
TF70

TF70 Cartridge Tape Drive Subsystem Service Manual

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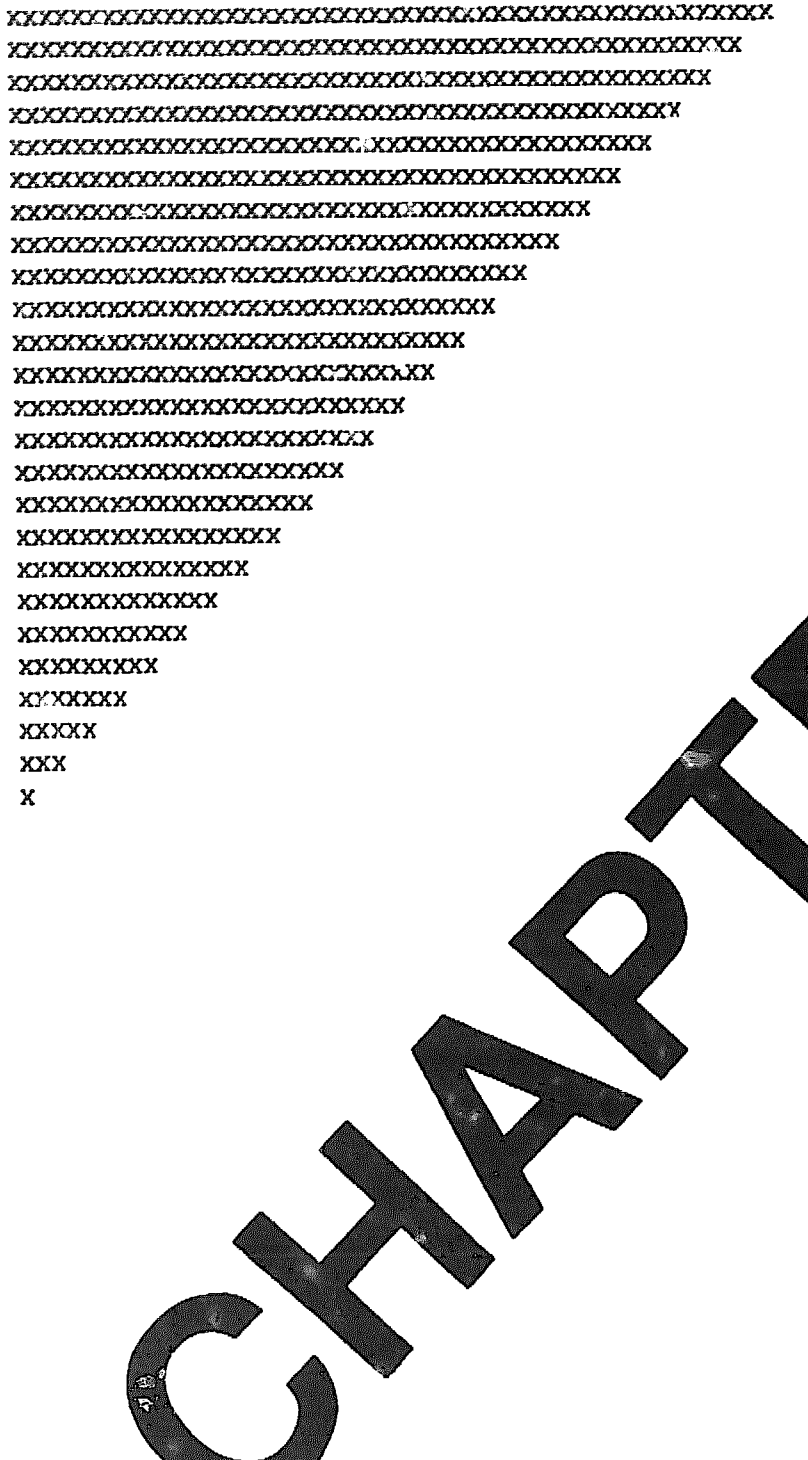


CHAPTER 1

1

TF70 Tape Drive Subsystem Overview

1.1 Introduction

This chapter introduces the user to the TF70 streaming tape drive subsystem. It provides a block diagram and overview of the TF70 tape drive subsystem, lists subsystem spares, service tools, and related documentation.

NOTE
This manual does not contain removal and replacement procedures. Refer to your system maintenance documentation for such information. For example, refer to the *VAXft 3000 Maintenance Guide* (EK-VXFT1-MG).

The TF70 tape drive subsystem consists of two major components:

1. A TK70 tape drive
2. A TFK70 DSSI controller module

1.2 Product Description

Figure 1–1 shows a streaming tape drive that stores up to 296 megabytes of data on CompacTape or CompacTape II tape cartridges. The drive is cabled to a DSSI controller to form an intelligent subsystem that provides backup and software distribution capability.

The TF70 tape drive subsystem is one of a family of storage products based on Digital Storage Architecture (DSA), which use the Digital Storage Systems Interconnect (DSSI) bus.

The tape cartridge, labeled CompacTape or CompacTape II, is a 10.2 cm (4 in) square, plastic cartridge. It contains 182.9 m (600 ft) of 1.27 cm (1/2 in) magnetic tape. The TF70 tape drive writes up to 48 tracks on the tape, and reads and writes data in a serial, serpentine fashion. It writes all even tracks in the forward direction on channel 1, and all odd tracks

in the reverse direction on channel 2 at approximately 100 inches per second.

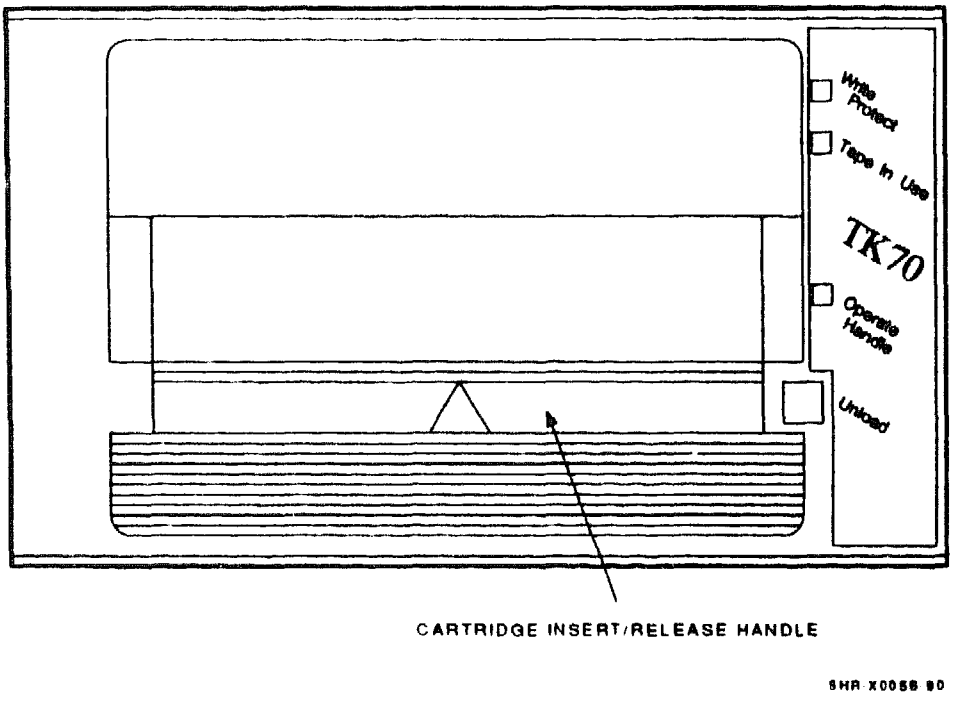


Figure 1–1 TK70 Tape Drive

1.2.1 DSSI Controller Module

The TFK70 DSSI controller module attaches externally to the TK70 drive to provide DSSI interface capabilities. The DSSI controller module handles bus protocol, buffer management, and error logging, as well as controlling system-to-drive communications. Figure 1–2 is a block diagram of the TFK70 DSSI controller module.

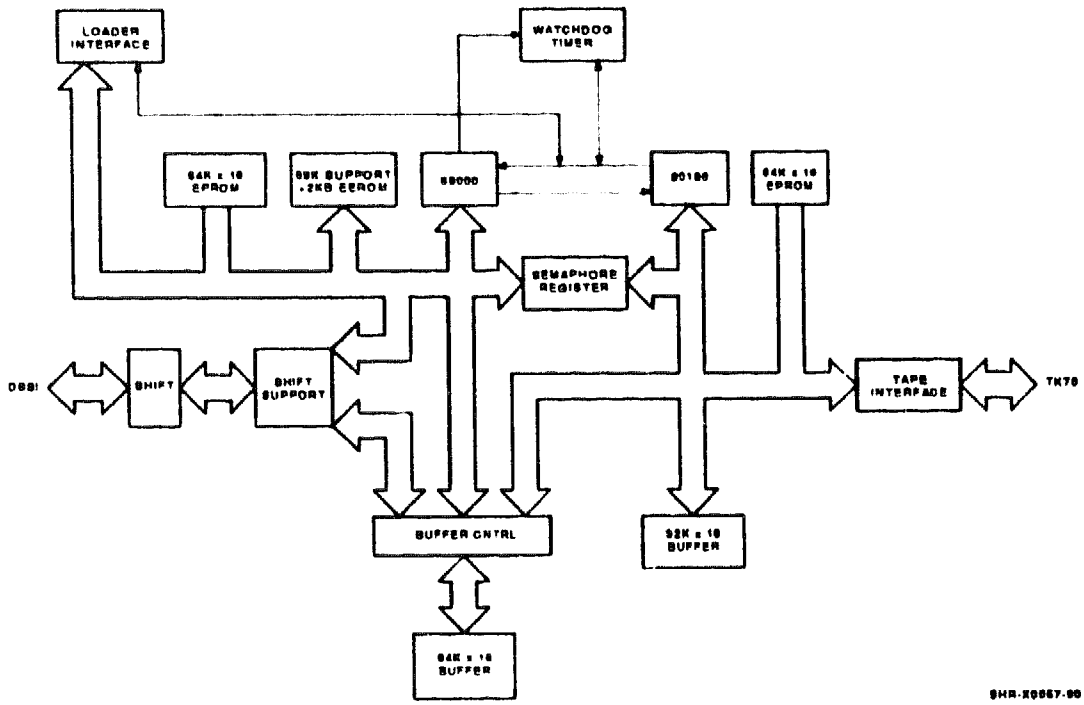


Figure 1–2 TFK70 DSSI Controller Module Functional Block Diagram

1.3 TF70 Tape Drive Subsystem Spares

Refer to your system maintenance documentation for information on removing and replacing field replaceable units (FRUs).

Table 1–1 Customer Services Spares

Part Number	Description
TK70-AX	Single tape drive package without tape cartridge for installation in a customer system (Customer Services spare)
74-28268-01	Tape drive takeup leader
30-20515-01	TK50-K CompacTape cartridge
30-28233-02	TK52-K CompacTape II cartridge
54-19085-01	TFK70 controller module
17-02679-01	26-pin communications cable

1.4 Service Tools

Table 1–2 lists tools required to service the TF70 tape drive subsystem.

Table 1–2 Required Service Tools

Tool	Part Number
TK50-K CompacTape cartridge	30-20515-01
TK52-K CompacTape II cartridge	30-28233-02
TKXX head cleaning kit	22-00436-01
TKXX head cleaning refill kit (wands and applicator only)	22-00436-02

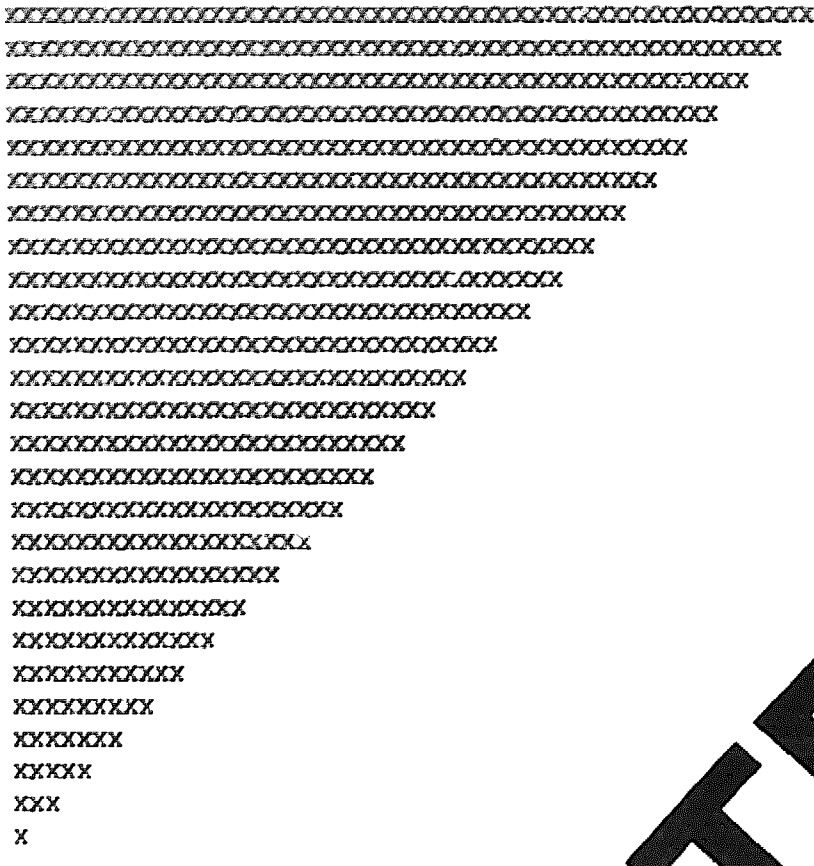
Table 1–3 lists related documentation for the TF70 tape drive subsystem.

Table 1–3 Related Documentation

Title	Order Number
VAXft 3000 Maintenance Guide	EK-VXFT1-MG
TK70 Streaming Tape Drive Owner's Manual	EK-OTK70-OM-001
TK70 Streaming Tape Drive Subsystem Technical Manual	Restricted Distribution
TK70 Streaming Tape Drive Subsystem Illustrated Parts Breakdown	EK-OTK70-IP

1.5 TF70 Tape Drive Subsystem Specifications

Mode of operation	Streaming
Drive interface	Digital Storage Systems Interconnect (DSSI)
Dimensions	86 mm (3.38 in) H × 150 mm (5.88 in) W × 223 mm (8.79 in) D
Media	12.77 mm (1/2 in) magnetic tape
Bit density	10,000 bits per inch
Number of tracks	48
Transfer rate	90 Kbytes per second (at host)
Tape speed	100 inches per second
Track format	Multiple track serpentine recording
Cartridge capacity	296 Mbytes, formatted
TK70 drive power requirements	+12 V ± 5% @ 2.5 A maximum, 150 mV ripple peak-to-peak
	+5 V ± 5% @ 1.5 A maximum, 75 mV ripple peak-to-peak
TFK70 DSSI controller module power requirements	+12 V ± 5% @ 0.0 A maximum, 150 mV ripple peak-to-peak
	+5 V ± 5% @ 3.5. A maximum, 75 mV ripple peak-to-peak
Power consumption	
TK70 drive	40 W maximum
TFK70 DSSI controller module	17.5 W maximum
Environmental	
Maximum operating temperature	10°C (50°F) to 40°C (104°F)
Nonoperating temperature	-30°C (-22°F) to 66°C (151°F)
Operating humidity	10% to 95% RH maximum
Nonoperating humidity	10% to 95% RH maximum
Operating altitude	3,658 m (12,000 ft)
Nonoperating altitude	9,144 m (30,000 ft)



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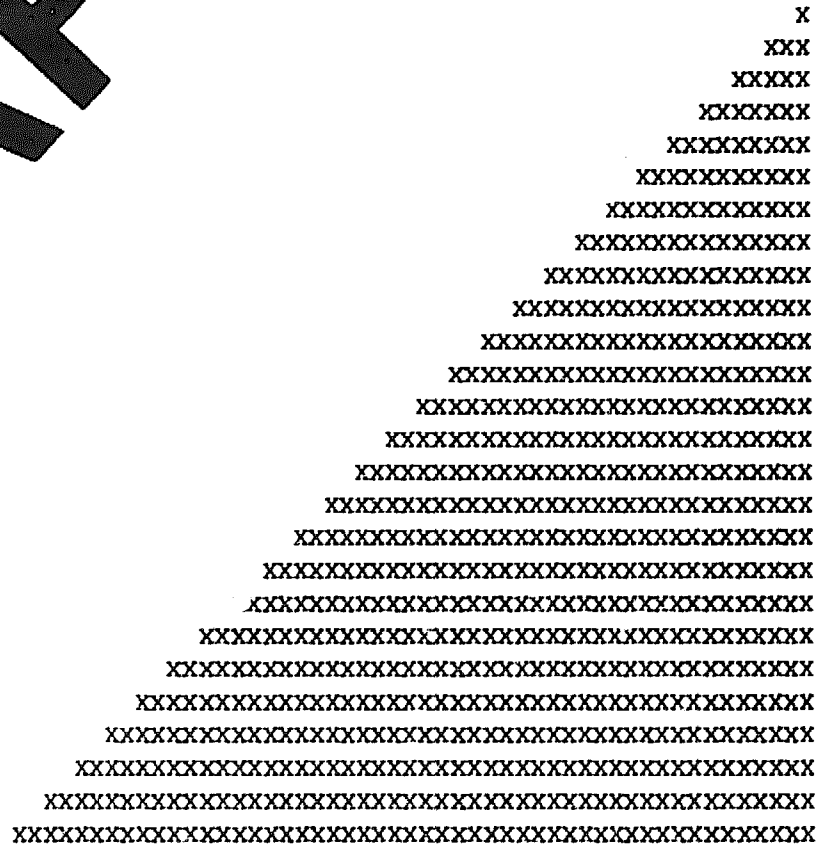


2
Operation

2.1 Introduction

This chapter explains the operation of the TK70 tape drive. This includes a description of the controls and indicators, how to load and unload tape cartridges, how to check the cartridge leader and drive takeup leader for proper operation, and how to configure the drive's DSSI node ID.

2.2 Controls and Indicators

This section describes the functions of the controls and indicators on the TK70 tape drive. As Figure 2–1 shows, the front of the drive has three LEDs, an unload button (momentary switch), and a cartridge lever. See Section 2.3, Operating Procedures, to learn how to insert, use, and remove tape cartridges.

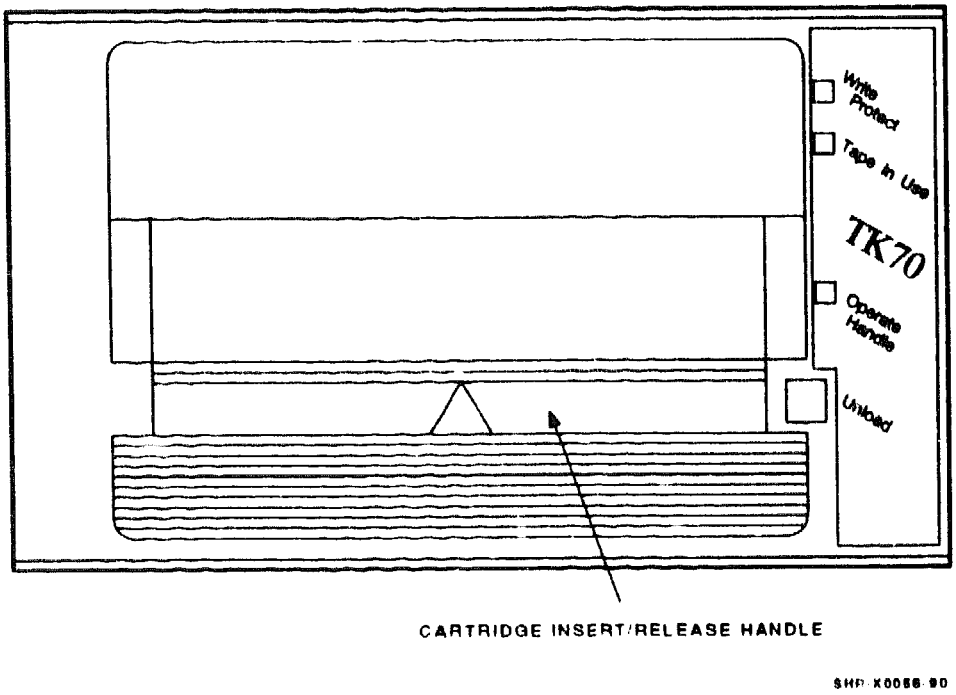


Figure 2–1 TK70 Tape Drive

2.2.1 TK70 Tape Drive LEDs

Table 2–1 is a summary of the TK70 LEDs and the conditions they indicate.

NOTE
The orange LED turns off if you set the write-protect switch to the write-enable position while the cartridge is in the drive. However, the VMS operating system still gives a message that the tape is write protected. Dismount the tape, and mount it again by using the VMS system DISMOUNT and MOUNT commands at a terminal.

Table 2–1 TK70 LED Indicators

LED	State	Condition
Green	On	Okay to operate the cartridge lever.
	Off	Do not operate the cartridge lever.
	Blinking	The drive has detected a cartridge or calibration error. Okay to operate the cartridge lever.
Yellow	Blinking[1]	The tape is in use.
	Blinking[2]	The tape is in use.
	On	The tape is loaded and ready for use.
Orange	On	The tape is write protected.
	Off	The tape is write enabled.
All three LEDs	On	The power-up diagnostic is in progress.[3]
All three LEDs	Blinking	Drive fault.

[1]Intermittent, fast blinking indicates that a write is in progress. Continuous, fast blinking indicates that a read is in progress. Medium blinking indicates calibration. Slow blinking indicates that the tape is initializing, loading, unloading, or rewinding.

[2]LED blinks slowly for 10 seconds indicating drive initialization. This occurs only on power up after the power-up diagnostic has run.

[3]All three LEDs light for a few seconds as the power-up diagnostic is running. If all three LEDs stay on or start blinking, the power-up diagnostic has failed. See Chapter 3 for information on testing and errors.

2.2.2 Unload Button

The unload button is a momentary switch used to rewind and unload the tape from the drive, and to clear a drive error.

- Use the unload button to perform a rewind and unload operation.

  The tape must be completely rewound into the cartridge before the cartridge can be unloaded.

  The green LED lights and the beeper sounds when the tape cartridge can be removed from the drive.

- The unload button can also clear a drive error.

  This error condition is indicated by all three LEDs blinking.

  If the error condition can be cleared, the TK70 drive unloads the tape cartridge and the beeper sounds.

  If the error condition cannot be cleared, refer to Chapter 3.

2.2.3 Beeper

The TK70 tape drive has an internal beeper that beeps once when the drive is powered up, and twice to indicate that the tape is unloaded and ready to be removed from the drive.

If a tape cartridge is not locked in the drive, the drive will beep twice after self-test diagnostics and drive initialization are completed. If a tape cartridge is locked into the drive before power down, upon power up the drive will beep once and attempt to load the tape cartridge. Successful completion is indicated by the yellow LED lighting and remaining on, and the green LED remaining off.

2.3 Operating Procedures

This section explains how to insert a tape cartridge into, and remove a tape cartridge from, the TK70 tape drive. This section also discusses tape use. Table 2–2 and Table 2–3 show the compatibility of CompacTape and CompacTape II tape cartridges with TK50 and TK70 tape drives.

Table 2–2 Non-Initialized Cartridge Compatibility

	CompacTape (TK50-K)	CompacTape II (TK52-K)
TK70 drive	Yes	Yes

Table 2–3 Initialized Cartridge Compatibility

	TK70 Drive
TK50 initialized cartridge	Read Only
TK70 initialized cartridge	Read/Write

2.3.1 Inserting the Tape Cartridge

Follow this procedure to insert a cartridge into the TK70 drive in service mode.

Make sure the system power is on. If you turn on the power, the TK70 LEDs light in the following sequence: The green, yellow, and orange LEDs remains on steadily for about 2 seconds. Then, the green and orange LEDs turn off and the yellow LED blinks, showing that the power-up self-tests (POSTs) are running. When the self-tests complete successfully, only the green LED lights.

1. When the green LED remains on steadily, pull the handle to the open position.
2. Insert the cartridge. If an error occurs when you insert the cartridge, the green LED blinks and the tape does not move. Remove that cartridge and use another cartridge.
3. Push the handle to the closed position.

The green LED turns off and the yellow LED blinks to show that the tape is loading. When the tape is at the beginning-of-tape (BOT) marker, the yellow LED remains on steadily. The tape is now ready to use.

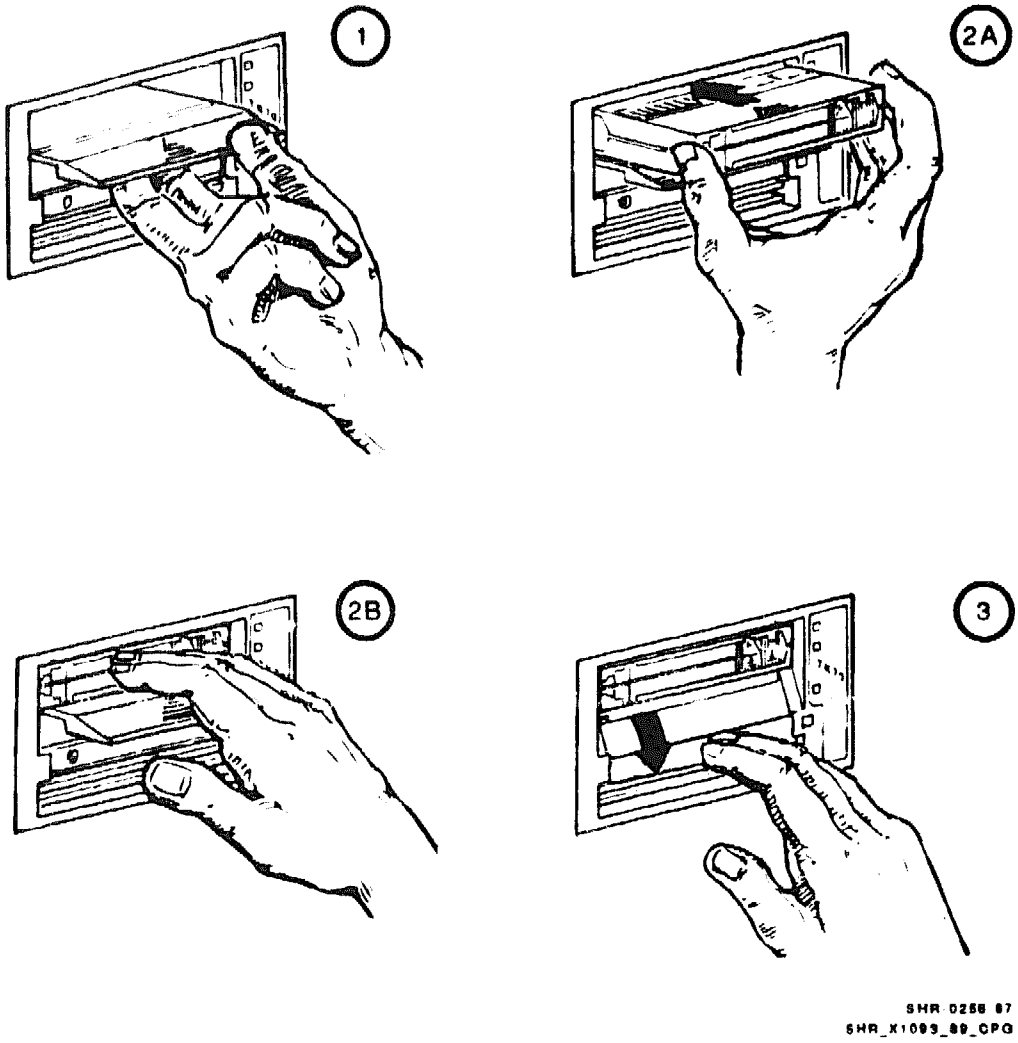


Figure 2–2 Inserting a Tape Cartridge

2.3.2 Using the Tape Cartridge

With the tape at BOT, you can perform your operation, such as running diagnostics. While the tape is in use (during a read or write operation, or while rewinding) the yellow LED blinks irregularly. If an error occurs during a read or write operation, all three LEDs blink.

When you use a new tape cartridge, the TK70 calibrates the tape as it executes your first command.

If you use a TK50-written tape, the orange LED lights to show that the tape is write protected. This means that you cannot perform write operations with the tape. The orange LED also lights if the write-protect switch on a CompacTape or CompacTape II cartridge is in the write-protect position.

NOTE
The orange LED turns off if you set the write-protect switch to the write-enable position while the cartridge is in the drive. However, the VMS operating system responds with a message that the tape is write protected. Dismount the tape and mount it again using the VMS system DISMOUNT and MOUNT commands at a terminal.

2.3.3 Removing the Tape Cartridge from a TK70 Drive in Service Mode

Follow this procedure and refer to Figure 2–3 to remove a tape cartridge from the TK70 drive in service mode.

1. Press the unload button to rewind and unload the tape into the cartridge.

   NOTE
   If you use the DISMOUNT command at the console to remove the cartridge, you do not need to press the unload button. If you use the /NOUNLOAD qualifier with the DISMOUNT command, you must press the unload button.

2. The green LED lights to indicate that it is okay to operate cartridge insert/release handle.
3. Pull the handle to the open position and remove the cartridge.
4. Push the handle to the closed position.

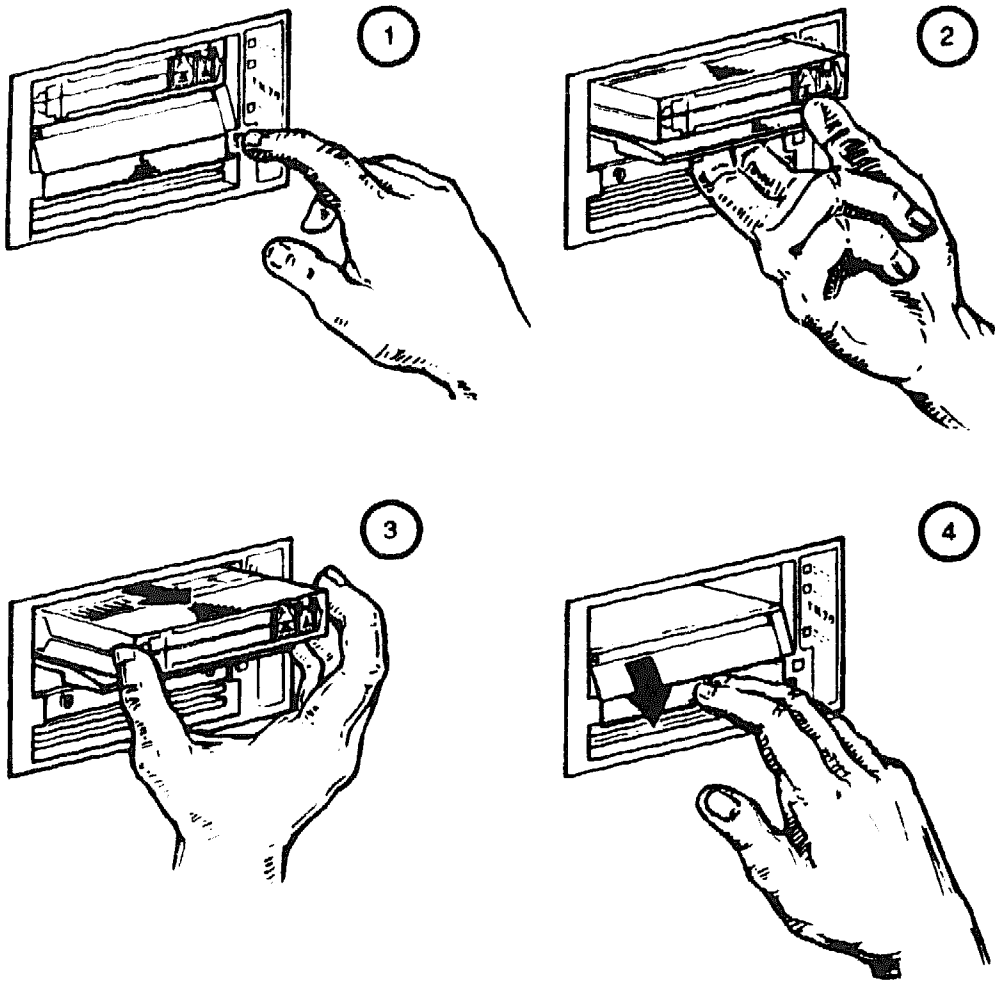


Figure 2–3 Removing a Tape Cartridge

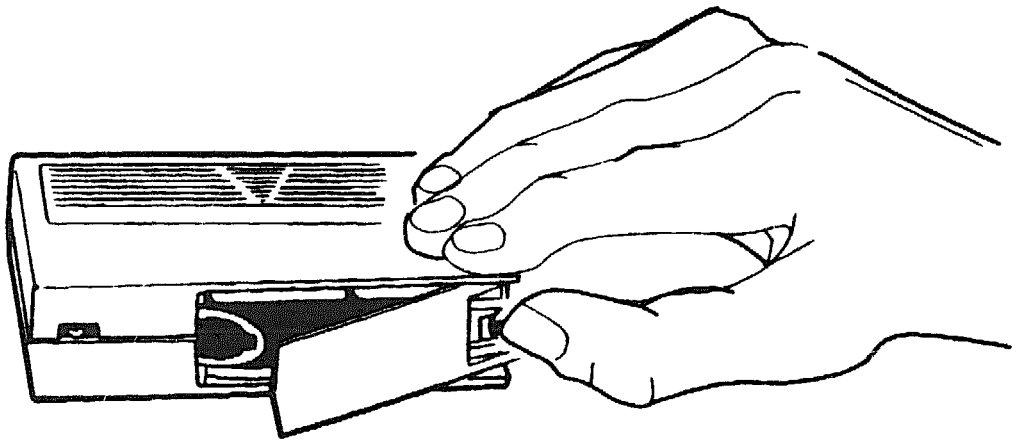
2.3.4 Cartridge Leader and Tape Takeup Leader Check

If an error occurs when you insert a tape cartridge into the TK70 tape drive, the green LED on the front of the drive blinks and the tape does not move. No diagnostic is available to determine if the takeup leader inside the drive, or the cartridge leader, needs replacement. You can, however, see if these leaders are correctly aligned and if they are damaged.

Cartridge Leader – Check the position of the cartridge leader by opening the cartridge door. Figure 2–4 shows how to unlock the door, and the correct position of the leader. Use another cartridge if the leader is misaligned or damaged.

Takeup Leader – Always check the takeup leader when you use the TK70 tape drive for the first time. Make sure the leader is in the correct position before you insert a cartridge. Figure 2–5 shows the takeup leader location, the correct alignment of the takeup leader, and some of the ways the takeup leader can misalign.

Use a small, nonmetallic instrument to realign the takeup leader. Replace the takeup leader if the mushroom-shaped part is misshapen or broken (refer to Section 2.3.5). The takeup leader part number is 74-28268-01.



SHR-0002-88
SHR_X1027_88_CPG

Figure 2–4 Cartridge Leader Position Check

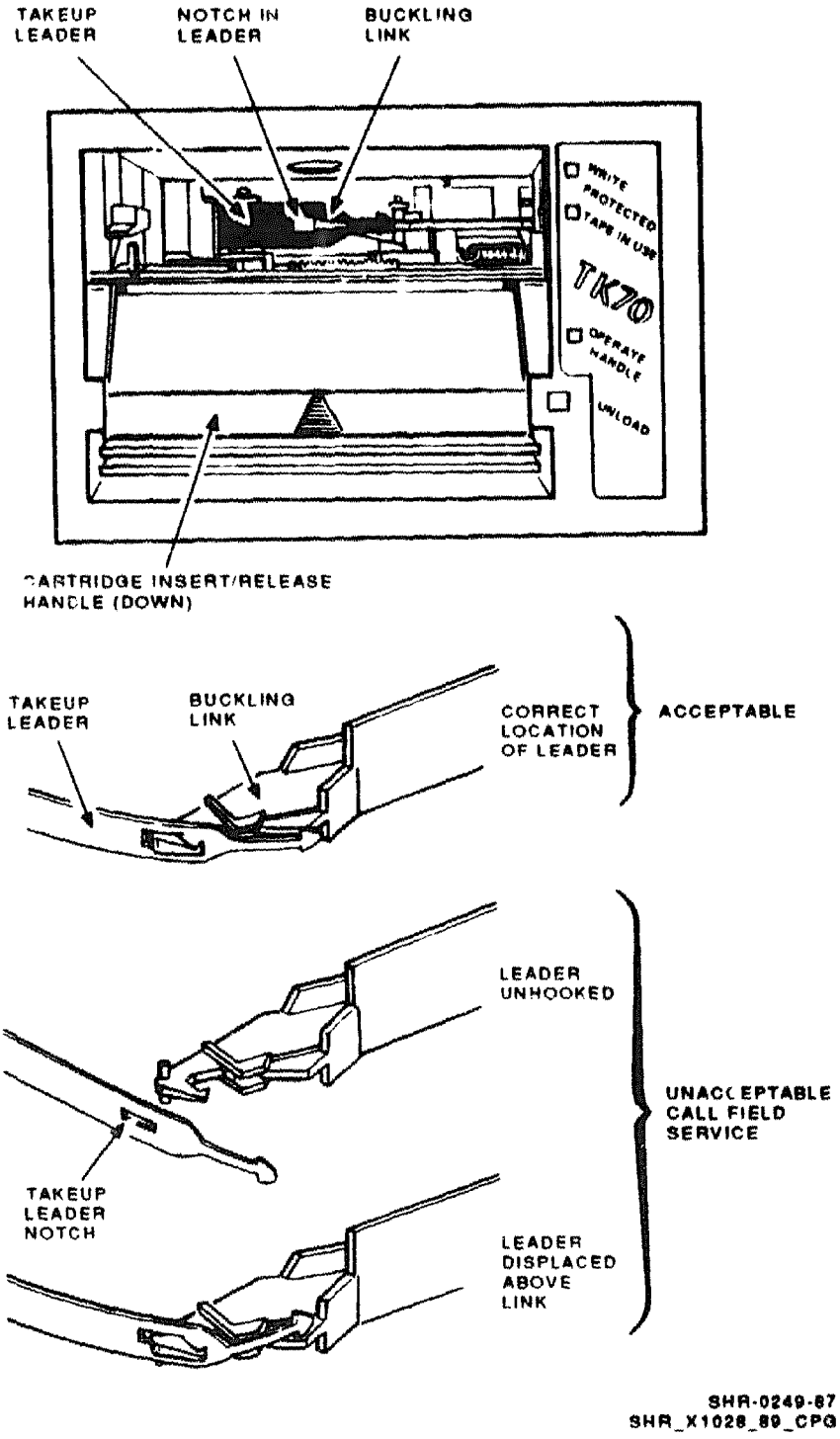


Figure 2–5 Takeup Leader Adjustment

2.3.5 TK70 Takeup Leader

The following procedure explains how to remove and replace a damaged takeup leader (part number 74-28268-01). This procedure assumes that you have removed the drive from its system enclosure.

Diagnostics cannot determine if the leader has failed. If you suspect a leader problem exists, observe the leader to determine if it needs to be repositioned or replaced. See Section 2.3.4, Cartridge Leader and Tape Takeup Leader Check for examples of misaligned leaders.

1. Remove the cover from the drive to access the takeup reel. Note where each screw is located and which screws have washers.
2. 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 2–6).
3. Disengage the square end of the leader from the small latch hook that fits through the hole in the end of the leader.
4. 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.
5. After you attach the square end to the slot in the takeup reel, begin to feed the mushroom-shaped end of the leader through the tape path.
6. Thread the tape through the tape path. 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 2–7).
7. Reach your fingers through the hole in the top of the receiver assembly. 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 in the drive and make sure the leader is correctly aligned.
8. 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.

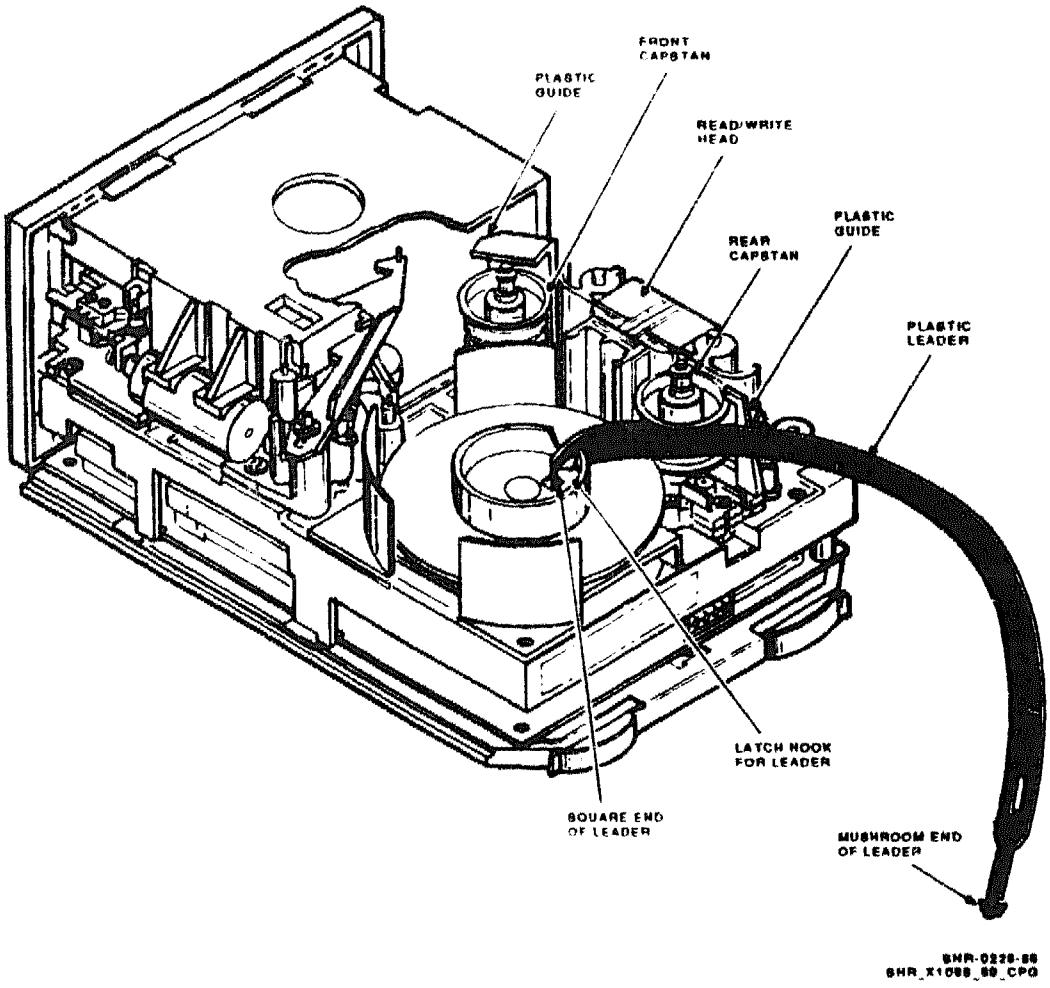


Figure 2–6 Replacing the Takeup Leader

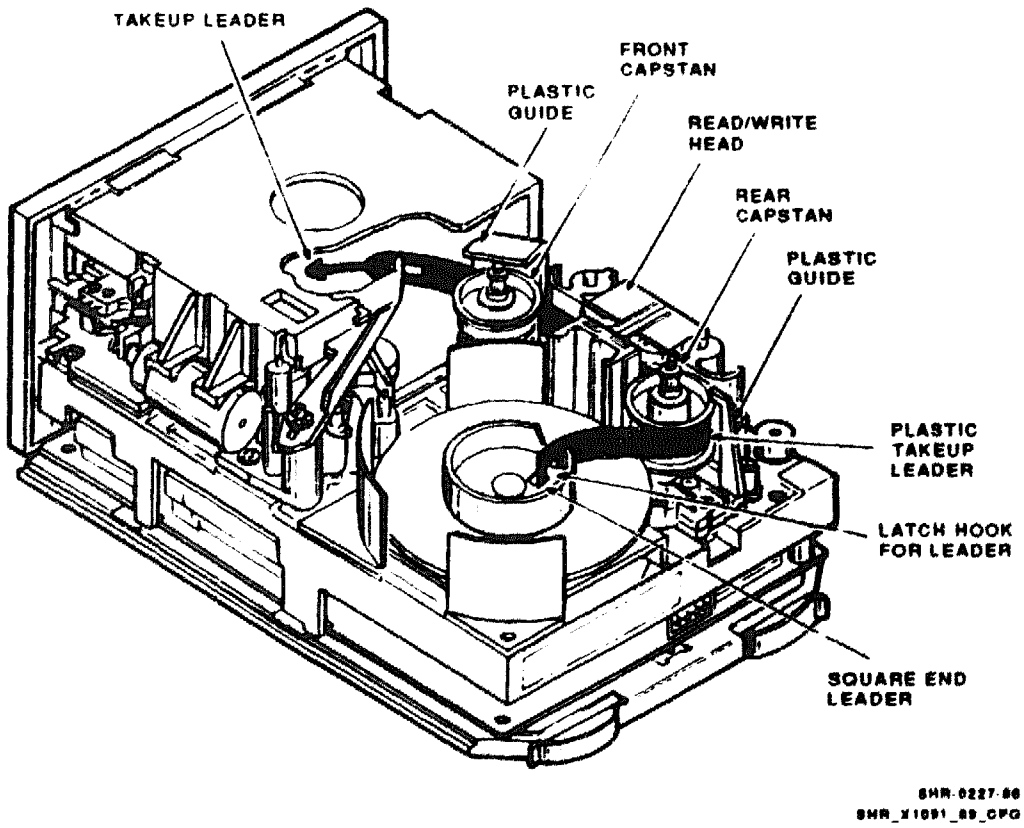


Figure 2–7 TK70 Tape Path (Takeup Leader Replaced)

2.4 Manually Rewinding a Tape

If the drive fails to rewind a tape, you can manually rewind the tape and unload the cartridge. The following procedure assumes that you have already removed the drive from its enclosure.

1. Turn the drive on its side and observe the hole in the circuit board near the front of the drive.

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

2. Using a phillips head screwdriver, turn the screw inside the hole counterclockwise. The tape begins to rewind into the cartridge.
3. Continue rewinding the tape until it unloads into the cartridge.
4. Pull the solenoid out and lift the handle to eject the cartridge (Figure 2–8).

2.5 TFK70 DSSI Controller Module Switches

The TFK70 controller module has a switch pack (S1) (Figure 2–9).

SW1-1 is the tape server switch. This switch is used in conjunction with the warm swaps. Refer to the *VAXft 3000 Maintenance Guide* (EK-VXFT1-MG).

SW1-2, SW1-3, and SW1-4 are the DSSI node ID switches. Table 2–4 shows the DSSI node ID switch settings.

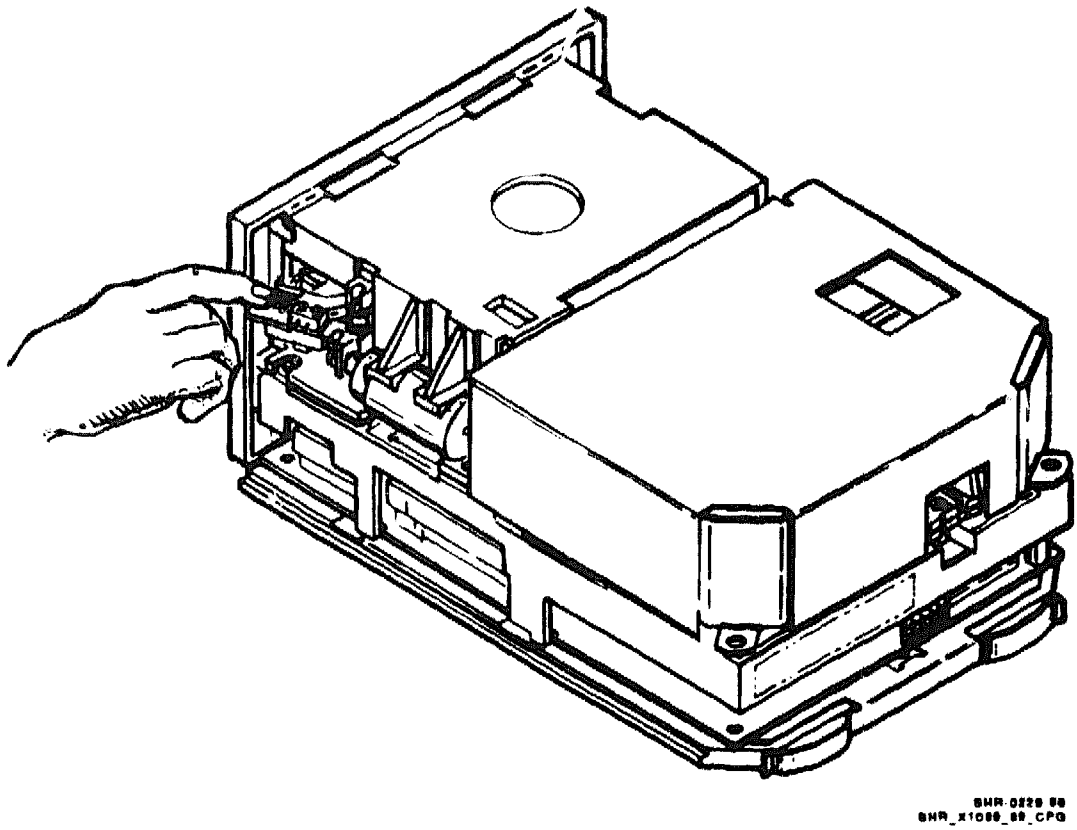


Figure 2–8 Releasing the Solenoid

Table 2–4 DSSI Node ID Switch Settings

DSSI Node ID	SW1-2	SW1-3	SW1-4
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

NOTE

Some systems have a remote front panel interface. This remote front panel may have a tape server switch, as well as DSSI node ID switches. Front panel switches are designed to override switch settings on the TFK70 controller module.

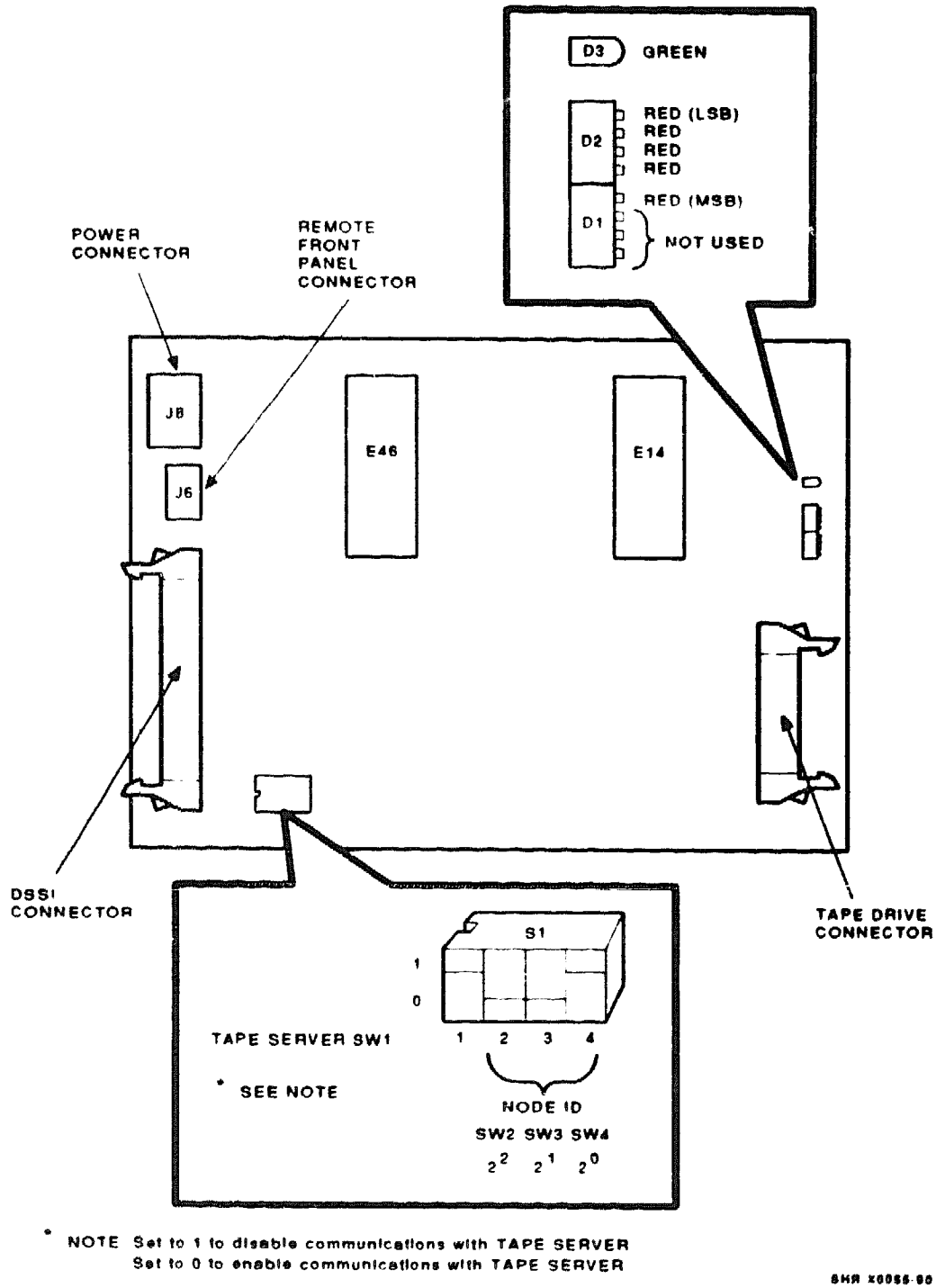
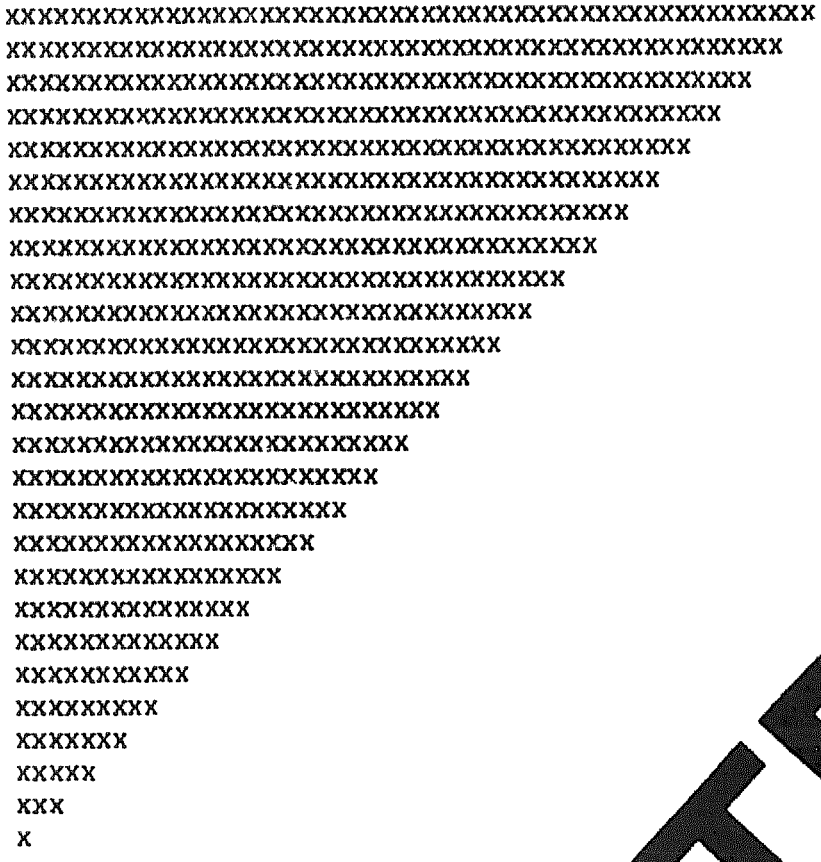


Figure 2–9 DSSI Node ID Switches



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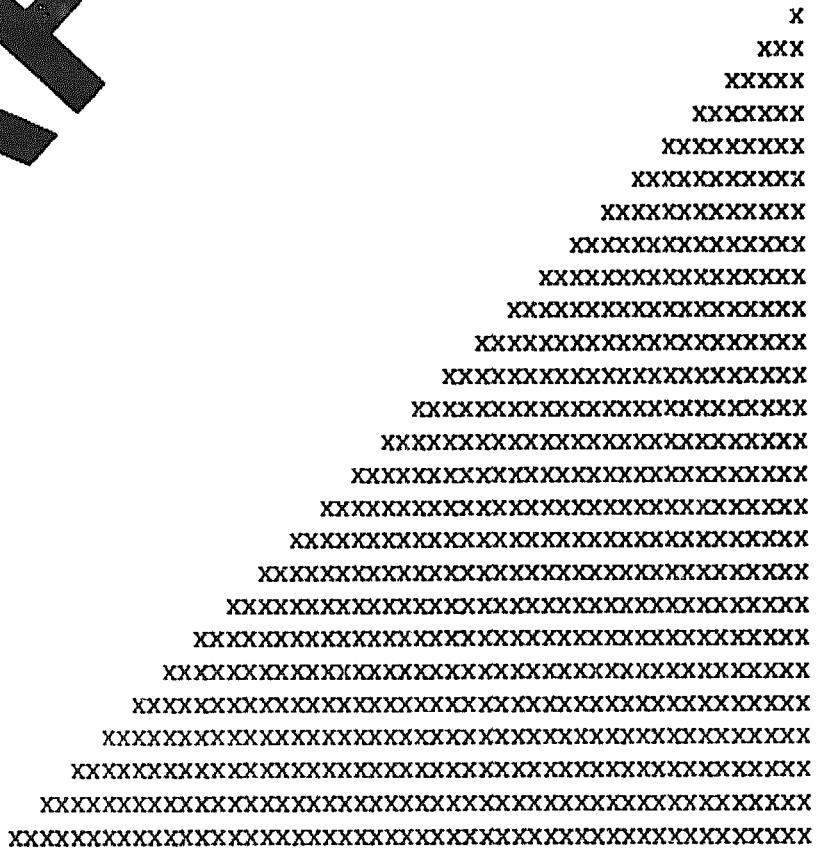


3
Local Diagnostics and Problem Resolution

This chapter describes the diagnostics used to test and troubleshoot the TF70 tape drive subsystem (Section 3.1). Also described in this chapter are problem resolutions associated with common failures, soft error rates, and error logs (Section 3.4).

3.1 Overview

The TF70 tape drive subsystem has two different types of diagnostics for testing and troubleshooting:

- Power-on self-test (POST). All DSSI devices run a POST to check the integrity of the device hardware. This occurs either at power-up, or when the device is reset.
- Device resident diagnostics. Device resident diagnostics are aimed at testing the device, or at providing data about the device that may help isolate a fault.

Together, these diagnostics provide a set of complementary tests that can isolate a problem by testing the entire DSSI subsystem, and the device to which the fault has been isolated.

This chapter discusses only the POST and device resident diagnostics that are specific to the TF70 tape drive subsystem.

NOTE

Host resident diagnostics vary depending on the host CPU type and operating system. Refer to the host system documentation for a description of the host resident diagnostics.

3.2 Power-On Self-Test (POST)

The power-up sequence begins with POST. POST is executed whenever power is applied to the TF70 tape drive subsystem, or when a system-initiated reset occurs. POST has two functions:

1. It performs a sequence of tests to check that the device hardware is functioning properly.
2. It performs start-up procedures to make the device operational before becoming accessible to the host.

3.2.1 TK70 Tape Drive POST

POST microdiagnostics execute on the TK70 tape drive in approximately 4 seconds.

Successful execution of POST on the TK70 tape drive is indicated by rapid flashing of drive (front panel) LEDs, after which the LEDs turn off.

If all three drive LEDs remain lit, or continue blinking, POST has failed. Replace the drive.

3.2.2 TFK70 DSSI Controller Module POST

POST microdiagnostics perform comprehensive testing of the controller logic.

Successful execution of POST on the DSSI controller module takes approximately 4 seconds. Successful execution of POST on the controller module is indicated when module's green LED remains lit.

If the TFK70 controller module's red LEDs light, and the green LED is off, POST has failed. The following table describes the POST fatal error codes, which are displayed in the red LEDS (Figure 2–9).

Table 3–1 POST Error LEDs, DSSI Controller Module

(MSB)XXXXX(LSB)	Description
11111	68000 tests never started executing
00001	68000 CPU test error
00010	68000 EPROM test error
00011	68000 Tri-ported RAM test error
00100	EEROM test error

Table 3–1 (Cont.) POST Error LEDs, DSSI Controller Module

(MSB)XXXXX(LSB)	Description
00101	SWIFT chip test error
00110	SWIFT external loopback test error
00111	68000 semaphore register test error
01000	Loader UART test error
01001	Loader 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 EPROM test error
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 EEROM
11110	Local 68000 memory verification error (TPRAM)
11111	Unexpected exception

3.2.3 POST Error Reporting To EEROM

Most TFK70 controller errors encountered during POST are recorded in the module's EEROM. The error data consists of error codes (Appendix A), test numbers, and LED error codes.

You can access the POST errors via the diagnostic and utilities protocol (DUP) local program, HISTRY (Section 3.3.5).

NOTE
POST errors are recorded in EEROM, but testing continues through the last test. The error LEDs on the controller module reflect the last POST error detected, but the EEROM retains error data from the last 10 test failures.

3.3 Local Diagnostic Programs

The TF70 tape drive subsystem contains the following local diagnostic programs.

- *DIRECT* - provides the directory of available local programs
- *DRVTST* - a comprehensive sub-test of DRVEXR that verifies that the drive hardware is functioning properly
- *DRVEXR* - a utility that exercises the TF70 tape drive subsystem and displays statistics after successful completion
- *HISTRY* - a utility that displays information about the subsystem
- *PARAMS* - an editor that allows the observation and/or changing of device status, and subsystem parameters

A description of each local program follows, including a table showing the dialogue of each program. The table also indicates the type of messages contained in the dialogue, although the screen display does not show the message type. Message types are abbreviated as follows:

- *Q* - question
- *I* - information
- *T* - termination
- *FE* - fatal error

NOTE
To exit from any question in the local program dialogue, type CTRL-C, CTRL-Z, or CTRL-Y.

3.3.1 Accessing Local Programs Through the VMS Operating System

Local programs can be accessed through the VMS operating system using the SET HOST/DUP command. The SET HOST/DUP command creates a virtual terminal connection to the storage device and the designated local program using the diagnostic and utilities protocol (DUP) standard dialogue. Once the connection is established, operations are performed under the control of the local program. When the program terminates, control is returned to the system.

NOTE
It is possible to SET HOST DUP via system-based console commands. Refer to your system maintenance documentation.

3.3.1.1 SET HOST/DUP

For VMS version 5.4 or later, execute the following commands to access the device resident diagnostics:

```
$ SHOW DEVICES MI (or SHOW CLUSTER)  ; to learn the node name of the device.

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

$ SET HOST/DUP/SERVER=MSCP$DUP/TASK=task-name node-name
```

where:

task-name = the name of the requested local program, for example DIRECT

node-name = the node name of the device, for example PICKLE$MIA1 (PICKLE is the node-name and MIA1 is the device name)

3.3.1.2 Loading FYDRIVER

If you receive an error message after typing SET HOST/DUP, then you may need to load the FYDRIVER, as follows.

```
$ MCR SYSGEN                ; to access SYSGEN.

$ SYSGEN> LOAD FYDRIVER     ; to load FYDRIVER, pre-requisite to using diagnosti

$ SYSGEN> CON FYA)/NOADAP ; to configure FYDRIVER.

$ SYSGEN> EXIT
```

3.3.1.3 Making the Subsystem Available for Mounting

After you are finished with device resident diagnostics, do the following:

```
$ SET DEVICE/available      ; to make the subsystem available for mounting.
```

3.3.2 DIRECT

DIRECT provides a directory of all available local programs resident in the TF70 tape drive subsystem. An example of a DIRECT program display is:

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

3.3.3 DRVTST

DRVTST invokes a comprehensive test of the TF70 tape drive subsystem hardware.

DRVTST is a pass/fail test. 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. Dialogue for this test includes: [1]

Message Type	Message
I	Copyright © 1990 Digital Equipment Corporation
Q	Write/read anywhere on the medium? [1=YES/0=NO]
Q	User data will be corrupted, proceed? [1=YES/0=NO]
I	8 minutes to complete.
T	Completed.
	or
FE	Unit is currently in use.
FE	Operation aborted by user.

[1] In the following dialogue, FE means fatal error.

Message Type	Message
FE	XXXX - Unit diagnostics failed, where XXXX equals failure data described in TMSCP error specification.
FE	XXXX - Unit read/write test failed, where XXXX equals failure data described in TMSCP error specification.

Answering NO to the first question results in a read-only test. Successful execution of the read-only test requires a previously written tape.

Answering YES to the first question results in a the second question being asked.

Answering NO to the second question results in a read-only test.

Answering YES to the second question permits write and read operations anywhere on the tape.

CAUTION

Prior to answering YES to the second question, make sure a scratch tape is installed.

NOTE

If the WRITE PROTECT switch on the remote front panel is set to *write protect*, and the answer to the second question is YES, the device does not allow the test to run and the error message "2006 - Unit read/write test failed" is displayed. In this case, the test has not failed, but has been prevented from running.

3.3.4 DRVEXR

The DRVEXR local program exercises the TF70 tape drive subsystem. The test is data transfer intensive and indicates the overall integrity of the device.

The dialogue for DRVEXR includes: [1]

Message Type	Message
I	Copyright © 1990 Digital Equipment Corporation
Q	Write/read anywhere on the medium? [1=YES/0=NO]
Q	User data will be corrupted, proceed? [1=YES/0=NO]
Q	Test time in minutes? [10-100]
I	ddd minutes to complete.
I	ddddddddd bytes read.
I	ddddddddd bytes written.
T	Complete.
	or
FE	Unit is currently in use.
FE	Operation aborted by user.
FE	Unit diagnostics failed.
FE	Unit read/write test failed.

Answering NO to the first question results in a read-only test. Successful operation of the read-only test requires a previously written tape.

Answering YES to the first question results in the second question being asked.

Answering NO to the second question results in a read-only test.

Answering YES to the second question permits write and read operations anywhere on the tape.

CAUTION
Prior to answering YES to the second question, make sure a scratch tape is installed.

[1] In the following dialogue, FE means fatal error.

NOTE

If the WRITE PROTECT switch on either the tape cartridge is set to *write protect*, and the answer to the second question is YES, the device does not allow the test to run and the error message "2006 - Unit read/write test failed" is displayed. In this case, the test has not failed, but has been prevented from running.

3.3.5 HISTRY

This local program displays information about the history of the TF70 tape drive subsystem. The output generated by HISTRY is described in the following table. (If no errors have been logged, no hexadecimal codes are are displayed in the HISTRY output.) See Section 3.3.5.1 for an example of HISTRY data output to a terminal.

Screen Display	Field Meaning
TF70	Product name
EN87988231	Drive serial number
T7X3MA	Node name
A01	Module revision level
V1.0	Firmware revision level[1]
10	Power-up hours
[3]20-character hexadecimal code(s)	Represents last 10 firmware detected errors from most recent to oldest.
[2]8-character hexadecimal code(s)	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 "node name". Then type SHOW FWREV. The date associated with the firmware revision is accessible via PARAMS.

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

[3]This displays the last 10 firmware detected error codes, see Appendix B.

3.3.5.1 HISTRY Example

The following is an example of HISTRY data output to a terminal.

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

TF70
EN00400267
T7YLBB
 A00
V1.0A
117
4404009377FF74572360
4404009377FC56D48A60
A71200937662D5ECB980
A71200937660A65FCA60
40070093765C0803C500
A7120093736CE658ADE0
40030000000005F5E100
40030000000005F5E100
04060565
04280565
04060565
04060565
04280565
04100565
04280565
04060565
04060565
04060565
```

In the example above, the ten 20-character codes are firmware entries. The ten 8-character codes are POST detected error entries.

The four left-most characters in a firmware detected error entry correspond to DSSI error/event codes in Appendix B. For example, the first firmware detected error is 4404009377FF74572360. The 4404 is defined in Appendix B as a Disconnect Clean-up Error.

The four left-most characters in a POST detected error entry correspond to the detailed error codes in Appendix A. For example, the first POST detected error entry is 04060565. The 0406 is defined in Appendix A as a SWIFT chip test, during a SEL timeout early occured.

The two right-most characters in a POST detected error entry correspond to the POST error LEDs on the TFK70 DSSI controller module (Table 3-1). 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 LEDs in Table 3-1. In this example, 0 0101 is a SWIFT chip test error.

3.3.6 PARAMS

The PARAMS local program enables you to examine and edit internal TF70 tape drive subsystem parameters, such as device node name. Invoke PARAMS the same way you would invoke the other local programs. Once invoked, all interaction is through the use of commands and responses. Table 3–2 lists the commands available in PARAMS.

Table 3–2 PARAMS Subsystem Commands

Command	Definition
HELP	Shows all PARAMS commands and their syntax.
SET	Sets a parameter to a value.
SHOW	Displays a specific subsystem value or, when used with /ALL, it displays all subsystem parameters.
STATUS LOGS	Displays the last 10 firmware loggable events.
WRITE	Records the device parameters changed using the SET command.
EXIT	Terminates the PARAMS local program.

3.3.6.1 HELP

The HELP command displays a brief list of available PARAMS commands.

```
PARAMS> help
  EXIT
  HELP
  SET (parameter | .) value
  SHOW (parameter |. | /class)
     /ALL
  SHOW FWREV
  STATUS [type]
    LOGS
  WRITE
```

3.3.6.2 SHOW

Use the SHOW subsystem command parameter to see the settings of subsystem parameters.

Section 3.3.6.4 summarizes SHOW and SET subsystem command parameters.

The SHOW /ALL subsystem command displays the following:

Parameter	Current	Default	Type	Radix
UNITUM	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

3.3.6.3 SET

Use the SET subsystem command to edit internal TF70 tape drive subsystem parameters. Section 3.3.6.4 summarizes SET and SHOW subsystem command parameters.

Syntax for the SET subsystem command is:

```
SET parameter value
```

Where *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.

The WRITE subsystem command must be used to record the edits made while using the SET command. Table 3–3 lists SET parameters that are available.

Examples:

```
PARAMS> SET NODENAME KEVIN

PARAMS> SET UNITNUM 18

PARAMS> WRITE

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

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

NOTE

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

3.3.6.4 Summary of SET and SHOW Subsystem Command Parameters

The following table summarizes subsystem commands available to you via SET and SHOW at the PARAMS prompt. (You can use the SHOW /ALL command to see the subsystem command parameters that follow.)

Table 3–3 Summary of SET and SHOW Subsystem Command Parameters

Parameter	Definition
UNITNUM	Displays the TMSCP unit number.
SYSTEMID	Shows the controller's 48-bit SCS system ID.
NODENAME	Sets or shows the SCS node name for the TF70 tape drive subsystem.
FORCENAM	1 = Default node name in use. (Derived from the subsystem serial number.)
	0 = Uses value set in NODENAM.
FORCEUNI	Determinse whether the TMSCP unit number or DSSI node ID is used.
	1 = Uses the DSSI node ID.
	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.
	If the tape server is unable to flush its write-back cache and perform a cleanup sequence, the controller module will bugcheck and reset itself.
DATAOPTMO	Data Operation Timer. Maximum time for a data operation to complete. Zero indicates no timeout. The default value is 180 seconds.
	A TF70 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 cache, depending on the transfer mode. If the data operation is unable to complete within the time-out period, the controller module will bugcheck and reset itself.
SYSTIME	Displays the current time and date.

3.3.6.5 STATUS LOGS

Use the STATUS LOGS subsystem command to display the last 10 firmware loggable events, such as VC restarts, maximum retries, etc.

3.3.6.6 WRITE

This command is used to record, in nonvolatile memory, the changes you have made using PARAMS. The WRITE command is similar in nature to the VMS SYSGEN WRITE command. There are no parameters available. The syntax is simply WRITE at the PARAMS> prompt. The program responds with the following.

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

To save changes made using PARAMS, you must answer Y(es) to the preceding question.

3.3.6.7 EXIT

The EXIT command terminates the PARAMS local program. The word "Completed" appears on the screen.

3.4 Problem Resolution

This section describes error conditions, failure influences, soft error rates, and how to run an error log code. See Table 3–4 for a list of common failures, causes, and fixes.

3.4.1 Error Conditions

The word *error* is sometimes misunderstood. Recoverable (soft) errors are a fact of life in the tape world. There are many reasons why a soft error can occur. The tape media is not perfect, drive heads eventually wear out and start producing higher error rates, heads can become contaminated, or foreign debris can pass through the tape path. If you examine the drive error count, you will see soft errors, events, and hard errors. For example, you will receive an error 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 swapping out the drive.

3.4.2 Common Failure Influences

The TF70 tape drive subsystem 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 there are many factors that influence failures.

Some of the more common factors are:

- Defective media
- Operator or user errors
- Incorrect back up commands
- Poor power or grounding

NOTE
Ensure that any problem you encounter is not due to the above causes before you replace the drive.

Table 3–4 Common Failures, Causes, and Fixes

Symptom	Probable Cause	Possible Fix
Volume not software enabled	Drive is not loaded or was unloaded by software	Ensure that the yellow LED is on (tape loaded and ready for use).
	TK50 formatted cartridge in a TK70 drive	Use correct cartridge.
	Bad cartridge or improperly written calibration tracks	Try another cartridge.
	Bad drive or dirty head	Clean head and/or replace drive.
Failure to mount or initialize with new media	Bad media	Clean head and retry with known good media.
All three LEDs blinking	Drive failed self-test or detected a hard error during operation	Attempt to clear error by pushing the unload button. If the error won't clear, you have a drive hardware failure or a power problem.

Table 3–4 (Cont.) Common Failures, Causes, and Fixes

Symptom	Probable Cause	Possible Fix
Green LED blinking	Calibration error	Clear error by pressing the unload button. 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. If that fails, refer to Section 2.4.
Drive leader runaway	Mispositioned cartridge leader	Inspect cartridge leader for correct position. Retire cartridge from use if leader cannot be repositioned.

3.4.3 Soft Error Rates

None of the cartridges contain perfect tape. 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 our vendor(s) and meet all of the specifications of Digital Equipment Corporation.

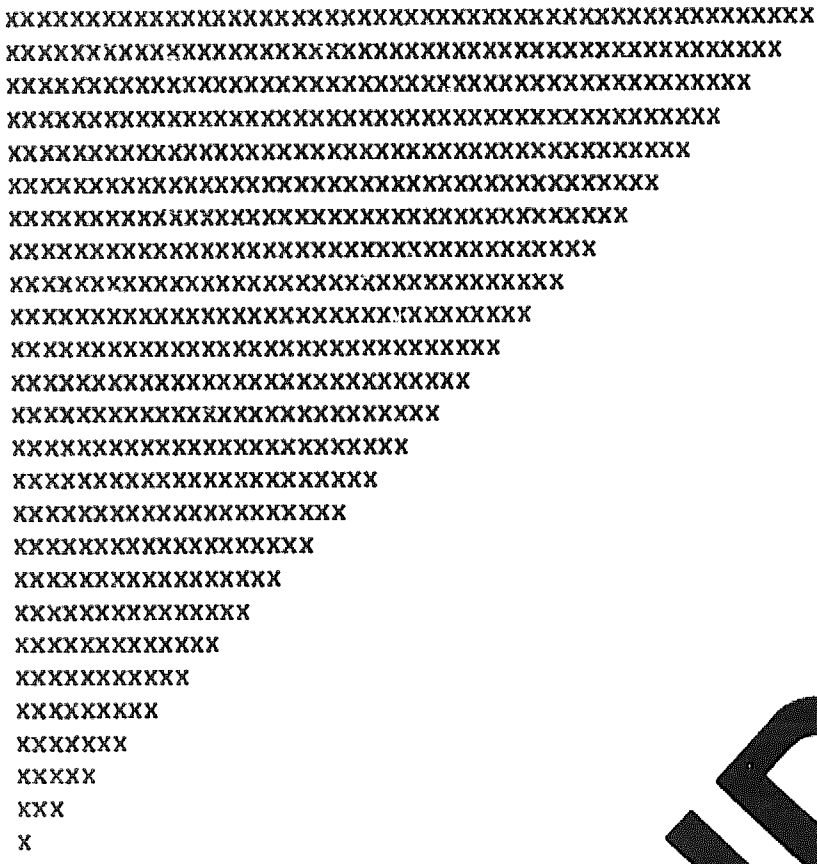
There are many variables that can cause soft errors. In fact, *errors* are somewhat of a misnomer since soft errors are considered to be events. In the case of soft errors, it is important to realize that no data has been lost. For a write, the data is rewritten. For a read, retries are performed.

Some of the variables that create soft errors are:

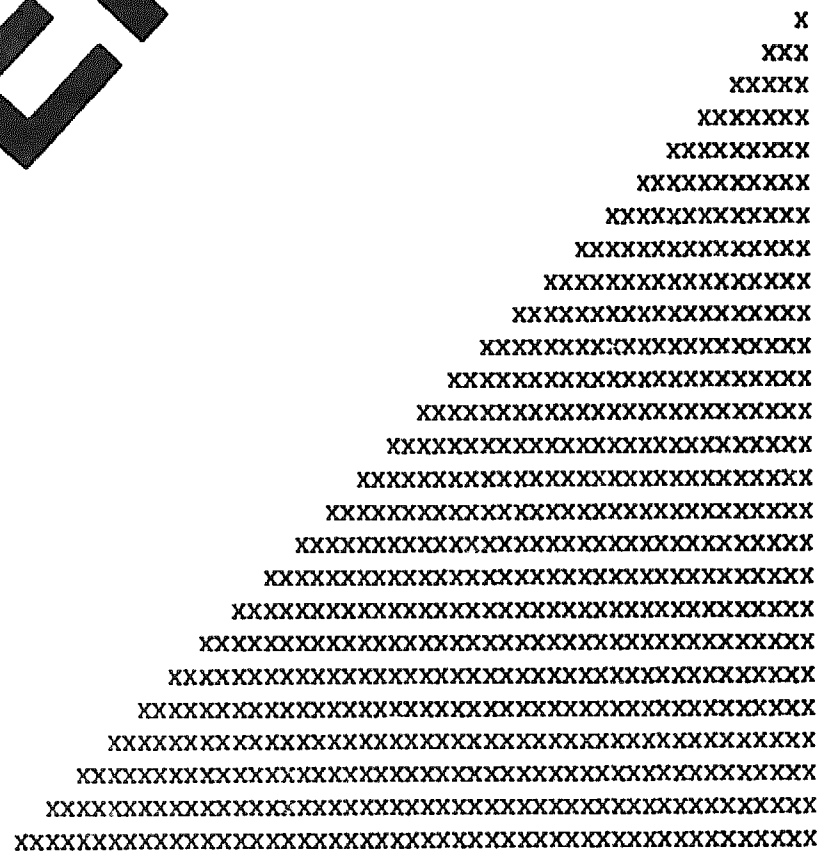
- Media dropouts
- Temperature of media (not acclimatized)
- System bus activity

- Applications
- Head wear
- Contamination

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.



APPENDIX A



A

TFK70 Controller POST Detected Error Codes

The following error codes are detailed POST detectable on the TFK70 controller module. If they occur, you can access the last 10 of them by using the local program HISTRY (Section 3.3.5).

Table A–1 Detail Error Codes

Error number (hex)	Test(s)	Description
0001	68000 CPU	Branch carry bit clear
0002	68000 CPU	Branch zero bit clear
0003	68000 CPU	Branch plus
0004	68000 CPU	Branch overflow bit clear
0005	68000 CPU	Branch if no carry and no zero
0006	68000 CPU	Branch if greater than zero
0007	68000 CPU	Branch if carry bit set
0008	68000 CPU	Branch if zero bit set
0009	68000 CPU	Branch if negative bit set
000A	68000 CPU	Branch if overflow set
000B	68000 CPU	Branch if carry set or zero set
000C	68000 CPU	Branch if greater or equal to zero
000D	68000 CPU	Branch if less than or equal to zero
000E	68000 CPU	Branch if less than zero
000F	68000 CPU	Data register, D0

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
0010	68000 CPU	Data register, D1
0011	68000 CPU	Data register, D2
0012	68000 CPU	Data register, D3
0013	68000 CPU	Data register, D4
0014	68000 CPU	Data register, D5
0015	68000 CPU	Data register, D6
0016	68000 CPU	Data register, D7
0017	68000 CPU	Address register, A0
0018	68000 CPU	Address register, A1
0019	68000 CPU	Address register, A2
001A	68000 CPU	Address register, A3
001B	68000 CPU	Address register, A4
001C	68000 CPU	Address register, A5
001D	68000 CPU	Address register, A6
001E	68000 CPU	Address register, A7
001F	68000 CPU	Extend bit in Status register
0020	68000 CPU	Auto increment w/byte
0021	68000 CPU	Auto increment w/word
0022	68000 CPU	Auto increment w/longword
0023	68000 CPU	Pre-decrement w/longword
0024	68000 CPU	Displacement w/longword
0025	68000 CPU	Index w/longword
0100	68000 EPROM	Error code for ROM checksum invalid
0200	68000 TPRAM	Buffer RAM 1st 64K
0204	68000 TPRAM	Buffer RAM 2nd 64K
0300	68000 EEPROM	EEPROM verification failed

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
0301	68000 EEPROM	Unable to write POST check in region 2
0302	68000 EEPROM	POST check written to region 1 instead of 2
0400	SWIFT chip	Failed init val test
0401	SWIFT chip	Failed R/W test
0402	SWIFT chip	IAD set after reg init
0403	SWIFT chip	IAD not set after IA
0404	SWIFT chip	IAD set during special
0405	SWIFT chip	Failed special reg test
0406	SWIFT chip	Sel timeout too early
0407	SWIFT chip	Sel timeout too late
0408	SWIFT chip	Sel timeout IStat bad
0409	SWIFT chip	Sel timeout PStat bad
040A	SWIFT chip	Sel not asserted
040B	SWIFT chip	Command not started
040C	SWIFT chip	Sel-Init/Targ/Par bad
040D	SWIFT chip	Cmd bytes wrong
040E	SWIFT chip	Cmd bytes checksum bad
040F	SWIFT chip	Recv cmd Ack not deasserted
0410	SWIFT chip	Recv cmd Ack not asserted
0411	SWIFT chip	Data bytes wrong
0412	SWIFT chip	Data checksum wrong
0413	SWIFT chip	Recv dat Ack not deasserted
0414	SWIFT chip	Recv dat Ack not asserted
0415	SWIFT chip	MBuff No Status Req
0416	SWIFT chip	Send cmd Req not deasserted

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
0417	SWIFT chip	Send cmd Req not asserted
0418	SWIFT chip	Send dat Req not deasserted
0419	SWIFT chip	Send dat Req not asserted
041A	SWIFT chip	Illegal entry into ISR
041B	SWIFT chip	InitTimeout too early
041C	SWIFT chip	InitTimeout2 too early
041D	SWIFT chip	TargTimeout too early
041E	SWIFT chip	SWIFT not in data phase
041F	SWIFT chip	Thread word incorrect
0420	SWIFT chip	Buffer header bad
0421	SWIFT chip	Buffer data bad
0422	SWIFT chip	Buffer EDC bad
0423	SWIFT chip	No deassert Ack in DCS
0424	SWIFT chip	No assert Ack in DCS
0425	SWIFT chip	No Ack in DDB
0426	SWIFT chip	No deassert Req in DDB
0427	SWIFT chip	Packet Status is bad
0428	SWIFT chip	Result in DCS is bad
0429	SWIFT chip	Result in DSCtrl bad
042A	SWIFT chip	Result in IStat is bad
042B	SWIFT chip	Result in LIP is bad
042C	SWIFT chip	Result in TLP is bad
042D	SWIFT chip	No interrupt when IAD
042E	SWIFT chip	Loopback test DDB verify failed
042F	SWIFT chip	Loopback test DDB complement verify failed

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
0420	SWIFT chip	Loopback test DCS verify failed
0421	SWIFT chip	Loopback test DCS complement verify failed
0500	Semaphore Registers	(68000) semaphore register 0 error
0501	Semaphore Registers	(68000) semaphore register 1 error
0502	Semaphore Registers	(68000) semaphore register 2 error
0503	Semaphore Registers	(68000) semaphore register 3 error
0600	Loader UART	Data received does not equal data transmitted
0601	Loader UART	No data received within timed period
0602	Loader UART	Interrupt failure on TX Buffer Empty
0700	BUDI chip	Failed to read Reset values
0701	BUDI chip	Failed to Toggle R/W register
0702	BUDI chip	Unable to clear EXP in TMTCSR
0703	BUDI chip	Failed to set EXP in TMTCSR
0704	BUDI chip	TMT is inaccurate
0705	BUDI chip	TMT failed to interrupt
0709	BUDI chip	Failed to set NEW_VAL
070B	BUDI chip	Failed to set NEW_VAL
070E	BUDI chip	By fault insertion
070F	BUDI chip	By fault insertion
0710	BUDI chip	By fault insertion

Table A–1 (Cont.) Detail Error Codes

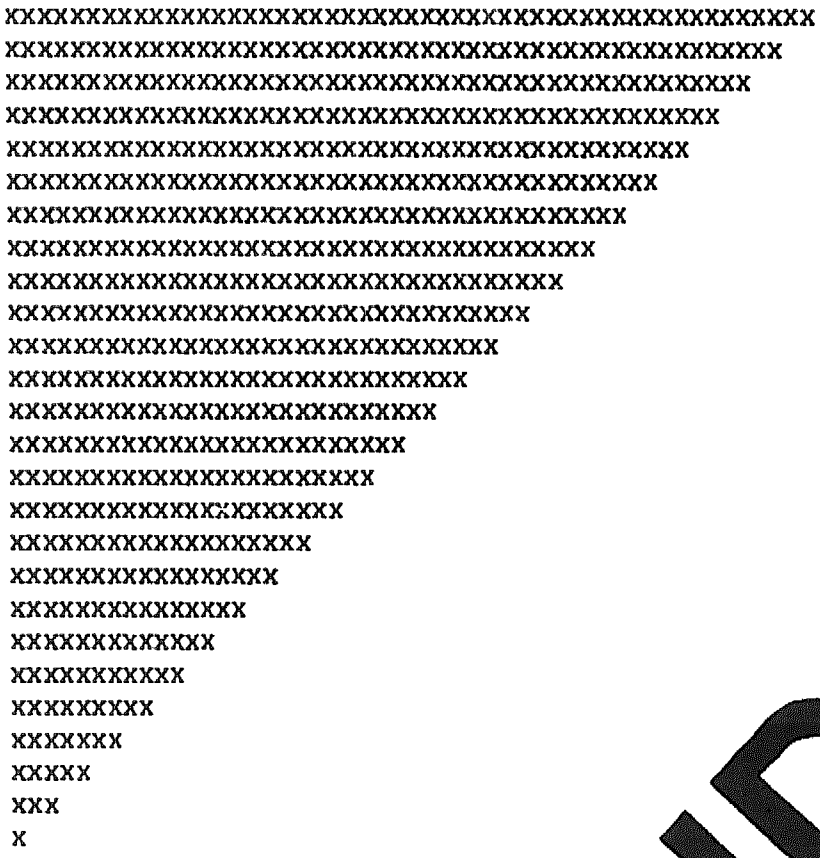
Error number (hex)	Test(s)	Description
0711	BUDI chip	IACK didn't clear IENB
0712	BUDI chip	TMT is dead
0713	BUDI chip	Cannot communicate with front panel
0714	BUDI chip	Illegal entry into TMT test ISR
0800	TPRAM	Correct pattern not read from TPR
0801	Semaphore Registers	Failure reading pattern from Sem regs
0802	Interface	80186 interrupt not acknowledged, ID confirmed
0803	Interface	Neither interrupt nor ID received from 80186
0804	Interface	80186 did not specify test results
0F00	Various	Reset encountered but not expected
1000	80186 CPU	80186 general purpose register, AX
1001	80186 CPU	80186 general purpose register, BX
1002	80186 CPU	80186 general purpose register, CX
1003	80186 CPU	80186 general purpose register, BP
1004	80186 CPU	80186 general purpose register, SI
1005	80186 CPU	80186 general purpose register, DI
1006	80186 CPU	Overflow bit error (JNO,JO)
1007	80186 CPU	Carry bit error (JNC,JC)
1008	80186 CPU	Sign bit error (JNS,JS)

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
1009	80186 CPU	Divide result incorrect
100A	80186 CPU	Zero bit error (JZ)
1100	80186 EEROM	Invalid checksum error code
1200	80186 BRAM	Verify failed on odd address
1201	80186 BRAM	Verify failed on even address
1300		Interrupt expected, but not acknowledged
1301	80186 CPU	Timer 0 is not accurate
1302	80186 CPU	Timer 1 is not accurate
1303	80186 CPU	Timer 2 is not accurate
1304	80186 CPU	Illegal entry to timer 0 ISR
1305	80186 CPU	Illegal entry to timer 1 ISR
1306	80186 CPU	Illegal entry to timer 2 ISR
1307	Gap Detect	Could not disable gap detection
1400	Cable	Break/Abort encountered
1401	Tape UART	Receive or transmit data error code
1500	Tape UART	Bad CRC detected when expecting good
1501	Tape UART	Bad CRC not detected when expected
1502	Tape UART	Data received incorrect
15FF	Tape UART	Unknown error
1600	Semaphore registers	(80186) Semaphore register 0 not what expected
1601	Semaphore registers	(80186) Semaphore register 1 not what expected
1602	Semaphore registers	(80186) Semaphore register 2 not what expected

Table A–1 (Cont.) Detail Error Codes

Error number (hex)	Test(s)	Description
1603	Semaphore registers	(80186) Semaphore register 3 not what expected
1700	TPRAM	(80186) Pattern expected not found
1701	Interface	68000 interrupt not acknowledged, pattern ok
1702	Interface	Linkup failure, pattern not found and no interrupt
1703	TPRAM	Unable to write to lower TPRAM region
9000	Watchdog Timer	Watchdog Timer did not reset within timeout
0FF00	TPRAM	Unable to get operational mode
0FF01	Interface	80186/Loader UART Interrupt acknowledged by
		Loader UART



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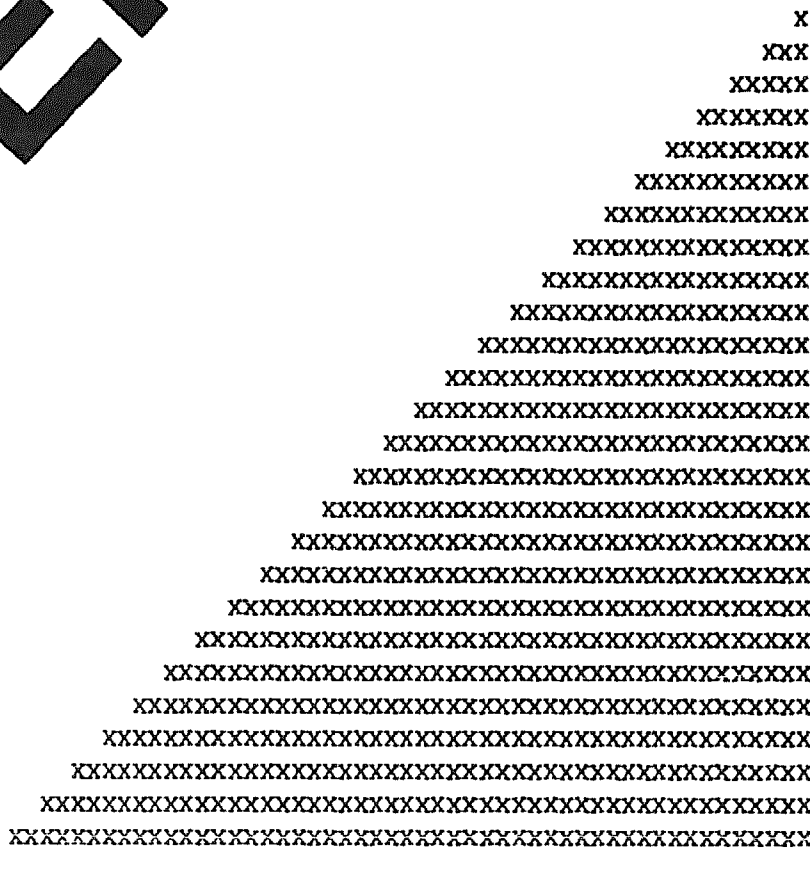


B

DSSI Event/Error Codes

The following table lists DSSI Event/Error Codes. These codes describe firmware events/errors, which are logged in EEPROM and traceable via the local program called HISTRY (Section 3.3.5).

Table B–1 DSSI Error/Event Codes

Swift Error Codes			
Event	**Error**	**Description**	**Probable Cause (Primary,Secondary)**
B	8101H	Illegal Access to Swift Register	HW,FW
B	8102H	Not Enough Buffers Interrupt Bit Set	HW,FW
B	8103H	No inbound buffers available	HW,FW

68000 Interrupt Error Codes			
Event	**Error**	**Description**	**Probable Cause (Primary,Secondary)**
B	8301H	Bus Error	HW,FW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

68000 Interrupt Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	8302H	Address Error	HW,FW
B	8303H	Illegal Instruction Error	HW,FW
B	8304H	Zero Divide Error	HW,FW
B	8305H	CHK Instruction	HW,FW
B	8306H	TRAPV Instruction	HW,FW
B	8307H	Privilege Violation	HW,FW
B	8308H	Trace Instruction	HW,FW
B	8309H	1010 Emulator Entry	HW,FW
B	830AH	1111 Emulator Entry	HW,FW
B	830BH	Illegal Trap Instruction	HW,FW
B	830CH	Uninitialized Interrupt Vector	HW,FW
B	830DH	Spurious Interrupt	HW,FW
B	830EH	Level 1 Interrupt AutoVector	HW,FW
B	830FH	Level 2 Interrupt AutoVector	HW,FW
B	8310H	Level 3 Interrupt AutoVector	HW,FW
B	8311H	Level 4 Interrupt AutoVector	HW,FW
B	8312H	Level 5 Interrupt AutoVector	HW,FW
B	8313H	Level 6 Interrupt AutoVector	HW,FW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

68000 Interrupt Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	8314H	Level 7 Interrupt AutoVector	HW,FW
B	8315H	Invalid Interrupt Received	HW,FW
B	8316H	Vector Chip Program Interrupt	HW,FW

Data Link Thread Module

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A101H	Data Link Free Pool List Empty	FW,HW
B	A102H	Data Link Input Parameter Error on Send	HW,DSSI
B	A103H	Data Link Input Parameter Error on Rcv	DSSI,HW

Port Layer Fork Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A201H	No data buffers available	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Port Layer Fork Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A202H	Port Layer Fork scheduled with nothing to do	FW,HW
B	A204H	Received invalid response from 80186	FW,HW
B	A205H	Transmit queue empty when retrying	FW,HW
B	A206H	Sent/Transmit queue head mismatch	FW,HW
B	A207H	Frame Sent Notification received on invalid frame	FW,HW
L	A20BH	Reset Frame Received	DSSI (Controller is reset)
B	A20CH	Unused Buffer Descriptor while Transferring Data	FW,HW
B	A20DH	Unknown Buffer Descriptor while Transferring Data	FW,HW
B	A20EH	Cannot find Data Operation Queue for data transfer	FW,HW

Data Link Fork Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A301H	Invalid Frame	DSSI,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Data Link Fork Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A302H	SWIFT EDC bit set in frame	HW,FW

Port to Port Driver Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A601H	Could Not Allocate Initial Message Buffers	FW,HW
B	A602H	Found no buffer for VC Circuit Disable	FW,HW
B	A603H	PPD scheduled with nothing to do	FW,HW
B	A604H	Response received with invalid opcode	FW,HW
B	A605H	Non SCS Message Sent Notification Received	FW,HW
B	A606H	Non SCS Message Type Received	FW,HW
B	A607H	SCS Message Received as Port Datagram	FW,HW
L	8012H	Remote Port restarted	DSSI
L	8013H	Virtual Circuit restarted	DSSI

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

SCS Layer Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A706H	SCS message sent with invalid message type	FW,HW
B	A712H	No message buffer for control message	FW,HW
B	A713H	SCS scheduled with nothing to do	FW,HW
B	A714H	SCS called with invalid opcode	FW,HW
B	A715H	Disconnect command in invalid state	FW,HW
B	A716H	Could not allocate initial message buffers	FW,HW
B	A717H	No buffer for path request upon connection getting closed	FW,HW

Executive Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	AA01H	Bad queue type in timer ISR	FW,HW
B	AA02H	ALLOCATE called with size zero	FW,HW
B	AA03H	Attempt to inactivate non-expired timer	FW,HW
B	AA04H	Attempt to activate a ready TCB	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmwar
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Executive Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	AA05H	EXE_W_STKDP not +1 as expected	FW,HW
B	AA06H	EXE_W_STKDP not 0 as expected	FW,HW
B	AA07H	Functional Thread Exited	FW,HW
B	AA08H	Out of Dynamic Memory	FW,HW
B	AA09H	Diagnostic Thread Starting	FW,HW

TF70 System Level Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	AD01H	Interprocessor Communications Command Queue Lock Failure	HW,FW
B	AD02H	Interprocessor Communications Response Queue Lock Failure	HW,FW

SCS$Directory Thread Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

SCS$Directory Thread Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	AE01H	No controller block available in free pool	FW,HW
B	AE02H	No control buffer available for listen	FW,HW
B	AE03H	Thread scheduled with nothing to do	FW,HW
B	AE04H	Invalid message type received from SCS	FW,HW

BDS Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	B001H	Unmap called for unmapped buffer	FW,HW
B	B002H	No block to perform write from	FW,HW
B	B003H	No block to perform read from	FW,HW

Timer Driver Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Timer Driver Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	B101H	Invalid TEB Address Received	FW,HW
B	B102H	Too many timer requests received	FW,HW
B	B103H	Cannot find timer to be flushed	FW,HW
B	B104H	Cannot find pointer to timer block	FW,HW
B	B105H	No control buffer for expiration notification	FW,HW

Miscellaneous Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	A901H	SCA Semaphore Error	FW,HW
B	AB01H	EEROM Thread Driver scheduled with nothing to do	FW,HW
B	AC01H	Bad SCB Type on interprocessor queue	FW,HW
B	AF01H	Loader UART Driver scheduled with nothing to do	FW,HW
B	AF02H	Loader UART Driver has no control buffers	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Miscellaneous Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	AF03H	Loader UART Driver Receiving characters too fast	FW,HW
L	0713H	Remote Front Panel Broken	HW (controller may fail)

Port Level Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	8001H	Invalid Port Packet Length	DSSI,HW
L	8002H	Port Level Credit Violation	DSSI,HW
L	8003H	Port Level Sequence Number Error	DSSI,HW
L	8004H	Port Level Invalid Frame	DSSI,HW
L	8011H	VC being closed on unknown open connection	HW,FW
L	8015H	VC being closed on open tape connection	DSSI,HW
L	8016H	VC being closed on open DUP connection	DSSI,HW
L	8017H	VC being closed on open SCS$Directory connection	DSSI,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

Port Level Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	8AAXH	Max retries exceeded while transmitting to node X	DSSI,HW

SCS Level Connect Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	8005H	Connect Rsp Nak'd by remote	DSSI
L	8006H	Accept Rsp Nak'd by remote	DSSI
L	8007H	Connection rejected by remote	DSSI

SCS Level Protocol Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	8009H	Message too short for its type	DSSI,HW
L	800AH	Message type invalid	DSSI, HW
L	800CH	Msg rcv'd invalid for connection state	DSSI,FW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–1 (Cont.) DSSI Error/Event Codes

SCS Level Protocol Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	800FH	SCS Level Credit Violation	DSSI,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–2 80186 Error/Event Codes

Host Port Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4001H	Notification Queue corrupted	FW,HW
B	4002H	Invalid SCB Type	FW,HW
B	4003H	Unused SCB type SCB	FW,HW
B	4004H	Invalid Loader SCB opcode	FW,HW
B	4005H	Invalid Timer Opcode	FW,HW
B	4006H	Invalid Timer ID	FW,HW
B	4007H	No Control Buffer for Timer	FW,HW
B	4008H	Error Dispatching in Logger	FW,HW

Connection Manager Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4101H	No buffer to build listen	FW,HW
B	4102H	Invalid state processing connect	FW,HW
B	4103H	Invalid state processing host disconnect	FW,HW
B	4104H	Invalid Controller ID	FW,HW
B	4105H	Invalid state processing disconnect notification	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–2 (Cont.) 80186 Error/Event Codes

Connection Manager Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4106H	Invalid state processing server disconnect	FW,HW

BDS Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4201H	No buffer to build a Pipe Cmd	FW,HW
B	4202H	Wrong state in DataManager	FW,HW
B	4203H	Wrong state in DataReq	FW,HW
B	4204H	No message buffer for data req	FW,HW
B	4205H	Wrong state in ReqCmplt	FW,HW
B	4206H	Wrong state in DataNotification	FW,HW
B	4207H	Wrong state in Receive Data	FW,HW
B	4208H	Lost the SCB to Receive Data	FW,HW
B	4209H	SCB not a SendDataCmd in RecvData	FW,HW
B	420AH	Wrong state to Send Data	FW,HW
B	420BH	Lost the SCB to Send Data	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–2 (Cont.) 80186 Error/Event Codes

BDS Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	420CH	SCB not a RcvDataCmd in SendData	FW,HW
B	420DH	Data Operation timed out	FW,HW

ECC Module Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4300H	EDC Error	HW,FW

Server Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4401H	No local message buffer for DUP SDI	FW,HW
B	4402H	No control buffer for time of day	FW,HW
L	4403H	Host Access Timeout	DSSI,HW
L	4404H	Disconnect Clean-up Error	HW,FW
L	4405H	Wrong state for expired timer	FW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–2 (Cont.) 80186 Error/Event Codes

Server Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
L	4406H	Invalid timer opcode	FW,HW
L	4407H	Local program not running	FW,HW

80186 Exception Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4600H	Divide Error Exception	HW,FW
B	4601H	Single step interrupt	HW,FW
B	4602H	Non Maskable Interrupt	HW,FW
B	4603H	Breakpoint interrupt	HW,FW
B	4604H	Int0 Detected Overflow	HW,FW
B	4605H	Array Bounds Exception	HW,FW
B	4606H	Unused Opcode Exception	HW,FW
B	4607H	Escape Opcode Exception	HW,FW
B	4609H	Reserved Exception	HW,FW
B	460CH	Interrupt 0	HW,FW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

Table B–2 (Cont.) 60186 Error/Event Codes

TKPort Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4701H	No local message buffer for application message	FW,HW
B	4702H	No DSSI message buffer for end message	FW,HW
B	4703H	No DSSI message buffer for ATTN message	FW,HW

Miscellaneous Error Codes

Event	Error	Description	Probable Cause (Primary,Secondary)
B	4801H	No buffer to send loader command	FW,HW
B	4802H	Received character buffer full in loader driver	FW,HW
B	4901H	No control buffer for local program to send command	FW,HW

Key to Probable Causes

HW—Error occurred because of a hardware failure.
FW—Error occurred because of a firmware error.
DSSI—Error occurred as result of event on the DSSI bus.

Key to Event Code

B—Bugcheck. Error is logged and controller is reset by the firmware.
L—Error is logged, but error recovery does not require the controller to be reset.

This appendix describes how to use the TKXX-HC head cleaning kit (part number 22-00436-01).

B.1 Instructions for Use

The head cleaning kit is for monthly use by customers and Digital Customer Services engineers.

Use the head cleaning kit as follows:

1. Insert the positioning cartridge until seated (Figure B–1). The power may be either on or off, and the drive handle may be in either position.
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 2 inches (5 centimeters) of the wand tip.
4. With the fabric side of the wand facing the square on the positioning cartridge, insert the wand into the cartridge's slot (Figure B–1) until the tab touches the front surface.
5. Move the wand in and out 10 times, about 1 to 2 inches (2.5 to 5 centimeters) each way.

   NOTE
   If the TK70 drive indicators begin to flash while cleaning, push the unload button to reset the drive.

6. Discard the wand and solvent applicator. They are designed for single use only.

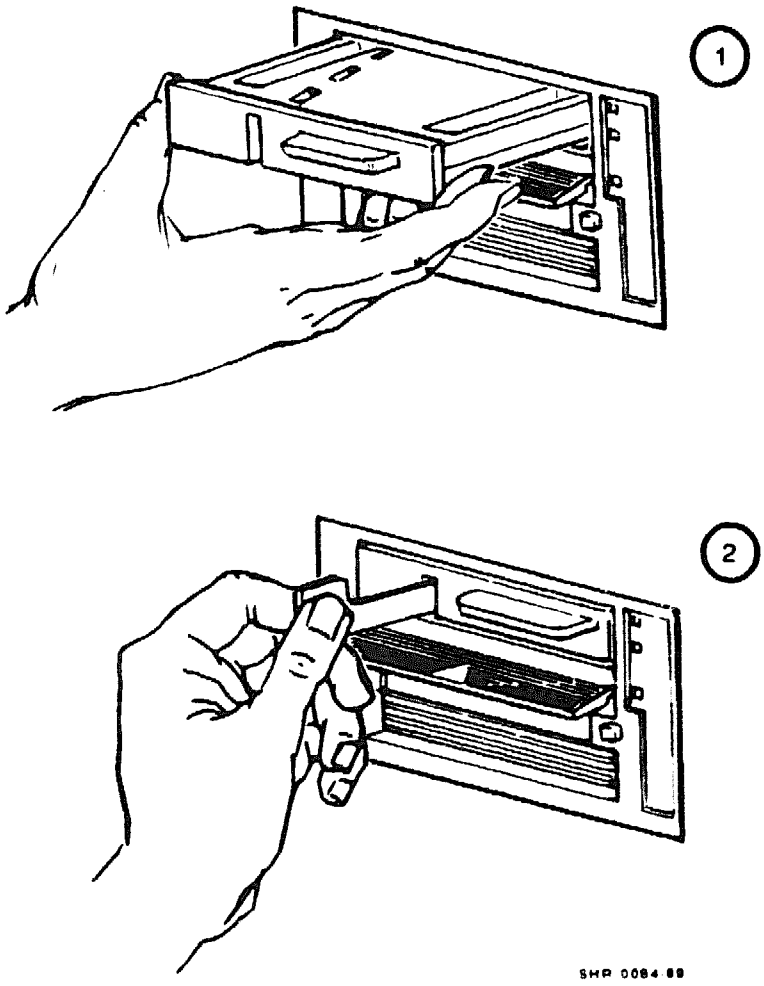
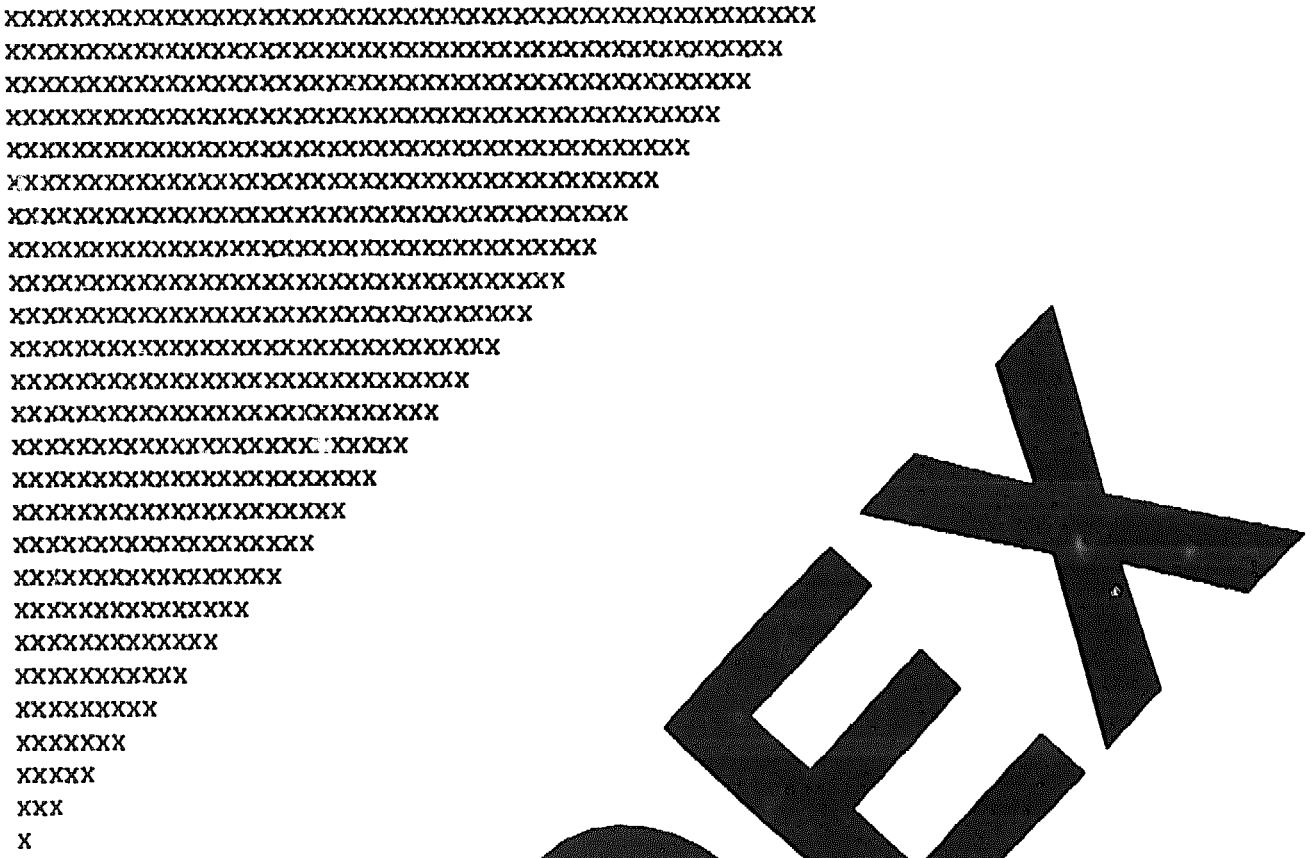


Figure B–1 Inserting the Positioning Cartridge and Wand into the Drive

B.1.1 Ordering Wand and Applicator Refills

To order wand and applicator refills, use part number 22-00436-02.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