.

- EF 8 — Enable User Selection of the Number of Records Transferred

  This flag, when set, allows you to specify the number of records to be transferred during the program operation. When set, it allows you to shorten the time the unit under test requires to complete an end of pass by controlling the amount of data the unit under test must transfer before test completion. This flag affects only the operation of tests 2 and 3. Default, with the flag reset, is defined as the number of records transferred when the tape goes from BOT to EOT.

A.6 Statistics

Performance statistics contain the following items in the following format:

```
Time: 21-AUG-1990  10:55:04.20

SUMMARY OF ERRORS (THIS PASS) FOR __XXXX

                     WRITE    READ    UNIT ACCESS
STAT ERRS               0       0        0
SOFT ERRS               0       0        0
NON-RECOV               0       0        0
DATA COMP ERRS          0       0        0
OTHERS                  0       0        0
BYTES X-FRRD (X10**4)   0       0        0
TIMES DROPPED:    0
```

Statistics are also maintained for the total run, accumulating data through each end of pass. These are available any time when you type SUMMARY or when the program reaches the final end of pass (end of run). The format of this output is as follows:

```
Time: 21-Aug-1990  12:55:40.20

TOTAL PERFORMANCE SUMMARY FOR _XXXX

                     WRITE    READ    UNIT ACCESS
STAT ERRS               0       0        0
SOFT ERRS               0       2        1
NON-RECOV               0       0        0
DATA COMP ERRS          0       0        0
OTHERS                  0       0        0
BYTES X-FRRD (X10**4)   2       2        2
TIMES DROPPED:  1

**** UNIT FAILED THE SPECIFIED ERROR RATE ****
```

The program displays one of the following messages when the performance statistics are produced at summary time:

```
**** UNIT FAILED THE SPECIFIED ERROR RATE ****,
**** UNIT PASSED THE SPECIFIED ERROR RATE ****,
**** NOT ENOUGH DATA ACCESSED TO DETERMINE ERROR RATES****
```

B
Head Cleaning Procedure

The Tx800 magazine tape subsystem uses the CleaningTape III cartridge (Figure B–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 B–1   CleaningTape III Cartridge
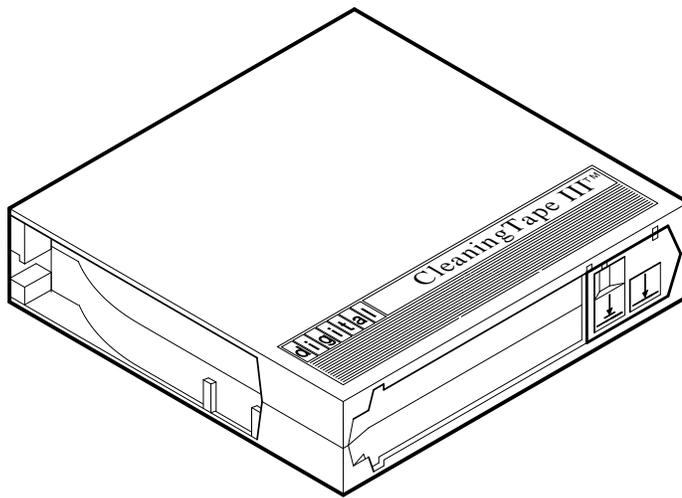
SHR_X1020E_89

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 B.1).

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

    Step 2 is recommended for cleaning the TF857/TF867 and the TZ857 /TZ867. Accessing the tape drive directly as in step 1 above may result in a magazine fault.

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

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

Figure B–2   TK85 Front Panel

CARTRIDGE INSERT/RELEASE HANDLE

SHR-X0056C-90
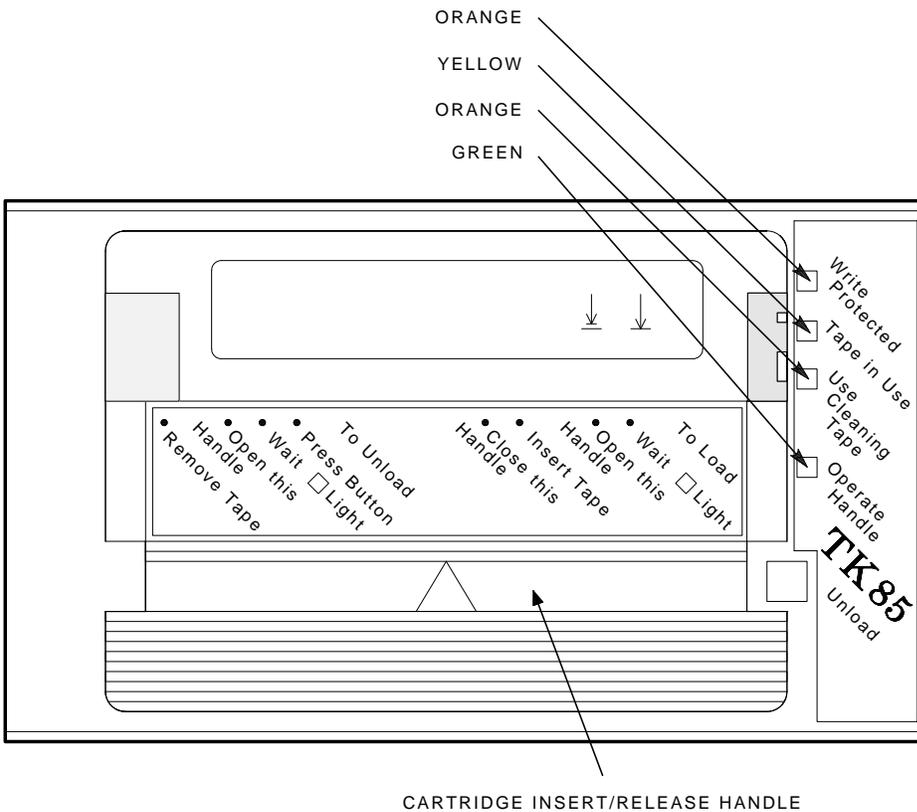
Figure B–3   Tx800 Operator Control Panel

SHR_X1025E_91
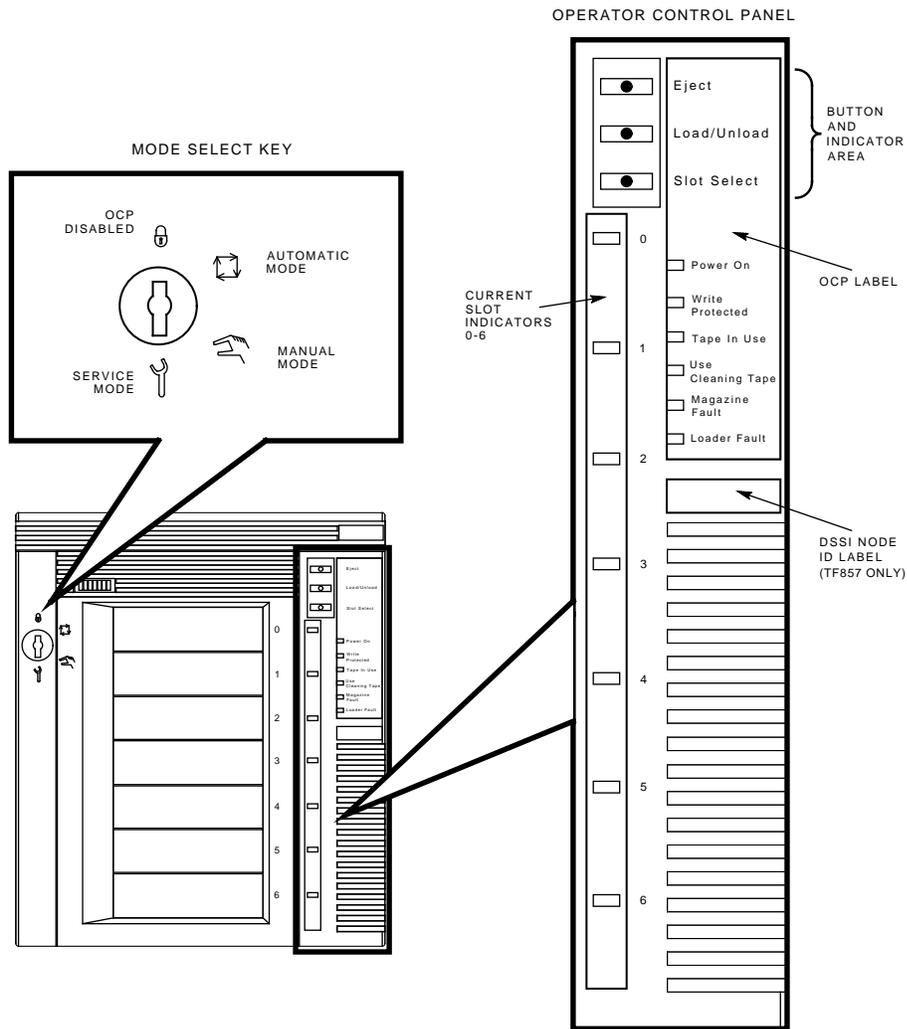
B.1   Accessing the Drive

To access the drive:

1. Be sure that all Tx800 subsystem operations are stopped.

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

3. Set the Mode Select key to Service mode.

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

5. Pull the Tx800 subsystem out of the storage array and toward you by placing your hand under the top of the Tx800 subsystem's front bezel (Figure B–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 B–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 TK85 drive's cartridge entrance (Figure B–2).

Figure B–4   Sliding the Tx800 Subsystem Toward You

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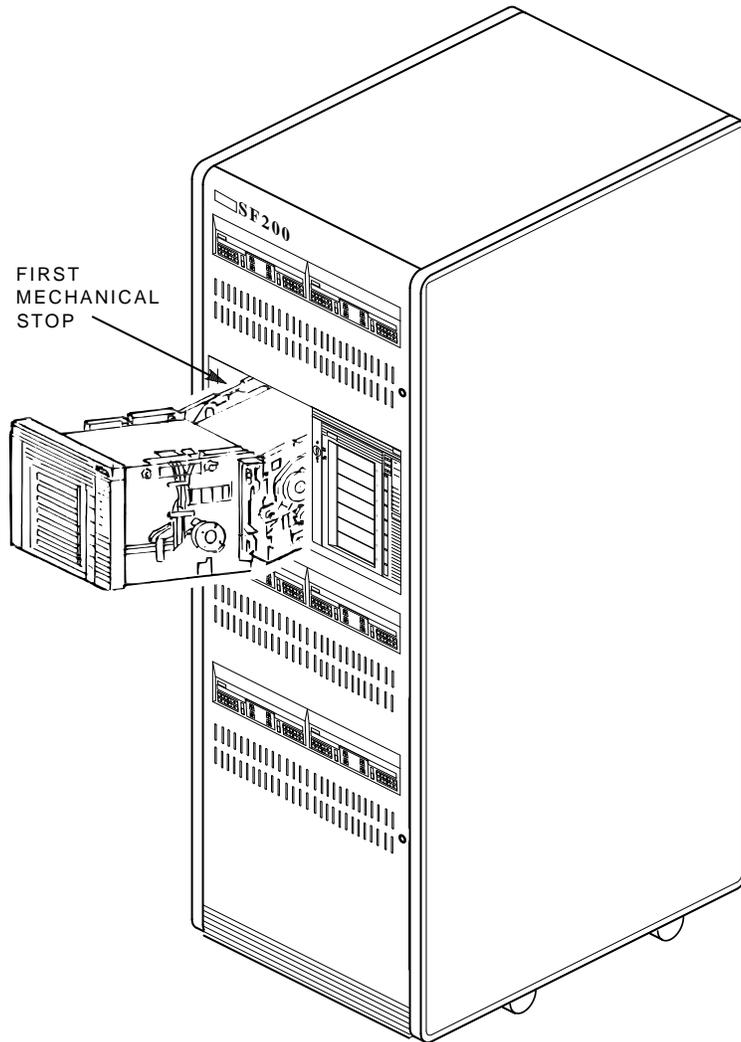
Figure B–5   Loader Open Latch

LOADER OPEN LATCH
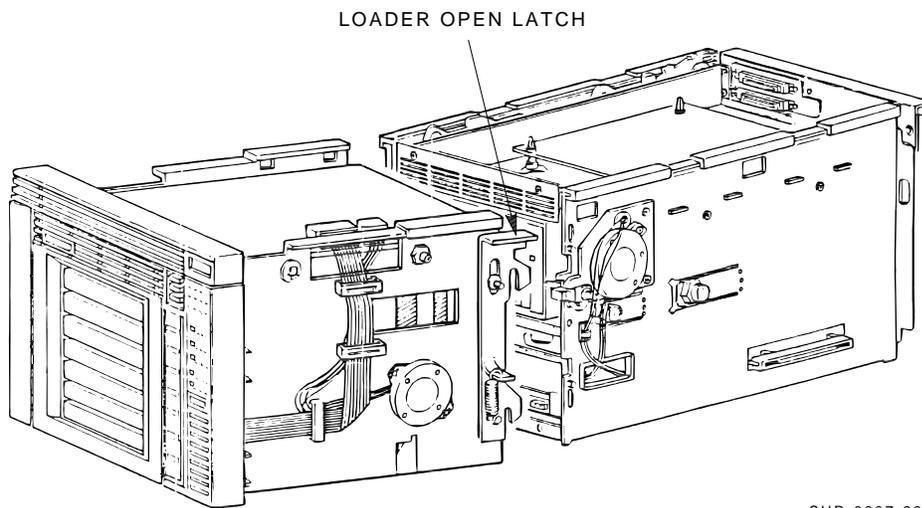
SHR-0007-90
SHR-X0140-90-CPG

B.1.1 Loading the CleaningTape III Cartridge into the Drive

Be sure to use a CleaningTape III cartridge.

NOTE
If a loader fault exists, clear the fault before proceeding.

To load the CleaningTape III cartridge:

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

2. Load the cartridge into the drive.

3. Push the handle closed. The green Operate Handle indicator turns off
    and the yellow Tape in Use indicator begins to blink, indicating the
    tape is loading.

When the cleaning process is finished, the green Operate Handle indicator
turns on and the beeper 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.**

B.1.2 Securing the Tx800 Magazine Tape Subsystem

After cleaning the head by inserting the cartridge directly into the drive,
secure the Tx800 subsystem as follows:

1. Close the loader transfer assembly.

2. Press the Tx800 loader open latch to secure the Tx800 subsystem
    (Figure B–5).

3. Push the Tx800 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 B–6   Loading the Cartridge

SHR-0256-87
SHR_X1093_89_CPG
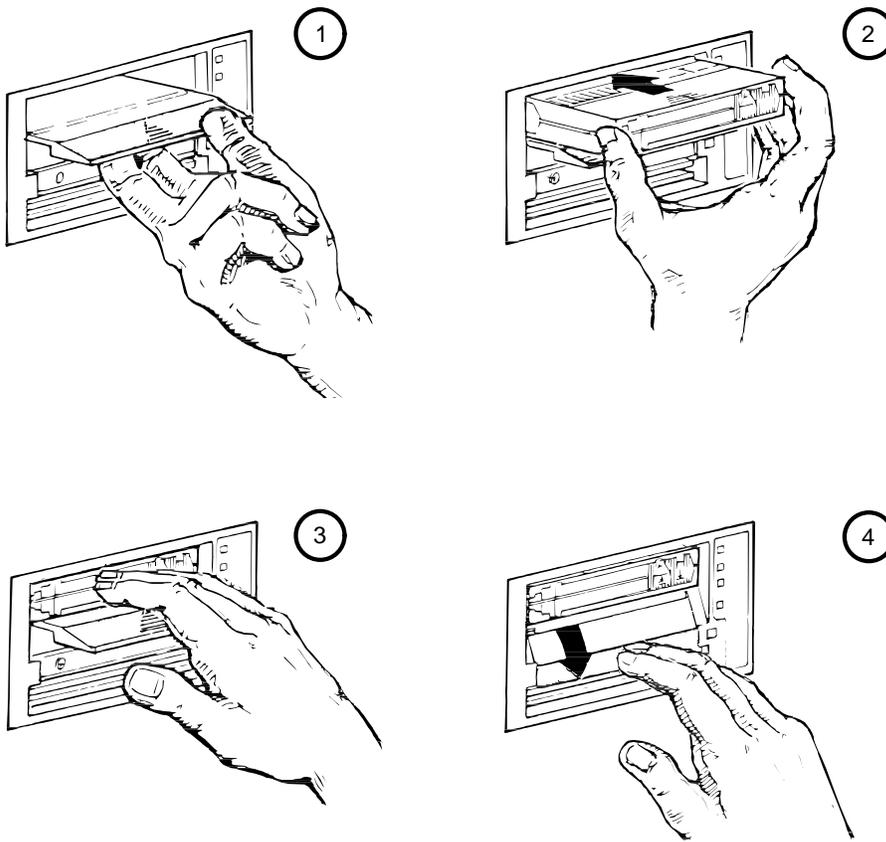
B.2 Inserting the CleaningTape III Cartridge into the Magazine

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 B–3):

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

C
Error Logs

This appendix describes the error information that the TF857 subsystem provides when errors occur.

TMSCP error logs are the most common way for the subsystem to report errors. Standard TMSCP and MSCP error log formats are used, with the device-dependent area containing information specific to the subsystem.

C.1   Media Loader Errors

The following is an example of a media loader error log:

```
|_byte_3_|_byte 2_|_byte_1_|_byte_0_|
_____  Byte
|                                       |  Offset (Hex)
|-        Standard Header          -|
|      ❶ Format = 10,  ❷ Event = 23    |
|-----------------------------------|
|   reserved      | uhvrsn | usvrsn |  20
|-----------------------------------|
|                                   |
|-     Media Loader Identifier    -|
|                                   |
|-----------------------------------|
| ml unit number  | mlhvrsn |mlsvrsn|
❸---------❹-------❺---------❻-----|
|cmd parm|   cmd   | ldr st |ldr err|  30
|-----------------------------------|
|   reserved            |retry ct ❼|
❽------------------❾--------------|
|   slot number   | Event Ref Number|
|---------❿------------------⓫------|
| slot 1 | slot 0 |   tbd   | Err Cnt|
|-----------------------------------|
| slot 5 | slot 4| slot 3  | slot 2 |  40
⓬--------⓭--------⓮----------------|
|mechVrsn| Switch2| Switch1| slot 6 |
|-----------------------------------|
|    ⓯ Cartridge Cycle Count        |
|-----------------------------------|
|ErrTrc3 |Errtrc2 |ErrTrc1 |Errtrc0 ⓰|
|-----------------------------------|
|ErrTrc7 |ErrTrc6 |ErrTrc5 |ErrTrc4 |  50
|-----------------------------------|
|              tbd                  |
|-----------------------------------|
```

Table C–1 defines the media errors that are logged in a media error log.

Table C–1   TF857 Media Errors

Field	Definition
Format code ❶	The format field is set to 10 for Media Loader Log.
Event code ❷	The event code field is set to the event code for Media Loader Error, with an appropriate subcode in the high 11 bits of event code.
Command parameter ❸	Parameter associated with command.
Command ❹	Subsystem command associated with the error.
Loader status ❺	Loader command status.
Loader error code ❻	Error code indicating the most recent subsystem error (Section C.2).
Retry count ❼	Number of retries performed by the subsystem and controller module on the failing command.
Slot number ❽	Current slot number in use or –1 if not applicable.
Event reference number ❾	Same as other logs.
Slot status, slots 0 to 6 ❿	Status bytes indicating the status of each slot and cartridge in the loader transfer assembly including:

Binary	Description
Bits 2–0 — Cartridge Status	
000	No cartridge present.
001	Cartridge in slot.
010	Cartridge in transit.
011	Cartridge in drive.
100	Cartridge missing.
Bit 3 — Cartridge Type	
0	Cartridge is TK50/TK52.
1	Cartridge is TK85.

Field	Definition
Error count ⓫	Number of errors that occurred with the subsystem command that failed during retries. See description of error trace ⓰.
Mechanics version number ⓬	Version number of subsystem mechanics.

Table C–1   (Continued)   TF857 Media Errors

Field	Definition
Switch byte 1 ⑬	Contains information about the state of the OCP indicators and pushbuttons. In each case below, the bit is set to indicate the condition:

Bit	Description
0	Set = Eject button is pressed.
1	Set = Load/Unload button is pressed.
2	Set = Select Slot button is pressed.
3	Set = OCP is disabled.
4	Set = Receiver is closed.
5	Set = 24 V failure.
6	Always 0.
7	Always 1.

Field	Definition
Switch byte 2 ⑭	This status byte indicates the position of the Mode Select key on the TF857 OCP:

Bit	Description
0	Set = Automatic
1	Set = Manual
2	Set = Service
3–5	Set = Reserved
6	Set = 0
7	Set = 1

Field	Definition
Cartridge cycle count ⑮	The total number of load/unload operations that have been performed (the load/unload pair counts as one). This count is saved in nonvolatile memory on the controller module, and is reset only when the controller module is replaced.
Error trace ⑯	If multiple types of errors occur during the retry of a subsystem command, the subsystem generates a list of up to eight error codes that occurred in the subsystem, starting with the most recent error. The error count field contains the number of codes that this list contains.

C.2   TF857 Subsystem Error Codes

Table C–2 lists the TF857 subsystem error codes (see Section C.1,
❻ ldr err).

Table C–2   Error Codes

Hex	Recovery Action	Description
01	C	Task level command communication timeout
02	C	Task level command communication error
03	C	Task level command response length error
04	C	Interrupt level command communication timeout error
05	C	Interrupt level command communication error
06	C	Interrupt level command communication length error
07	C	Interrupt level timeout on reset
80	I	Success
81	F	Invalid loader command
82	F	Undefined error
83	F	Undefined error
84	F	Cartridge slot number unknown
85	F	Lost picker home position
86	F	Lost PICKPOS1
87	F	Timeout moving cartridge to elevator
88	F	Lost home position
89	F	Undefined
8A	F	Stuck at DRIVEPOS
8B	F	Timeout closing drive handle
8C	F	Timeout picker to PICKPOS1
8D	F	Timeout picker to home position
8E	F	Timeout picker to PICKPOS2
8F	F	Undefined error

C = Controller detected loader communication error. Considered fatal.
F = Fatal error.
I = Informational, no error.
R = Reissue the command that failed.
R1 = First execute SCAN MAGAZINE, then reissue original command.
R2 = First unload the cartridge from the drive, then retry the command.
R3 = If occurs as the only error, treat as code R2. If second error after either a 94H or
A9H, then this is fatal.

Table C–2   (Continued)   Error Codes

Hex	Recovery Action	Description
90	F	No cartridge in drive
91	F	Lost PICKPOS2
92	R	Timeout opening drive handle
93	R	Timeout finding picker home position
94	R	Timeout moving cartridge from drive
95	R	Timeout elevator to slot position
96	R	Timeout finding PICKPOS1
97	R	Timeout cartridge to slot
98	I	Timeout finding picker home position
99	R1	Timeout elevator to DRIVEPOS
9A	R	Timeout finding PICKPOS2
9B	R	Cannot open receiver
9C	R	Failed to find all slots
9D	R	Timeout during scan
9E	R	Timeout leaving DRIVEPOS
9F	F	Undefined error
A0	F	Cartridge already in drive
A1	F	No cartridge in slot
A2	R1	Timeout elevator to slot position
A3	R	Timeout finding PICKPOS1
A4	R	Timeout cartridge to elevator
A5	R	Timeout finding home position
A6	R1	Timeout elevator to drive
A7	R	Timeout opening drive handle
A8	R3	Timeout cartridge to drive
A9	R	Timeout finding PICKPOS2
AA	I	Reserved—not an error
AB	R2	Timeout on picker park
AC	F	Timeout closing drive handle
AD	F	Timeout moving to park position
AE	F	Timeout cartridge to slot
AF	F	Undefined error

Table C–2   (Continued)   Error Codes

Hex	Recovery Action	Description
B0	F	24 volt error
B1	F	Standalone jumper in place
B2	I	Receiver open
B3	I	Reset
B4	R1	Timeout prepositioning
B5	R1	Failed to find all slots
B6	F	EEPROM failure
B7	F	Undefined error
B8	F	URART test failed
B9	F	EEPROM full
BA	F	EEPROM checksum failed
BB	F	RAM error
BC	F	ROM error
BD	F	CTC error
BE	F	Cannot write to EEPROM
BF	F	Undefined error

C = Controller detected loader communication error. Considered fatal.
F = Fatal error.
I = Informational, no error.
R = Reissue the command that failed.
R1 = First execute SCAN MAGAZINE, then reissue original command.
R2 = First unload the cartridge from the drive, then retry the command.
R3 = If occurs as the only error, treat as code R2. If second error after either a 94H or A9H, then this is fatal.

C.3   TF857 Subsystem Command Codes

Table C–3 lists the TF857 subsystem commands and their codes (see Section C.1, ❹ cmd).

Table C–3   Command Codes

Hex	Description	Number of Command Bytes	Number of Reply Bytes	Timeout
C4H	Send status	1	11	100 ms
C5H	Load cartridge	2	1	50 s
C6H	Unload cartridge	1	1	60 s
C7H	Scan magazine	1	1	20 s
C8H	Open receiver	1	1	20 s
C9H	Set current slot	2	1	100 ms
CAH	Set write-protect	1	1	100 ms
CBH	Clear write-protect	1	1	100 ms
CCH	Set motion	1	1	100 ms
CDH	Set rewind	1	1	100 ms
CEH	Set stop	1	1	100 ms
CFH	Set unload	1	1	100 ms
D0H	Set drive error	1	1	100 ms
D1H	Clear drive error	1	1	100 ms
D2H	Set loader error	1	1	100 ms
D3H	Clear loader error	1	1	100 ms
D4H	Set select	1	1	100 ms
D5H	Clear select	1	1	100 ms
D6H	Set eject	1	1	100 ms
D7H	Clear eject	1	1	100 ms
D8H	Set load	1	1	100 ms
D9H	Clear load	1	1	100 ms
DAH	Enter diagnostic mode	Varies	Varies	None
DBH	Set cycle count	5	1	100 ms
DCH	Report cycle count	1	5	100 ms
DDH	Report revision	1	7	100 ms
DEH	Set slot status	3	1	100 ms
DFH	Set drive type	2	1	100 ms

Table C–3   (Continued)   Command Codes

Hex	Description	Number of Command Bytes	Number of Reply Bytes	Timeout
E0H	Preposition	2	1	10 s
E1H	Execute diagnostic	2	Varies	Varies
E2H	Execute loopback	2	Varies	None
E3H	Set head cleaning	1	1	100 ms
E4H	Clear head cleaning	1	1	100 ms
E5H	Flash head cleaning	1	1	100 ms
E6H	Flash write-protect	1	1	100 ms
E7H	Extended scan magazine	1	1	90 s
E8H	Set error code	3	1	100 ms

NOTE
In the case of a multibyte command, the controller module does not act on the command until it receives all bytes. If it receives an undefined command, the controller module reports an invalid command error.

D
TF/TZ 85/86 Removal and Replacement Procedure

This appendix describes the removal and replacement procedure for the TF/TZ 85/86 series of subsystems.

D.1 Preliminary Steps

To begin the removal and replacement procedure:

1. Use all ESD procedures

2. Disconnect power

3. Disconnect external cables from the rear of the panel

D.1.1 Removing the Enclosure Top

To remove the enclosure:

1. Remove the two screws at the rear of the enclosure.

2. Lift the rear of the enclosure and remove the top.

D.1.2 Removing the Fan

To remove the fan:

1. Disconnect the internal cables

2. Remove the four screws that secure the fan

D.1.3 Removing the SCSI ID Switch and Cable

To remove the SCSI ID switch and cable:

1. Disconnect the SCSI ID cable from the controller module.

2. Remove the two screws, inside the rear panel, that secure the SCSI ID switch assembly to the panel.

D.1.4 Removing the Internal SCSI Bus Cable

To remove the internal SCSI bus cable:

1. Disconnect the internal SCSI bus cable from the controller module.

2. Remove the four screws, at the rear panel, that secure the two SCSI bus connectors.

D.1.5 Removing the Controller Module

To remove the controller module:

1. Disconnect the internal cables connected to the controller module.

2. Press the two metal locking tabs at the rear of the controller module to release the module.

D.1.6 Removing the Power Supply

To remove the power supply:

1. Loosen the two captive screws securing the power supply.

2. Place the power supply outside the enclosure.

3. Disconnect the input power wires.

4. Release the input power wires from the power supply housing by squeezing the grommet that secure the cable to one another.

5. Cut the tie-wraps to release the output power wires from the housing.

D.1.7 Removing the Drive

To remove the drive:

- Remove the controller module (Section D.1.5).

- Disconnect the power cable and the drive-to-controller cable from the drive.

- Remove the two screws on the left that secure the drive bracket to the enclosure floor.

- Align the bracket keyholes with the screws and lift the drive/bracket assembly from the enclosure.

- Remove the bracket from the drive.

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2 TF/TZ 85/86 Removal and Replacement Procedure
   Preliminary Steps