# TF837 Magazine Tape Subsystem Service Manual

**Digital Equipment Corporation**

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# About This Manual

## Manual Structure

Chapter 1, Overview, provides a basic product description of and specifications for the TF837 magazine tape subsystem. It also contains dual-host information relating to the TF837 subsystem.

Chapter 2, Operation, describes the keys and indicators on the operator control panel (OCP), the operating modes of the Mode Select key, and the magazine and cartridge removal and replacement processes.

Chapter 3, Power-On Self-Test, describes the loader transfer assembly, TK71 tape drive, and DSSI bus controller module activities during POST. POST errors in EEPROM and POST failures are included.

Chapter 4, Local Programs and Utilities, describes local diagnostic programs and utilities, and the SET HOST/DUP command.

Chapter 5, Problem Resolutions, Error Conditions, and Jam Recovery, describes failures in the TF837 subsystem and how to recover from them.

Chapter 6, Removal and Replacement, describes how to remove and replace subsystem FRUs and how to perform the warm swap procedure.

Appendix A, Head Cleaning, describes how to access the tape drive to clean the read/write heads.

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

Appendix C, Wiring, provides a diagram of the wiring connections in the TF837 magazine tape subsystem.

## Intended Audience

This manual is for use by Customer Services field engineers.

## Conventions

The term *TF837 subsystem* refers to the TF837 magazine tape subsystem. This manual uses both terms.

# 1
# Overview

This chapter provides a general description of the TF837 magazine tape subsystem.

## 1.1  Product Description

The TF837 magazine tape subsystem (Figure 1–1) is a data storage device that can store approximately 2 Gbytes of data using 7 CompacTape II cartridges. It can store up to 296 Mbytes of data per CompacTape II cartridge.

In addition, the TF837 subsystem combines automatic cartridge loading capabilities with a TK71 tape drive. The TF837 subsystem can load and unload tape cartridges into and from the tape drive, providing a degree of unattended backup, as well as perform single cartridge operations. The TF837 subsystem performs automatic, sequential tape operations.

The TF837 subsystem can be configured on VAX systems with a DSSI (Digital Storage System Interconnect) device, supported under the VMS operating system.

The TF837 magazine tape subsystem installs in an SF200 storage array that can contain a maximum of two TF837 subsystems. The first TF837 subsystem installs in position 5; a second TF837 subsystem installs in position 6 (Figure 1–2).

**NOTE**
**The SF200 storage array can also contain other Digital storage devices such as the RF72 series disk drives. For more information about the SF200 storage array, refer to the *SF200 Storage Array Installation Guide*.**
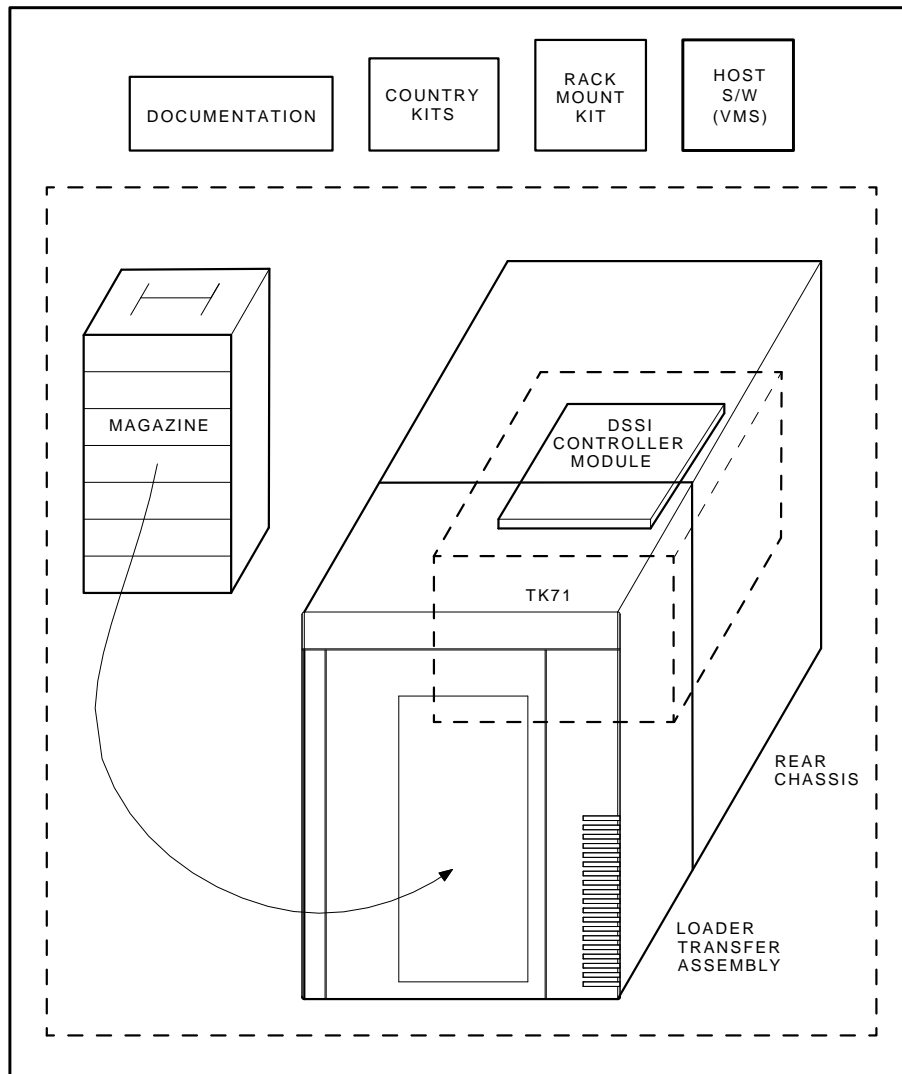
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**Figure 1–1    TF837 Magazine Tape Subsystem Block Diagram**
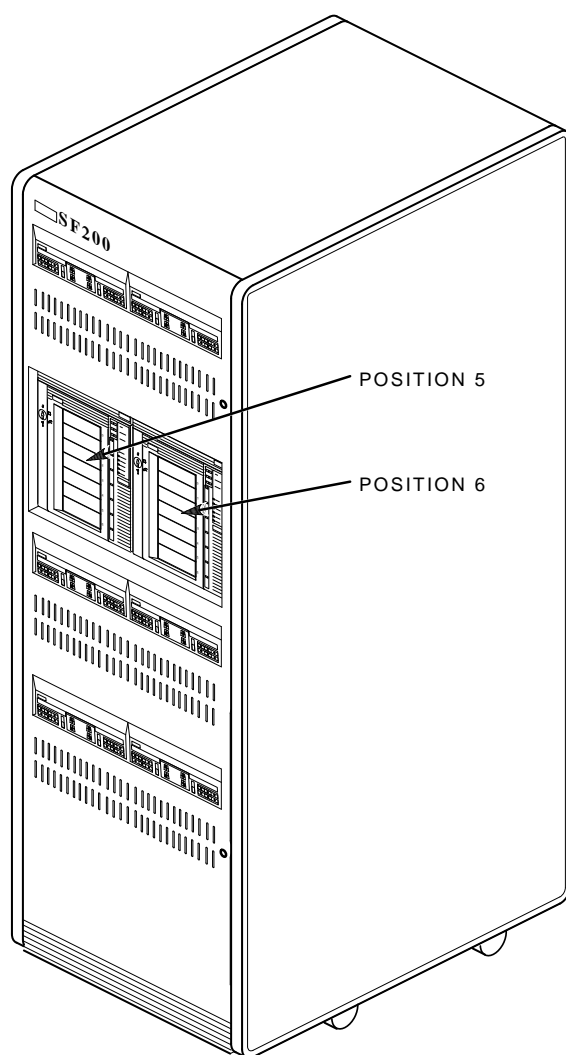
CXO-2461B
SHR_X1106A_89

**Figure 1–2    SF200 Storage Array**

## 1.2   Operating Modes

The TF837 subsystem operates in the following modes:

- **OCP Disabled mode**  — Locks the subsystem into the enclosure and locks the receiver. The buttons 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 buttons remain enabled.

- **Manual mode** — Locks the subsystem into the enclosure but leaves the receiver unlocked. This mode allows for single cartridge operations only. The OCP buttons remain enabled. 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 to perform the head cleaning, jam recovery, and servicing procedures.

You can select these modes through the Mode Select key (Figure 1–3). Refer to Section 2.3 for more information.

## 1.3   DSSI Node ID Label

The operator control panel has a space for a DSSI node ID label that identifies the device bus ID number (Figure 1–3). The DSSI node ID is preset during manufacturing to its normal setting of zero (0), and should be verified during installation at the customer site.

OPERATOR CONTROL PANEL

MODE SELECT KEY

OCP
DISABLED

AUTOMATIC
MODE

SERVICE
MODE

MANUAL
MODE

Eject

Load/Unload

Slot Select

BUTTON
AND
INDICATOR
AREA

0

Power On

Write
Protected

Tape In Use

Use
Cleaning Tape

Magazine
Fault

Loader Fault

OCP LABEL

CURRENT
SLOT
INDICATORS
0-6

1

2

3

DSSI NODE
ID LABEL

4

5

6
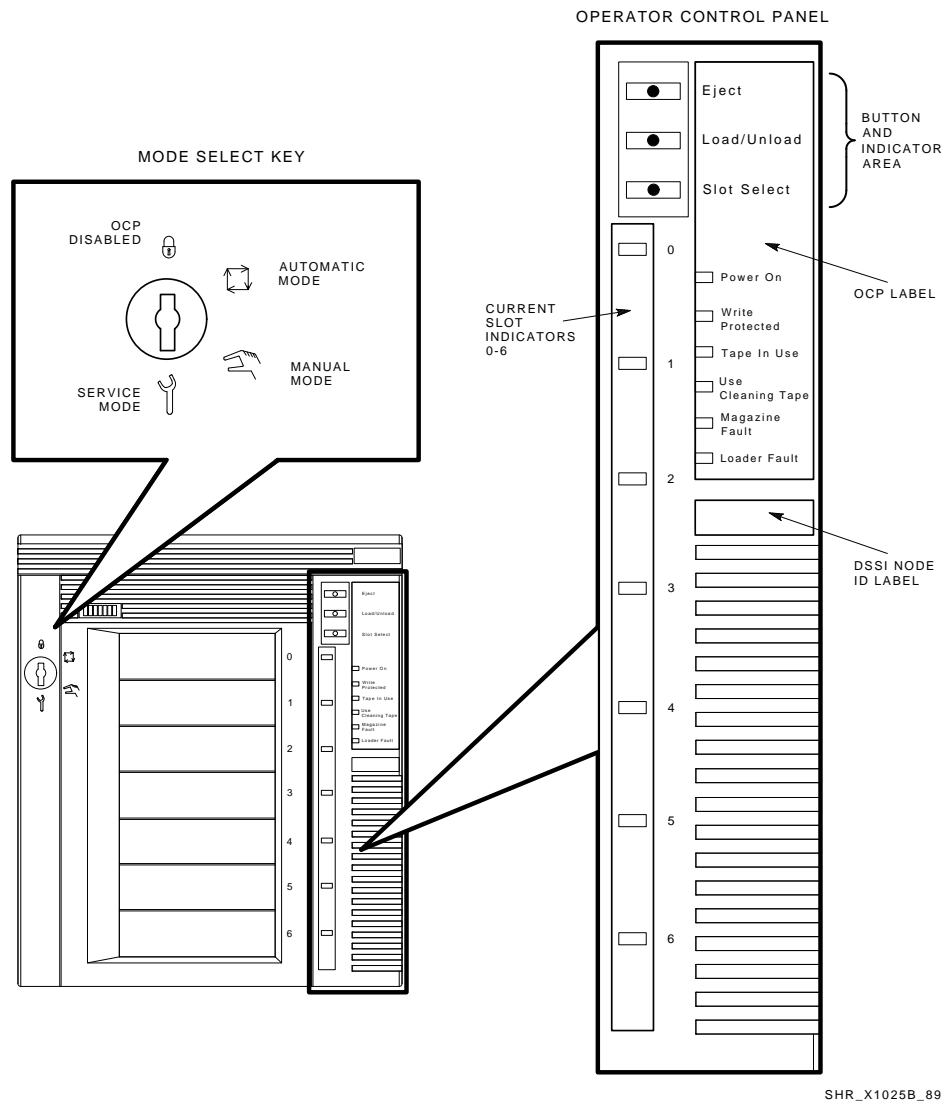
SHR_X1025B_89

**Figure 1–3    Front View of TF837 Magazine Tape Subsystem**

## 1.4   Hardware Components

The TF837 magazine tape subsystem consists of the following major hardware components (Figure 1–4):

- **Loader**

    — Operator control panel (OCP)

    — Magazine

    — Loader transfer assembly consisting of elevator, mechanics, and electronics

- **Rear Chassis**

    — TK71 tape drive

    — Power supply assembly

    — Handle motor assembly

    — Fan

    — Interlock switch

    — DSSI bus controller module

### 1.4.1   Operator Control Panel

The TF837 operator control panel (OCP) (Figure 1–3) contains buttons and indicators that are used with the Mode Select key (Section 2.3).

LOADER TRANSFER ASSEMBLY

DSSI
CONTROLLER
MODULE

INTERLOCK
SWITCH

OPERATOR
CONTROL
PANEL
(OCP)

TK71
TAPE
DRIVE

POWER SUPPLY
ASSEMBLY

HANDLE
MOTOR
ASSEMBLY

FAN
(LOCATED ON
OUTSIDE REAR
OF UNIT)

SHR-X0147A-90-CPG
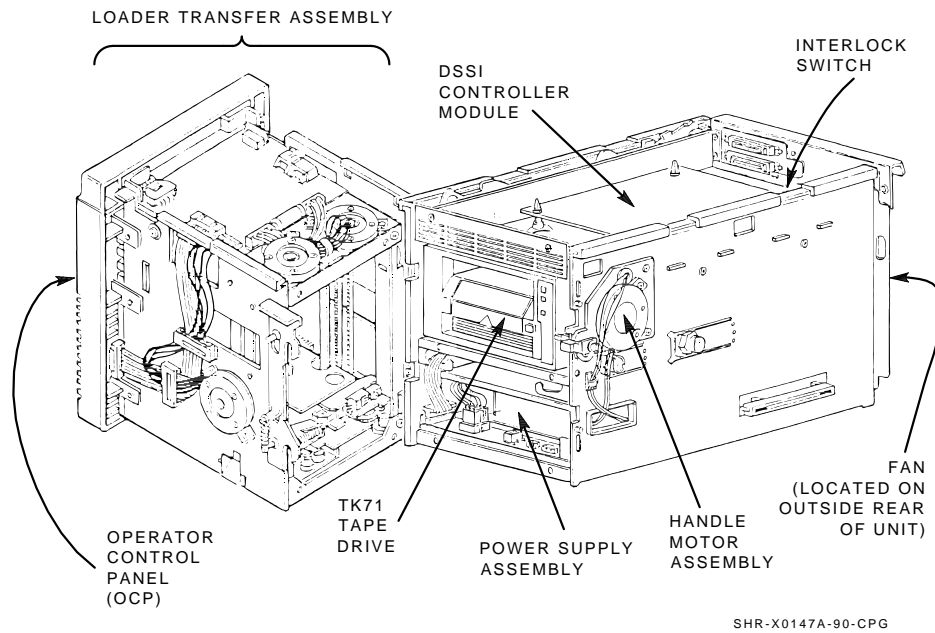
**Figure 1–4    TF837 Magazine Tape Subsystem Components**

### 1.4.2  Magazine

The TF837 subsystem's magazine (Figure 1–5) serves as a removable cartridge container.  The magazine stores up to seven CompacTape II cartridges.

### 1.4.3  Loader Transfer Assembly

The loader transfer assembly (Figure 1–4) 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 tape drive. (The signals that drive the elevator mechanics originate at the loader transfer assembly electronics module.)
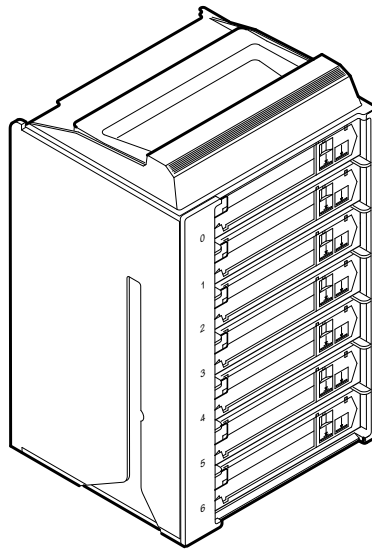


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**Figure 1–5    Front View of TF837 Magazine**

### 1.4.4  Rear Chassis

The rear chassis contains the DSSI bus controller module, power supply assembly, interlock switch, TK71 tape drive, and the handle motor assembly that lifts and lowers the drive's handle when cartridges are ready for insertion into, or removal from, the drive.

### 1.4.5  TK71 Tape Drive

The TF837 subsystem uses the CompacTape II cartridge (Figure 1–6). It is a 4-inch plastic cartridge containing 600 feet of 1/2-inch magnetic tape. The TK71 tape drive writes 48 tracks on the tape, up to 296 Mbytes per CompacTape II cartridge. The tape drive reads and writes data in a serpentine fashion, traveling the entire length of tape on one track (at approximately 100 inches per second), then reversing direction on the next track.

The maximum time to back up (read or write) on a CompacTape II cartridge in a continual, or streaming, mode is approximately one hour. Therefore, executing a backup to seven cartridges takes approximately seven hours.
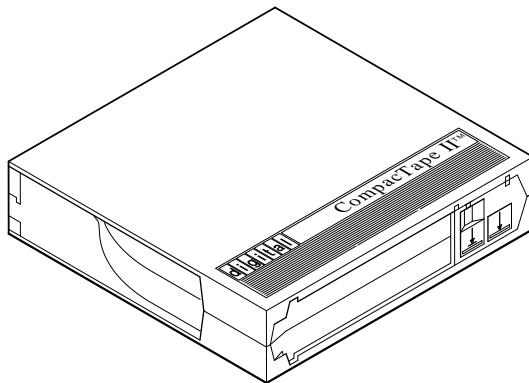
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**Figure 1–6    CompacTape II Cartridge**

Tables 1–1 and 1–2 show the compatibility of CompacTape and CompacTape II cartridges with the TK71 tape drive.

**Table 1–1  Noninitialized Cartridge Compatibility**

|  | CompacTape | CompacTape II |
|---|---|---|
| TK71 drive | Not supported (See Caution below) | Yes |

**Table 1–2  Initialized Cartridge Compatibility**

|  | TK50 Initialized Cartridge | TK70 Initialized Cartridge | TK71 Initialized Cartridge |
|---|---|---|---|
| TK71 drive | Read-only | Read/write | Read/write |

**CAUTION**
**If you load a CompacTape cartridge into the drive, the subsystem will initialize the drive; however, a higher incidence of errors or data corruption is likely to occur.**

### 1.4.6  DSSI Bus Controller Module

The TF837 magazine tape subsystem connects to the host system through a DSSI bus. The physical interface is a TFK70 DSSI controller module that resides in the rear chassis of the TF837 subsystem (Figure 1–4).

A serial communications path passes commands, messages, data, and error information between the TFK70 DSSI controller module and the loader transfer assembly. A second serial path does the same between the TFK70 DSSI controller module and the TK71 tape drive.

## 1.5 Service Features

The TF837 magazine tape subsystem has these service features:

- Power-on self-testing (POST) for the electronics and mechanics associated with the loader transfer assembly, the TK71 tape drive, and the DSSI bus controller module

- Automatic calibrating of the TK71 tape drive

- Automatic home positioning of the elevator (home position is down)

- Interlocking circuitry that disables 24 Vdc to the loader transfer assembly when the TF837 subsystem is pulled out of the enclosure for either head cleaning or servicing

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

## 1.6 Dual-Host Configuration

Although the TF837 subsystem is not a dual-host device, it can be used in a dual-host configuration as a dual-*ported* tape subsystem.

While a dual-ported TF837 subsystem can establish two virtual circuits (one to each host), only one tape connection (to one of the two hosts) is actually made. This connection is made by the host that configures the TF837 subsystem first. Once connected, the TF837 subsystem can be accessed through that host only.

### 1.6.1  Accessing the TF837 Subsystem through a Specific Host

To access the TF837 subsystem through a specific host, you must power on that host first. This tape connection is permanent until the host system or the TF837 subsystem is powered down. If the current host is powered down, the TF837 subsystem automatically connects to the other host.

Certain conditions cause the TF837 subsystem to disconnect from the original host and randomly reconnect to one of the two hosts. It is not evident which host establishes the tape connection. To determine the tape status, check both hosts. Some conditions that can cause this are:

1.  Reinitialization through the DUP command

2.  Power-on of the TF837 subsystem

3.  Virtual circuit closed by port for certain errors; for example, transmission failure

## 1.7  TMSCP Communications Protocol

The TF837 magazine tape subsystem conforms to Digital's protocol for tape mass storage communications. As with other TMSCP subsystems, the controller module is the logical area that contains the intelligence to perform detailed I/O handling tasks. This arrangement allows the CPU to send command messages (requests for reads or writes) to the controller and receive messages from the controller.

## 1.8  Software Support

The TF837 magazine tape subsystem is supported by VMS version 5.4 or later.

## 1.9  Related Documentation

Table 1–3 lists references that supplement this manual.

**Table 1–3   Related Documentation**

| Title | Audience | Order Number |
|---|---|---|
| *TF837 Magazine Tape Subsystem Owner's Manual* | System managers and operators | EK–TF837–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 |
| *Guide to VAX/VMS Disk and Magnetic Tape Operations* | System managers and operators | AI–Y506B–TE |
| *VAX/VMS Error Log Utility Reference Manual* | System managers and operators | AA–Z402B–TE |

## 1.10  Diagnostics Listing

Table 1–4 lists the TF837 magazine tape subsystem diagnostics.

**Table 1–4   TF837 Magazine Tape Subsystem Diagnostics**

| Diagnostic | Component Tested | Reference Chapter |
|---|---|---|
| POST | TFK70 DSSI controller module | 3 |
| POST | Loader transfer assembly | 3 |
| POST | TK71 tape drive | 3 |
| Local diagnostic programs | TF837 magazine tape subsystem | 4 |

## 1.11   Specifications

Table 1–5 lists the specifications for the TF837 magazine tape subsystem, and Table 1–6 lists those for the TK71 tape drive.

**Table 1–5   TF837 Magazine Tape Subsystem Specifications**

| Characteristic | Specification(s) |
|---|---|
| Height | 264.7 mm (10.42 in) |
| Width | 222.0 mm (8.74 in) |
| Length | 685.4 mm (26.98 in) |
| Weight | 22.1 kg (55 lb) |
| Noise level | 62 dB |
| Electrical power requirements | 120 V at 60 Hz or 220/240 at 50 Hz |
| Environmental temperature, operating | 10°C to 40°C (50°F to 104°F) |
| Environmental temperature, nonoperating | –40°C to 66°C (–40°F to 150.8°F) |
| Humidity, operating | 20% to 80% noncondensing |
| Humidity, nonoperating | 10% to 95% |
| EMI certification | Meets applicable FCC, VDE, and FTZ standards for Class A devices |
| Safety certification | Meets UL, CSA, GS mark, VDE, and IEC standards |
| Maximum number of cartridges for TF837 magazine tape subsystem | 7 |
| Power consumption | 60 W |
| Communications interface | DSSI bus |
| Cycle time | 50 s (maximum) |

**Table 1–6   TK71 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 (45 tracks) |
| Bit density | 10,000 bits/in |
| Number of tracks | 48 |
| Transfer rate (at tape) | 125 Kbytes/s |
| Tape speed | 100 in/s |
| Track format | Multiple track serpentine recording |
| Cartridge capacity | Up to 296 Mbytes, formatted (approximately) |
| Power requirements | 12 V ± 5% @ 1.6 A (2.4 A surge), 75 mV ripple peak-to-peak |
| | +5 V ± 5% @ 1.1 A (1.5 A surge), 75 mV ripple peak-to-peak |
| Power consumption | |
| Drive | 40 W (maximum) |
| Host adapter | 15 W (maximum) |

# 2
# Operation

This chapter describes the functions of the operator control panel, magazine, Mode Select key, and DSSI node ID label on the TF837 magazine tape subsystem.

## 2.1  Operator Control Panel

The TF837 operator control panel (OCP) (Figure 2–1) contains buttons and indicators that are used with the Mode Select key (Section 2.3).

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

**NOTE**
**The Eject, Load/Unload, and Slot Select buttons have indicators within them, and are operable only when their corresponding indicators are on.**

**The Load/Unload button has three functions: load, unload, and reset. In the event of a malfunction, if the Loader Fault or Magazine Fault indicator is on, press the Load/Unload button to reset the TF837 subsystem.**

### 2.1.1  Disabling the Operator Control Panel

To disable the operator control panel (OCP), set the Mode Select key to OCP Disabled mode (Figure 2–1). This mode prevents unwanted manual intervention when the TF837 subsystem is running unattended.
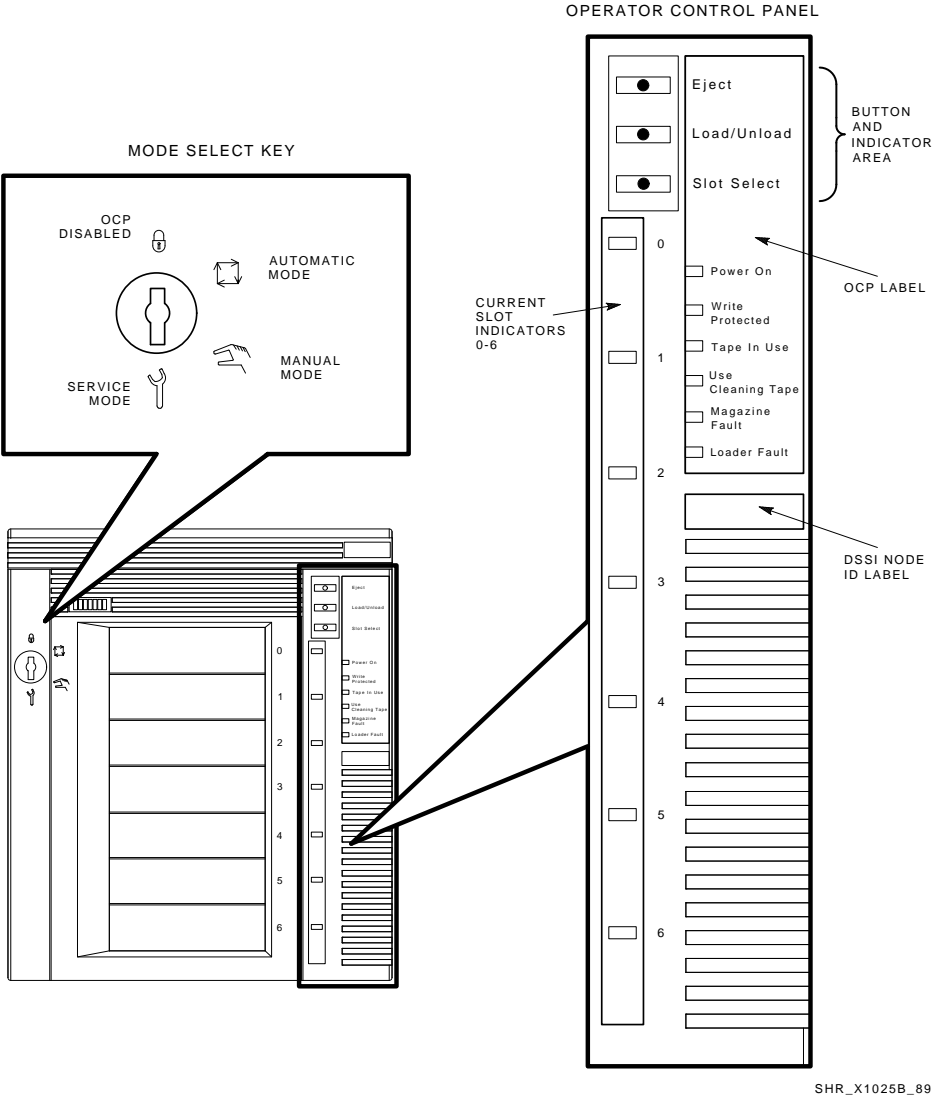
Figure 2–1    TF837 Operator Control Panel

**Table 2–1   TF837 Operator Control Panel**

| Button/Indicator | Color | Function |
|---|---|---|
| Eject button | NA | Opens the receiver, allowing access to the magazine for removal and insertion of cartridges. Also can be used to unload the tape from the drive. |
| Eject indicator | Green | When on, indicates that pressing the Eject button opens the receiver. When off, inhibits switch function; no effect. |
| Load/Unload button | NA | Loads the currently selected cartridge into the TK71 tape drive, or unloads the cartridge currently in the tape drive. |
| | | If the Loader Fault or Magazine Fault indicators are on, can also be used to reset the subsystem. |
| Load/Unload indicator | Green | When on, indicates that you can press the Load/Unload button. When off, inhibits switch function; no effect. |
| Slot Select button | NA | When pressed, increments the current slot indicator to the next slot. |
| Slot Select indicator | Green | When on, indicates that pressing the Slot Select button will increment the current slot indicator to the next slot. When off, indicates that the switch function is disabled. |
| Power On indicator | Green | When on, indicates the TF837 magazine tape subsystem is in a known good power state (ac and dc voltages are within tolerance). When off, indicates that the power is missing from the loader. |
| Write Protected indicator | Orange | When on, indicates that the cartridge currently in the drive is write-protected.[1] When off, indicates that the current cartridge is write-enabled. |
| Tape In Use indicator | Yellow | Indicates tape drive activity as follows: |

[1]Cartridges can be write-protected in three ways:

- Setting the write-protect tab to write protect

- Using software write-protect qualifiers (See your operating system documentation.)

- Using a CompacTape cartridge originally written to by a TK50 tape drive (read-only)

**Table 2–1 (Cont.)   TF837 Operator Control Panel**

| Button/Indicator | Color | Function |
|---|---|---|
| | | Slow flashing indicates tape is rewinding; rapid flashing indicates tape is reading or writing. |
| | | When on, indicates that the tape is stopped. |
| | | When off, indicates that no tape is in the drive. |
| Magazine Fault indicator | Red | When on, indicates a magazine failure. When off, indicates that there is no magazine failure. |
| Use Cleaning Tape indicator | Orange | Not implemented in TF837 subsystem. |
| Loader Fault indicator | Red | When on, indicates a TF837 loader transfer assembly error or drive error. When off, indicates no loader fault. |
| Current slot indicators 0–6 | Green | When on, identifies the current slot (see Slot Select button). Each current slot indicator flashes when its corresponding cartridge is moved to or from the drive. Also used with the Magazine Fault or Loader Fault indicator to show the type of fault. |
| | | During BACKUP command execution in either Automatic or OCP Disabled mode, the current slot indicators flash as the storage capacity of each tape cartridge is used. |

## 2.2   Magazine

This section describes how to remove the TF837 magazine (Figure 2–2) from the receiver, load and unload cartridges into and from the magazine, and restore a magazine to the receiver.

### 2.2.1   Removing the Magazine from the Receiver

To remove the magazine from the TF837 subsystem, first:

1. Be sure that the Power On indicator is on (Figure 2–1).

2. Be sure that the Eject indicator is on before you press the Eject button.

Then:

1. Press the Eject button (Figure 2–1) (indicator must be on).  The receiver opens slightly.

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

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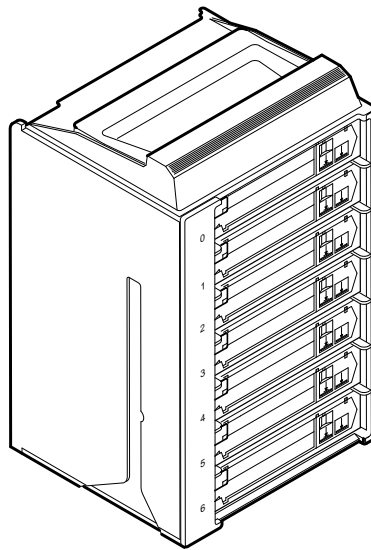


SHR_X1023A_89

**Figure 2–2    Front View of TF837 Magazine**

SHR-X0045-90
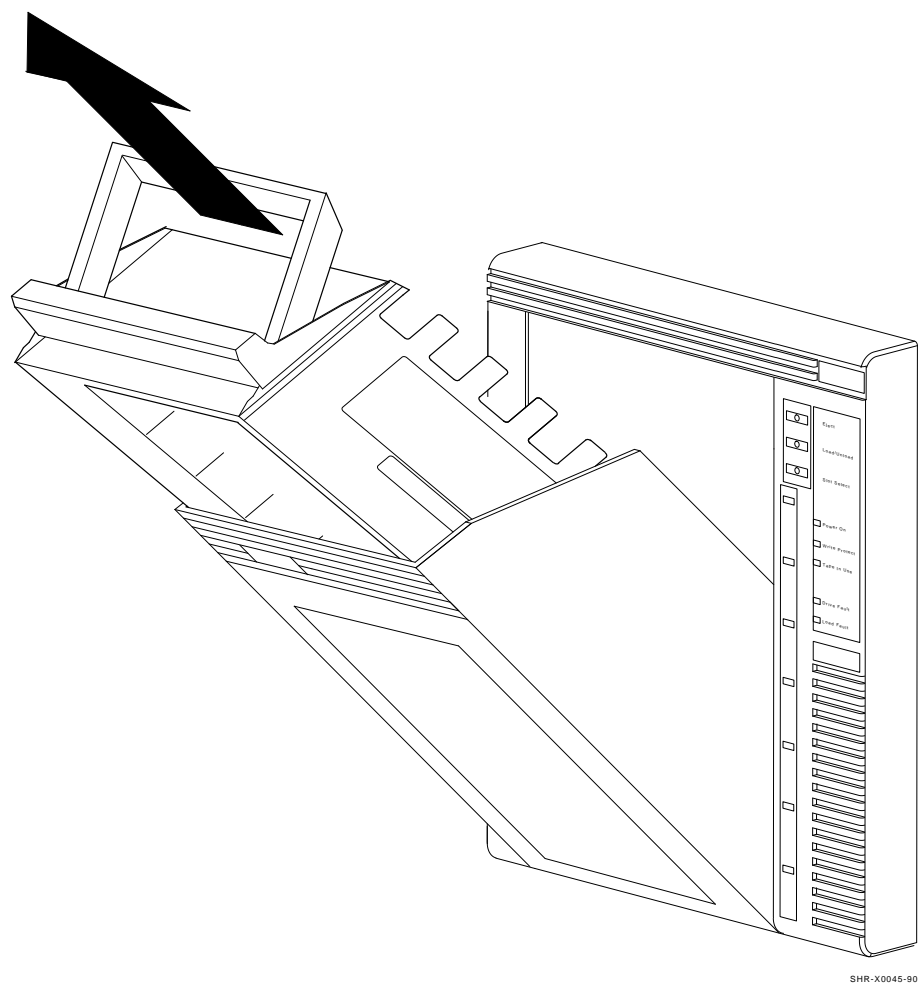
**Figure 2–3     Receiver Opened**

### 2.2.2  Loading Cartridges into the Magazine

To load a cartridge:

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

2.  Set the cartridge's write-protect tab to the desired position. (For backup operations, set the write-protect tab to the write position. You can set the write-protect tab to write protect when you want the host system to only read data off the tape. Setting the tab to the write-protect position helps ensure data integrity.)

3.  Load the cartridge into the desired magazine position at the front of the magazine (Figure 2–5) until you hear a "click" (each magazine position is spring-loaded).

**NOTE**
**All cartridges must be loaded at the *front* of the magazine. The front of the magazine shows the numbers 0 through 6, signifying the number of the slot.**
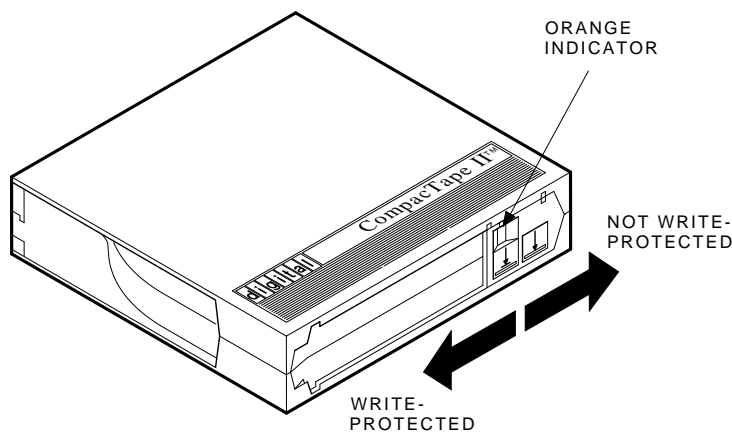


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**Figure 2–4    Write-Protect Tab on a CompacTape II Tape Cartridge**

BACK OF
MAGAZINE

NOTE: Push tape in
until a click is heard

1

2   3

SLOT
NUMBERS
0-6
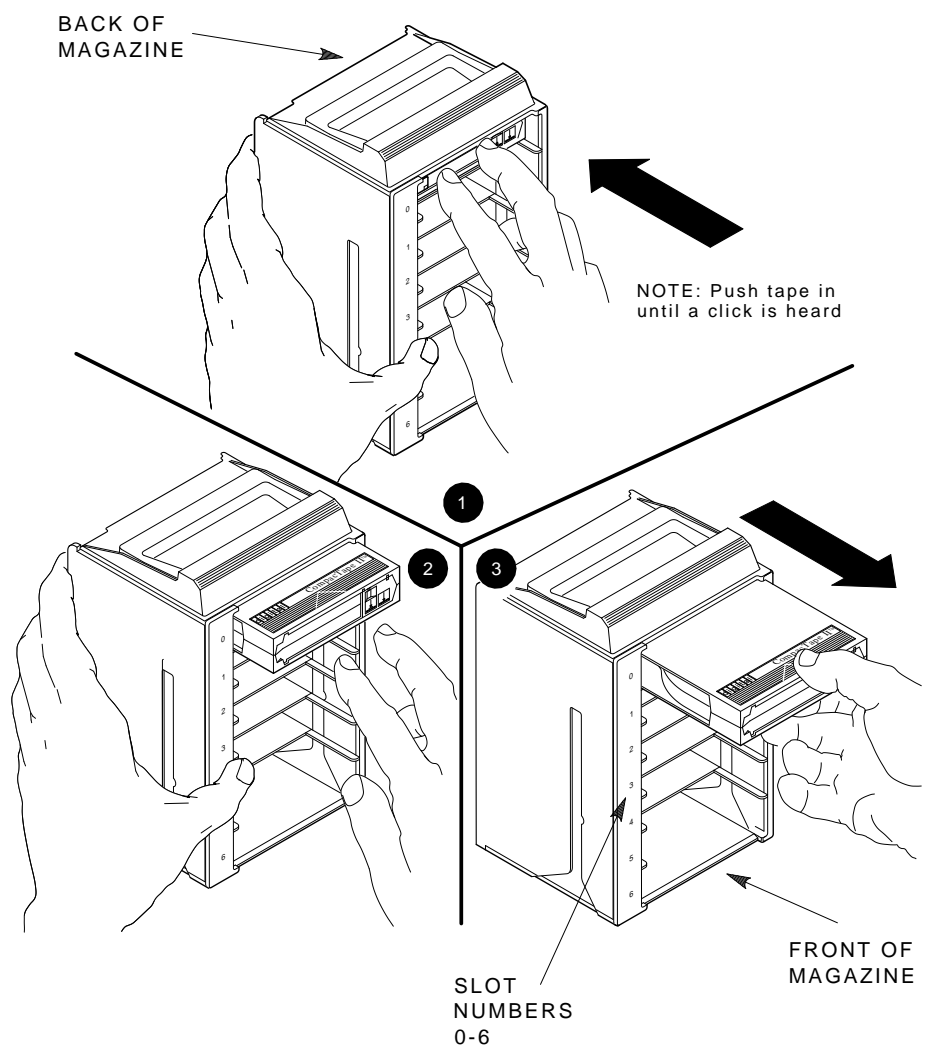
FRONT OF
MAGAZINE

SHR_X1021_89

**Figure 2–5    Loading a Cartridge into the Front of the Magazine**

### 2.2.3  Unloading Cartridges from the Magazine

To unload a cartridge from the magazine, press the cartridge at the front of the magazine.  After pressing the cartridge in all the way, it "springs forward," toward you.

**NOTE**
**Always be sure to load and unload cartridges at the front of the magazine.**

**Never apply labels to the top or bottom of tape cartridges.  Doing so can cause cartridge jams in the TF837 subsystem.**

### 2.2.4  Restoring the Magazine to the Receiver

To restore the magazine to the receiver:

1.  Slide the magazine into the receiver (Figure 2–3).  Since the magazine is slotted, you can restore it only in the correct orientation.

2.  Push the receiver closed.

3.  Be sure that the receiver is fully closed in the TF837 subsystem before proceeding.

## 2.3  Mode Select Key

The Mode Select key (Figure 2–1) can lock the loader transfer assembly into the enclosure as well as lock the magazine closed.

The Mode Select key has four modes; three modes are for operational use, and one is for head cleaning and servicing:

- OCP Disabled
- Automatic
- Manual
- Service

### 2.3.1  Operating Modes

The following modes are for operational use:

- **OCP Disabled 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 tape
  cartridge is exceeded, or no tape cartridge is in the next sequential
  slot in the magazine.

  To lock the TF837 subsystem into the enclosure and lock the receiver,
  set the Mode Select key to **OCP Disabled** mode. The OCP indicators
  are disabled.

- **Automatic mode** — Is the default, or "normal," mode of the TF837
  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 tape cartridge is exceeded, or no tape cartridge is in the next
  sequential slot in the magazine.

  To lock the TF837 subsystem into its normal operating position in the
  enclosure but leave the receiver unlocked, set the Mode Select key to
  **Automatic** mode. The receiver can be opened; all OCP buttons are
  enabled.

- **Manual mode** — Is similar to Automatic mode, with one major
  exception. In Manual mode, you select one tape cartridge at a time;
  then press the Slot Select button to select the next cartridge. This
  mode is most useful for, but not restricted to, copying specific files to
  or from tape.

  To lock the TF837 subsystem into the enclosure, set the Mode Select
  key to **Manual** mode. The receiver is unlocked and can be opened; all
  OCP buttons are enabled.

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

### 2.3.2  Service Mode

Use Service mode to perform head cleaning, jam recovery, and servicing procedures.

To unlock the TF837 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.

Two mechanical stops (Figure 2–6) are associated with Service mode: first and second. The first stop allows you to pull the TF837 subsystem forward from the enclosure to:

- Remove a faulty loader transfer assembly

- Remove a faulty operator control panel

- Remove a faulty power supply

- Perform the head cleaning procedure

By pressing the first stop, you can access the the second stop, which allows you to pull the rear chassis forward from the cabinet. This position provides access to the following FRUs:

- TK71 tape drive

- Handle motor assembly

- TFK70 DSSI controller module

For specific instructions about how to access the internal assemblies of the TF837 subsystem, see Chapter 5.

SECOND
MECHANICAL
STOP

FIRST
MECHANICAL
STOP

MECHANICAL
EJECTION LEVER

SHR-0012-90
SHR-X0147C-90-CPG
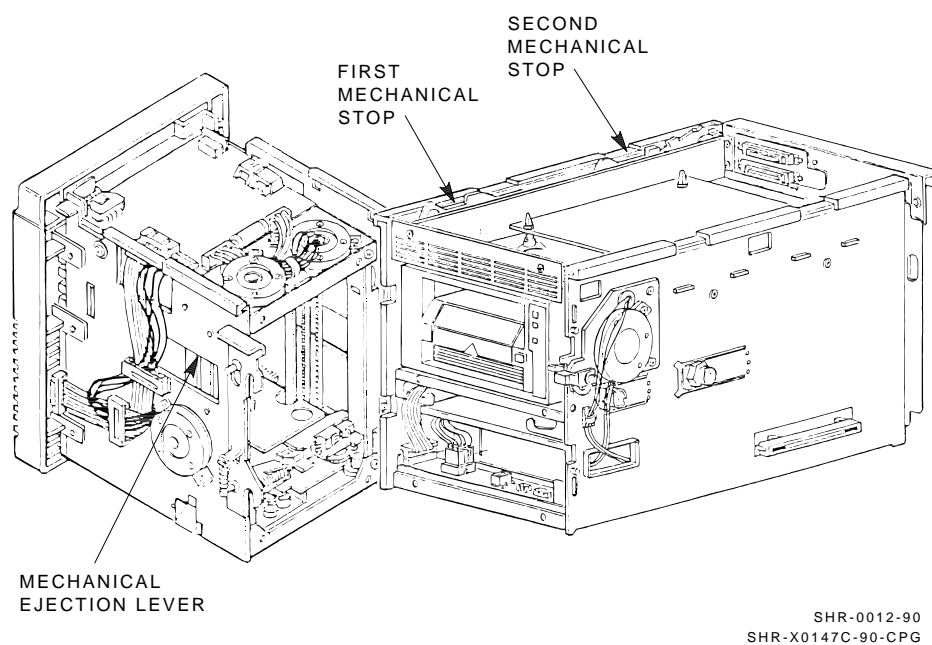
**Figure 2–6    Mechanical Stops Associated with Service Mode**

# 3
# Power-On Self-Test

This chapter describes the power-on self-test (POST) sequence associated with three major TF837 magazine tape subsystem assemblies:

Loader transfer assembly
TK71 tape drive
TFK70 DSSI controller module

## 3.1  TF837 Initialization

Powering on the TF837 subsystem initiates POST and initializes the subsystem.

During POST, all of the subsystem's OCP indicators turn on—including the Magazine Fault and Loader Fault indicators, generally within 15 seconds. Then, if no errors occur, the TFK70 DSSI controller module turns off the OCP indicators, except for Power On, and initiates a magazine scan.

Once initialization is complete, the Slot Select, Load/Unload, and Eject buttons become active, provided the Mode Select key is in any position other than OCP Disabled.

Upon successful execution of POST, and assuming the TF837 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]

POST failures display in the Magazine Fault and Loader Fault indicators. For information on magazine and loader faults, refer to Chapter 5.

---

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

## 3.2   Loader Transfer Assembly

This section describes how POST operates within the loader transfer assembly. Information includes mechanical status and drive handle status checks.

Some POST tasks and subtests are as follows:

- Tests ROM, RAM, and CTC

- Initializes channel A (RS422 host port)

- Initializes CTC, RAM, and EEPROM

- Initializes loader transfer assembly mechanics

- Initializes the loader transfer assembly electronics

- Sets motors, sensor indicators, and OCP indicators to default states

### 3.2.1   Checking Mechanical Status

Before checking mechanical status, the loader transfer assembly checks the status of the drive handle. If the drive handle is up (open), POST closes it (provided the cartridge is not in transition in the drive).

During POST, the loader transfer assembly checks whether the:

- Picker arm moved to its home position (down) (Figure 3–1)

- Elevator contains a cartridge

- Elevator moved to its home position

If the elevator contains a cartridge, the following process occurs:

1. The subsystem restores the cartridge to its original slot.

2. The subsystem moves the elevator to its home position.

3. POST determines whether the receiver is open.

4. If the receiver is closed, the elevator moves to slot 0. (During this move operation, the elevator's ELEVPOS sensor scans the magazine slots to determine which slots contain cartridges and the type of cartridge (CompacTape or CompacTape II cartridge) in those slots.)

PICKER ARM
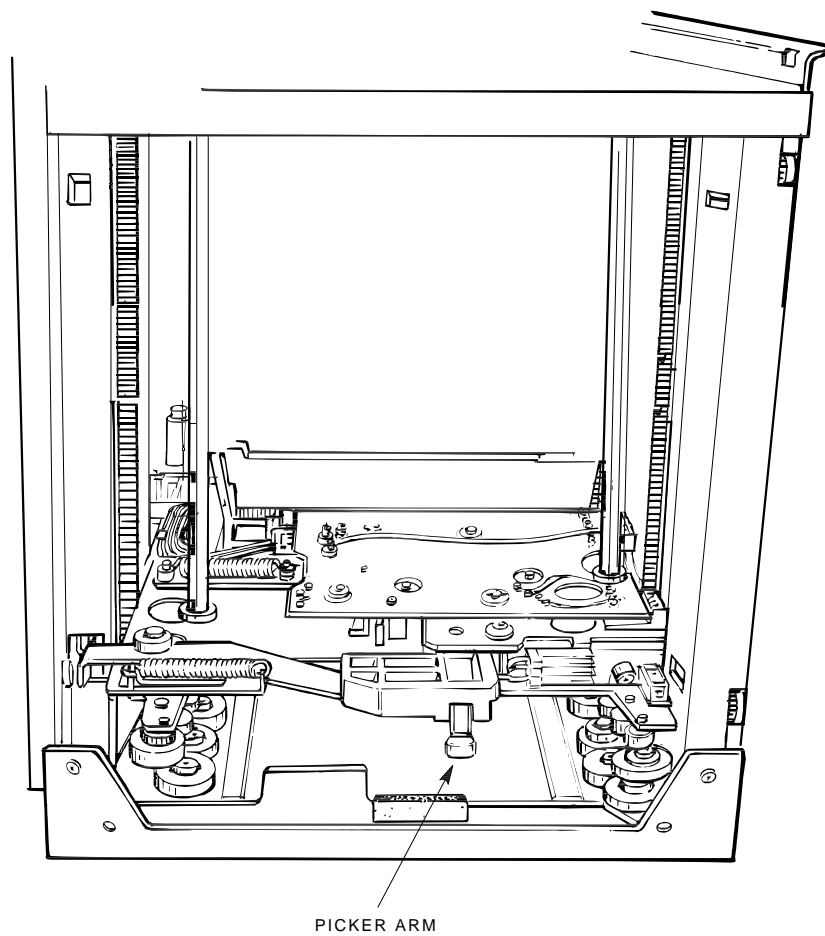
SHR-0060-89
SHR_X1080_89_CPG

**Figure 3–1    Home Position of the Elevator**

## 3.3  TK71 Tape Drive

The TK71 drive module executes POST during power-up or reset.
Successful execution of POST is indicated by the Magazine Fault indicator
(on the TF837 OCP) turning off and remaining off.

## 3.4  TFK70 DSSI Controller Module

Successful execution of POST on the TFK70 DSSI controller module
is indicated by the module's green indicator (Figure 3–2). Successful
execution takes approximately 4 seconds. The red indicators on the
module indicate POST failure (the green indicator is not on).

**NOTE**
**If the TFK70 DSSI controller module fails POST, the controller
module does not establish communications with the loader
transfer assembly. All OCP indicators should remain on, except
for the Loader Fault indicator.**

Table 3–1 describes the fatal POST codes that the red indicators display.

**Table 3–1   TFK70 DSSI Controller Module POST Error Codes**

| Code[1] | Description |
| --- | --- |
| 11111 | 68000 tests never started executing |
| 00001 | 68000 CPU test error |
| 00010 | 68000 EEPROM test error |
| 00011 | 68000 tri-ported RAM test error |
| 00100 | EEPROM test error |
| | |
| 00101 | SWIFT chip test error |
| 00110 | SWIFT external loopback test error |
| 00111 | 68000 semaphore register test error |
| 01000 | Subsystem UART test error |
| 01001 | Subsystem UART external loopback test error |
| | |
| 01010 | BUDI chip test error |
| 01011 | Interprocessor communication test error (68000 detected) |
| 01100 | Watch dog timer test failed |
| 01111 | 80186 CPU test error |
| 10000 | 80186 EEPROM test error |

[1](MSB)XXXXX(LSB)

**Table 3–1 (Cont.)    TFK70 DSSI Controller Module POST Error Codes**

| Code[1] | Description |
|---|---|
| 10001 | 80186 local RAM test error |
| 10010 | 80186 timers test error |
| 10011 | Gap detection test error |
| 10100 | 80186 MPSC command channel test error |
| 10101 | 80186 MPSC command channel external loopback test error |
| 10110 | 80186 MPSC data channel test error |
| 10101 | 80186 MPSC data channel external loopback test error |
| 11000 | Drive cable test error |
| 11001 | 80186 semaphore register test error |
| 11010 | Interprocessor communication error (80186 detected) |
| 11100 | Reset encountered but not expected |
| 11101 | Unable to write error to EEPROM |
| 11110 | Local 68000 memory verification error (TPRAM) |
| 11111 | Unexpected exception |

[1](MSB)XXXXX(LSB)

### 3.4.1  Recording POST Errors in EEPROM

TFK70 DSSI controller module errors found during POST are recorded in on-board EEPROM. The error data consists of error codes, test numbers, and indicator error codes.

Although POST errors are recorded in EEPROM, testing continues through the last test. The error indicators on the controller module reflect the last POST error detected, but the EEPROM retains error data from the last ten test failures.

**NOTE**
**You can access the POST errors by using the DUP local program, HISTRY (Section 4.7).**
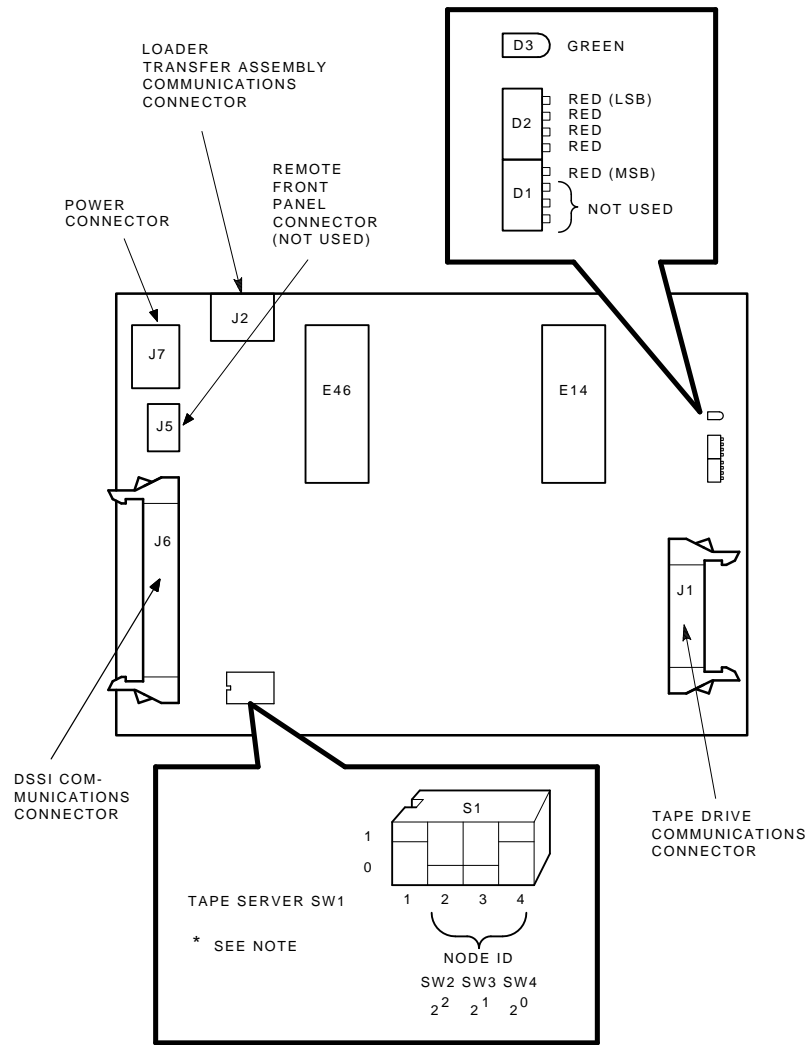
SHR-X0055-90

**Figure 3–2    TFK70 DSSI Controller Module Diagnostic Indicators**

## 3.5   Power-On Self-Test Failures

POST failures usually indicate a failing FRU. Chapter 6 describes the
removal and replacement procedures for failing FRUs.

# 4
# Local Programs and Utilities

This chapter describes how to to access resident local programs and utilities on the TF837 magazine tape subsystem.

**NOTE**
**You need specific privileges to access these programs and utilities.**

The local programs and utilities described in this chapter are:

- **PARAMS** (Parameter Configuration Utility) — Displays or changes subsystem parameters (Section 4.2).

**NOTE**
**The following programs are used primarily for diagnostic purposes.**

- **DIRECT** (Directory) — Lists the available local programs (Section 4.3).

- **DRVTST** (Drive Test) — Verifies the correct functioning of subsystem hardware (Section 4.4); it is a comprehensive subtest of DRVEXR.

- **DRVEXR** (Drive Exerciser) — Exercises the TF837 subsystem and TK71 tape drive (Section 4.5).

- **LOADER** — Exercises the internals of the loader transfer assembly (Section 4.6).

- **HISTRY** (Historical Statistical Data) — Displays information about the TF837 subsystem (Section 4.7).

- MAGTST (Magazine Test) — Examines the types of cartridges in the magazine (Section 4.8).

- MAGINI (Magazine Test and Initialization) — Executes the MAGTST utility and destroys any existing labels and an amount of data that may be on the cartridge (Section 4.9).

## 4.1 Accessing Local Programs

Access local programs with the VMS command:

```
$ SET HOST/DUP
```

If you have the correct VMS system privileges, this command allows you to access the local programs, which reside in ROM on the TF837 subsystem. If you execute **SET HOST/DUP**, communications between the host system and the TF837 subsystem are through diagnostic utilities protocol (DUP). Drive operations under DUP are controlled through the local programs. When you exit the program, control returns to the operating system.

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

```
$ SHOW DEVICES MI (or SHOW CLUSTER)  ; to learn the nodename
                                     ; 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
```

**NOTE**
**A typical example of a device nodename is T7X3MA. This default nodename is comprised of the module serial number, which is assigned randomly during manufacturing. You can change this nodename by using the PARAMS utility.**

**Note also that you can substitute any of the previously listed programs and utilities after the qualifier /TASK.**

### 4.1.1 Error Message after Executing SET HOST/DUP

If you receive an error message when using the SET HOST/DUP command, 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
```

## 4.2   PARAMS Utility

Use the **PARAMS** utility to display or change internal parameters for the TF837 magazine tape subsystem. The subsystem's parameters are factory set, but system managers may want to change them.

Once you invoke the PARAMS utility through **SET HOST/DUP**, the terminal displays the following prompt:

```
PARAMS>
```

This prompt indicates that you have accessed the PARAMS utility.

Table 4–1 lists the subsystem parameters accessible at the PARAMS> prompt.

### 4.2.1   Displaying, Setting, and Saving Parameters

At the PARAMS> prompt, you can use the following commands:

- **SHOW /ALL** to display subsystem parameters
- **SHOW parameter** to display a specific parameter
- **SET parameter** to set a parameter
- **WRITE** to save changes to parameters

**Table 4–1   Summary of TF837 Subsystem Parameters**

| Parameter | Definition |
| --- | --- |
| UNITNUM | The TMSCP unit number. |
| SYSTEMID | The DSSI bus controller module's 48-bit system ID. |
| NODENAME | The nodename for the TF837 subsystem. |
| FORCENAME | 1 = Default nodename in use. (Derived from the subsystem serial number.)<br><br>0 = Uses value set in NODENAME. |
| FORCEUNI | Determines whether the TMSCP unit number, or DSSI node ID is used.<br><br>1 = Uses the DSSI node ID.<br><br>0 = Uses the TMSCP unit number. |
| CSHFLTM0 | Cache flush timer. Maximum seconds required for tape server to wait for cache to empty following a tape server disconnect sequence. Zero indicates no timeout. The default value is 60 seconds.<br><br>If the tape server cannot flush its write-back cache and perform a cleanup sequence, the controller module will reset and restore itself. |
| DATAOPTMO | Data operation timer. Maximum time for a data operation to complete. Zero indicates no timeout. The default value is 180 seconds.<br><br>A data operation is defined as the time it takes to complete an end-to-end data transfer between the system and either the tape or the cache, depending on the transfer mode. If the data operation cannot complete within the timeout period, the controller module will bugcheck and reset itself. |
| SYSTIME | Displays the current time and date in machine-readable format. |

### 4.2.1.1 SHOW /ALL Command

Use the SHOW /ALL command to display the settings of subsystem parameters:

```
PARAMS> SHOW /ALL
```

When typing the **SHOW /ALL** command, be sure to leave a space between SHOW and /ALL. The SHOW /ALL command displays the following:

```
Parameter          Current            Default        Type    Radix
---------          -------            -------        ----    -----

UNITNUM                  0                  0         Word     Dec
FORCEUNI                 1                  1      Boolean     0/1
NODENAME            TFBL50             T74ZJ9       String   ASCII
FORCENAME                1                  0      Boolean     0/1
SYSTEMID     BC2D000D0000       BC2D000D0000     Quadword     Hex
CSHFLTMO                60                 60         Word     Dec
DATAOPTMO              180                180         Word     Dec
SYSTIME     000000021D481D80   000000021D481D80   Quadword     Hex
```

**NOTE**
**To display a specific parameter, type SHOW parameter.  For example, SHOW SYSTEMID.**

### 4.2.1.2 SET Command

Use the **SET** command to change internal TF837 subsystem parameters. Table 4–1 summarizes SET and SHOW command parameters.

The syntax for the SET subsystem command is:

```
PARAMS> SET parameter value
```

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

**NOTE**
**Use the WRITE command to save the changes made while using the SET command.**

### 4.2.1.3 WRITE Command

Use the **WRITE** command to save, in nonvolatile memory, the changes
you have made using the PARAMS utility. The WRITE command is
similar to the VMS SYSGEN WRITE command. Refer to the following
example:

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

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

### NOTE
**To save changes made using PARAMS, you must answer YES.**

This sets the TF837 subsystem's nodename to TAPE1, and the TMSCP
unit number to 18. Executing **WRITE** and answering **YES** to the question
saves the nodename and unit number in EEPROM.

### NOTE
**When you answer YES to the controller initialization prompt, your
changes take effect immediately and program control returns to
the VMS command prompt. The TF837 subsystem then restarts
and executes the POST sequence.**

### 4.2.1.4 EXIT Command

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

## 4.3   DIRECT Program

The **DIRECT** program provides a directory of all available local programs
resident in the TF837 magazine tape subsystem. An example of a
DIRECT program display follows:

```
Copyright © 1990 Digital Equipment Corporation
DIRECT    V1.0   SD
DRVEXR    V1.0   SD
DRVTST    V1.0   SD
LOADER    V1.0   SD
HISTRY    V1.0   SD
PARAMS    V1.0   SD
MAGTST    V1.0   SD
MAGINI    V1.0   SD
End of Directory
```

## 4.4   DRVTST Program

The **DRVTST** program is a pass/fail test that invokes a comprehensive test of the TK71 tape drive hardware. No statistics are sent to the host upon completion of this test. Testing terminates with either a Test Complete message or a fatal error message. An example of the dialogue follows:

| Message Type | Message |
| --- | --- |
| Information | Copyright © 1990 Digital Equipment Corporation |
| Question | Write/read anywhere on the medium? [1=YES/(0=NO)]<br>Answering 0 (NO) results in a read-only test. (Successful execution of the read-only test requires a previously written tape.) Answering 1 (YES) results in the next question being asked. |
| Question | User data will be corrupted, proceed?<br>[1=YES/(0=NO)]<br>Answering 0 (NO) results in a read-only test. Answering 1 (YES) permits write and read operations anywhere on the tape.<br><br>**CAUTION**<br>**Before answering 1 (YES), be sure a scratch tape is installed.** |
| Information | 8 minutes to complete. |
| Termination | Completed. |
| Fatal error | Unit is currently in use. |
| Fatal error | Operation aborted by user. |
| Fatal error | XXXX – Unit diagnostics failed.<br>XXXX is either a program error or loader error. Note loader errors start with FFXX. |
| Fatal error | XXXX – Unit read/write test failed.<br>XXXX equals failure data described in TMSCP error specification. |

**NOTE**
**If the write-protect switch on the tape cartridge is set to write-protect, and the answer to the second question above is 1 (YES), the device does not allow the test to run and the error message** 2006 – Unit read/write test failed **displays. In this case, the test has not failed but was prevented from running.**

## 4.5   DRVEXR Progam

The **DRVEXR** program exercises the TK71 tape drive. It is an intensive
data transfer test and indicates the overall integrity of the device. The
dialogue for DRVEXR includes:

| Message Type | Message |
|---|---|
| Information | Copyright © 1990 Digital Equipment Corporation |
| Question | Write/read anywhere on the medium? [1=YES/(0=NO)]<br>Answering 0 (NO) results in a read-only test. Successful operation of the read-only test requires a previously written tape. Answering 1 (YES) results in the next question being asked. |
| Question | User data will be corrupted, proceed?<br>[1=YES/(0=NO)]<br>Answering 0 (NO) results in a read-only test. Answering 1 (YES) question permits write and read operations anywhere on the tape.<br><br>**CAUTION**<br>**Before answering 1 (YES), be sure a scratch tape is installed.** |
| Question | Test time in minutes? [10-100]<br>Answering from 10 to 100 minutes runs the test for the time you specify. |
| Information | ddd minutes to complete. |
| Information | dddddddd bytes read. |
| Information | dddddddd bytes written. |
| Termination | Complete. |
| Fatal error | Unit is currently in use. |
| Fatal error | Operation aborted by user. |
| Fatal error | XXXX – Unit diagnostics failed. |
| Fatal error | XXXX – Unit read/write test failed. |

**NOTE**
**If the write-protect switch on the tape cartridge is set to write-protect,
and the answer to the second question above is 1 (YES), the device does
not allow the test to run and the error message** 2006 – Unit read/write
test failed **displays. In this case, the test has not failed but was
prevented from running.**

## 4.6   LOADER Program

The local **LOADER** program analyzes the magazine through the **SCAN MAGAZINE** command and displays the results.  These results can include:

- Compatible cartridge (TK50 or TK52)

- Noncompatible cartridge

- Empty slots

The diagnostic test then proceeds to load and unload the number of requested cartridges, ignoring noncompatible cartridges and empty slots. The default is seven cycles.  The following are two examples of LOADER program output:

```
                    Diagnostic Software
           Property of Digital Equipment Corporation
               ** Confidential and Proprietary **
           Copyright © 1990 Digital Equipment Corporation

Number of loader cycles to perform? [1-(7)-21]
Slot number 0:   compatible cartridge
Slot number 1:   compatible cartridge
Slot number 2:   compatible cartridge
Slot number 3:   compatible cartridge
Slot number 4:   empty
Slot number 5:   compatible cartridge
Slot number 6:   compatible cartridge
^C
Abort acknowledged.  Cleanup may take several seconds.
3 out of 7 load cycles were completed.
Operation aborted by user.


                    Diagnostic Software
           Property of Digital Equipment Corporation
               ** Confidential and Proprietary **
           Copyright © 1990 Digital Equipment Corporation

Number of loader cycles to perform? [1-(7)-21] 1
Slot number 0:   compatible cartridge
Slot number 1:   empty
Slot number 2:   NON compatible cartridge
Slot number 3:   compatible cartridge
Slot number 4:   empty
Slot number 5:   compatible cartridge
Slot number 6:   compatible cartridge

NON COMPATIBLE TAPES WILL NOT BE TESTED.
Completed.
```

## 4.7   HISTRY Program

The HISTRY program displays information about the history of the
TF837 magazine tape subsystem. The output generated by this program
is described in the following table. (If no errors have been logged, no
hexadecimal codes are displayed in the HISTRY output.)

| Screen Display | Field Meaning |
| --- | --- |
| TF837 | Product name |
| EN87988231 | Drive serial number |
| T7X3MA | Nodename |
| A01 | Module revision level |
| V1.0 | Firmware revision level[1] |
| 10 | Power-up hours |
| 20-character hexadecimal code(s)[3] | Represents last 10 firmware-detected errors from most recent to oldest |
| 8-character hexadecimal code(s)[2] | Represents last 10 POST-detected errors from most recent to oldest |
| Completed. | — |

[1]For another method of determining the firmware revision, type the following at the $
prompt: SET HOST/DUP/Server=Dup/TASK=PARAMS nodename. Then type the following
at the PARAMS> prompt: SHOW REV. The date associated with the firmware revision is
accessible through the PARAMS utility.

[2]This displays the last 10 POST-detected error codes. For a listing of POST-detected error
codes, see Appendix B.

[3]This displays the last 10 firmware-detected error codes.

The following is an example of HISTRY data output:

```
                          Diagnostic Software
         Property of Digital Equipment Corporation
            ** Confidential and Proprietary **
                     Copyright © 1990 Digital Equipment Corporation
TF837
EN00400267
T7YLBB
A00
V1.0A
117
4404009377FF73572360
4404009377FC56D48A60
A71200937662D5ECB980
A71200937660A65FCA60
40070093765C0803C500
A7120093736CE658ADE0
40030000000005F5E100
40030000000005F5E100
04060565
04280565
04060565
04060565
04280565
04100565
04280565
04060565
04060565
04060565
```

In the previous example, the first eight 20-character codes are firmware
entries. The next ten 8-character codes are POST-detected error entries.

The four leftmost characters in a firmware-detected error entry correspond
to DSSI error/event codes.

The four leftmost characters in a POST-detected error entry correspond to
the detailed error codes.

The two rightmost characters in a POST-detected error entry correspond
to the POST error indicators on the TFK70 DSSI controller module.
For example, the first POST-detected entry is 04060565. The 65 is a
hexadecimal code which, when converted to binary code, is 0110 0101.
The five least significant bits of the code correspond to error indicators in
Table 3–1. In this example, 0 0101 is a SWIFT chip test error.

## 4.8 MAGTST Program

Use the **MAGTST** program to examine each magazine slot. This program verifies that writeable cartridges are available, and is a useful program to run before executing the VMS BACKUP procedure.

Access the MAGTST program with the **SET HOST/DUP** command. When you use this command, the test automatically executes.

In the following example, MAGTST is the local program; TF0422 is the nodename.

```
$ SET HOST/DUP/SERVER=mscp$dup/task=magtst tf0422
```

The MAGTST program examines each magazine slot for a contiguous writeable cartridge. If the utility finds an empty slot, a write-protected cartridge, a TK74 or TK50 initialized cartridge, or an unrecognizable cartridge, it reports the failure message, `Invalid Magazine Configuration`. Note, however, that in the case of an empty slot, the configuration is invalid only if a cartridge follows the empty slot.

The following are three examples of MAGTST output:

```
                 Copyright © 1990  Digital Equipment Corporation

No cartridge found in slot #0
No cartridge found in slot #1
Write protected cartridge found in slot #2
No cartridge found in slot #3
TK50 cartridge found in slot #4
No cartridge found in slot #5
No cartridge found in slot #6

Magazine configuration is INVALID.
```

In the above example, the configuration is invalid because you cannot execute a BACKUP operation to a TK50 (CompacTape) cartridge in slot 4. Before running BACKUP, you must replace it with a TK70 (CompacTape II) cartridge.

```
                 Copyright © 1990  Digital Equipment Corporation

Non-compatible cartridge found in slot #0
*** VALID *** cartridge found in slot #1
2 out of 7 slots were examined.
FF85 - Unit diagnostics failed.
```

**NOTE**
**FF85 is an error code indicating a TF837 FRU error.**

```
          Copyright © 1990  Digital Equipment Corporation
*** VALID *** cartridge found in slot #0
*** VALID *** cartridge found in slot #1
*** VALID *** cartridge found in slot #2
No cartridge found in slot #3
No cartridge found in slot #4
No cartridge found in slot #5
No cartridge found in slot #6

Verified.
```

## 4.9  MAGINI Program

The MAGINI program writes random data, at the beginning of the tape,
to a writeable cartridge.  It writes over any label that may have existed,
allowing the **BACKUP/REWIND** command to create labels itself.  This
program executes automatically when you use the **SET HOST/DUP**
command.

**NOTE**
**You can use this program for functional verification during
installation.**

The MAGINI output is identical to the MAGTST output; the only
difference is the message, Verified and Cleared, during a successful
configuration.

**CAUTION**
**The MAGINI program destroys any existing labels and an amount
of data that may be on the cartridge.**

# 5

# Problem Resolutions, Error Conditions, and Jam Recovery

This chapter describes problem resolutions specific to the TF837 magazine tape subsystem, error conditions, and jam recovery procedures. Figure 5–1 shows the TF837 subsystem.



LOADER TRANSFER ASSEMBLY

DSSI CONTROLLER MODULE

INTERLOCK SWITCH

RIGHT CAPTIVE SCREWS

LATCH

OPERATOR CONTROL PANEL (OCP)

TK71 TAPE DRIVE

POWER SUPPLY ASSEMBLY

HANDLE MOTOR ASSEMBLY

FAN (LOCATED ON OUTSIDE REAR OF UNIT)

HOME POSITION OF ELEVATOR

SHR-X0147F-90-CPG
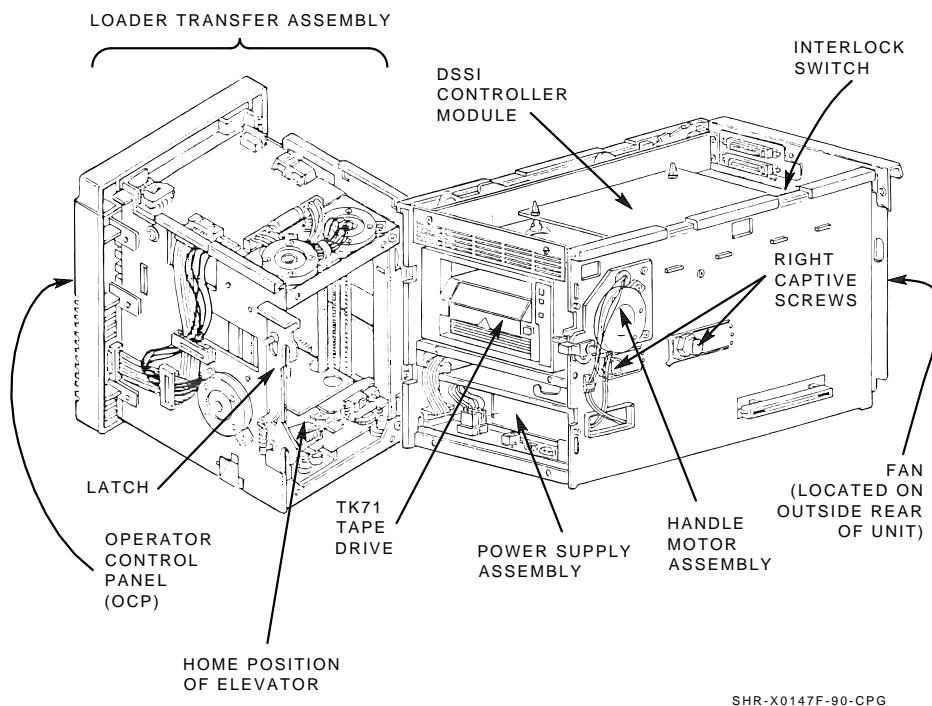
**Figure 5–1    TF837 Magazine Tape Subsystem**

## 5.1   Nondetectable FRU Failures

Table 5–1 describes possible scenarios associated with field replaceable
unit (FRU) failures not detectable through diagnostics.

**Table 5–1   Fault Matrix**

| FRU | Possible Failure Scenario |
|-----|---------------------------|
| Interlock switch | After you slide the TF837 subsystem forward for head cleaning or service, the Power On indicator remains lit. |
| Tape drive communications cable | After you replace either a faulty drive or a subsystem 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, either the OCP buttons or indicators do not function. |
|  | All indicators turn off briefly at power-on. |
| Fan | Visual inspection required. |

## 5.2  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 5–2 for a list of common failures, causes, and corrections.

### 5.2.1  Detecting Common Failure Influences

The TK71 tape drive may appear to be the failing unit due to the operation being performed at the time of failure (such as backup). However, it is important to understand that many factors influence failures.

Some of the more common factors that influence failures are:

- Defective media

- Operator or user errors

- Incorrect backup commands

- Poor power or grounding

**NOTE**
**Before you replace the drive, ensure that any problems you find are not due to the above factors.**

### 5.2.2  Detecting Soft Error Rates

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

Some of the variables that create soft errors are:

Media dropouts
Temperature of media (not acclimatized)
System bus activity
Applications
Head wear
Contamination
Foreign debris in tape path

**Table 5–2   Common Failures, Causes, and Corrections**

| Symptom | Probable Cause | Possible Fix |
|---|---|---|
| Volume not software enabled | Drive is not loaded or was unloaded by software | Ensure that the yellow indicator on the drive is on (tape loaded and ready for use). |
| | TK50 formatted cartridge in a TK71 drive | Use the correct cartridge. |
| | Bad cartridge or incorrectly written calibration tracks | Try another cartridge. |
| | Bad drive or dirty head | Clean the head. |
| Failure to mount or initialize with new media | Bad media | Clean the head and retry with known good media. |
| All three TF837 OCP indicators flashing | 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. |
| Green indicator on drive flashing | Calibration error | Clear the error by pressing the Unload button on the drive. 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. |
| Drive leader runaway | Mispositioned cartridge leader | Inspect the cartridge leader for correct position. Retire the cartridge from use if you cannot reposition the leader. |

Changes in soft error rates for any particular drive and cartridge are more significant than any absolute number of soft errors. This is due to the variables described above.

When examining the drive error count, soft errors or events and hard errors can be detected. For example, an error will occur if you give the wrong label name during a mount. Be sure the errors you are interpreting are indicative of a real hardware problem before replacing the drive.

**NOTE**
**All tapes contain some 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.**

## 5.3   Magazine and Loader Faults

Error indications fall into two main categories:

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

- **Loader Fault** — Is a condition that most likely requires service from the Customer Services organization. It is indicated by the Loader Fault indicator being on.

### 5.3.1   Magazine Fault Description

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

Inconsistent magazine status can occur when:

- The magazine is full and an extra cartridge is in the drive

- The magazine is full and an extra cartridge is in the elevator

- The flag is set in the magazine but no cartridge is present

- The loader has loaded a cartridge into the drive but the cartridge has been removed

- An unrecognized cartridge is in the magazine

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

Slot indicators are as follows:

- Slots 6 and 0 light to indicate the problem is a cartridge in the drive that was not loaded by the loader.

- Slots 5 and 0 light to indicate the problem can be corrected by replacing any missing cartridges in the magazine.

**NOTE**
**The slot 0 indicator is not a Slot Select indicator; rather, it is on in all error conditions to indicate that an error has occurred.**

## 5.3.2  Loader Fault Description

A loader fault indicates that the TF837 subsystem has detected a fatal error. In many cases, the subsystem has retried this error three times before failure. All loader faults (including magazine faults) generate an error log as well as light the Loader Fault indicator and generate an associated subcode.

The Loader Fault indicator indicates 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 a loader fault.

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

**NOTE**
**Error indicators do not flash. During hardware failures, action is determined by the DSSI bus controller module.**

### 5.3.2.1 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 TF837 subsystem attempts to clear the error and opens the receiver to let you access the magazine.

**NOTE**
**After a successful initialization, the DSSI bus controller module initiates a magazine scan to determine which slots in the magazine contain cartridges.**

## 5.4   Jam Recovery Procedure

On occasion, a cartridge may jam in the elevator or drive mechanism. A jam is indicated when the Magazine Fault indicator on the TF837 operator control panel is on, a cartridge cannot load or unload, or an unusual sound is in the motor.

This section describes how to remove cartridges from a jammed loader in such a manner that neither the loader nor data is harmed. This section does not provide information on fault finding, repair, or maintenance of the loader.

**CAUTION**
**Lift the magazine slowly. Remember, excessive force could disrupt the operation of other devices in the same storage array.**

### 5.4.1   Loader Action During a Jam

If a jam occurs during a cartridge movement, the loader attempts to move the cartridge back to a *known position*. There are three such positions:

- Cartridge fully in the drive

- Cartridge fully on the elevator

- Cartridge fully in its correct magazine slot

The position used depends on the movement that fails. The following table shows this interrelationship:

| Going from | Going to | Movement Attempted after a Jam |
|---|---|---|
| Magazine slot | Elevator | Go back to slot |
| Elevator | Drive | Go back to elevator |
| Drive | Elevator | Go back to drive |
| Elevator | Magazine slot | Go back to elevator |

In some situations, a jam may prevent the return of the cartridge to a known position. In such cases, the loader stops, and no further action occurs. This means that the cartridge may be found in two additional places:

| Cartridge Location | Position |
|---|---|
| Cartridge fully in its correct magazine slot | Known |
| ⇑ | |
| Somewhere between the magazine slot and the elevator | Unknown |
| ⇓ | |
| Cartridge fully on the elevator | Known |
| ⇑ | |
| Somewhere between the elevator and the drive | Unknown |
| ⇓ | |
| Cartridge fully in the drive | Known |

To recover the data, it is important to ascertain the locations of the cartridges. In certain circumstances, you may have to maneuver the cartridges manually before trying to remove them; otherwise damage could result. The *unknown* positions are of particular concern.

You will need the following tools:

- A flashlight

- A nonmagnetic rod, approximately 23 cm (9 in) long

- An adjustable inspection mirror

The following instructions are to assist you with removing tape cartridges; note, however, that they do not cover all possible situations. Follow each step as instructed. The points do not necessarily follow in numerical order.

### 5.4.2 Terminology and Definitions

Be sure you are familiar with the terminology used here before proceeding.

- **Left and Right Sides** — The loader as seen from the front.

- **Clockwise and Counterclockwise** — The loader as seen from above when referring to a vertical axis.

- **Mode Select Key** — Located on the left side of the front panel; unlocks the TF837 subsystem from the storage array.

- **Mechanical Stop** — A mechanical stop (Figure 5–2) prevents the TF837 subsystem from being accidentally pulled out too far. In this position, the loader transfer assembly can be swung open to allow access to the inner mechanisms.

- **Transfer Assembly** — The detachable front half of the loader.

- **Elevator** — The mobile portion of the loader transfer assembly that is responsible for loading and unloading cartridges.

Before you begin, note the following information:

- Are indicators on or off on the front panel?

- In what position is the Mode Select key?

- How many cartridges are in the loader?

- What type of cartridges are they?

- What command is in progress?

- What is the error code on the subsystem?

Set the Mode Select key to Service mode and press the Eject button.
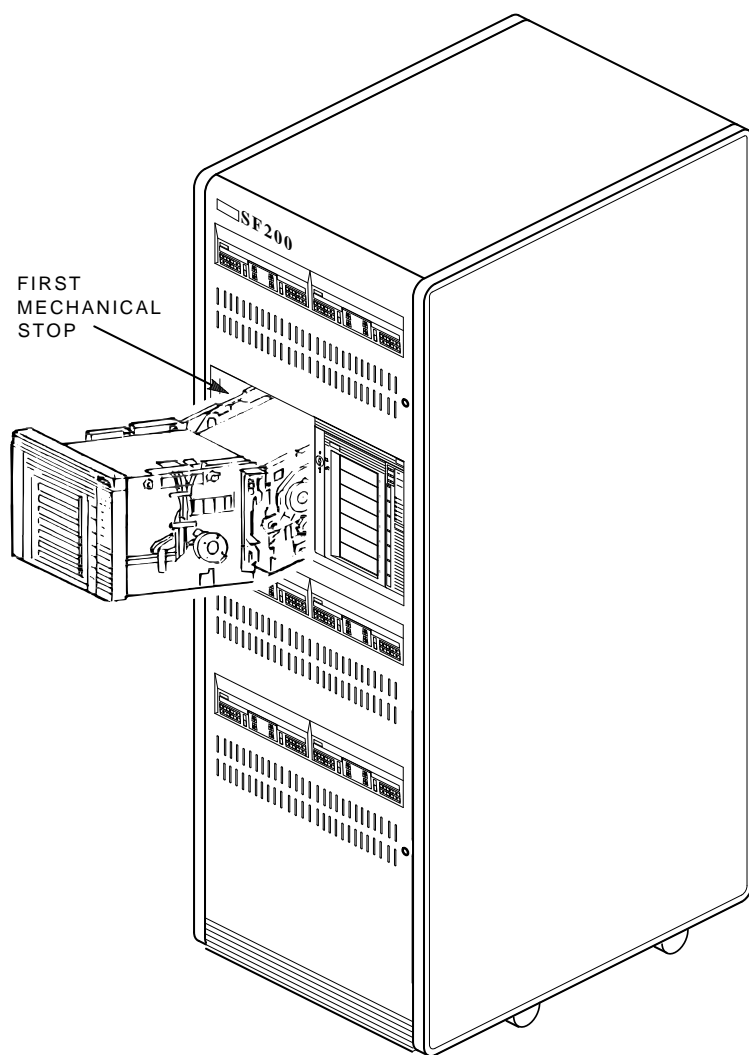
CXO-2461B
SHR_X1106B_89

**Figure 5–2    First Mechanical Stop**

### 5.4.3  Steps to Follow During the Jam Recovery Process

#### Step 1:  Power Down the Loader

Power down the loader; the switch is at the back.

#### Step 2:  Check the Receiver

If the receiver is already open (Figure 5–3) and no magazine is present, continue to **step 15**.  If the receiver is already open and a magazine is present, then continue to **step 14**.

If the receiver door is fully closed, do *not* touch it.  Continue to **step 3**.

If the receiver door is partially open, pull gently at the top of the door to see if it will open fully.  If it does, continue to **step 14**.  If it does not open fully, do *not* force; rather, attempt to close it.  If it does not close easily, let it remain and continue to **step 3**.

#### Step 3:  Note the Position of the Cartridges

**This step is essential to jam recovery.**  Look through the receiver window, and note any cartridge that is partway in or out of its slot. Remember, if all seven cartridges are present, another cartridge or cleaning cartridge may still be in the machine.  Continue to **step 4**.
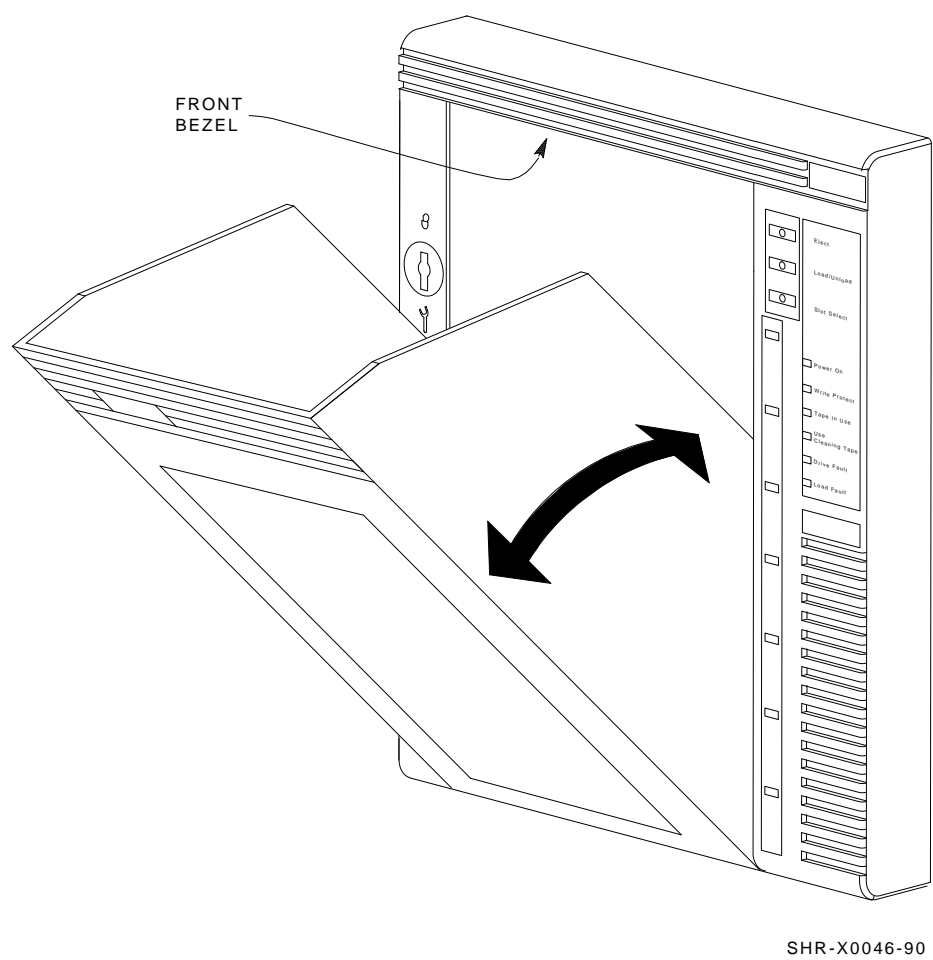
SHR-X0046-90

**Figure 5–3    Open Receiver**

**Step 4:  Unlock the TF837 Subsystem from the Storage Array**

Unlock the TF837 subsystem from the storage array by setting the Mode
Select key to Service mode.  Gently but firmly pull the subsystem out to
the first stop (32 cm or 12.5 inches) (Figure 5–2).  Be careful not to use
excess force as it could disrupt the operation of other devices in the same
array.  Continue to **step 5**.

**Step 5:  Check for a Jammed Cartridge**

Look for a cartridge jammed inside.  There are three places to look (you
may need to use a flashlight):

- Through the receiver window, note the number of cartridges present.

- Through the rectangular opening in the right side of the sheet metal.

- From the top, look down through the gap where the loader transfer
  assembly and rear chassis meet.

> **NOTE**
> **Do not confuse an open drive handle with a cartridge.**

A cartridge fully in the drive or fully on the elevator does not prevent the
loader transfer assembly from being opened.  If this is the case or if there
is no cartridge, continue to **step 6**.

If a cartridge is partway between the elevator and the drive, try to move
the cartridge back onto the elevator by turning the gear wheel that drives
the cartridge rollers in a counterclockwise direction.  Access to the rim
of this gear wheel is through the upper rectangular opening on the right
side, just underneath the connectors to the electronics module.  If the
cartridge can be successfully moved fully onto the elevator, then continue
to follow instructions at **step 6**.  If the cartridge does not move, continue
to **step 10**.

### Step 6:  Unlatch the Loader Transfer Assembly

You can unlatch the loader transfer assembly by lifting the latch on the right side (Figure 5–1).  The loader transfer assembly can then be swung to the left; be careful not to let it hit the left neighboring device if there is one.  You now have a clear view of the rear of the elevator and access to the front panel of the tape drive.  Continue to **step 7**.

### Step 7:  Check for the Presence or Position of a Cartridge

If no magazine is present, continue to **step 18**.

If a cartridge is not stuck between the elevator and the magazine, continue to **step 8**.

If a cartridge is stuck partway between the elevator and the magazine, push it forward into the magazine by using a rod or similar tool.  Turn the left shaft (Figure 5–4) counterclockwise as far as it will go.  As you turn the shaft, you will see the black slide on the elevator move toward you. Continue to **step 8**.

### Step 8:  Open the Receiver Door

A rectangular opening in the sheet metal on the right side exposes two metal uprights (Figure 5–1).  The rear one is fixed, but the front one forms part of the receiver opening mechanism.  Firmly squeezing these two parts together opens the receiver door.  If it opens, continue to **step 9**.

If the receiver fails to open correctly, push it closed again, locate and clear the jam before attempting to reopen the door.  Possible things to note are:

• Is the Mode Select key set to Service mode?

• Did you turn the left shaft fully counterclockwise?

• Is the magazine correctly seated?

• Is anything caught between the outer side walls of the receiver and the inner wall of the loader transfer assembly?
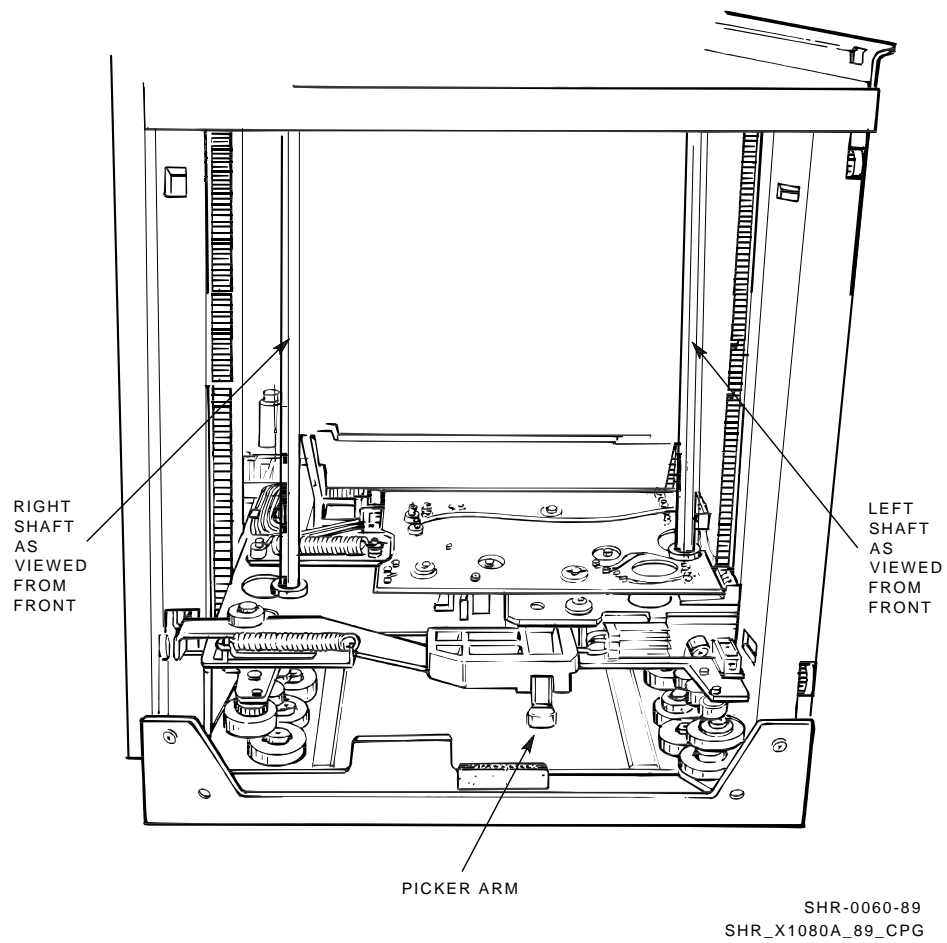
RIGHT
SHAFT
AS
VIEWED
FROM
FRONT

LEFT
SHAFT
AS
VIEWED
FROM
FRONT

PICKER ARM

SHR-0060-89
SHR_X1080A_89_CPG

**Figure 5–4    Right and Left Shaft Locations**

### Step 9:  Remove the Magazine

Look down the rear side of the magazine from the top.  If there is
no apparent obstruction, remove the magazine by lifting the handle.
Continue to **step 18**.

If the magazine does not remove easily, check once again for an
obstruction.  If there is no apparent cause, some of the cartridges may
no longer be latched in the magazine, pushing against the inside of
the receiver window and increasing the force required to remove the
magazine.

Another cartridge may be in the machine; continue to **step 18**.

### Step 10:  Open the Receiver Door

A rectangular opening is in the sheet metal on the right side that exposes
two metal uprights (Figure 5–1).  The rear one is fixed, but the front one
forms part of the receiver opening mechanism.  Firmly squeezing these
two parts together opens the receiver door.  If it opens, continue to **step
11** If the receiver fails to open correctly, push it closed again, locate and
clear the jam before attempting to reopen the door.  Possible situations to
note are:

- Is the Mode Select key set to Service mode?

- Did you turn the left shaft counterclockwise?  (The left shaft is behind
  the "toothed" rubber belt.  Note that you cannot see into the machine,
  but on the left side you can reach in through the opening.)

- Is the magazine correctly seated?

### Step 11: Remove the Magazine

If the receiver door is open or can be fully opened and a magazine is present, look down the rear side of the magazine from the top. If there is no obstruction, remove the magazine by lifting the handle (Figure 5–5). Continue to **step 12** even if no magazine is present.

If the magazine does not remove easily, check once again for an obstruction. If there is no apparent cause, cartridges may no longer be latched in the magazine, pushing against the inside of the receiver window and increasing the force required to remove the magazine. Another cartridge may be in the machine. Continue to **step 12**.

### Step 12: Push the Cartridge into the Drive

A cartridge may be jammed between the drive and the elevator. As this cartridge could not be moved with the rollers, try to push it back into the drive. Apply force to the front of the cartridge with a rod by reaching through the receiver opening. If the cartridge does not move, leave it as is. Even if the cartridge is not in its correct position, it may be possible to open the loader transfer assembly. Continue to **step 13**.

### Step 13: Unlatch the Loader Transfer Assembly

You can unlatch the loader transfer assembly by lifting the latch on the right side (Figure 5–1). The loader transfer assembly can then be swung to the left; be careful not to let it hit the left neighboring device if there is one. You now have a clear view of the rear of the elevator and access to the front panel of the tape drive. Continue to **step 18**.

### Step 14: Remove the Magazine

If the receiver door is open or can be fully opened and a magazine is present, look down the rear side of the magazine from the top. If there is no obstruction, remove the magazine by lifting the handle (Figure 5–5). Continue to **step 15** whether or not a magazine is present.

If the magazine does not remove easily, check once again for an obstruction. If there is no apparent cause, cartridges may no longer be latched in the magazine, pushing against the inside of the receiver window and increasing the force required to remove the magazine. Another cartridge may be in the machine. Continue to **step 15**.

SHR-X0045-90
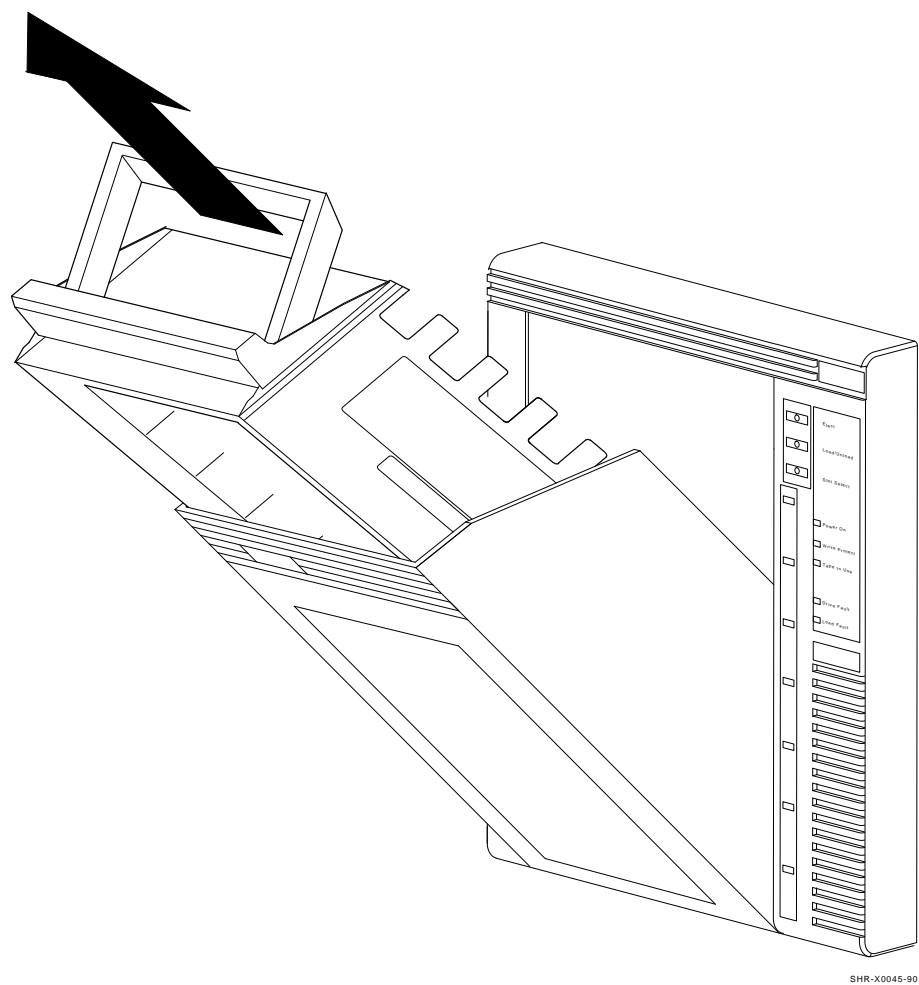
**Figure 5–5   Removing Magazine**

### Step 15:  Unlock the TF837 Subsystem from the Storage Array

Unlock the TF837 subsystem from the storage array by setting the Mode Select key to Service mode.  Gently but firmly pull the subsystem out to the first stop (32 cm or 12.5 inches) (Figure 5–2).  Be careful not to use excess force as it could disrupt the operation of other devices in the same array.  Continue to **step 16**.

### Step 16:  Check for a Jammed Cartridge

Look for a cartridge jammed inside.  There are three places to look (you may need to use a flashlight):

- Through the receiver window; note the number of cartridges present.

- Through the rectangular opening in the right side of the sheet metal.

- From the top, look down through the gap where the loader transfer assembly and rear chassis meet.

> **NOTE**
> **Do not confuse an open drive handle with a cartridge.**

A cartridge fully in the drive or fully on the elevator does not prevent the loader transfer assembly from being opened.  If this is the case or if there is no cartridge, continue to **step 17**.

If a cartridge is partway between the elevator and the drive, try to move the cartridge back onto the elevator by turning the gear wheel that drives the cartridge rollers in a counterclockwise direction.  Access to the rim of this gear wheel is through the upper rectangular opening on the right side, just underneath the connectors to the electronics module.  If the cartridge can be successfully moved fully onto the elevator, continue to **step 17**.

If the cartridge does not move, try to push the cartridge back into drive.  Apply force to the front of the cartridge with a rod by reaching through the receiver opening.  If the cartridge does not move, leave it as is.  Even if the cartridge is not in its correct position, it may be possible to open the loader transfer assembly.  Continue to **step 17**.

### Step 17:  Unlatch the Loader Transfer Assembly

You can unlatch the loader transfer assembly by lifting the latch on the right side (Figure 5–1).  The loader transfer assembly can then be swung to the left; be careful not to let it hit the left neighboring device if there is one.  You now have a clear view of the rear of the elevator and access to the front panel of the tape drive.  Continue to **step 18**.

**Step 18: Final Check**

Even if no cartridges are left inside the loader, check for anything that
may be unusual. If the elevator is in the lowest position and it still has
a cartridge in it, lift it gently. You can remove the cartridge by pulling
it with your thumb and forefinger toward the back of the elevator. It is
acceptable for the elevator to slide back down again.

If a cartridge is in the tape drive, follow the instructions in the drive
documentation to retrieve the cartridge. This step will probably require
the power to be switched back on. This procedure is acceptable, as the
loader motors are shut off when the TF837 subsystem is pulled out of the
enclosure. However, the 5 volts supply is not shut off, so the TF837 OCP
indicators will be on.

Close the receiver. Gently close the loader transfer assembly, lifting the
latch on the right side at the same time. Remember, excess force could
disrupt the operation of other devices in the same storage array. Gently
but firmly slide the TF837 subsystem into the enclosure and lock it in
position with the Mode Select key.

After you have removed the jammed cartridge, be sure to inspect it for
damage, and the source of the jam.

# 6
# Removal and Replacement

This chapter explains how to remove and replace the field replaceable units (FRUs) in the TF837 magazine tape subsystem (Table 6–1 and Figure 6–1). This chapter includes guidelines for performing the removal and replacement procedures, instructions for manually unloading a cartridge, and a table listing recommended spares, FRUs, and part numbers.

**Table 6–1   Field Replaceable Units**

| FRU | Reference Section |
| --- | --- |
| TFK70 DSSI controller module[1] | 6.3.1 |
| Loader transfer assembly | 6.3.2 |
| TK71 tape drive | 6.3.3 |
| TK71 tape drive takeup leader | 6.3.4 |
| Operator control panel (OCP) | 6.3.5 |
| 12 Vdc fan | 6.3.6 |
| Interlock switch | 6.3.7 |
| Power supply assembly | 6.3.8 |
| Handle motor assembly | 6.3.9 |

[1]The instructions for removing and replacing this FRU include a warm swap procedure (Section 6.3.1).

LOADER TRANSFER ASSEMBLY

INTERLOCK
SWITCH

DSSI
CONTROLLER
MODULE

OPERATOR
CONTROL
PANEL
(OCP)

TK71
TAPE
DRIVE

POWER SUPPLY
ASSEMBLY

HANDLE
MOTOR
ASSEMBLY

FAN
(LOCATED ON
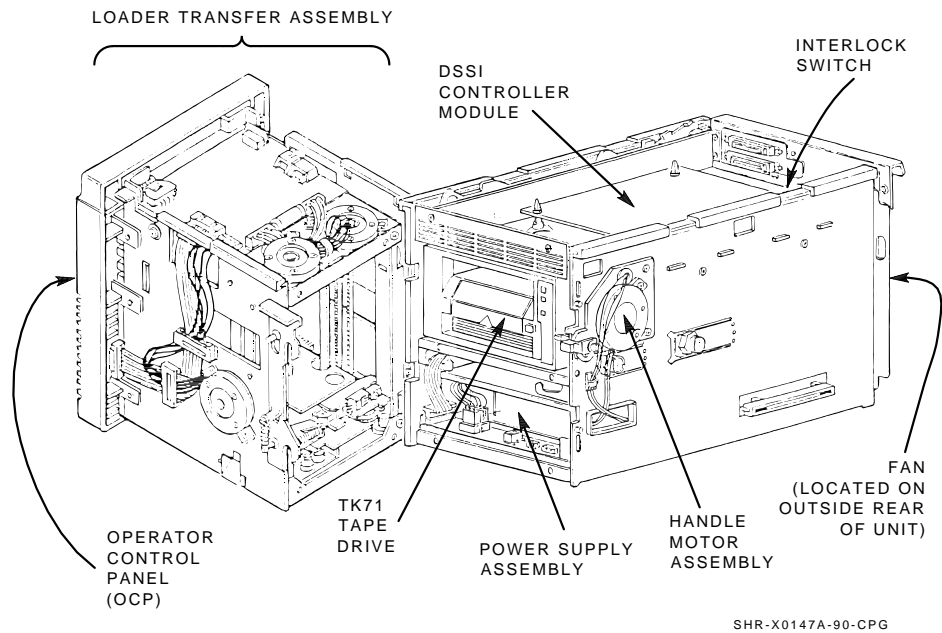OUTSIDE REAR
OF UNIT)

SHR-X0147A-90-CPG

**Figure 6–1    TF837 Magazine Tape Subsystem FRUs**

## 6.1   Recommended Spares

Table 6–2 lists the recommended spares, including subsystem FRUs, and part numbers.

**Table 6–2   Recommended Spares List**

| Description | Part Number |
| --- | --- |
| Tape drive | TK71–01 |
| TFK70 DSSI controller module | 54–19085–01 |
| Tape drive communications cable (26 pin) | 29–28973–01 |
| Loader transfer assembly communications cable (10 pin) | 29–28972–01 |
| Loader power harness | 29–28974–01 |
| Internal DSSI communications cable (50 pin) | 29–28975–01 |
| | |
| Transfer assembly power cable (10 pin) | 29–28976–01 |
| Transfer assembly OCP cable (16 pin) | 29–28977–01 |
| Interlock switch cable (2 pin) | 29–28978–01 |
| Transfer assembly keyswitch cable (3 pin) | 29–28979–01 |
| Handle open sensor cable (3 pin) | 29–28980–01 |
| External DSSI communications cable, 70 inch | BC21R–5L |
| | |
| External DSSI communications cable, 42 inch | BC21Q–3F |
| Takeup leader | 74–28268–01 |
| Loader transfer assembly | 29–28102–01 |
| Key lock assembly | 29–28981–01 |
| Transfer assembly key (universal) | 29–28982–01 |
| 110 V power supply | 29–28102–01 |
| | |
| 220 V power supply | 29–28103–01 |
| Operator control panel | 29–28104–01 |
| Interlock switch | 29–28105–01 |
| Handle motor assembly | 29–28106–01 |
| Fan | 12–23373–13 |
| Magazine | 30–32447–01 |
| | |
| Head cleaning kit | 22–00436–01 |
| Head cleaning refill kit | 22–00436–02 |
| Antistatic kit | 29–26246–00 |

## 6.2   Removal and Replacement Guidelines

Follow these guidelines during a removal and replacement procedure:

- Do not disconnect the external DSSI communications cable unless the system is shut down. Doing so while the system is running can cause a system failure and possibly cause the loss of customer data.

- Save the hardware; the screws are of metric size and are not readily available.

- Use an antistatic kit where required in a procedure.

- Use the power-on self-test (POST) procedure and local diagnostic programs to diagnose most FRUs. (For nondiagnostic-detectable failures, refer to the subsystem-specific and drive-specific problem resolution sections in Chapter 5).

**NOTE**
**Before you remove an FRU, be sure that:**

- **A tape is not in the tape drive**

- **You dismount the device by using a console command**

## 6.3   FRU Removal and Replacement Procedures

This section describes how to remove and replace failing FRUs. TF837 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 devices connected on the DSSI bus.

**CAUTIONS**
**Observe all ESD precautions while removing or replacing TF837 FRUs. An antistatic wrist strap is inside the front and rear doors of the SF200 storage array.**

**To maintain stability, slide only *one* TF837 subsystem from its enclosure at a time.**

**Do not try to pick up or support the TF837 subsystem by the rear of the enclosure. Doing so can cause personal injury or damage to the power supply.**

### 6.3.1  Removing and Replacing the TFK70 DSSI Controller Module

Each controller module comes from the manufacturer with a unique device name and system ID number. When you power up a TF837 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 by using the *warm swap* procedure.

#### 6.3.1.1 Beginning the Warm Swap Procedure

This section describes how to remove and replace the TFK70 DSSI controller module by using the warm swap procedure. The warm swap procedure lets you remove and replace a TFK70 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.

Use this procedure when you are replacing a single TF837 subsystem.

**CAUTION**
**Be sure not to disconnect the external DSSI communications cable at the rear chassis; doing so can cause an error on the DSSI bus.**

**NOTE**
**You will need to refer to the current nodename during the warm swap procedure. To list all nodenames, use the VMS command, SHOW CLUSTER.**

```
$ SHOW CLUSTER
```

**The nodename and unit number may appear as either T7SXJ9$MIA1 or TAPE1$MIA2.**

### 6.3.1.2 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 during the procedure:

- Current nodename
  This is the parameter known as NODENAME.

- Unit number
  This is the parameter known as UNITNUM.

- System ID number
  This is the parameter known as SYSTEMID.

There are three ways of obtaining these parameters:

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).

### 6.3.1.2.1 System Site Guide

Check the guide for the original UNITNUM, NODENAME, and SYSTEMID.

### 6.3.1.2.2 ANALYZE/SYSTEM Command

At the DCL prompt ($), enter the following VMS command:

```
$ ANALYZE/SYSTEM
```

The system then displays the system analyzer prompt:

```
SDA>
```

At this prompt, enter the command:

```
SDA> SHOW DEVICE MI
```

to list the nodename, system ID number, and unit number.

The following is an example output screen showing the nodename and unit number:

```
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
```

In the above example, the nodename is TAPE1; the unit number is the final digit in the MIA0 portion of the nodename. In this case, the unit number is 0.

The following example is an output screen showing the system ID number:

```
            --- 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        TF70                           00010000
Local hardware vers. 202020202020  SCS poller timeout        001A
                     303041202020  SCS poller enable mask      01


Press RETURN for more.
```

To exit the system analyzer, you must type the entire word EXIT at the SDA> prompt. For example:

```
SDA> EXIT
```

If you found the correct information, proceed with the warm swap procedure.

### 6.3.1.2.3 SET HOST/DUP Command

**NOTE**
**Before running the SET HOST/DUP command, be sure to load the FYDRIVER local program by using this command:**

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

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

The following is an example output screen showing the information collected with the **SET HOST/DUP** command. 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. This command lists the current parameters.**

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 will continue to recognize the *old* controller module parameters as well as the *new* ones until you reboot the system.

### 6.3.1.3 Removing the TFK70 DSSI Controller Module

To remove the controller module:

1. Set the Mode Select key to Service mode (Figure 6–2).

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

3. Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

4. Set up an antistatic mat, and put on an antistatic wrist strap.

5. Release the one-quarter turn captive screws that secure the TFK70 DSSI controller module tray (Figure 6–3).

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.

   **NOTE**
   **You may need to press the inside cable for it to clear the metal edge.**

7. Disconnect the large internal DSSI communications cable (J6) from the controller module (Figure 6–4). This cable is dressed from the controller module to the inside bulkhead of the rear chassis.

   **NOTE**
   **This cable (J6) must be the first cable you disconnect from the controller module and the last one you reconnect when removing and replacing the TFK70 DSSI controller module.**

8. Release the two front module clips in each corner (Figure 6–3).

9. Disconnect the loader transfer assembly communications cable (J2), the power harness (J7), the tape drive communications cable (J1), and remove the two rear module clips in each corner.

10. Remove the controller module and place it on the antistatic mat.

11. Note the DSSI node ID settings (Figure 6–4) on the faulty module.

OPERATOR CONTROL PANEL

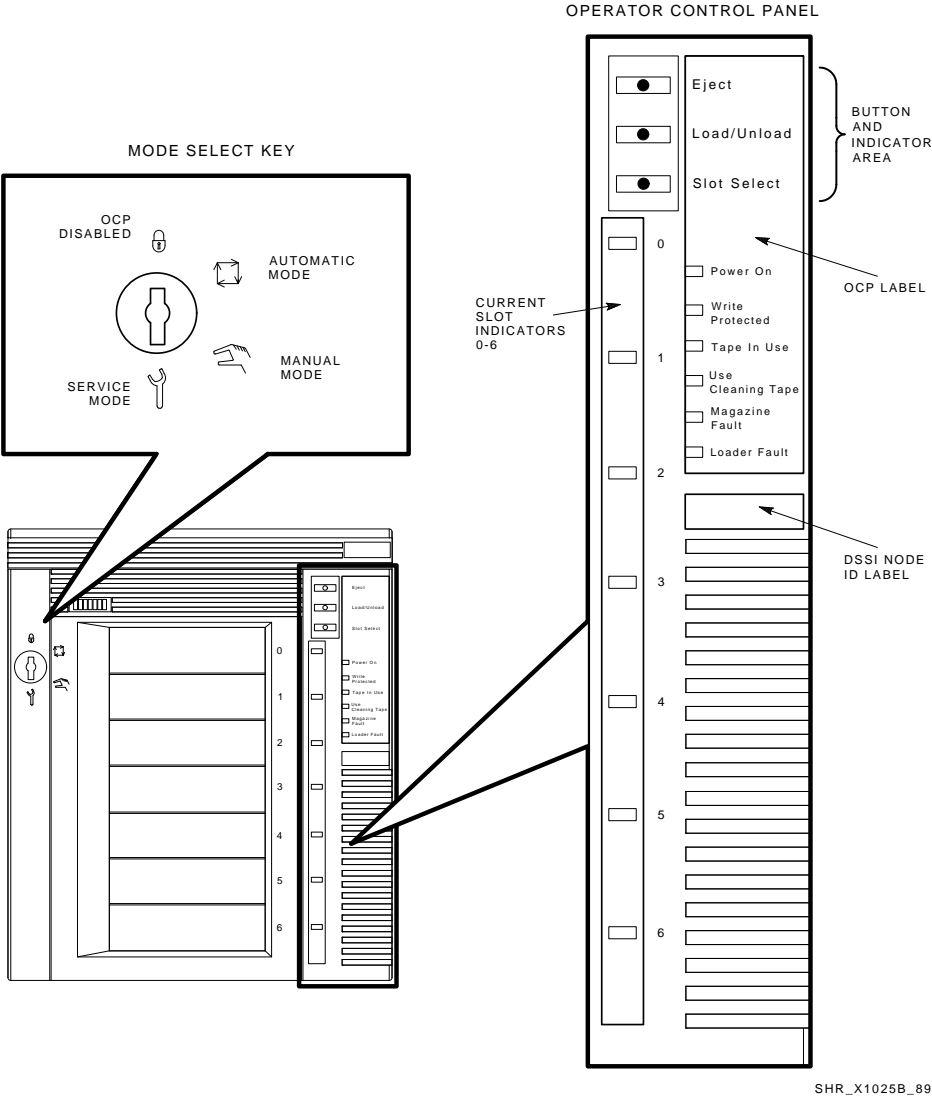MODE SELECT KEY

OCP DISABLED

AUTOMATIC MODE

SERVICE MODE

MANUAL MODE

Eject

Load/Unload

Slot Select

BUTTON AND INDICATOR AREA

0

1

2

3

4

5

6

Power On

Write Protected

Tape In Use

Use Cleaning Tape

Magazine Fault

Loader Fault

CURRENT SLOT INDICATORS 0-6

OCP LABEL

DSSI NODE ID LABEL

SHR_X1025B_89

**Figure 6–2    Operator Control Panel**

TFK70 MODULE
TRAY

DSSI
BULKHEAD
CONNECTOR

TRAY
SCREWS

MODULE CLIPS

POWER SWITCH

SHR-0002-90
SHR-X0141A-90-CPG
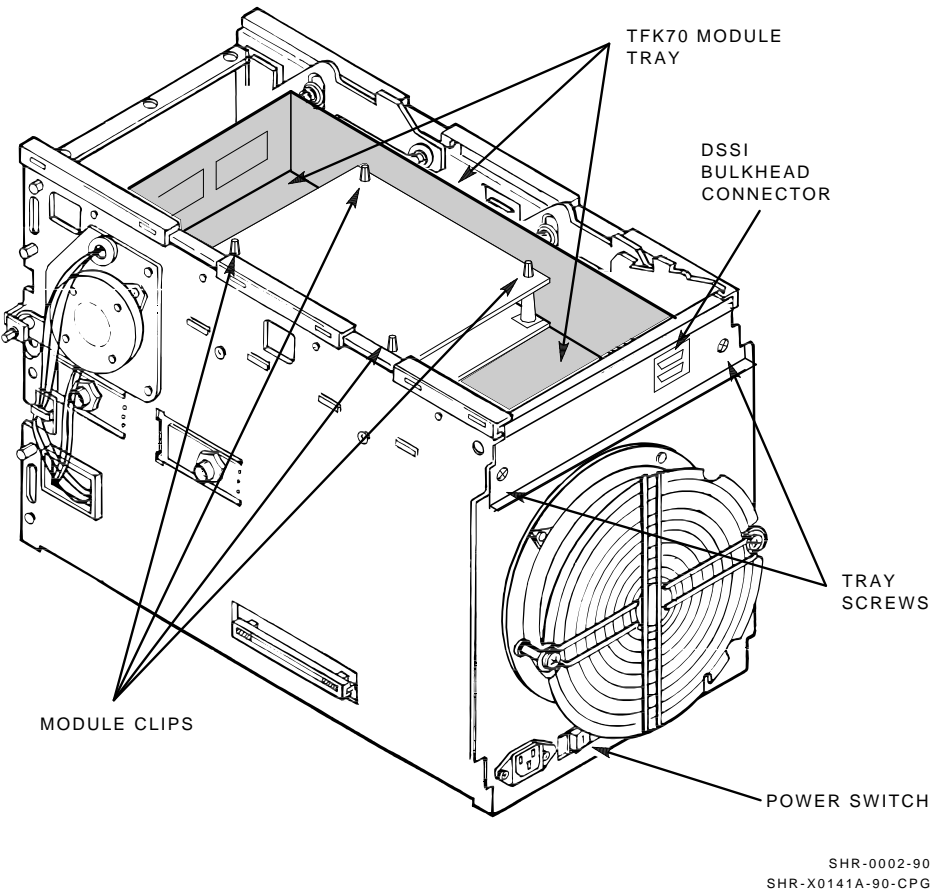
**Figure 6–3    TFK70 DSSI Bus Controller Module Tray**
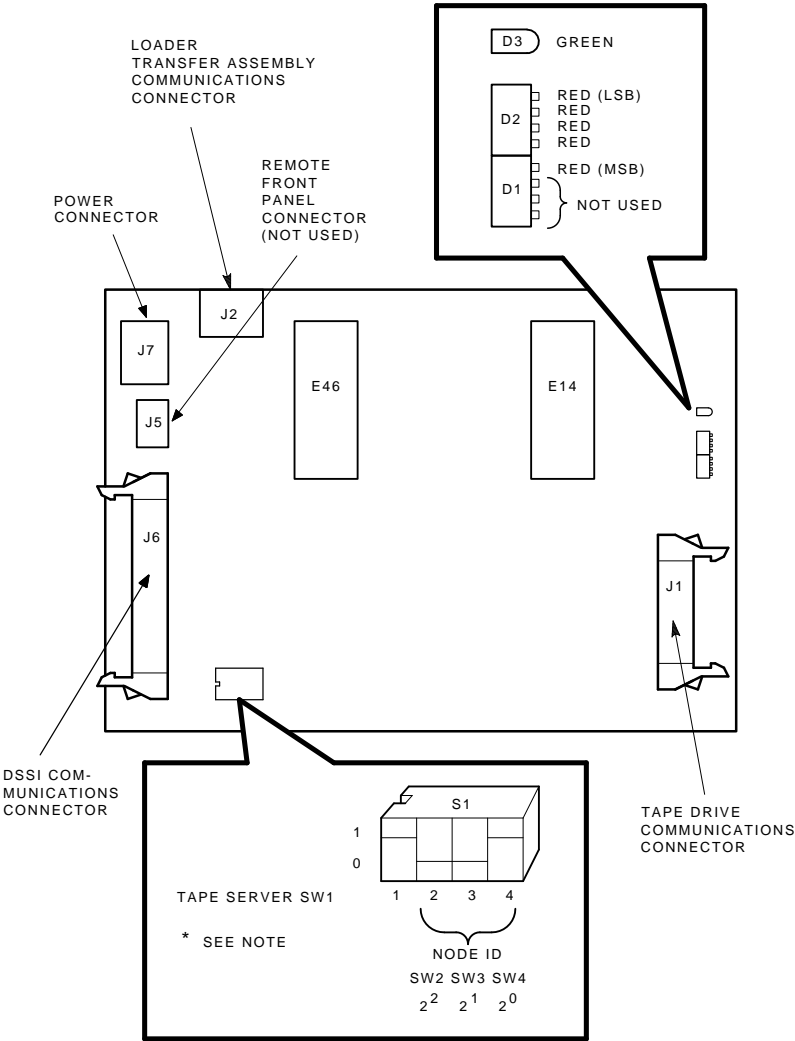
SHR-X0055-90

**Figure 6–4   TFK70 DSSI Bus Controller Module Block Diagram**

### 6.3.1.4 Replacing the TFK70 DSSI Controller Module

To install a new TFK70 controller module:

1.  Set the DSSI node ID switches (Figure 6–4) so that they are identical to the DSSI node ID switch settings on the faulty module.

2.  Set TMSCP to disabled (SW0 = on position (1)).

3.  Connect the loader transfer assembly communications cable (J2) before setting the controller module onto the module tray.

4.  Seat the new controller module onto the module clips at the front and rear of the tray.

5.  Reconnect the power harness (J7) and the tape drive communications cable (J1) to the module.

6.  Connect the internal DSSI communications cable (J6).

7.  Slide the module tray back into the rear chassis. Do not lock the tray as you will need to access the module again. Set the TF837 subsystem's power switch to 1 (on). The POST sequence takes 15 seconds to complete.

> **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 cable management scheme.**

**Verification Procedure**

Power up the TF837 subsystem.

**6.3.1.5 Restoring Parameters**

Follow these steps to restore the parameters collected in Section 6.3.1.2:

1. Enter the **SHOW CLUSTER** command, which now lists a new nodename. 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 nodename 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 nodename.

     ```
     PARAMS> SET NODENAME TAPE01
     ```

   • Set the unit number.

     ```
     PARAMS> SET UNITNUM 0
     ```

   • Set the force unit number.

     ```
     PARAMS> SET FORCEUNI 0
     ```

   • Set the force nodename.

     ```
     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 will be 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.

### 6.3.1.6 Completing the Warm Swap Procedure

To complete the warm swap procedure:

1.  Set the TF837 subsystem's power switch to 0 (off).

2.  Slide the TFK70 DSSI controller module tray out of the rear chassis.

3.  Set TMSCP to enabled (SW0 = off position (0)).

4.  Secure the module tray and the SF200 rear door.

5.  Set the TF837 subsystem's power switch to 1 (on).

6.  Enter the **SHOW DEVICE** command to display the original name of
    the replaced controller module.

**NOTE**
**The TF837 subsystem may take several minutes to appear on-line.**

## 6.3.2  Removing and Replacing the Loader Transfer Assembly

Use the following steps to remove and replace the loader transfer assembly. The loader transfer assembly contains the electronics module, receiver, OCP, elevator, and associated motor drive trains.

**Removal Procedure**

1. Verify with the operator or system manager that the TF837 magazine tape subsystem is dismounted.

2. Verify that you have the following service aids: antistatic kit (PN 29–26246–00) and a scratch tape.

3. Set the Mode Select key to Service mode (Figure 6–2). Press the Eject button to unload any cartridge and open the receiver door.

   **NOTE**
   **Do not open the front door of the SF200 storage array. It will hinder removal and replacement of the loader transfer assembly.**

4. If the receiver does not open, follow these steps:

   a. Access the rear of the TF837 subsystem.

   b. Push the TF837 subsystem forward to the first mechanical stop (Figure 6–5).

   c. Squeeze the mechanical ejection lever to open the receiver (Figure 6–6).

   With the receiver open, grasp under the top of the front bezel and slide the subsystem to the first mechanical stop (Figure 6–5).

5. Remove the magazine (with customer cartridges) from the receiver.

6. Close the receiver.
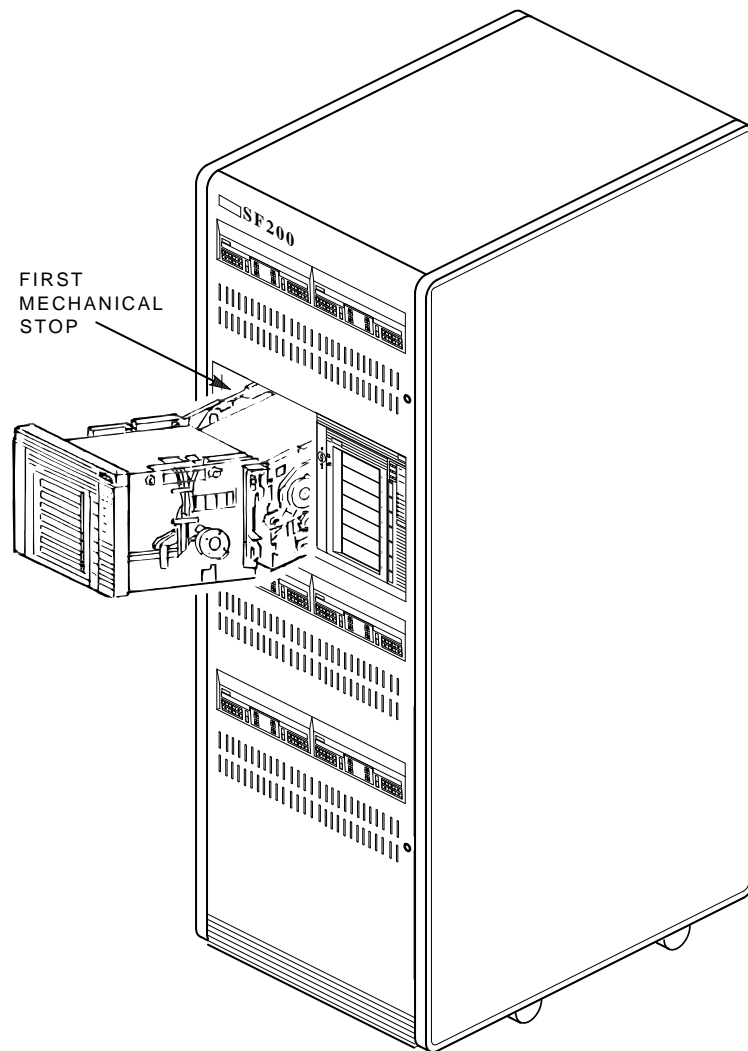
CXO-2461B
SHR_X1106B_89

**Figure 6–5    Sliding the TF837 Subsystem to the First Mechanical Stop**

SECOND
MECHANICAL
STOP

FIRST
MECHANICAL
STOP

MECHANICAL
EJECTION LEVER

SHR-0012-90
SHR-X0147C-90-CPG
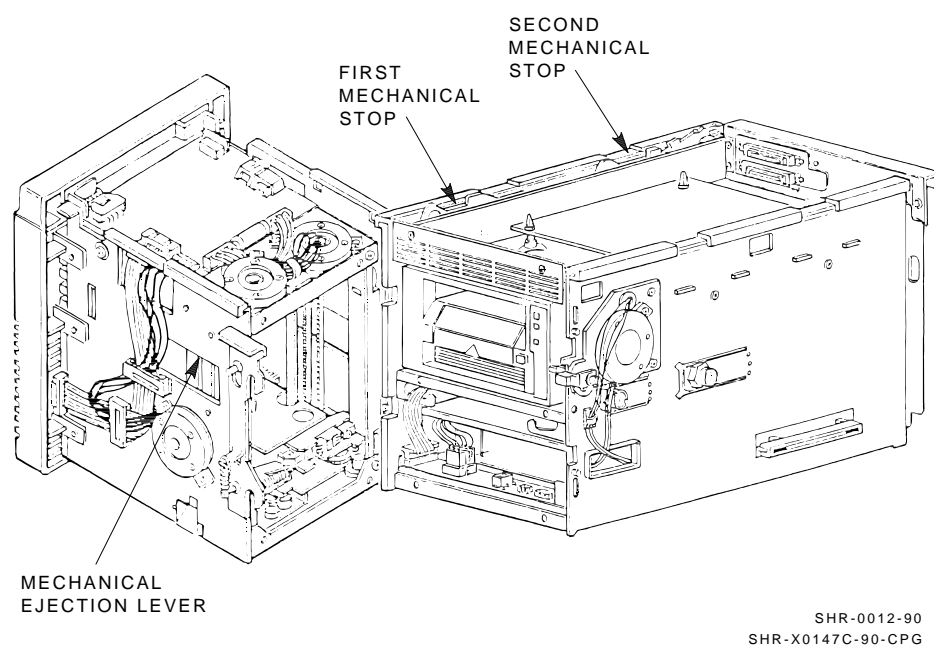
**Figure 6–6    Mechanical Ejection Lever**

7. Lift the latch (Figure 6–7) and swing open the loader transfer assembly.

8. If the cartridge did not unload from the tape drive, see section Section 6.4, Manually Removing a Cartridge from the Drive.

9. Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

10. Set up an antistatic mat, and put on an antistatic wrist strap.

11. Open the cable clamps on the left side of the subsystem assembly (Figure 6–8).

12. Disconnect the two loader transfer assembly interface cables that plug into the electronics module (Figure 6–8).

13. Disconnect the ground strap on the left side of the loader transfer assembly (Figure 6–8).

14. Push down on the hinge locking lever (Figure 6–8).

15. Lift the open loader transfer assembly off the two hinge pins. The loader transfer assembly must be completely open.

16. Place the loader transfer assembly on the antistatic mat.

17. Note the number on the DSSI node ID label (Figure 6–2).

18. Package the loader transfer assembly (for return to the repair depot) in the box that contained the new loader transfer assembly.

LOADER TRANSFER ASSEMBLY

INTERLOCK
SWITCH

DSSI
CONTROLLER
MODULE

RIGHT
CAPTIVE
SCREWS

LATCH

TK71
TAPE
DRIVE

HANDLE
MOTOR
ASSEMBLY

FAN
(LOCATED ON
OUTSIDE REAR
OF UNIT)

OPERATOR
CONTROL
PANEL
(OCP)

POWER SUPPLY
ASSEMBLY

HOME POSITION
OF ELEVATOR

SHR-X0147F-90-CPG
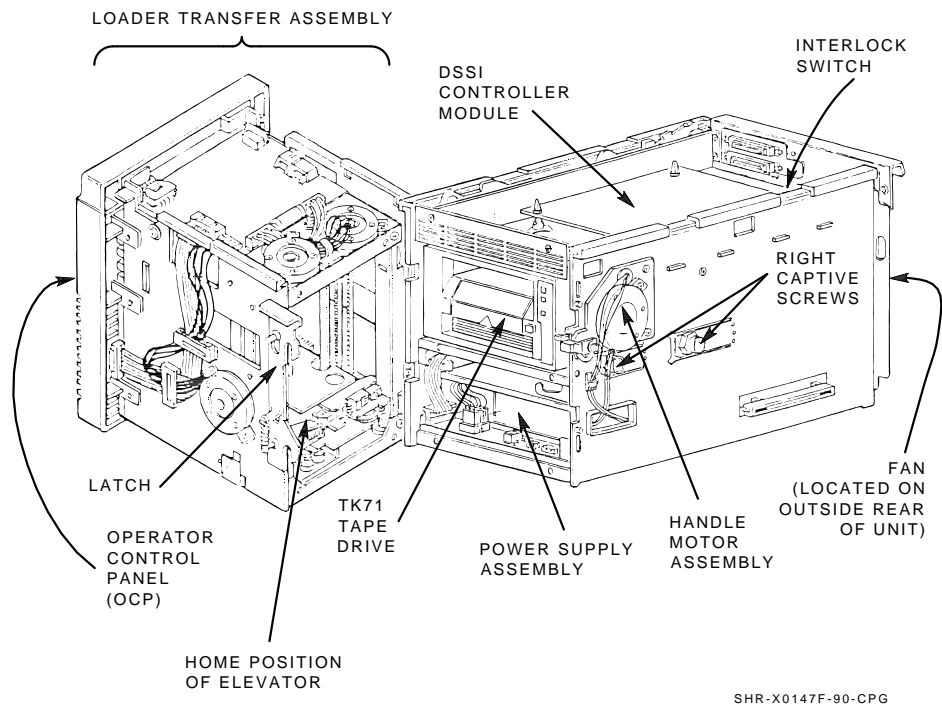
**Figure 6–7    Loader Transfer Assembly Latch Position**

HINGE LOCKING LEVER

INTERFACE
CABLES

LEFT
CAPTIVE
SCREWS

GROUND
STRAP

CABLE CLAMPS

MODE
SELECT KEY
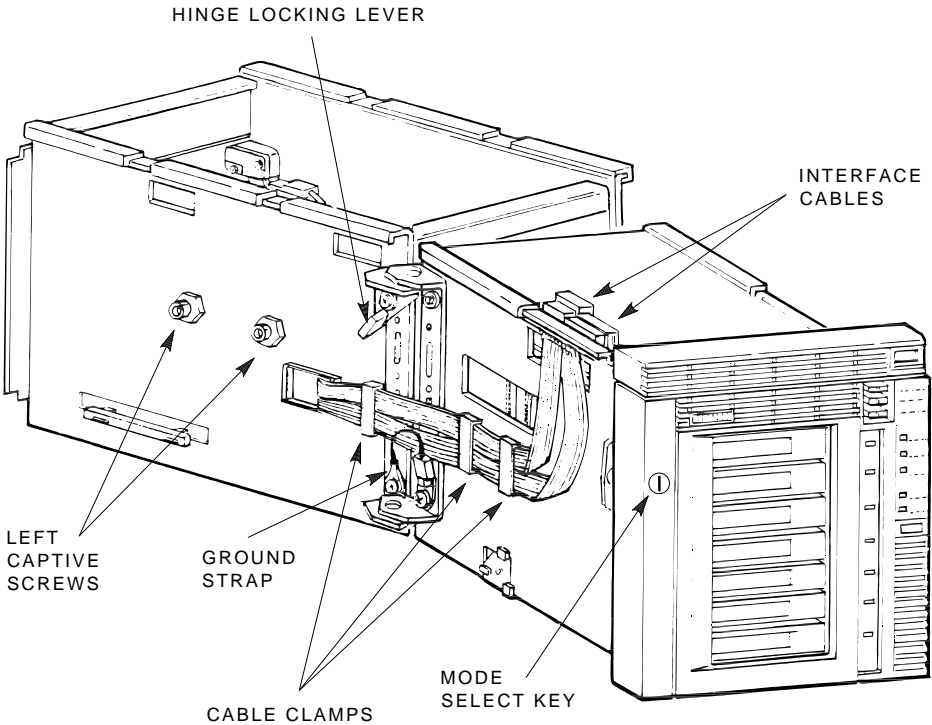
SHR-X0143-90-CPG

**Figure 6–8    Left Side View of Magazine Tape Subsystem**

**Replacement Procedure**

1. Install the new loader transfer assembly on the rear chassis hinge pins. Transfer assembly must be completely open.

2. Push the bottom part of the hinge locking lever to clamp the top hinge pin.

3. Reconnect the ground strap.

4. Reconnect the loader transfer assembly interface cables to the electronics module. Secure the cable clamps.

5. Swing the loader transfer assembly closed. Observe that the loader transfer assembly latch is closed.

6. Push the TF837 subsystem into the enclosure.

7. Set the Mode Select key to Service mode (Figure 6–2).

8. Fill out and install a new unit ID label. The label should contain the same information as the label on the faulty unit. (Labels are provided in a label booklet stored inside the front door of the SF200 storage array.)

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

**Verification Procedure**

1. Set the TF837 subsystem's power switch to 1 (on). Observe that all indicators on the OCP light. (If the Power On indicator is not on, it is likely that you have not fully pushed the subsystem into the enclosure (thereby enabling the 24 Vdc interlock switch).

2. After 15 seconds, POST should have executed successfully. Except for the Loader Fault indicator, all indicators should remain on until the host system initializes the TF837 subsystem.

3. Press the Eject button to open the receiver.

4. At the front of a spare magazine (Figure 6–9), insert a scratch tape into slot 0. Be sure the cartridge is write-enabled.

5. Insert the magazine into the receiver (Figure 6–10).

6. Close the receiver. Wait 15 seconds for the elevator to scan the magazine.

7. Press the Load/Unload button to verify a successful load operation. After the cartridge loads to the drive, observe that the Load/Unload and Tape In Use indicators light.

8. To unload the cartridge, press the Load/Unload button again. After the cartridge unloads, observe that the Load/Unload, Eject, and Slot Select indicators light.

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

10. Close the receiver and return the subsystem to the customer.

For more detailed verification, see Section 4.6.
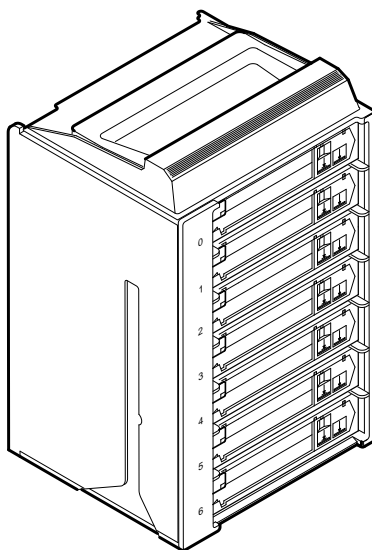
SHR_X1023A_89

**Figure 6–9   Front of Magazine Showing Cartridge Slots**

FRONT
BEZEL

Eject

Load/Unload

Slot Select

Power On

Write Protect

Tape in Use

Use
Cleaning Tape

Drive Fault

Load Fault
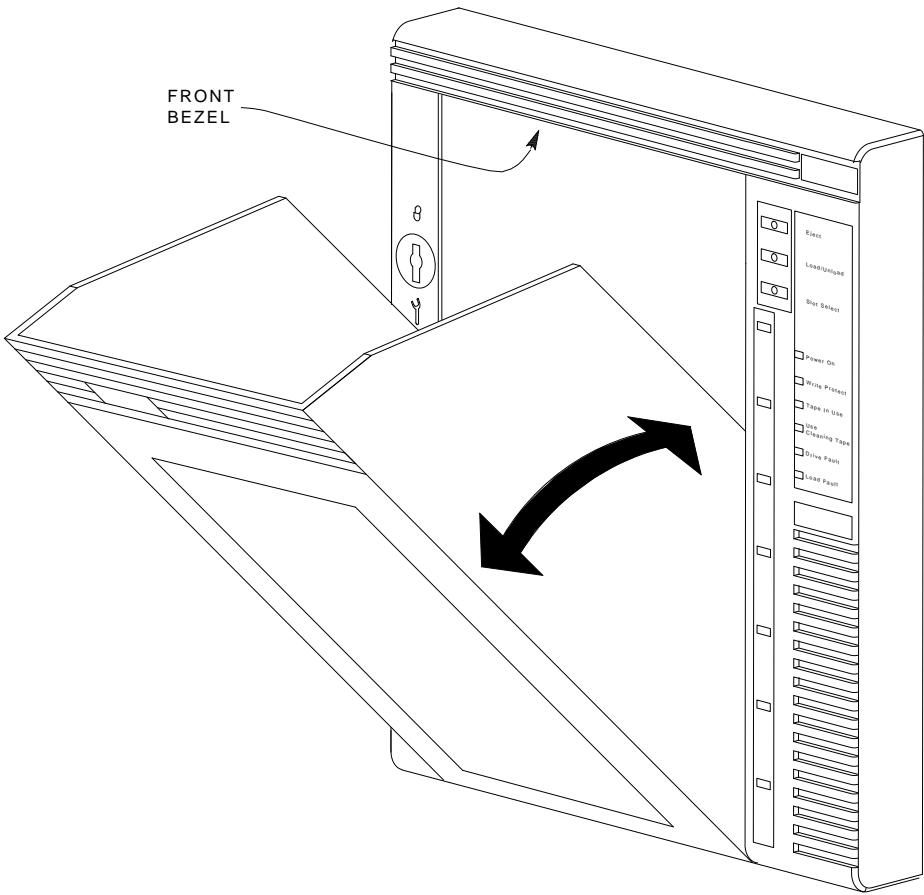
SHR-X0046-90

**Figure 6–10    Open Receiver**

### 6.3.3  Removing and Replacing the TK71 Tape Drive

Refer to the following steps to remove and replace a failing TK71 tape drive:

**Removal Procedure**

1. Verify with the operator or system manager that the TF837 magazine tape subsystem is dismounted.

2. Verify that you have the following service aids: antistatic kit (PN 29–26246–00) and a scratch tape.

3. Set the Mode Select key to Service mode (Figure 6–2). Press the Eject button to unload any cartridge and open the receiver door. Refer to step 7 if the receiver fails to open.

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

5. Release the one-quarter turn captive screws that secure the TFK70 module tray (Figure 6–3).

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.

   **NOTE**
   **You may need to press the inside cable for it to clear the metal edge.**

7. If the receiver does not open, follow these steps:

   a. Access the rear of the TF837 subsystem.

   b. Push the TF837 subsystem forward to the first mechanical stop (Figure 6–5).

   c. Squeeze the mechanical ejection lever to open the receiver (Figure 6–6).

   With the receiver open, grasp under the top of the front bezel and slide the subsystem to the first mechanical stop (Figure 6–5).

8. Remove the magazine (with customer cartridges) from the receiver.

9. Close the receiver.

10. Lift the latch (Figure 6–7) and swing open the loader transfer assembly.

11. If the cartridge did not unload from the tape drive, see section Section 6.4, Manually Removing a Cartridge from the Drive.

12. Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

13. Set up an antistatic mat, and put on an antistatic wrist strap.

14. Use a screwdriver to press the first mechanical stop; slide the subsystem to the second mechanical stop (Figure 6–11).

15. Use a screwdriver to disengage the four captive screws that secure the drive at the right (Figure 6–7) and left (Figure 6–8) sides of the rear chassis. Each screw is recessed inside a nut. Do not attempt to loosen these nuts.

16. Push or pull the plastic tab on the handle motor assembly about one inch to the right (Figure 6–12). (You may have to move the drive slightly to release the plastic tab.)

17. Rotate the black plastic tab toward the handle motor assembly.

18. Slide the drive toward you almost fully out of the rear chassis.

19. Disconnect the 4-pin power supply cable the communications cable from the rear of the drive (Figure 6–13).

SECOND
MECHANICAL
STOP
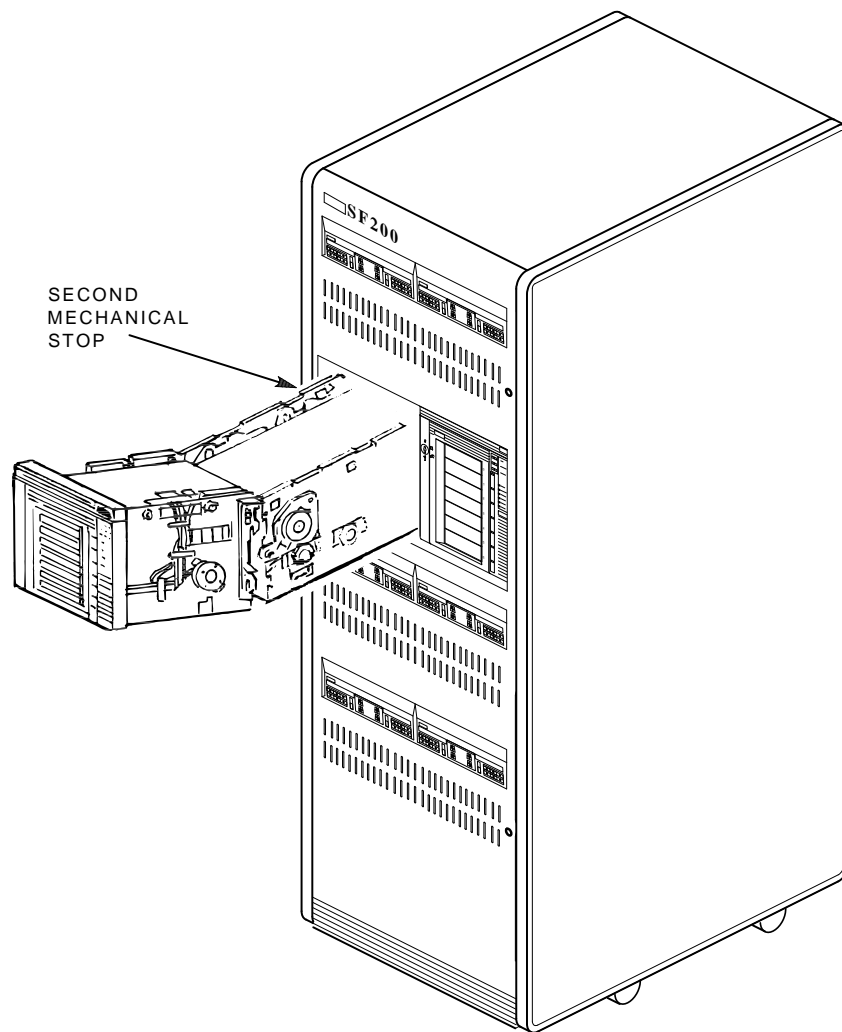
CXO-2461B
SHR_X1106C_89

**Figure 6–11    Sliding the TF837 Subsystem to the Second Mechanical
Stop**

3 SCREWS          PLASTIC TAB

SHR-0012-90
SHR-X0147B-90-CPG
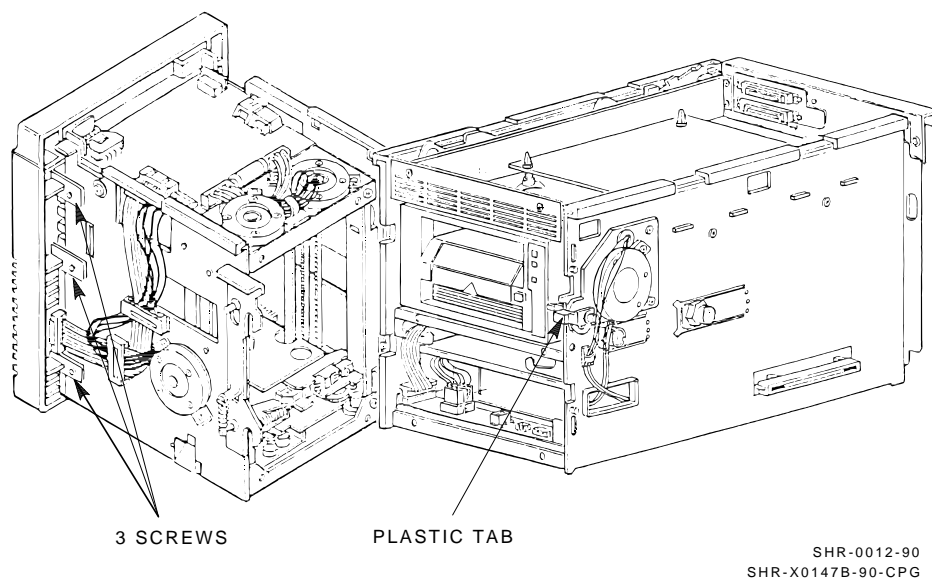
**Figure 6–12    TF837 Magazine Tape Subsystem Plastic Tab**

**Replacement Procedure**

1.  Insert the TK71 tape drive halfway into the rear chassis.

2.  Connect the power supply and communications cables to the rear of
    the replacement TK71 tape drive (Figure 6–13).

REAR CHASSIS

BACK OF TK71

COMMUNICATIONS
CABLE

POWER SUPPLY
CABLE

SHR-X0013-91
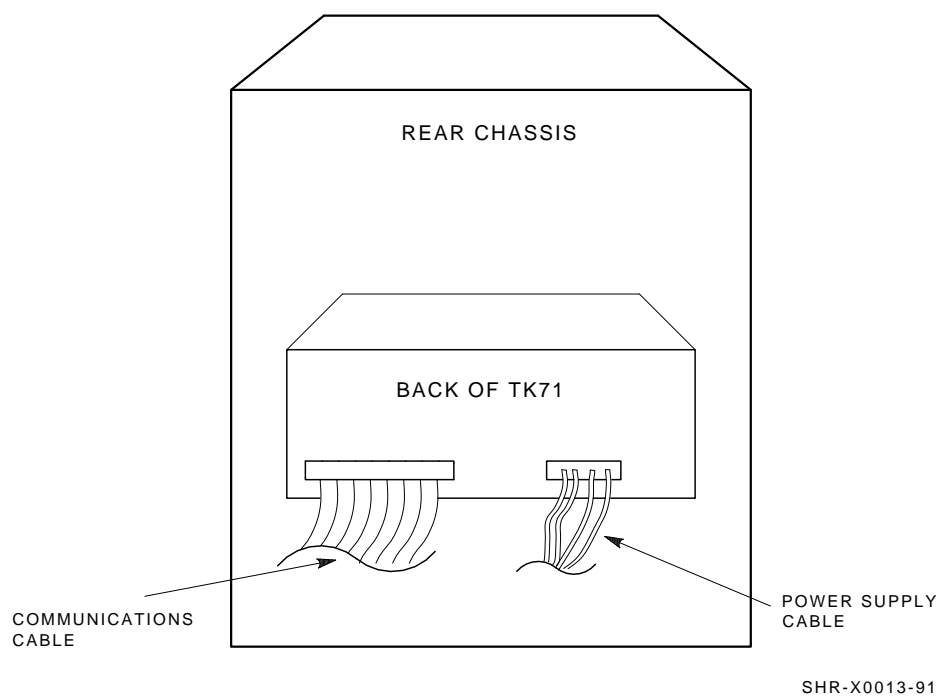
**Figure 6–13    Cabling at Rear of Drive**

3.  Slide the drive into the rear chassis; align the drive handle shaft
    with the handle motor coupling shaft (Figure 6–14). You can see the
    drive handle shaft by looking down on the drive from the top. A half-
    moon cutout in the drive bezel accommodates the shaft and coupling
    assembly.

    **CAUTION**
    **Carefully position cables when sliding the drive into the
    chassis to ensure no damage occurs from snagging.**
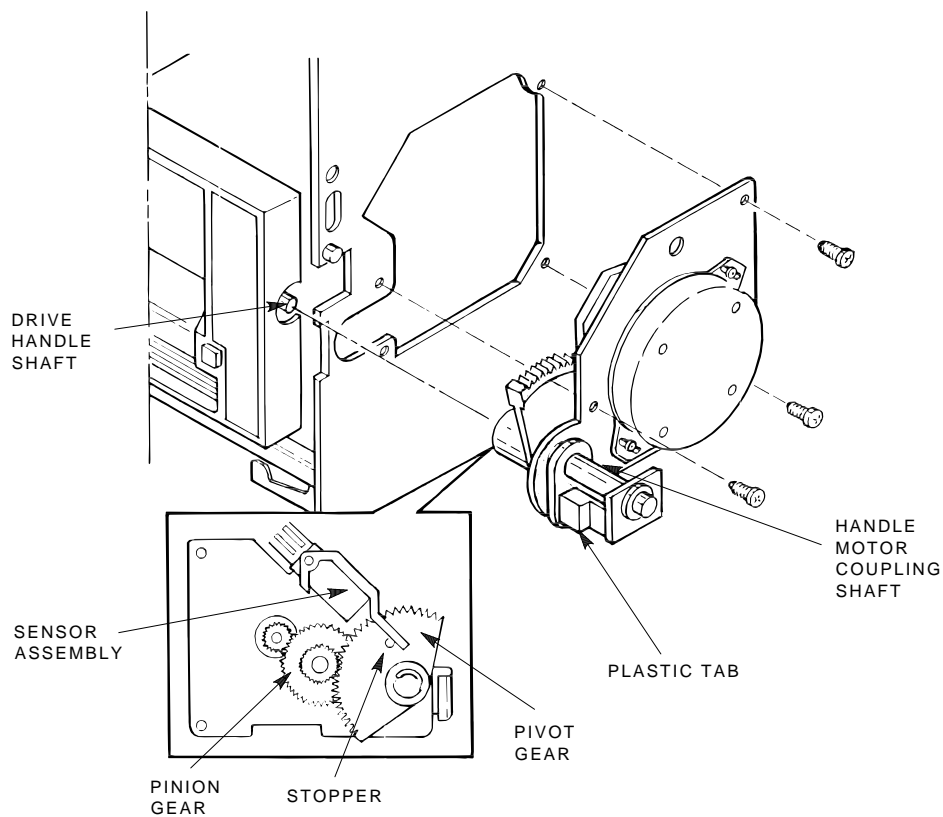


SHR-0067-89
SHR-X0146-90-CPG

**Figure 6–14    Handle Motor Assembly**

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

    a.  Push the handle motor coupling shaft toward the drive; it will partially slip onto the handle shaft. Place the black plastic tab that was rotated 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.

    b.  Locate the white plastic tab (interposer) on the drive. This tab along with a small metal tab (write-protect switch) is inside the cartridge opening adjacent 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.

        **CAUTION**
        **Failure to release the interposer before lifting the handle could cause damage; do not force the handle against the locking mechanism.**

    c.  With the handle now lifted to the open position, apply pressure to the handle coupling shaft and slowly rotate the drive handle downward. It may be necessary to wiggle the drive slightly to firmly seat the shaft.

    d.  Engage all four mounting screws of the chassis to the drive but ensure that the right rear screw is tightened last.

    **CAUTION**
    **If the handle motor coupling shaft is seated correctly, the loader transfer assembly can be closed and latched without difficulty. Use caution in closing the transfer assembly and push the black plastic tab farther toward the drive, if necessary, to seat it fully. Be careful not to damage the heads on the drive mounting screws.**

5. Slide the TF837 subsystem fully into the enclosure.

   **CAUTION**
   **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.**

6. Tighten the one-quarter turn captive screws that secure the TFK70
   DSSI controller module tray (Figure 6–3).

7. Redress the external DSSI communications cables into the rear
   chassis' cable restraints.

8. Redress the subsystem's ac power cable into the cable restraints.

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

**Verification Procedure**

1. Set the TF837 subsystem's power switch to 1 (on). If the Power On
   indicator does not light, verify that the subsystem is placed as far into
   the enclosure as possible.

2. Press the Eject button and remove the customer's magazine (if you
   have not already done so).

3. Install a scratch tape in slot 0 at the front of a spare magazine
   (PN 30–32447–01). Be sure that the cartridge's write-protect tab is
   adjacent to the slot number on the front of the magazine (Figure 6–9).

4. Install the magazine into the receiver.

5. Execute either the DRVTST or DRVEXR test.

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

### 6.3.4  Removing and Replacing the TK71 Tape Drive Takeup Leader

The following procedure explains how to remove a damaged takeup leader from the TK71 tape drive and replace it with a new one:

1.  Perform the drive removal procedure as described in Section 6.3.3 to access the drive.

2.  Remove the cover from the drive to access the takeup reel. Note where each screw was located and which screws have washers.

3.  Pull the leader out of its tape path, removing the mushroom-shaped end from the drive. The square end of the leader is still connected to the takeup reel (Figure 6–15).

4.  Disengage the square end of the leader from the small latch hook that fits through the hole in the end of the leader.

5.  Insert the square end of the new leader through the small slot in the takeup reel. Hook the hole in the leader through the small latch hook in the takeup reel slot.

6.  Begin to feed the mushroom-shaped end of the leader through the tape path after you attach the square end to the slot in the takeup reel.

7.  Thread the tape through the tape path as follows:

    Feed the mushroom-shaped end behind the capstan closest to the takeup reel (rear capstan), in front of the plastic guide, in front of the read/write head, behind the second capstan (front capstan), in front of its plastic guide, and into the drive's receiver assembly (Figure 6–16).

8.  Reach through the hole in the top of the receiver assembly and latch the hole in the mushroom-shaped end of the leader around the hook on the latch mechanism inside the receiver assembly. When you are finished, look into the drive from the front and make sure the leader is correctly aligned.

9.  Replace the cover with the front of the drive facing you. Install the screws in the following sequence: right rear, left front, and left rear. Torque the screws to 13 inch-pounds.

FRONT
CAPSTAN

PLASTIC
GUIDE

READ/WRITE
HEAD

REAR
CAPSTAN

PLASTIC
GUIDE

PLASTIC
LEADER

LATCH HOOK
FOR LEADER

SQUARE END
OF LEADER

MUSHROOM END
OF LEADER

SHR-0228-86
SHR_X1088_89_CPG
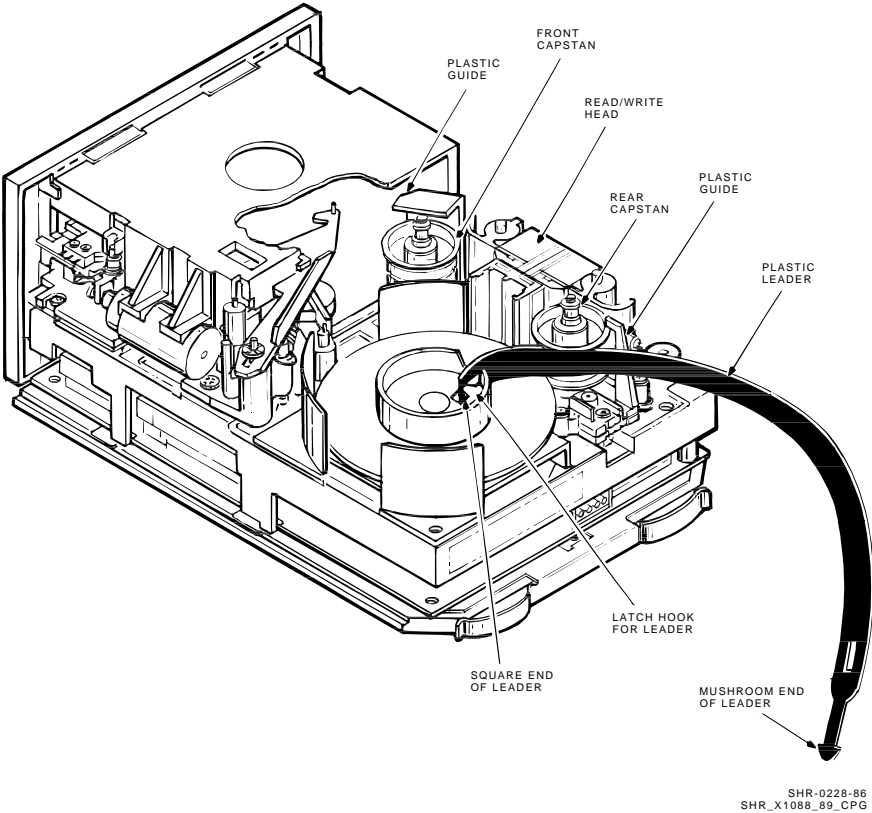
**Figure 6–15    Replacing the Takeup Leader (Leader Removed from the
Tape Path)**

TAKEUP LEADER

FRONT
CAPSTAN

PLASTIC
GUIDE

READ/WRITE
HEAD

REAR
CAPSTAN

PLASTIC
GUIDE

PLASTIC
TAKEUP
LEADER

LATCH HOOK
FOR LEADER

SQUARE END
LEADER

SHR-0227-86
SHR_X1091_89_CPG
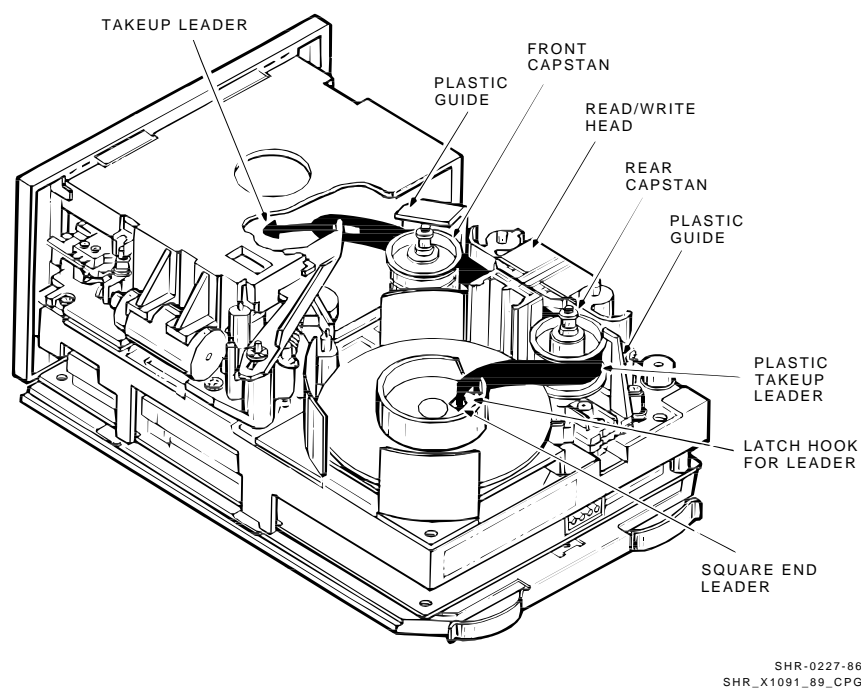
**Figure 6–16    TK71 Tape Path (Takeup Leader Replaced)**

### 6.3.5  Removing and Replacing the Operator Control Panel

Refer to the following steps to remove and replace the operator control panel (OCP).

**Removal Procedure**

1. Verify with the operator or system manager that the TF837 magazine tape subsystem has been dismounted.

2. Set the Mode Select key to Service mode (Figure 6–2).

3. Press the Eject button. In the receiver opening, grasp under the front bezel and slide the subsystem to its first mechanical stop (Figure 6–5).

   **NOTE**
   **Access the rear of the TF837 subsystem, if the Eject button fails to function, and push the subsystem to the first mechanical stop.**

4. Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

5. Set up an antistatic mat, and put on an antistatic wrist strap.

6. Remove the three screws (Figure 6–17) that secure the control panel assembly to the loader transfer assembly. (Be careful not to misplace the screws as they are metric and not easily obtainable.)

7. Disconnect the OCP cable from the OCP.

8. Remove the OCP.

**Replacement Procedure**

Reverse the preceding steps to replace the operator control panel.

**Verification Procedure**

Execute the POST procedure. Except for the Loader Fault indicator, all OCP indicators should remain on until the host system initializes the tape subsystem.

3 SCREWS          PLASTIC TAB

SHR-0012-90
SHR-X0147B-90-CPG
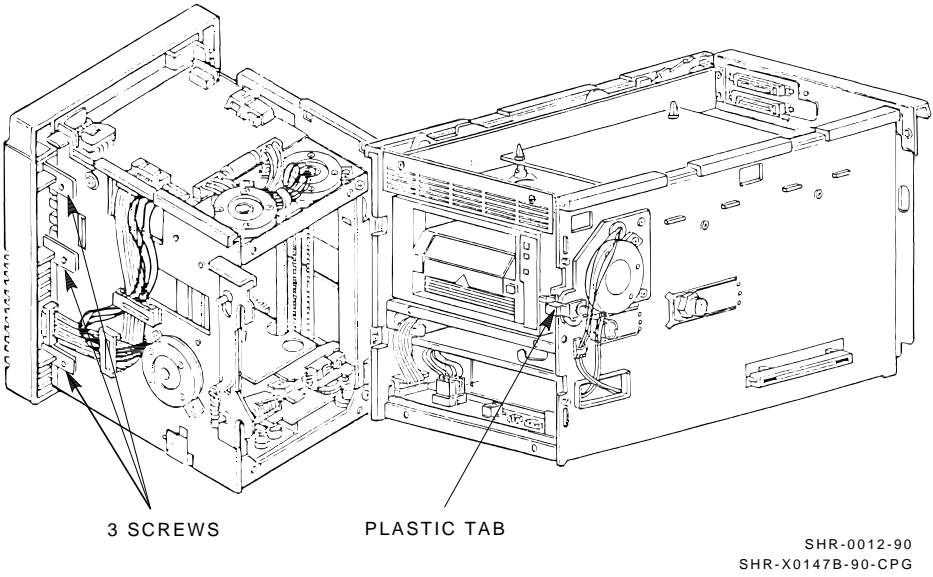
**Figure 6–17    Removing the OCP**

### 6.3.6  Removing and Replacing the 12 Vdc Fan

Refer to the following steps to remove and replace the 12 Vdc fan:

**Removal Procedure**

1. Access the rear of the TF837 magazine tape subsystem.

2. Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

3. Remove the two screws that secure the fan. Remove and set aside the fan's grill. (Be careful not to misplace the screws as they are metric and not easily obtainable.)

4. Note the orientation, for reinstallation purposes, of the fan's power wires and disconnect them.

5. Remove the fan.

**Replacement Procedure**

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

**Verification Procedure**

1. Set the TF837 subsystem's power switch to 1 (on).

2. Observe counterclockwise rotation of the fan.

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

### 6.3.7  Removing and Replacing the Interlock Switch

Refer to the following steps to remove and replace the interlock switch
(Figure 6–18):

**Removal Procedure**

1.  Verify with the operator or system manager that the TF837 magazine
    tape subsystem is dismounted.

2.  Set the Mode Select key to Service mode (Figure 6–2).

3.  Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

4.  Set up an antistatic mat, and put on an antistatic wrist strap.

5.  Disconnect the TF837 subsystem's power supply cable.

6.  Release the one-quarter turn captive screws that secure the TFK70
    DSSI controller module tray (Figure 6–3).

7.  Pull the tray several inches out of the rear chassis.

8.  Disconnect the internal DSSI communications cable (J7) from the
    TFK70 DSSI controller module (Figure 6–4).

    **CAUTION**
    **Do not disconnect the external DSSI communications cable
    (Figure 6–3) from the bulkhead connector. Doing so can cause
    system failure and possible loss of customer data.**

9.  Remove the screws that secure the DSSI bulkhead connector. (Be
    careful not to misplace the screws as they are metric and not easily
    obtainable.)

10. Remove the internal DSSI communications cable through the rear of
    the module tray.

11. Push the tray back into the rear chassis.  Secure the one-quarter turn
    captive screws.

    **CAUTION**
    **Be careful not to damage cabling or module components when
    performing this step.  Check the cable management scheme.**
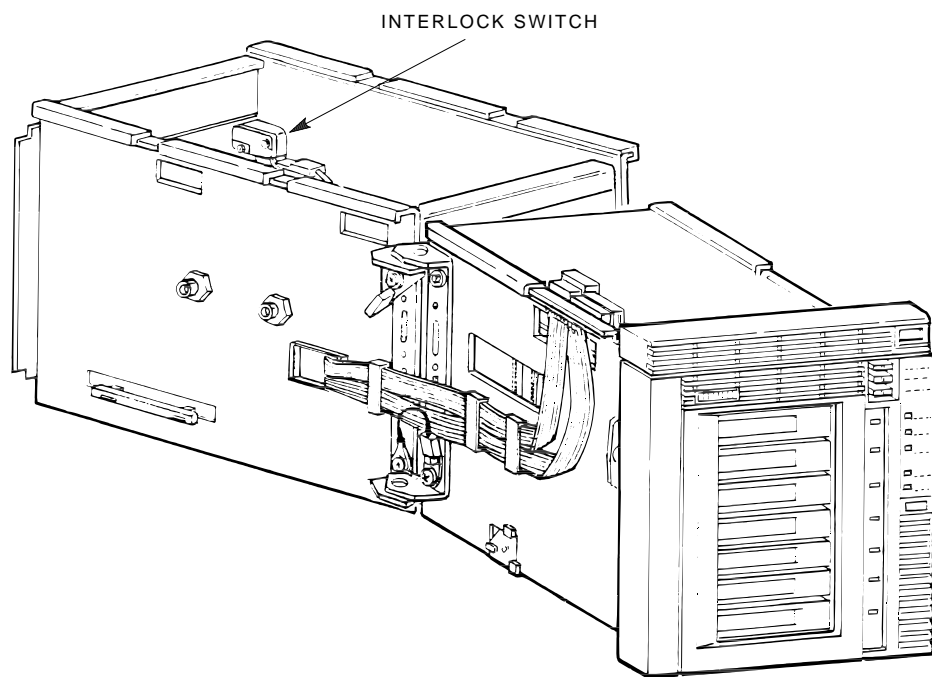
INTERLOCK SWITCH

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

**Figure 6–18    Interlock Switch**

12. Push the TF837 subsystem forward to its first mechanical stop (Figure 6–5).

13. Use a screwdriver to press the first mechanical stop; slide the subsystem forward to its second mechanical stop (Figure 6–11).

   **WARNING**
   **Be careful when performing the next several steps; the TF837 subsystem is heavy.**

14. Press the second mechanical stop; slide the TF837 subsystem just beyond the second mechanical stop.

15. Hold the subsystem under the front bezel and rear chassis. Carefully slide the subsystem fully out of the enclosure.

16. Place the subsystem on the antistatic mat.

17. Release the one-quarter captive screws that secure the TFK70 module tray (Figure 6–3).

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

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

20. Remove the two screws that secure the interlock switch. While performing this step, place a hand under the switch to catch both the switch and mounting hardware.

21. Remove the interlock switch.

**Replacement Procedure**

Reverse the preceding steps to replace the interlock switch.

**CAUTION**
**When sliding the TFK70 module tray back into the enclosure, pull the power cable (J7) taut to avoid snagging it behind the rail that supports the tray.**

### 6.3.8  Removing and Replacing the Power Supply Assembly

Refer to the following steps to remove and replace the power supply assembly:

**Removal Procedure**

1.  Verify with the operator or system manager that the TF837 magazine tape subsystem is dismounted.

2.  Set the Mode Select key to Service mode (Figure 6–2).

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

4.  Set the TF837 subsystem's power switch to 0 (off) (Figure 6–3).

5.  Set up an antistatic mat, and put on an antistatic wrist strap.

6.  Disconnect the power plug from the rear of the TF837 subsystem.

7.  Push the TF837 subsystem forward to its first mechanical stop (Figure 6–5).

8.  Lift the latch (Figure 6–7) and swing open the loader transfer assembly.

9.  Loosen the captive screws securing the lower intermediate bezel (Figure 6–19) and remove the bezel.

10. Disconnect the cable connections at the front of the power supply assembly (Figure 6–20) (except for the cable harness X1, second from the left).

11. Move the cables into the sheet metal cutouts (Figure 6–20).

12. Grasp the top cover of the power supply assembly and lift up the assembly.

13. Slide the assembly toward you to remove it. While performing this step, ensure that the cables are not pinched.

SHR-X0147D-90-CPG
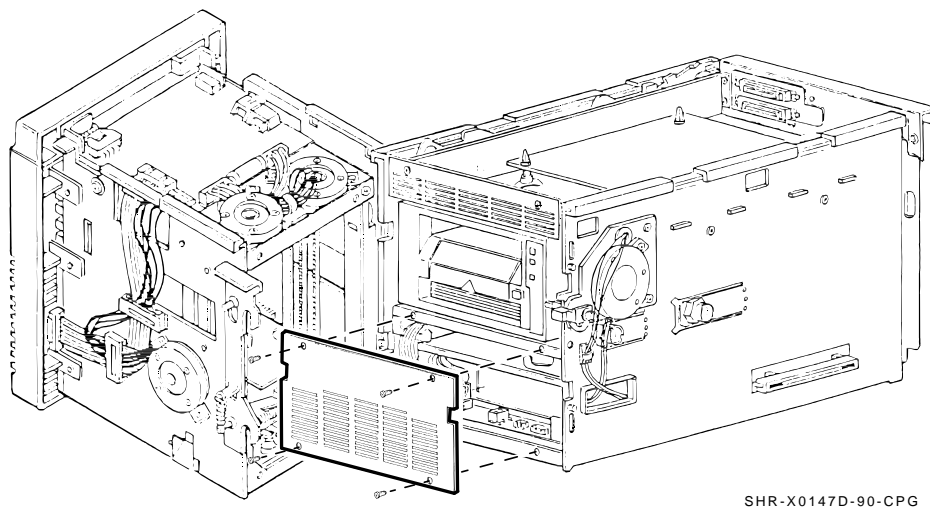
**Figure 6–19    Removing the Intermediate Bezel**
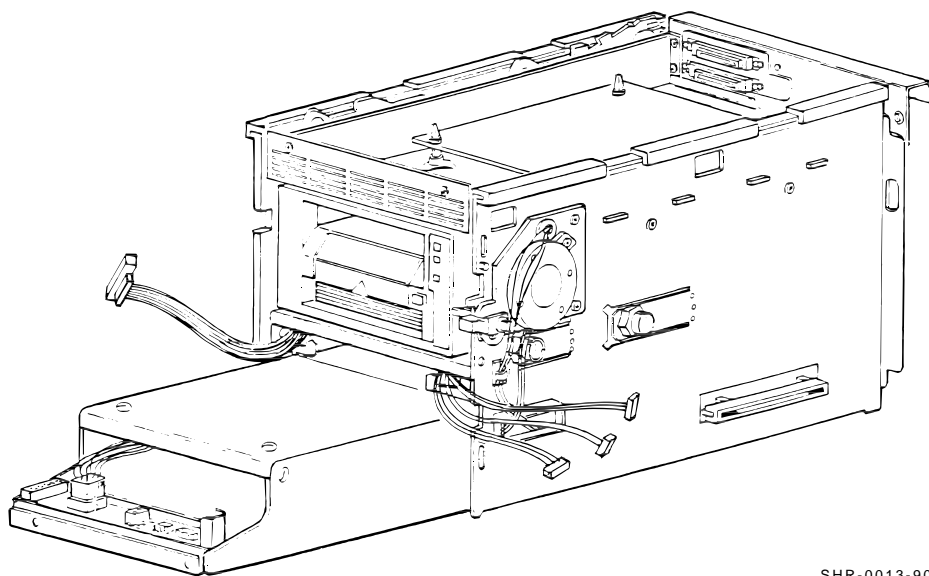
SHR-0013-90
SHR-X0142-90-CPG

**Figure 6–20    Power Supply Assembly**

**Replacement Procedure**

Reverse the preceding steps to replace the power supply assembly.

**Verification Procedure**

1.  Set the TF837 subsystem's power switch to 1 (on).

    **NOTE**
    **If the Power On indicator fails to light, you may not have
    pushed the subsystem fully into the enclosure to activate the
    24 Vdc interlock switch. You can also verify the interlock
    switch by checking its circuitry with an ohm meter. Check X3
    on the power supply assembly; a good interlock switch circuit
    reads 0 ohm.**

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

### 6.3.9  Removing and Replacing the Handle Motor Assembly

Refer to the following steps to remove and replace the handle motor assembly:

**Removal Procedure**

1.  Verify with the operator or system manager that the TF837 magazine tape subsystem is dismounted.

2.  Set the Mode Select key to Service mode (Figure 6–2). Press the Eject button to unload any cartridge and open the receiver door.

3.  If the receiver does not open, follow these steps:

    a.  Access the rear of the TF837 subsystem.

    b.  Push the TF837 subsystem forward to the first mechanical stop (Figure 6–5).

    c.  Squeeze the mechanical ejection lever to open the receiver (Figure 6–6).

    With the receiver open, grasp under the top of the front bezel and slide the subsystem to the first mechanical stop (Figure 6–5).

4.  Remove the magazine (with customer cartridges) from the receiver.

5.  Close the receiver.

6.  Lift the latch (Figure 6–7) and swing open the loader transfer assembly.

7.  If the cartridge did not unload from the tape drive, see section Section 6.4, Manually Removing a Cartridge from the Drive.

8.  Set the TF837 subsystem's power switch to 0 (off). (Figure 6–3).

9.  Set up an antistatic mat, and put on an antistatic wrist strap.

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

11. Release the one-quarter turn captive screws that secure the TFK70 DSSI controller module tray (Figure 6–3).

12. 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.

    **NOTE**
    **You may need to press the inside cable for it to clear the metal edge.**

13. From the front, use a screwdriver to press the first mechanical stop. Slide the TF837 subsystem to its second mechanical stop (Figure 6–11).

14. Release the captive screws that secure the lower intermediate bezel (Figure 6–19). Remove the bezel.

15. At the two rightmost cable connections on the power supply assembly, disconnect the handle motor assembly wiring (Figure 6–20) on right exterior of the loader transfer assembly.

16. Release the cable clamp that secures the motor assembly wiring.

17. Slide the plastic tab to the right (Figure 6–21).

18. Disconnect the wire harness to the door open sensor assembly on the right interior of the rear chassis.

19. Remove the three screws (Figure 6–21) that secure the handle motor assembly to the side of the rear chassis. (Be careful not to misplace the screws as they are metric and not easily obtainable.)

   **NOTE**
   **You do not have to remove the screws that secure either the door open sensor assembly or the coupling shaft. The sensor and coupling shaft are part of the larger FRU.**

20. Slide the wire harness through the cutout in the rear chassis.

21. Move the handle motor assembly toward the rear of the subsystem to free the coupling shaft.

22. Remove the handle motor assembly from the cutout.

DRIVE
HANDLE
SHAFT

SENSOR
ASSEMBLY

PINION
GEAR

STOPPER

PIVOT
GEAR

PLASTIC TAB

HANDLE
MOTOR
COUPLING
SHAFT
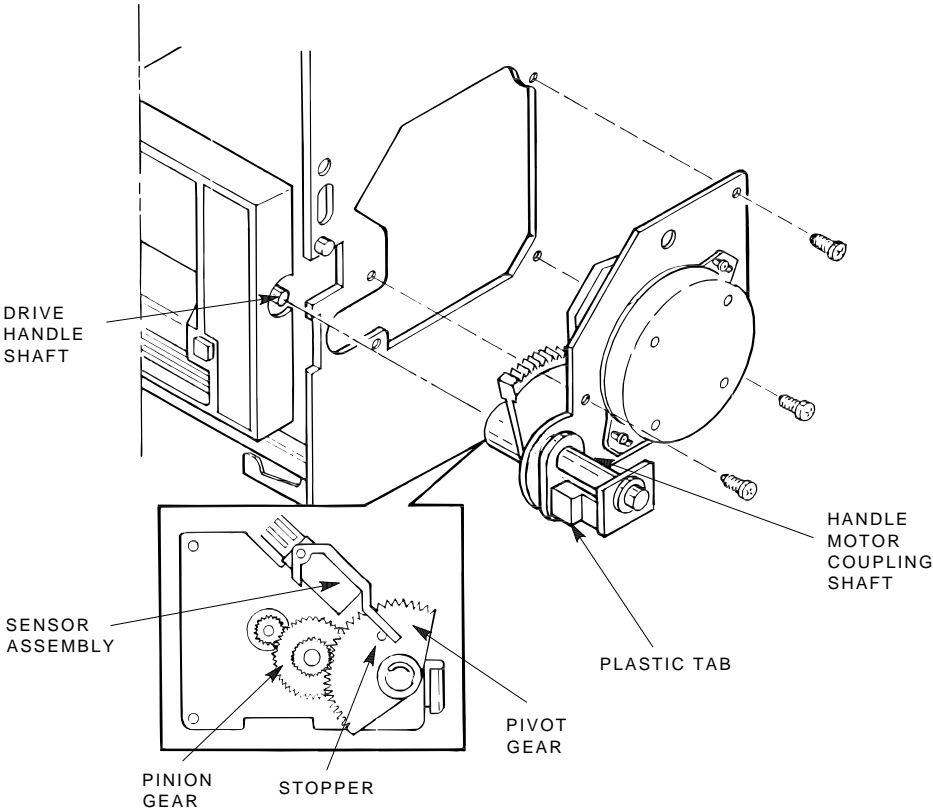
SHR-0067-89
SHR-X0146-90-CPG

**Figure 6–21   Handle Motor Assembly**

**Replacement Procedure**

**NOTE**
**Before replacing the handle motor assembly, be sure that the
sensor assembly arm rests on the plastic stopper of the pivot gear
(Figure 6–21). You may have to maneuver the gears slightly 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. Be sure to seat the handle motor coupling shaft fully. You may have
   to move the pivot gear slightly; if so, be sure that the sensor assembly
   arm remains on the plastic stopper.

   **NOTE**
   **If the handle motor coupling shaft is not seated correctly, the
   subsystem will not close.**

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

   **NOTE**
   **Be sure the connector wires are not tangled to ensure that the
   subsystem does not jam when you push it into the enclosure.**

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

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

6. Close the TF837 subsystem.

## 6.4   Manually Removing a Cartridge from the Drive

If a cartridge does not unload from the TK71 tape drive when you press the Eject button on the TF837 OCP, 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 (Figure 6–22).

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.

   **CAUTION**
   **Do not turn the drive upside down or the tape will fall off the takeup reel.**

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 (Figure 6–22).

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 6–9).) 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 tab 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.**
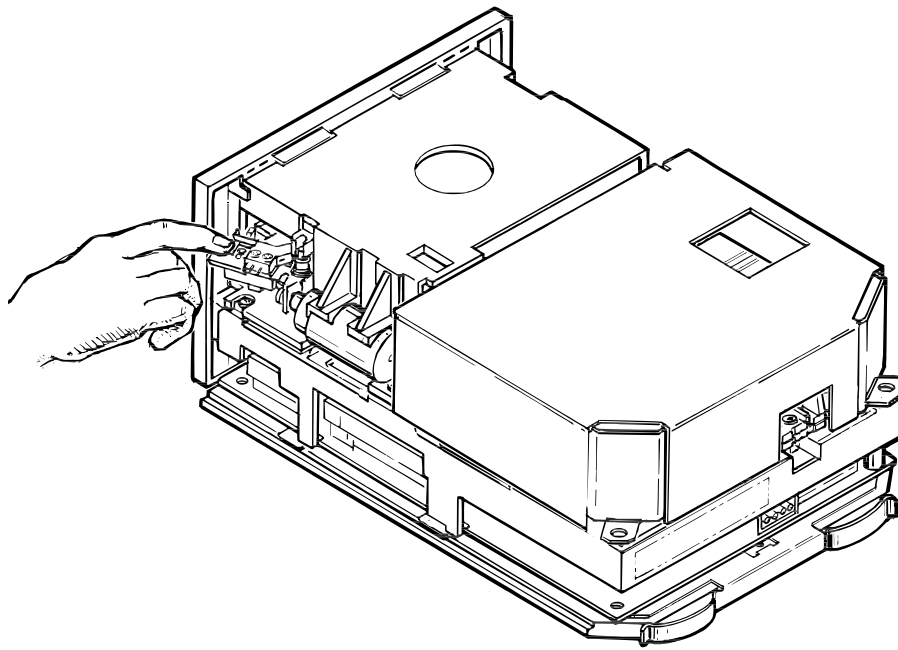
SHR-0229-86
SHR_X1089_89_CPG

**Figure 6–22     Manually Rewinding Tape in a TK71 Tape Drive**

# A
# Head Cleaning

This appendix describes how to clean the read/write head of the TK71 tape drive in the TF837 magazine tape subsystem. To perform the procedures, make sure you have a head cleaning kit (PN 22–00436–01).

The head cleaning kit contains the following items:

- **Positioning Cartridge** — Directs the wand over the head.

- **Wand** — Carries the cleaning fluid.

- **Capsule** — Contains a single-dose cleaning fluid applicator.

**NOTE**
**The wand and capsules are disposable.**

## A.1  Tape Drive Access

To gain access to the drive to clean the read/write head, perform the
following procedure:

1.  Ensure that the TF837 subsystem operations are complete.

2.  Ensure that the Eject indicator is on.

3.  Open the SF200 storage array.

4.  Set the Mode Select key to Service mode (Figure A–1).

5.  Press the Eject button (Figure A–1).

6.  Pull the TF837 subsystem toward you by placing your hand under the
    top of the TF837 front bezel (Figure A–2).

    **CAUTION**
    **An internal service stop should prevent you from from pulling
    the TF837 subsystem more than several inches forward.  The
    Power On indicator should turn off at this time.  If, after you
    pull the subsystem forward, the Power On indicator does not
    turn off, do _not_ attempt the head cleaning procedure.**

7.  Lift the subsystem (loader) open latch (Figure A–3) (to the right of the
    unit).

8.  Swing the front of the TF837 subsystem to the left.  Be careful not to
    hit the storage array with the front of the subsystem.

You now have access to the TK71 drive's cartridge entrance (Figure A–4).

OPERATOR CONTROL PANEL

MODE SELECT KEY

OCP
DISABLED

AUTOMATIC
MODE

SERVICE
MODE

MANUAL
MODE

Eject

Load/Unload

Slot Select

BUTTON
AND
INDICATOR
AREA

0

Power On

Write
Protected

Tape In Use

Use
Cleaning Tape

Magazine
Fault

Loader Fault

OCP LABEL

CURRENT
SLOT
INDICATORS
0-6

1

2

DSSI NODE
ID LABEL

3

4

5

6

Eject

Load/Unload

Slot Select

0

Power On
Write
Protected
Tape In Use
Use
Cleaning Tape
Magazine
Fault
Loader Fault

1

2

3

4

5

6

SHR_X1025B_89

**Figure A–1    Operator Control Panel**
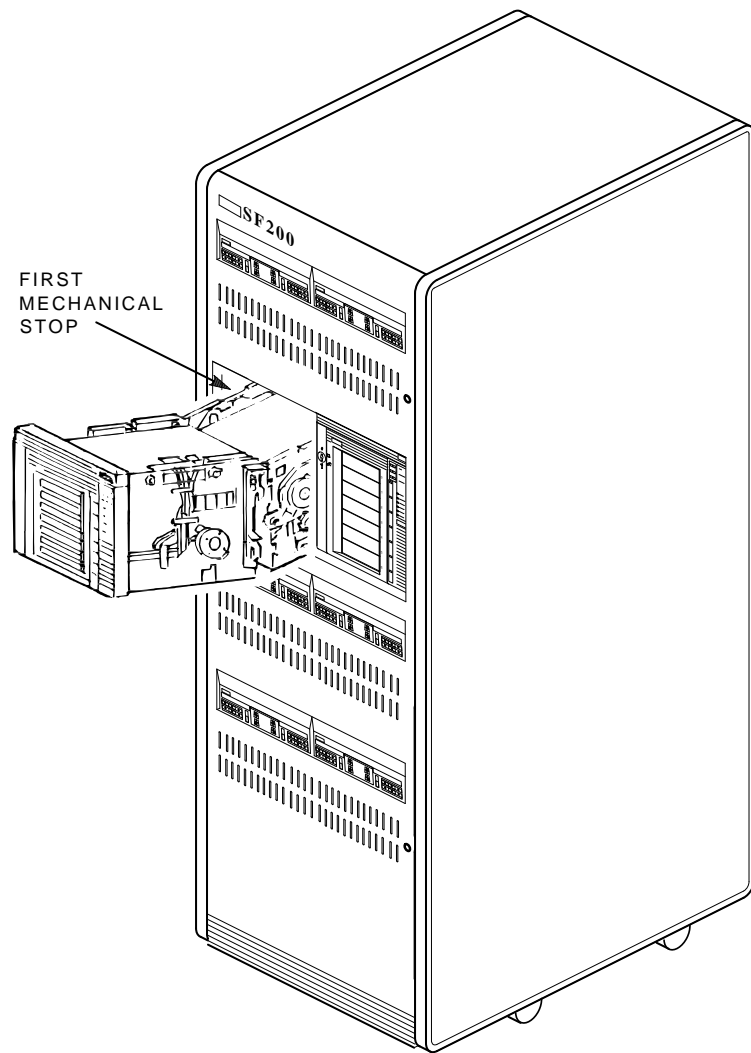
CXO-2461B
SHR_X1106B_89

**Figure A–2    Sliding the TF837 Magazine Tape Subsystem Toward You**

LOADER OPEN LATCH

SHR-0007-90
SHR-X0140-90-CPG
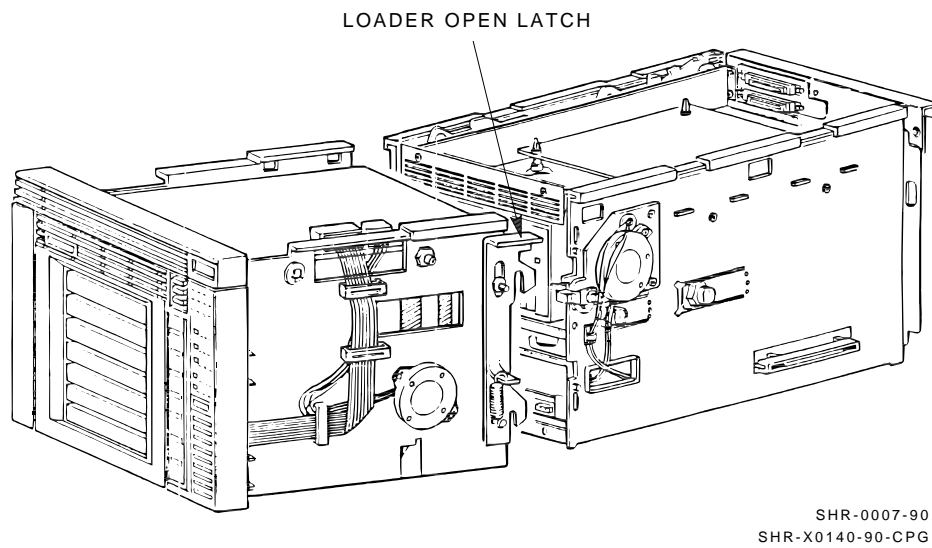
**Figure A–3    Using the Loader Open Latch**

CARTRIDGE INSERT/RELEASE HANDLE
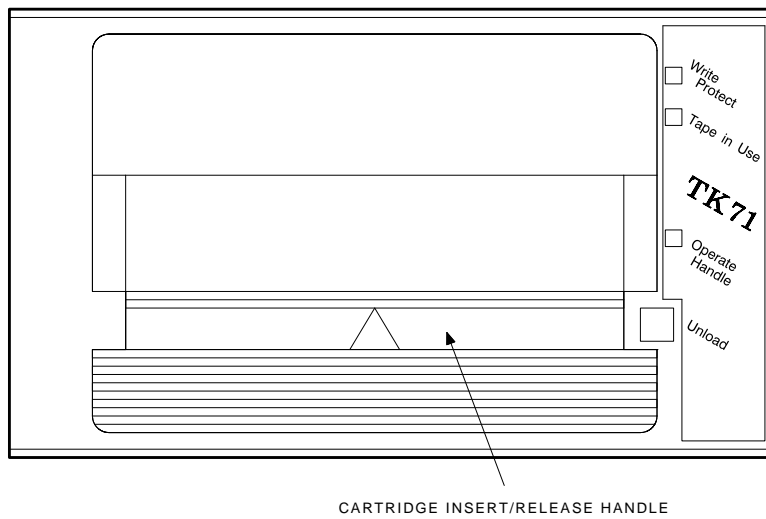
SHR-X0056A-90

**Figure A–4    TK71 Tape Drive**

### A.1.1  Cleaning the Read/Write Heads

To clean the read/write heads in the TK71 tape drive, perform the following procedure:

1.  Insert the positioning cartridge into the drive (Figure A–5).

    **CAUTION**
    **You do not have to lift the drive's insert/release handle to insert the positioning cartridge.**

2.  Hold the solvent applicator with the bristle end down. Pinch the applicator at the dot, and crush it to release fluid and saturate the bristles.

3.  Apply solvent to the fabric side of the wand. Cover about 5 cm (2 in) of the wand tip.

4.  Insert the wand into the slot, with the fabric side of the wand facing the square on the positioning cartridge, until the wand tab touches the front surface of the drive (Figure A–5).

5.  Move the wand in and out 10 times, about 2.5 cm to 5 cm (1 in to 2 in) each way.

    **NOTE**
    **If the TK71 drive indicators begin to flash while you are cleaning, press the drive's Unload button to reset the drive.**

6.  Discard the wand and solvent applicator. They are designed for single use only.
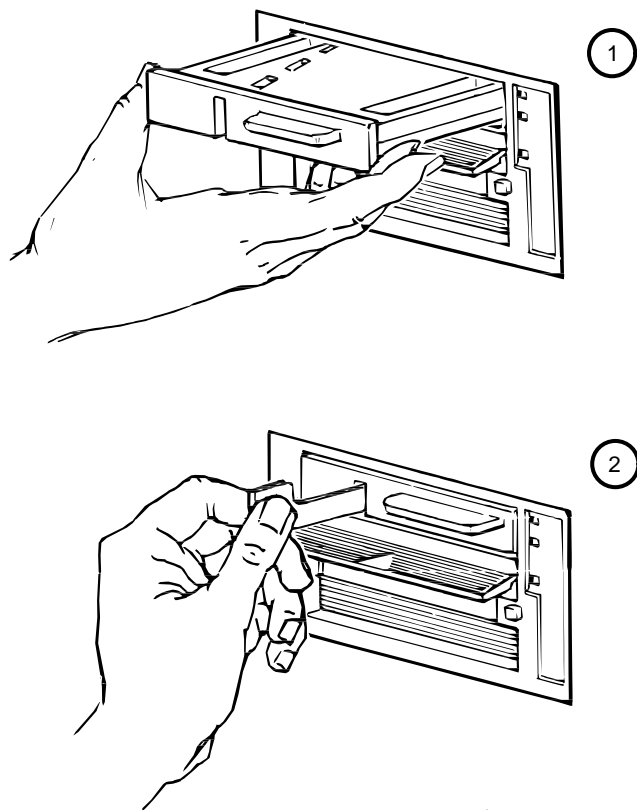
SHR-0064-89
SHR_X1090_89_CPG

**Figure A–5   Inserting the Positioning Cartridge into the TK71 Tape Drive**

## A.1.2  Securing the TF837 Subsystem

After cleaning the heads, secure the TF837 subsystem as follows:

1.  Note that the drive's cartridge insert/release handle is lowered.

2.  Close the front of the subsystem.

3.  Press down on the latch to secure the TF837 loader (Figure A–3).

4.  Push the TF837 subsystem back into the SF200 storage array.

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

# B
# Error Logs

This appendix describes the error logs created by the VMS operating system as it monitors operation of the TF837 magazine tape subsystem. Information on accessing error logs is available in the *VAX/VMS Error Log Utility Reference Manual*. As of this printing, VMS error logs contain the following TF837 subsystem information:

- Unit number

- Firmware revision

- Hardware revision

- Fault code

To obtain a VMS error log printout, use the **ANALYZE/ERROR_LOG** command. For example:

```
$ ANALYZE/ERROR_LOG/INCLUDE=MIXX
```

where XX is a DSSI bus identifier and TMSCP number.

Subsystem faults are returned to an error log. The faults are logged to the tape drive (model byte = decimal). To find a subsystem error among drive errors, look for the entry `Media Subsystem Error`.

For a detailed description of error logging related to the TF837 subsystem, refer to Chapter 4.

## B.1   Device-Dependent Error Codes

The following are device-dependent error codes for the TF837 subsystem:

```
CODE          DESCRIPTION
----          -----------

80H           No error
81H           Unrecognized subsystem command
82H           Undefined error
83H           Undefined error
84H           Cartridge slot number unknown
85H           Lost picker homeposition
86H           Lost PICKPOS1
87H           Timeout moving cartridge to elevator
88H           Lost DRIVEPOS
89H           Lost elevator homeposition
8AH           Stuck at DRIVEPOS
8BH           Error during picker test
8CH           Timeout picker to PICKPOS1
8DH           Timeout picker to homeposition
8EH           Timeout picker to PICKPOS2
8FH           Undefined error
90H           No cartridge in drive
91H           Lost PICKPOS2
92H           Timeout opening drive handle
93H           Timeout finding picker homeposition
94H           Timeout moving cartridge from drive
95H           Timeout elevator to slot position
96H           Timeout finding PICKPOS1
97H           Timeout cartridge to slot
98H           Timeout finding picker homeposition
99H           Timeout elevator to DRIVEPOS
9AH           Timeout finding PICKPOS2
9BH           Cannot open receiver
9CH           Failed to find all slots
9DH           Timeout leaving cartridge type window
9EH           Timeout leaving DRIVEPOS
9FH           Undefined error
A0H           Cartridge already in drive
A1H           No cartridge in selected slot
A2H           Timeout elevator to slot position
A3H           Timeout finding PICKPOS1
A4H           Timeout cartridge slot to elevator
A5H           Timeout finding picker homeposition
A6H           Timeout elevator to drive
A7H           Timeout opening drive handle
A8H           Timeout cartridge to drive
A9H           Timeout finding PICKPOS2
AAH           Reserved
ABH           Timeout prepositioning elevator
ACH           Timeout closing drive handle
ADH           Failed to find all slots
AEH           Timeout cartridge to slot
AFH           Undefined error
```

```
CODE          DESCRIPTION
----          -----------

B0H           24 volt error
B1H           Standalone jumper in place
B2H           Receiver open
B3H           Unit was reset or powered-up
B4H           Undefined error
B5H           Undefined error
B6H           Undefined error
B7H           Undefined error
B8H           Undefined error
B9H           EEPROM full
BAH           EEPROM checksum failed
BBH           RAM error
BCH           ROM error
BDH           CTC error
BEH           Cannot write to EEPROM
BFH           Undefined error
```

## B.2  Device-Dependent Status Codes

The following are device-dependent status codes associated with the
TF837 magazine tape subsystem:

```
CODE          DESCRIPTION
----          -----------

01H           Subsystem timeout
02H           Invalid queue type
03H           Invalid message size
04H           Reserved
05H           Reserved
06H           Invalid command code
07H           Invalid number of parameters
08H           UART receiver error
09H           UART input buffer overflow
0AH           Subsystem data size inconsistency
0BH           UART has stalled on transmission
0CH           Cartridge in drive
0DH           No cartridge in drive
0EH           Specified slot is empty
0FH           Specified slot is occupied
10H           Invalid load command
11H           Invalid unload command
12H           DRIVE_FLAGS was zero
13H           Retry count exhausted
14H           End of magazine
15H           SEND STATUS command failed
16H           Reserved
17H           Reserved
18H           Retries done
19H           Reset count exhausted
1AH           Reserved
1BH           Reserved
1CH           Reserved
1DH           Reserved
1EH           Reserved
1FH           Reserved
20H           Reserved
```

## B.3 Error Reporting Format

The following format is used to report errors that occur during subsystem operations:

```
                     31                            0
                     +-----------------------------+
                     |   command reference number  |  0
                     +--------------+--------------+
                     |sequence number|  unit number |  4
                     +--------------+------+-------+
                     |  event code  | flags | format|  8
                     +--------------+------+-------+
                     |                             | 12
                     +---  controller identifier ---+
                     |                             | 16
                     +--------------+------+-------+
                     |multi-unit code|chvrsn | csvrsn| 20
                     +--------------+------+-------+
                     |                             | 24
                     +---     unit identifier    ---+
                     |                             | 28
                     +------+-------+------+-------+
                     |    reserved   |uhvrsn | usvrsn| 32
                     +------+-------+------+-------+
                     |                             | 36
                     +---media subsystem identifier--+
                     |                             | 40
                     +------+-------+------+-------+
                     |ml unit number |mlhvrsn|mlsvrsn| 44
                     +------+-------+------+-------+
*****                |cmd par| cmd  |ldr st |ldr err| 48
*****                +------+-------+------+-------+
*****                |    reserved       | retry | 52
*****                +-----------------------------+

***** ldr err = error code returned by subsystem
***** ldr st  = status associated with subsystem,
*****           such as recovery performed
***** cmd     = subsystem command associated with error
***** cmd par = command parameter
***** retry   = number of retries performed by subsystem
```

# C
# Wiring

Figure C–1 shows the wiring connections in the TF837 magazine tape
subsystem.

## C–2 Wiring



**Figure C–1    Wiring Diagram**

SHR_X1003_89

# Index