

**TKZ09**

***Workstation Compatible/8mm 5GB  
High Performance Backup Drive***

***Owner's Manual***



TRANSITIONAL  
TECHNOLOGY, INC.

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# About This Manual

## Purpose of This Manual

This manual describes how to install, test, and maintain the TKZ09 helical scan cartridge tape subsystem.

## Who Should Use This Manual

This manual is for anyone setting up and using the TKZ09 for the first time.

## Structure of This Manual

This manual is divided into three chapters:

- Chapter 1 includes an overview of the TKZ09 tape subsystem and introduces you to some of the features of the product.
- Chapter 2 shows how to install your new TKZ09.
- Chapter 3 gives you information you will need to make optimal use of the TKZ09.



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## Your TKZ09

This chapter describes some of the features of the TKZ09.

### Overview

The TKZ09 is a fourth-generation, high performance, high capacity 8mm cartridge tape subsystem for computers. The product utilizes advanced helical scan technology which affords a very high recording density and data storage capacity. It uses an industry standard 8mm data grade tape cartridge which is removeable and re-writeable. The cartridge stores approximately 5 gigabytes of formatted user data. The TKZ09 includes a proprietary configurable SCSI interface that provides plug-and-play compatibility with a variety of workstation models, including DEC VAXstation 3100, DECstation 3100, and MicroVAX 3100. In addition, the TKZ09 can be used with any host computer/ SCSI host adapter combination that supports the Exabyte EXB-8200 8mm drive, while providing a full status display panel, and many extra features.

## System Features

- The TKZ09 uses advanced helical scan recording technology. Using alternate-azimuth recording, the TKZ09 stores twice as much data as previous 8mm units.
- The TKZ09 stores its data on readily available, industry standard 8mm data grade cartridges. Each cartridge can store up to 5 gigabytes of user data.
- The TKZ09 has a comprehensive display panel that always lets you know what the drive is doing, how much tape you have left, and the quality of the tape you are using.
- The TKZ09 has many advanced data integrity features, including read-after-write error checking with automatic rewrite, and a powerful on-board error correcting code (ECC). The resulting non-recoverable bit error rate is one bit in  $10^{13}$ .
- The TKZ09 has a built-in 1Mbyte data buffer.
- All switches required to set up the TKZ09 are accessible from the rear panel of the unit for convenience.
- The TKZ09 is compatible with AC power sources all over the world and configures itself automatically to the line voltage in use.

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## Installing Your TKZ09

After helping you check that you have all your equipment, this chapter shows how to set up your TKZ09, including:

- Connecting it to your host computer
- Terminating your SCSI bus
- Setting the SCSI ID and option switches
- Connecting the power cord

### Environmental Considerations

In general, any location suitable for computer use is probably acceptable for the TKZ09 also. Observe the following points when choosing an operating location for the unit:

- The recommended operating temperature range is from 16° to 32°C (60° to 90°F), and relative humidity from 40% to 60%, non-condensing.
- Keep the equipment away from heaters, photocopiers, direct sunlight, and abrasive particles.
- Keep the fan opening at the rear of the unit and the air vents on each side of the unit clear for proper ventilation.
- Do not place the unit on its side. Blocking the air vents can cause the unit to overheat.
- If the unit has been moved inside from a cold environment, allow it to warm up to room temperature before attempting to operate it. Condensation can form on the head assembly, causing damage to the heads and tape.

- Insure bail-locks are locked to cable connectors.

## Unpacking

Before beginning with the installation, check to make sure you have the following parts which are shipped with your TKZ09 subsystem:

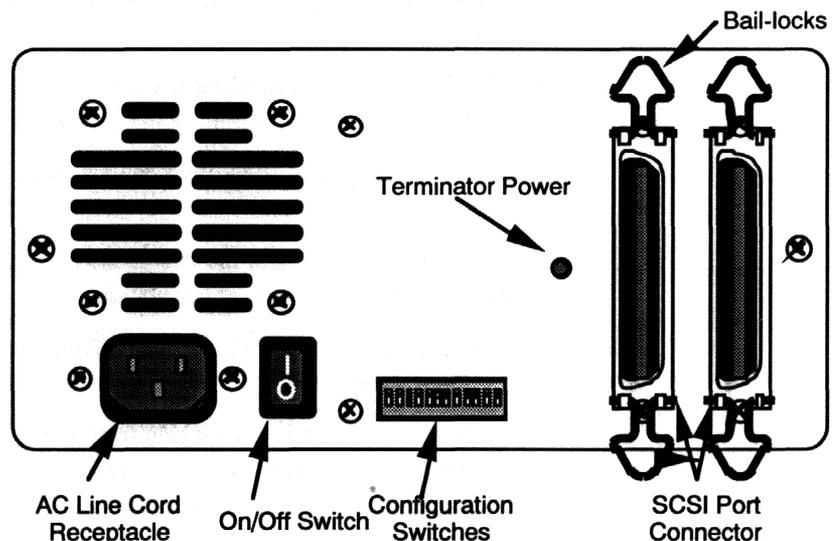
- The TKZ09 itself
- The AC line cord
- The SCSI terminator plug
- The TKZ09 Owner's Manual (this book)

In addition, you will need a suitable SCSI cable to connect the unit to your host computer. This cable may be obtained separately from TTI.

## Rear Panel Ports and Connectors

You are now ready to set up your system. Turn the TKZ09 around so that the back of it is facing you. Take a moment to familiarize yourself with the ports and connectors shown in Figure 2-1.

**Figure 2-1 Rear Panel Ports and Connectors**



- The AC line cord receptacle connects AC power to the unit.
- The on/off switch turns the unit on and off.
- The configuration switches set the SCSI ID of the TKZ09, and also are used to enable and disable various options.
- The terminator power LED indicates that terminator power is present on the SCSI connectors.
- The SCSI connectors are used to connect the unit to the host computer's SCSI bus.

## Connecting the Power Cable

Your TKZ09 has a universal power input which can accept any power source from 100VAC to 240VAC, 50-60Hz, without jumper changes.

The TKZ09 should be connected to the same grounded outlet or outlet strip as your CPU and other SCSI devices.

## About SCSI

The Small Computer Systems Interface (SCSI) is an ANSI standard interface for connecting computers and peripherals together.

### SCSI Cabling

There can be as many as eight SCSI devices (including your workstation or host computer) connected in a system. SCSI disks and tapes that are built-in to your computer are also included in the total.

Devices are connected to the SCSI bus in a *daisy chain* manner. This means that the cable goes from the host to the first device on the bus, from the first device to the second, and so on.

The overall length of the SCSI cabling may not exceed 6 meters (19.6 feet). This includes cabling which may be hidden inside the SCSI devices themselves. The circuits in the TKZ09 that drive the SCSI bus are located very close to the rear panel connectors, so you can assume that the length of the signal path between the two connectors is about two inches.

Most SCSI devices including the TKZ09 have two SCSI connectors to facilitate daisy chaining. The two connectors may be used interchangeably.

### **SCSI ID**

Each device on the SCSI bus, including the host adapter, is identified by a SCSI ID which is a number ranging from 0 to 7. Each device connected by means of SCSI must have its own unique SCSI ID. Although any of the SCSI IDs may be used, each computer vendor typically has its own convention for assigning SCSI IDs.

### **Terminators**

An important part of a properly configured SCSI system are components called SCSI terminators. Terminators are required to avoid electrical reflections that may produce unwanted signals in the SCSI cabling. The TKZ09 uses an external terminator plug which is supplied with the unit.

The very last device at the end of the SCSI chain should have a terminator installed. If you are adding the TKZ09 to a system that already has other SCSI devices attached, you will likely need to remove the terminator from an existing SCSI device. In some cases, you may have to refer to the device manufacturer's documentation to determine if an internal SCSI terminator is installed (some SCSI devices use terminators that are installed inside the device's case and require opening the device).

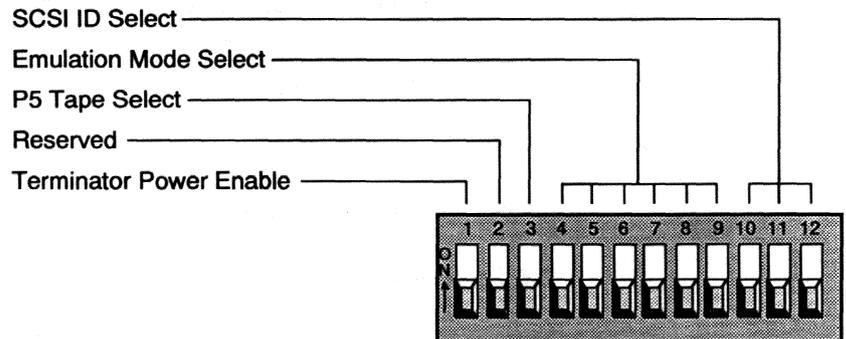
## Setting the Configuration Switches

The SCSI ID and configuration options are set by means of the twelve configuration switches on the rear panel. They are numbered from 1 to 12 starting at the left. Figure 2-2 shows the individual switch functions and their recommended settings for various operating system. As indicated, a switch is ON when it is in the up position, and OFF in the down position.

With the exception of switches 1 and 2, the switches are scanned by the TKZ09 only during its power-up cycle. It is therefore necessary to cycle the power to the unit in order for any of the other switch settings to become effective when changed.

*Switch 1, which controls the supply of terminator power to the tape drive, is not actually scanned by the TKZ09. It can be changed at any time, but be aware that changing it while the tape drive is in use could result in damage to the tape drive.*

**Figure 2-2 Configuration Switch Summary**



# Switch Functions

## 1 Terminator Power

This switch, when turned ON, connects 5VDC terminator power to the rear-panel SCSI connectors. The terminator power is supplied through a diode and a fuse. The green terminator power LED on the rear panel indicates that terminator power is present at the SCSI connectors (either from the TKZ09 or an external source). Terminator power must be present (i.e., the LED must be lighted) for an external terminator plug such as the one supplied with the TKZ09 to function.

We recommend that this switch remain OFF if the host supplies terminator power, and the device is not the last device on the SCSI bus. It is recommended that the host and last device supply terminator power. Start with switch 1 OFF and connect the TKZ09 to your host. Turn on the host computer and the drive. If the green LED is lighted, leave switch 1 OFF, otherwise, turn it ON.

*If the green terminator power LED does not light even with AC power applied and switch 1 turned ON, the internal terminator power fuse may be blown. Contact TTi Technical Support for assistance.*

## 2 Reserved

Switch 2 is reserved for future use.

## 3 P5 Tape Select

When turned ON, this switch causes the TKZ09 to recognize P5 (European) tape lengths. When OFF, the unit recognizes P6 (US) tape lengths. Refer to "Cartridge Types and Sizes" in Chapter 3 for more information on P5 and P6 tapes.

## 4-9 Emulation Mode

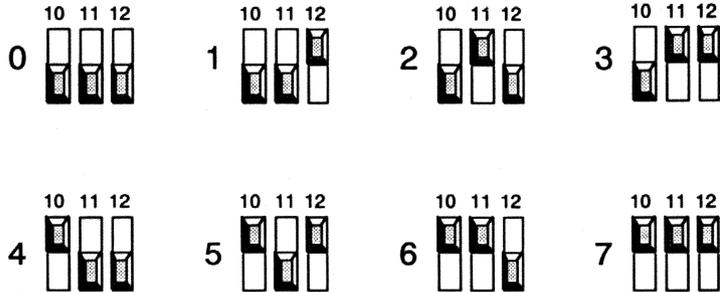
Switches 4 through 9 determine the emulation mode of the TKZ09, and select various options for the selected emulation. The function of these

switches is to select either EXB-8200/DEC TKZ09 mode or DEC TK50Z mode.

## 10-12 SCSI ID

Switches 10, 11, and 12 select the drive's SCSI ID. Refer to Figure 2-3 for these settings.

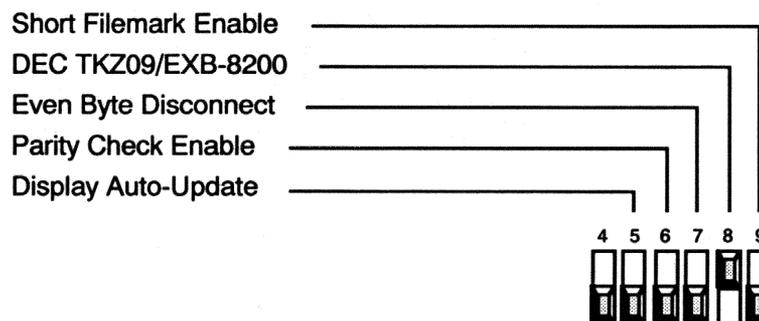
**Figure 2-3 SCSI ID Selection**



## EXABYTE EXB-8200/DEC TKZ09 Mode

EXABYTE EXB-8200/DEC TKZ09 mode is selected whenever switch 4 is OFF. This mode is recommended for host applications which include support for the EXB-8200 8mm drive. Additionally, it is the recommended mode for *non-TTi* SCSI host adapters for DEC UNIBUS and Q-BUS. When this mode is enabled, switches 5 through 9 select various options, as shown in Figure 2-4. When switch 4 is OFF, switch 8 is used to identify either the EXB-8200 mode or the DEC TKZ09 mode (refer to the description of switch 8, below).

**Figure 2-4 EXABYTE Mode and Options**



In EXABYTE EXB-8200 mode, switches 5 through 9 enable and disable the following options:

### **5 Display Auto-Update Disable**

When EXB-8200 mode is enabled and switch 5 is OFF, the tape remaining and %rewrites/ECC displays will update automatically at approximately two second intervals. With switch 5 in the ON position, automatic display updates are disabled. In this case, the host must issue Request Sense commands to the unit in order to cause the display to update. The recommended setting is for normal applications is OFF.

## **6 Parity Check Enable**

When switch 6 is ON, the TKZ09 checks the SCSI data bus parity bit. With switch 6 OFF, the parity bit is ignored. The TKZ09 always generates parity regardless of the switch setting. The recommended setting for normal applications is ON. This switch affects the power-up state of the unit. The host may override this option via a Mode Select command.

## **7 Even Byte Disconnect**

With switch 7 ON, the TKZ09 will only disconnect on even byte boundaries. This is required for some host computers which cannot handle disconnects on odd byte boundaries. This switch affects the power-up state of the unit. The host may override this option via a Mode Select command.

## **8 DEC TKZ09/EXB-8200 ID**

The TKZ09 can identify itself as either an EXABYTE EXB-8200 or a DEC TKZ09 drive. This is for compatibility with hosts which support the EXB-8200 but do not yet support the DEC TKZ09. Switch 8 OFF identifies the drive as an EXB-8200 via the SCSI Inquiry command. With switch 8 ON, the drive identifies itself as a TKZ09 .

## **9 Short Filemark Enable**

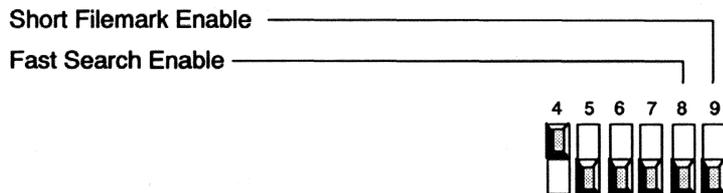
Setting switch 9 to the ON position causes the TKZ09 to write "short" filemarks to the tape by default. Short filemarks save a considerable amount of space on tape, but cannot be erased and overwritten as can normal filemarks. The TKZ09 never writes more than one consecutive short filemark—the 2nd, 3rd etc. consecutive filemarks are always written as normal filemarks for operating system compatibility.

## DEC TK50Z Mode

For older systems which don't recognize a TKZ09, the DEC TK50Z mode is selected whenever switch 4 is on and switches 5, 6, and 7 are OFF.

TK50Z mode is recommended when the TKZ09 is used with the VAXstation 3100, MicroVAX 3100, DECstation 3100, DECstation 5000, and other DEC VMS and ULTRIX workstations with a built-in SCSI port. When TK50Z mode is enabled, switches 8 and 9 select optional features as shown in Figure 2-5.

**Figure 2-5 TK50Z Mode and Options**



In TK50Z mode, switches 8 and 9 enable and disable optional features as follows:

### **8 Fast Search Enable**

In TK50Z mode, with switch 8 turned ON, the TKZ09 will convert space block commands with a block count greater than 255 blocks into space filemark commands. This provides a considerable performance improvement on VMS systems, which use a series of space block commands to skip filemarks. It may, however, cause problems with some non-DEC supplied applications software. In this case, switch 8 should be turned OFF to suppress this feature. This switch should also be turned OFF when the TKZ09 is used with ULTRIX

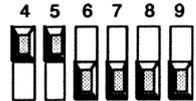
## 9 Short Filemark Enable

Refer to the EXB-8200 mode section of this manual for an explanation of this feature.

## TTi Mode

TTi mode is enabled by setting switches 4 and 5 on and switches 6, 7, 8, and 9 OFF. TTi mode is the recommended mode for use with TTi's DEC UNIBUS and Q-BUS host adapters. Figure 2-6 shows the correct switch settings to enable TTi mode.

**Figure 2-6 TTi Mode Switches**



There are no optional features in TTi mode.

If the drive is a Digital TKZ09 refer to paragraphs 6 and 7 of this section.

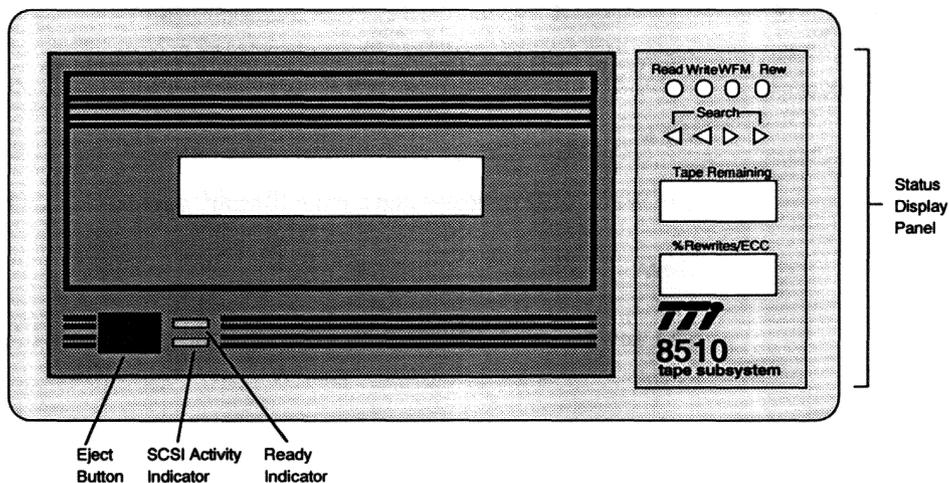


## Using Your TKZ09

### Front Panel Indicators and Controls

The TKZ09 front panel provides the controls and indicators required for normal operation of the unit, including a comprehensive display of tape drive status. There are ten LED indicators, two numeric LED displays, and an eject switch on the front panel as shown in Figure 3-1.

**Figure 3-1** TKZ09 Front Panel



## **Ready**

The green ready indicator light is illuminated when the tape drive is powered up and there is a tape loaded and ready to read/write. The ready indicator is extinguished momentarily during a rewind operation.

## **SCSI Activity**

The amber SCSI activity light flashes whenever the drive is actively transferring data to or from the host via the SCSI interface.

## **Eject Button**

Pressing the eject button causes the cartridge tape to be unloaded from the mechanism and ejected.

## **Read**

The Read LED indicates that a read operation is in progress.

## **Write**

The Write LED indicates that a write operation is in progress.

## **WFM**

The WFM LED indicates that a write filemark operation is in progress.

## **Rew**

The Rew (Rewind) LED indicates that a rewind operation is in progress.

## **Search**

The four arrow shaped Search LEDs indicate that a space operation is in progress in the direction indicated by the arrows. A single arrow indicates that a space block command is being performed (low speed), while double arrows indicate that a space filemark command is being performed.

## **Remaining Tape**

The Remaining Tape display indicates the amount of tape until logical end-of-tape (LEOT) in 1000's of kilobytes (units of 1,024,000 bytes). The tape remaining display is only updated at the end of the current operation, i.e., the display will remain frozen during a space or rewind operation until the desired tape position is reached. The display is also left unchanged if the tape is unloaded.

## **%Rewrites/ ECC**

The %Rewrites/ECC display is a dual function counter displaying write retries and read ECC for recovered physical blocks. During write operations, the display indicates the percentage of blocks which had to be re-written due to read-after-write failures. During read operations, the display indicates the percentage of blocks which had to be reconstructed using the ECC (Error Correction Code). The display will be blanked if too few blocks have been written or read from the tape to calculate a meaningful figure.

# Operating the TKZ09

## Power-On Sequence

The unit performs an elaborate diagnostic routine when power is first applied. This mode is indicated by front panel Ready and SCSI Activity LEDs illuminated continuously. After approximately 8 seconds, the diagnostic will complete and both LEDs will be extinguished. If the LEDs begin flashing alternately, it indicates that a problem was encountered while performing the diagnostic and that the drive requires service.

Assuming that the diagnostic finishes successfully, any tape which may be inside the drive will be re-wound to the beginning of tape.

The status display panel displays the SCSI ID of the tape drive during the initial power-on sequence to allow you to verify that you have set the ID switches correctly.

## Tape Loading and Unloading

Cartridge loading is accomplished by pressing the Eject button on the front of the drive, inserting the tape, and manually closing the drive door. To unload the tape, simply press the Eject button. The tape is always re-wound before it is ejected so there may be some delay before the door opens and the tape can be removed.

## Normal Cleaning Procedures

TTi recommends that you regularly clean the heads on your 8mm tape drives. The recommended cleaning time is after 30 gigabytes of recording or every 30 days, whichever ever comes sooner. However, you should clean the heads whenever you feel the error rate is higher than expected. You should also clean the heads more frequently if the drive is in a high dust area, such as near copy machines or laser printers. For planning purposes, one gigabyte of data is transferred every hour of continuous streaming operation.

The TTi cleaning kit is easy to use and requires no special software. Each separate cleaning kit is good for three cleanings.

*Use only TTi or other EXABYTE approved cleaning kits to clean your TKZ09. Use of any other cleaning device will void your warranty. Consumer 8mm head cleaning cartridges such as the Sony V8-25CL contain an abrasive that will cause permanent damage to the CTS head assembly.*

### **EXB-8200 Compatibility**

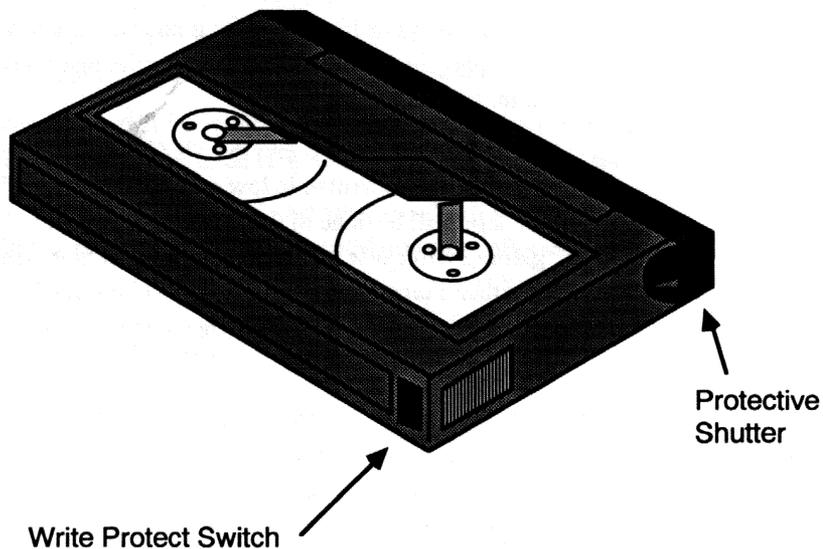
In addition to its high-capacity mode which allows for up to 5 GB per tape cartridge, the TKZ09 can read and write tapes written by earlier 2.3 GB 8mm tape drives.

When a tape is loaded into the TKZ09, the unit automatically senses whether it was written in low or high density mode. Any data appended to the tape will be done in the existing format. Rewriting a tape from the beginning will cause it to be reformatted in high density mode. You can tell whether a tape is low or high density by referring to the Tape Remaining display on the TKZ09 drive when a tape is loaded.

## 8mm Tape Cartridge

The 8mm tape cartridge is shown in Figure 3-2. The cartridge may be manually write-protected by moving the write protect switch to the left so that the red tab fills the window.

**Figure 3-2** 8mm Tape Cartridge



## Cartridge Types and Sizes

8mm tapes are available in several different lengths as shown in Figure 3-3.

**Figure 3-3 Cartridge Types and Sizes**

Domestic (P6)	Capacity (Megabytes)	
	8200 Mode	8500 Mode
P6-15	287	574
P6-30	573	1147
P6-60	1146	2293
P6-90	1719	3439
P6-120	2292	4585

European (P5)	Capacity (Megabytes)	
	8200 Mode	8500 Mode
P5-15	419	838
P5-30	816	1632
P5-60	1609	3219
P5-90	2413	4827

The TKZ09 cannot distinguish between P6 and P5 sizes on its own. For this reason, it is necessary to select the proper tape type when configuring the TKZ09 (see Chapter 2).

The TKZ09 is designed to use any high quality 8mm data grade tape; however, TTI strongly recommends using Sony brand metal particle 8mm tapes (P/N P6-120MP) due to their consistently high quality.

### Tape Handling

8mm tapes should be treated with the same care as other magnetic media used for data storage. The tapes should be kept under stable temperature conditions—environments between 17°C and 20°C (62°F – 68°F) are ideal. Humidity should be 35–45%. Rapid environmental changes can cause permanent tape damage. Store cartridges on edge, not horizontally, to avoid possible damage to the tape edges. Always store tapes in the original storage containers.

## **Tape Wear and Useful Life**

Generally, tape will endure thousands of passes before it wears out. The greatest enemy of tape is contamination. Each time a section of tape is used, it is exposed to ambient conditions. Experience has shown that the probability of a media error gradually increases with use after an initial “clean-up” period of about 10 passes. The rate of this increase is related to the initial state of cleanliness of the drive and tape as well as airborne contamination levels during use and storage. Each time the tape is exposed it has an opportunity to come in contact with airborne debris. Dirty conditions increase the probability of failure with use. In the ideal case the tape actually improves with use until physical wear-out occurs. Operation above 40°C (104°F) can cause immediate media failure.

## **Monitoring Tape Quality with the TKZ09 Display**

The %Rewrites/ECC display provided on the front panel of the TKZ09 is a useful means of monitoring tape quality and tape wear. Good tapes with more than 10 passes typically have rewrite and ECC percentage statistics of less than 0.5%. These statistics should remain constant during the useful life of the tape. When the Rewrite and/or ECC statistics increase by a factor of 3, either the tape is a target for replacement or the drive needs to be cleaned. Tapes which show rewrite or ECC percentages of greater than 5% should be avoided.

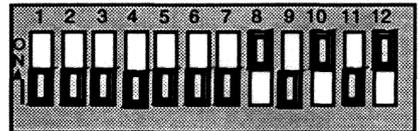
It is normal for tapes to show a rather high percentage of rewrites at the very beginning of the tape, and for the percentage to “average down” as more and more of the tape is written.

## Example Switch Settings

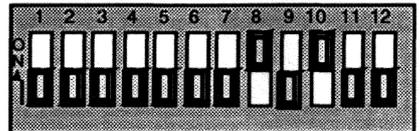
Some example switch settings for common host configurations are shown in Figure A-1 on the next page. This information is intended to supplement, not replace, the information in Chapter 2.

**Figure A-1 Sample Configuration Switch Settings**

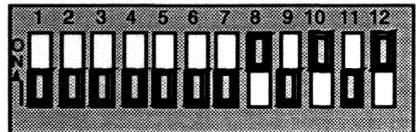
VAXstation 3100  
1st Tape Drive, SCSI ID 5



VAXstation 3100  
2nd Tape Drive, SCSI ID 4

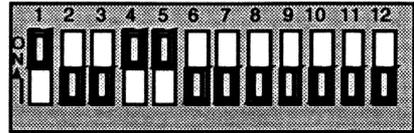


DECstation 3100, 5000  
1st Tape Drive, SCSI ID 5

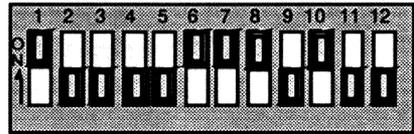


**Figure A-1 (continued)    Sample Configuration Switch Settings**

TTI UNIBUS/Q-BUS  
Host Adapter, SCSI ID 0



Digital TKZ09, SCSI ID 4  
(Default)



# Appendix **B**

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## Notice for VMS Users

**22 June 1992**

At the time of publication of this manual the VMS operating system does not have the capability of changing the format density on 8mm tape drives. Users must use the switch provided for that purpose located on the rear of the table top enclosure. The current version of VMS that is available is v5.5-2. Density format selection is not included in this version nor is it included in earlier versions.

This feature will be included in a future release of the VMS operating system. Refer to the Software Product Description of future releases of VMS to determine whether the density selection feature has been added for 8mm tape drives.

