

9-Track Tape Utilities for XENIX 386

User's Manual



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XENIX Tape Drive Utilities

page contents

1-2	What This Software Does
1-2	How to Avoid Reading this Manual
1-3	How to Use this Manual
2-1	Installation
3-1	Basic Operation
4-1	Advanced Operation
5-1	Troubleshooting
5-6	Index

What This Software Does

This is Flagstaff Engineering's integrated package of driver, test, and utility software for 9-track tape drives installed on 386 systems running under the XENIX System V operating system. This software can:

- Test the installation and operation of your 9-track tape drive.
- Change tape drive settings (such as speed and density).
- Position a tape at a particular file or block.
- Write a tape mark.
- Display data.
- Display tape drive status bytes.

All of these things can be done from the interactive `tapetest` program. You can also call many of these utilities directly from the XENIX command line (see page 4-6).

How to Avoid Reading this Manual

It isn't really necessary to read this manual to use these utilities — just type:

```
tapetest <ENTER>
```

The `tapetest` menu will guide you. If you have a question, press <F1> for help.

Of course, the software must have been properly installed first. If it hasn't been installed yet, take a look at Section 2.

How to Use this Manual

Read Sections 1, 2, and 3 *now* — before using this software.
Read Sections 4 and 5 later, when you want to know more
or have a problem.

INTRODUCTION Section 1 tells you what this software does and how this manual is organized.

INSTALLATION Section 2 explains how to load the software into your computer and how to tell your computer it's there.

BASIC OPERATION Section 3 briefly describes how to use these programs.

ADVANCED OPERATION Section 4 provides additional reference information that you may or may not need, depending on how you use these programs. Detailed information about the tests, tape formats, XENIX command line operation, and tape drive status bytes is included.

TROUBLESHOOTING Section 5 helps you identify the specific source of any problem you might have, then suggests solutions.

Each section begins with a detailed table of contents, and there is a comprehensive index at the end of the manual.

In this manual, keys are represented as: <ENTER>, <TAB>, etc.,
commands and file names as: `tapetest`, `xenix.tape`, etc.

In the on-screen summaries of available `tapetest` commands, [#] before a command indicates that the command can optionally be preceded by a number (see page 3-7).

Notes:

Before Using these Utilities

page	contents
------	----------

2-2	What You Need
-----	---------------

2-2	What You Get
-----	--------------

2-3	Installation Instructions
-----	---------------------------

What You Need

(system requirements)

1. An IBM-compatible 386 computer with the following installed:

Santa Cruz Operation (SCO) XENIX System V Operating System
Version 2.2.1 or later.

Active terminfo database

See your XENIX documentation for more information about terminfo.

9-track tape drive with a Pertec-compatible signal interface

Flagstaff Engineering series V8 tape controller card

This card should be installed on the XENIX server.

5¹/₄-inch diskette drive

For loading this software.

ABOUT KEYBOARDS: XENIX supports many different kinds of keyboards. Some of these keyboards will not have all of the keys listed on the screen. To accommodate these keyboards, `tapetest` will also respond to other, more common (but possibly less convenient) keys. These alternate keys are listed in Table 1 on page 3-12.

What You Get

(packing list)

In addition to this manual, its binder and a diskette, you should have received a warranty registration card and a software license.

Installation Instructions

If you have not already done so, install the Flagstaff Engineering tape controller card in your computer (the system server), then connect your tape drive. See the instructions supplied with the card and drive.

It's always a good idea to make back-up copies of programs *before* using them, just in case.

Put the original Flagstaff XENIX Tape Utilities Program Diskette in your 0: drive, and a blank diskette in your 1: drive. Then type: `diskcp -f -48ds9` at the XENIX prompt. (This can also be done with just one floppy drive — see your XENIX manual for more information.)

Step 1. Log in to your XENIX system as the superuser (root).

Step 2. Type custom at the # prompt.

is the default prompt; your system may use a different prompt.

Step 3. Select add a supported product.

If the Flagstaff Engineering tape driver has been previously installed, select Flagstaff Engineering tape driver instead.

Step 4. Insert the Flagstaff XENIX Tape Utilities Program Diskette into your diskette drive.

Step 5. Select install one or more packages, **then type** femt util.

The XENIX system will display status messages as it copies files into the `/usr/bin` directory, asks you what device name the tape drive should be assigned, links the driver to the kernel, and then creates a new kernel. It will also ask you for the DMA channel and IRQ level of your tape controller card (Flagstaff cards are shipped with the DMA set to 1 and the IRQ set to 5).

Make a note of the major device number assigned to the tape drive by XENIX. You will need to know this number when installing other devices in the future.

The old kernel is saved as `xenix.old`. You may boot from the old kernel by specifying `xenix.old` at boot-up (see your XENIX manual for instructions). Alternatively, you can rename the new `xenix` kernel something like `xenix.tape`, and change the name of `xenix.old` back to `xenix`. Then, your system will boot with the old kernel, and you can specifically invoke the new kernel at boot-up when you want to use your tape drive.

Step 6. When the custom menu reappears, type q **to quit installation.**

Step 7. Remove the Program Diskette, type shutdown, **then re-boot the system.**

Installation is now complete.

Because you have just changed the kernel, you may get the error message "`ps: /xenix: not the booted system`" during shutdown. This is normal, ignore it.

Step 8. Return the Warranty Registration Card.

Then, we can tell you about updates and improvements to this software.

How to Use tapetest

page	contents
3-2	What to Do
3-5	Testing Tape Drive Operation
3-6	Changing Tape Drive Settings
3-7	Positioning the Tape
3-8	Inspecting Data
3-11	Writing a File Mark
3-12	Table 1: Alternate Keys

IMPORTANT

These instructions assume these XENIX Tape Utilities have been installed according to the directions in Section 2.

What to Do

All test, tape drive control, and data inspection functions are available from the main `tapetest` menu.

START: To start `tapetest` in interactive mode, type: `tapetest <ENTER>`

INTERRUPT: Press `<ESC>` or `<F2>` to interrupt any operation.

During tape tests, `tapetest` checks for interrupts after it writes or reads each block.

`tapetest` checks for interrupts after each file or block when it is moving the tape forward or back more than one file or block. REWIND cannot be interrupted.

EXIT: To exit `tapetest`, select EXIT TO XENIX, then press `<ENTER>`.

Repeatedly press the `<↓>` or `<↑>` key until EXIT TO XENIX is highlighted to select it. You may also type X to select EXIT TO XENIX. (The `<TAB>` key also steps through the menu choices.)

HELP: To get help at any time, press `<F1>`.

THE REST OF THIS SECTION explains how to:

- Test your tape drive.
- Change tape drive settings.
- Position a tape.
- Write a tape mark.
- Inspect data.

INPUT FIELDS: When `tape` asks you to supply information, a blank input field will be displayed in reverse video. The full length of this field is displayed (any characters pushed past the right end of this field are lost). Use the `<→>`, `<←>`, `<BACKSPACE>`, and `<INSERT>` keys to edit your entry. Press `<TAB>`, `<↓>`, or `<↑>` to move from one field to the next. Press `<ENTER>` to accept your entries in all fields and execute the command. Or press `<ESC>` to abort your input.

COMMAND LINE OPERATION: Most of these utilities can also be run directly from the XENIX command line (see page 4-6). With the Flagstaff XENIX Tape Utilities installed, you may also copy files to or from tape directly from the XENIX command line (see page 4-9).

KEYBOARDS: XENIX supports many different kinds of keyboards. If the following directs you to press a key that your keyboard does not have, use the alternate key listed in Table 1 on page 3-12.

STATUS BYTES: Programmers, technicians, or others may want to directly view the tape drive status bytes by pressing `<F4>` (see page 4-5).

Main Menu

Error messages
displayed here

What the keys do
& current settings

```
TAPETEST      Version 2.0                                (c) 1989 Flagstaff Engineering

Automatic test
User-defined test
Continuous test

exit to XENIX

Ready

F1  help
F2  Stop test
F3  View data
F4  status Byte
F5  Rewind
^F5 rewind and Unload

F6  sSpeed:  LOW
F7  deNsity: LOW
F8  dEvice:  /dev/rmt0
F9  read/write Tries: 3
F10 Write file mark

[##]left/right to block
[##]hOme/enD to file mark
```

Test or drive status
displayed here

Numbers and commands
you type displayed here

Testing Tape Drive Operation

Step 1. Load a tape onto your drive.

See tape drive instructions. **Do not use a tape which contains data you want to save.** Make sure the tape's "write-enable" ring is in place (tapetest will not be able to write to the tape unless it is).

Step 2. At the XENIX prompt, type: tapetest <ENTER>.

Step 3. Correct the device name and change drive settings, if necessary.

In most cases, just verify that the device name and settings displayed at the right of the screen are correct. If the device name is not correct, press <F8> and enter the correct device name (for more about device names, see your XENIX documentation). See page 3-6 for information about changing the tape drive settings.

Step 4. Select a test.

There are three choices on the tapetest menu: AUTOMATIC (two read/ write tests), USER-DEFINED (you specify the number and length of test data blocks), and CONTINUOUS (puts the drive through its paces until you tell it to stop). See page 4-2 for more information about these tests.

The selected choice is highlighted. Use the <↓> and <↑> (or <TAB> and <SHIFT> + <TAB> keys) to move the highlighting to the test you want. You may also type the first letter in a test's name (A, U, or C) to select it.

Step 5. Press <ENTER> to start the test.

If you select the USER DEFINED test, tapetest will ask you to specify the number and size of data blocks to write, then read. If you make a mistake or change your mind while answering these questions, press <ESC> to return to the menu. The results of the test will be displayed in the lower left of the screen. Press <F2> to interrupt a test.

Changing tape drive settings

[Your tape drive must support the relevant function for the following to work. If, for example, your tape drive operates at one speed only, you cannot change the the speed setting.]

The current speed, density, device, and read/write tries settings are displayed next to the explanation of the appropriate key on the right side of the menu screen.

SPEED: Press <F6> to change tape drive speed from HIGH to LOW, or from LOW to HIGH.

DENSITY: To switch between HIGH and LOW density tape, press <F7> .

The density setting can only be changed when the tape is at the BOT (beginning of tape).

DEVICE NAME: To change the XENIX tape driver device name, press <F8>.

See your XENIX documentation for more about device names.

TRIES: To change the maximum number of write/read tries attempted, press <F9>.

If tapetest fails several times in a row to successfully write to or read from a tape, it will stop and tell you that something is wrong. Set the number of tries before giving up by pressing <F9>, typing the number, then pressing <ENTER>.

Positioning the Tape

REWIND: To rewind a tape, press <F5>.

UNLOAD: To rewind *and* unload a tape, hold down <CTRL> while pressing <F5>.

MOVE BY BLOCK: To move forward or back one file block, press <→> or <←>.

To move forward or back *more than one* file block, type the number of blocks forward or back you want to move, then press <→> or <←>.

This is abbreviated [#] LEFT/RIGHT on the screen. Any number from 1 through 99999 may be entered; if no number is entered, "1" is assumed. The number you type is displayed in the lower right corner of the screen. Use the <BACKSPACE> key to correct your entry, if necessary.

Movement by block is limited to the current file. If you attempt to move beyond the beginning or end of the file, `tapeTest` will move past the file mark, stop the tape, and then display an error message.

MOVE BY FILE: To move to the beginning or the next or previous file, press <END> or <HOME>.

To move forward or back *more than one* file, type a number (1–99999) before pressing <END> or <HOME>.

Inspecting data

Step 1. Press <F3> to display data.

The data screen is shown on page 3-9.

Step 2. Inspect the data.

You may position the tape before or after pressing <F3>: the data inspection screen's rewind and movement by block or file commands are the same as on the main menu screen (see page 3-7) — *except* when moving back by file. The normal Pertec-standard "file backspace" moves back to the previous file mark. To facilitate data inspection, tapetest moves back past the previous file mark, then displays the first block of data in the file.

Press <↑>, <↓>, <PgUp>, or <PgDn> to move through the data. You can type a number before pressing one of these keys to scroll multiple lines or screens.

Go directly to a line by typing the number of a byte in that line (see left column of data screen), then pressing <F4>.

To change the ASCII (the ANSI standard) display to EBCDIC (the IBM standard) or back, press <F3>.

NOTE that the current block number is calculated by counting the number of blocks since the last file mark read. If the last mark read was the one at the beginning of the current file, the current block number will be accurate. If the last mark read was at the beginning of the next file, current block numbers will be calculated back from that point.

Step 3. Return to the main menu by pressing <F2>.

Data Screen

Error/status messages displayed here

										Block #	1	Length: 10000					
BYTE	HEX								ASCII								
0	00	00	00	00	01	00	00	00	02	00	00	00	03	00	00	00
16	04	00	00	00	05	00	00	00	06	00	00	00	07	00	00	00
32	08	00	00	00	09	00	00	00	0A	00	00	00	0B	00	00	00
48	0C	00	00	00	0D	00	00	00	0E	00	00	00	0F	00	00	00
64	00	00	00	00	11	00	00	00	12	00	00	00	03	00	00	00
80	04	00	00	00	15	00	00	00	16	00	00	00	07	00	00	00
96	08	00	00	00	19	00	00	00	1A	00	00	00	0B	00	00	00
112	0C	00	00	00	1D	00	00	00	1E	00	00	00	0F	00	00	00
128	00	00	00	00	21	00	00	00	22	00	00	00	03	00	00	00	...!..."....#...
144	04	00	00	00	25	00	00	00	26	00	00	00	07	00	00	00	\$....%...&... '...
160	08	00	00	00	29	00	00	00	2A	00	00	00	0B	00	00	00	(...)...*...+...
176	0C	00	00	00	2D	00	00	00	2E	00	00	00	0F	00	00	00	...-.../...
192	00	00	00	00	31	00	00	00	32	00	00	00	03	00	00	00	0...1...2...3...
208	04	00	00	00	35	00	00	00	36	00	00	00	07	00	00	00	4...5...6...7...
224	08	00	00	00	39	00	00	00	3A	00	00	00	0B	00	00	00	8...9...:...;...
240	0C	00	00	00	3D	00	00	00	3E	00	00	00	0F	00	00	00	<...=...>...?...
256	00	00	00	00	41	00	00	00	42	00	00	00	03	00	00	00	@...A...B...C...
272	04	00	00	00	45	00	00	00	46	00	00	00	07	00	00	00	D...E...F...G...
288	08	00	00	00	49	00	00	00	4A	00	00	00	0B	00	00	00	H...I...J...K...

[#]up/down, [#]Pgup/pGdn=scroll [#]left/right=to block [#]hOme/enD=to file
 F1=help F2=eXit F3=Ascii/ebcdic [#]F4=to Byte F5=Rewind

Numbers and commands you type displayed here

What the keys do

Notes:

Writing a file mark:

Each tape file ends with a file mark. The logical end of tape is indicated with two file marks with no data between them. Because tape marks are not automatically written when files are copied with the XENIX `tar` or `cpio` commands, `tapetest` provides a way to write these marks. This capability also lets you change where a file or tape ends by writing new file marks.

Step 1. Position the tape to where you want the mark.

See page 3-7.

Step 2. Press <F10> to write the file mark.

Table 1 — Alternate Keys

Key	Screen	Function	Alternate key ¹
<F1>	both	Help	<?>
<F2>	menu	Stop test	<CTRL> + <C> or <ESC>
<F2>	data	eXit data screen	<CTRL> + <X> or <ESC>
<F3>	menu	View data	<CTRL> + <V>
<F3>	data	select ASCII or EBCDIC format	<CTRL> + <A>
<F4>	menu	display status Byte	<CTRL> +
<F4>	data	go to Byte	<CTRL> +
<F5>	both	Rewind tape	<CTRL> + <R>
<CTRL> + <F5>	menu	rewind and Unload tape	<CTRL> + <U>
<F6>	menu	set tape drive sPeed	<CTRL> + <P>
<F7>	menu	set tape deNsity	<CTRL> + <N>
<F8>	menu	set dEvice name	<CTRL> + <E>
<F9>	menu	set maximum number of	
	menu	write/read Tries	<CTRL> + <T>
<F10>	menu	Write file mark	<CTRL> + <W>
<↑>	menu	step through menu choices	<SHIFT> + <TAB>
<↑>	data	scroll up by line	<u>
<↓>	menu	step through menu choices	<TAB>
<↓>	data	scroll down by line	<d>
<→>	both	move forward by block	<+>
<←>	both	move back by block	<->
<END>	both	move to start of next file	<CTRL> + <D> or <>>
<HOME>	both	move to start of previous file	<CTRL> + <O> or <<<
<PgUp>	both	scroll up by screen	<CTRL> + <P>
<PgDn>	both	scroll down by screen	<CTRL> + <G>

1. Because XENIX supports many different kinds of keyboards, some keyboards may not have all the keys listed in the left column. If your keyboard lacks any of these keys, use the alternative key (or combination of keys) listed in the right column.

More about Tape Utilities

page	contents
<hr/>	
4-2	About the Tests
4-3	About 9-Track Tape
4-5	Tape Drive Status Bytes
4-6	XENIX Command Line Operation
4-10	Programming Information

About the Tests

Each of the three tests of tape drive operation writes a series of data blocks to the tape. The data consists of a running 32-bit count. The series of blocks are terminated by two file marks.

After the data is written, `tapetest` reads the data from the tape and then verifies that the data is correct.

While the test is in progress, a brief description of the test is displayed in the lower left of the menu screen. When the test is over, the results are displayed in the same location. “Recoverable errors” (sometimes known as “soft errors”) are those errors that do not recur when the read/write is tried again. “Unrecoverable errors” (or “hard errors”) are errors that persist through repeated read/write attempts.

The **AUTOMATIC TEST** writes 50 blocks of 10,000 bytes each, reads those blocks, then writes 75 blocks of 35,000 bytes each and reads those.

The **USER-DEFINED TEST** writes the as many blocks of whatever length you like. Any number or length from 1 through 65,536 is allowed.

The **CONTINUOUS TEST** cycles through a series of write/read tests until <F2> is pressed. `tapetest` will write, then read 50, 250, and 1000 blocks of 500 bytes each, 50, 250, and 1000 blocks of 10,000 bytes each, 50, 250, and 1000 blocks of 35,000 bytes each, then start over with 50 500-byte blocks.

About 9-Track Tape

Data is recorded in nine parallel tracks along the length of a 9-track tape:

Track 1	0
Track 2	1
Track 3	0
Track 4	1
Track 5	0
Track 6	0
Track 7	0
Track 8	1
Track 9	0 (parity bit)

Each byte of data to be recorded is made of eight bits, like: 0101 0001. The first bit of each byte is recorded on the first track, the second bit on the second track, and so on. The ninth track contains an additional, *parity* bit calculated from the other bits in the byte and used for error checking. This 9-track method allows the tape drive to read an entire byte at once.

Reflective foil strips mark the *logical beginning of tape* (BOT) and the *logical end of tape* (EOT). These strips are located 10 to 15 feet from the actual ends of the tape, so the tape between the *logical* BOT and EOT and the *physical* ends of the tape can be used as leaders.

Data is organized into *files*, which are subdivided into *blocks* (also called *records*). Each data block is written and read as a single unit. Files are separated by *file marks*. Applications software interprets two file marks with no intervening data as the logical EOT. Blocks (and file marks) are separated by small gaps, called *inter-record gaps* (IRG). The tape is normally positioned on an IRG between movements.

file mark	FILE 1 Block 1	FILE 1 Block 2	file mark	FILE 2 Block 1	FILE 2 Block 2	...	file mark	file mark
-----------	-------------------	-------------------	-----------	-------------------	-------------------	-----	-----------	-----------

Tapes may be *labeled* or *unlabeled*. Unlabeled tapes are organized as above, with an optional file mark before the first file. Labeled tapes also have headers, or labels, that provide information about the contents of

the tape. Both ASCII (ANSI-standard) and EBCDIC (IBM-standard) tape labels follow the same conventions.

Each labeled tape begins with an 80-byte *volume label*, which contains the name of the tape only (or is blank).

Each file on a labeled tape begins with two 80-byte *file header labels*. The first file header label contains the file name, file sequence number, file creation data, and other information. The second file header label specifies whether file blocks are of fixed or variable length, block length if fixed, and other information.

Each file on a labeled tape ends with two 80-byte *end-of-file labels*. These are identical to the file's header labels, except that the first end-of-file label also specifies the number of blocks in the file.

Volume Label	FILE 1 Header 1	FILE 1 Header 2	FILE 1 Block 1	FILE 1 Block 2	FILE 1 End Label 1	FILE 1 End Label 2	file mark	FILE 2 Header 1
--------------	-----------------	-----------------	----------------	----------------	--------------------	--------------------	-----------	-----------------

FILE 2 Header 2	FILE 2 Block 1	FILE 2 Block 2	...	FILE 2 End Label 1	FILE 2 End Label 2	file mark	file mark
-----------------	----------------	----------------	-----	--------------------	--------------------	-----------	-----------

Status Bytes

For those who need it, `tapetest` can display the status information produced by the tape drive. This information is contained in two data words (four bytes). Press `<F4>` at the `tapetest` menu screen to display the status bytes.

This status information can also be accessed from the XENIX command line — see page 4-8.

Table 2 — Tape Drive Status Bits

Status Bit Name	Status Bit Location (In hex)	Value ¹	Meaning ²
DQ	10000	1	Data in I/O queue.
ONL	08000	1	Tape drive on-line.
SPD	04000	1	Indicates speed or density on some drives.
DBY	02000	1	Data transfer in progress.
FPT	01000	1	File is write-protected.
RWD	00800	1	Rewind in progress.
RDY	00400	1	Ready for another command.
LPT	00200	1	Tape is at load point (beginning of tape).
FBY	00100	1	Formatter is busy.
ABORT	00080	1	Read/write has crossed 64K boundary.
CMDREJ	00040	1	Invalid function number.
NOTREADY	00020	1	Controller was not ready for command.
OVERRUN	00010	0	Data overrun (read buffer not big enough).
HER	00008	1	Unrecoverable ("hard") error.
FMK	00004	1	File mark read.
EOT	00002	1	End of tape reached.
CER	00001	1	Temporary read error: data is OK.

- 1 = true, 0 = false — except in the Data overrun bit, where 0 indicates an overrun.
2. These are the meanings when the values of the status bits are as shown. When the value is changed, the opposite of the meaning is true.

XENIX Command Line Operation

Many of the functions available interactively through `tapetest` can also be called directly from the XENIX command line.

The individual utilities described below were copied to your `/usr/bin` directory during installation.

(For technical information about these and other command line functions, programmers should refer to page 4-10.)

Automatic Test of Tape Drive Operation

To run the AUTOMATIC TEST from the XENIX command line without bringing up the `tapetest` menu screen, type:

```
tapetest -a
```

`tapetest` will display the description, status, and results of the test on the XENIX command line.

You may also specify the device name on the command line. Type:

```
tapetest -n /dev/frog
```

to specify the XENIX device name `/dev/frog`. You may also change the device name from `tapetest`'s main menu by pressing `<F8>` (see page 3-6). The default device name is `/dev/rmt0`.

If you also add the `-a` switch:

```
tapetest -a -n /dev/frog
```

`tapetest` will perform the AUTOMATIC TEST on the specified drive without displaying the main menu.

Tape Positioning

There are six command-line positioning utilities:

- `mtbsr` moves the tape back a specified number of blocks.
- `mtfsr` moves the tape forward a specified number of blocks.
- `mtbsf` moves the tape back a specified number of files.
- `mtfsf` moves the tape forward a specified number of files.
- `mtrewind` rewinds the tape to the beginning (BOT).
- `mtunload` rewinds and unloads the tape.

`mtbsr`, `mtfsr`, `mtbsf`, and `mtfsf` use the same syntax:

```
mtfsr [-v] [num] [device]
```

When the `-v` (verbose) switch is included, the utility will display the number of blocks or files moved. `num` specifies the distance to move, in blocks or files (if omitted, "1" is assumed). If the `device` name is not declared here, the default device name (`/dev/rmt0`) is assumed.

For example: `mtfsf -v 4 /dev/rmt2` will move the tape drive named `/dev/rmt2` forward 4 files, displaying the block number of each block as it passes.

`mtrewind` and `mtunload` use the syntax:

```
mtrewind [-n] [device]
```

When the `-n` (no wait) switch is included, the utility returns control to the caller immediately without waiting for the rewind (or rewind and unload) to finish. If the `device` name is not declared here, the default device name (`/dev/rmt0`) is assumed.

All six positioning utilities return a 0 if the operation was successfully performed. If the operation fails, a numbered error message is returned (these are defined in the standard XENIX error message file `errno.h`).

Tape Status

To display the tape status bytes from the XENIX command line, type:

```
mtstatus [device] [-q] [-v]
```

If the device name is not declared here, `mtstatus` assumes the device name is `/dev/rmt0`. If the `[-q]` (quiet mode) switch is included, `mtstatus` will return the value of the status bits (the values displayed below would be expressed `0100 0011 0000 0000` in binary, or `4300` in hex).

In the default `[-v]` (verbose) mode, `mtstatus` will display the value of each status bit in this format:

(reserved	=0)
Online	=1
Speed/Density	=0
Data busy	=0
File protect	=0
Rewinding	=0
Ready	=1
Load point	=1
Formatter busy	=0
Cmd aborted	=0
Cmd rejected	=1
Not ready	=0
Data overrun	=0
Hard error	=0
File mark	=0
End of tape	=0
Recoverable error	=0

The Cmd aborted, Cmd rejected, Not ready, and Data overrun bits are set by Flagstaff Engineering hardware or software. The other status bits are those defined by the Pertec standard. 0 indicates the condition is not true; 1 indicates that it is — *except* in the Data overrun bit, where 0 indicates an overrun. See Table 2 on page 4-5 for more about the status bytes.

Writing a File Mark

To write a file mark from the XENIX command line, position the tape to the desired point, then type:

```
mtwtm [-v] [device]
```

When the `-v` (verbose) switch is included, the utility will display “File mark written”. If the device name is not declared here, the default device name (`/dev/rmt0`) is assumed.

`mtwtm` will return a 0 if a file mark was successfully written. If `mtwtm` fails to write a file mark, a numbered error message is returned (these are defined in the file `error.h`).

XENIX System Commands

With Flagstaff Engineering’s XENIX Tape Utilities and a Flagstaff Engineering controller card installed in your computer, your tape drive will respond to XENIX system commands. These include `tar`, `cpio`, and `tapedump`. Your XENIX documentation explains how to use these commands.

Programming Information

[This technical information is supplied for programmers' reference, and can be ignored by most users.]

Flagstaff Engineering's XENIX Tape Utilities access your tape drive with standard XENIX file-system calls: OPEN, CLOSE, READ, WRITE, and IOCTL. The READ and WRITE calls are used for data transfer. The IOCTL call is used for tape positioning. The tape device is OPENed before any operation is performed, and CLOSEed after the operation is complete; all pending operations are completed before the device is released.

Because the tape device is accessed as a raw XENIX device, the XENIX Tape Utilities maintain complete control of block and record sizes. Each call to WRITE will write one complete block, and each call to READ will read one complete block — regardless of the byte count passed to WRITE or READ. If the byte count passed to READ is less than the number of bytes in the block, the excess bytes will be truncated and lost. For this reason, the maximum block size (65536 bytes) should be passed to every READ call.

For IOCTL to control tape positioning and tape drive settings, it requires as its third argument a special structure for passing parameters and status information between an application and the tape drive. This structure is defined in the include file FEMT.H, and here:

```
struct mtioctlblk {
    int status;
    int p1;
    int p2;
};
```

The IOCTL commands currently defined in FEMT.H are listed below. Examples of their use follow. All IOCTL commands return the tape drive status to XXX.status (see Table 2 on 4-5 for the structure of the status word). The use of other fields varies from command to command. To ensure compatibility with future releases, applications that use these commands should use them as defined in FEMT.H.

Table 3 — Implemented IOCTL Commands

Command	Function
FEMT_STATUS	Returns current tape drive status
FEMT_LASTSTAT	Returns tape drive status as of last command
FEMT_REWIND	Rewinds tape to BOT <i>(returns before operation complete)*</i>
FEMT_UNLOAD	Rewinds tape past BOT to unload <i>(returns before operation complete)*</i>
FEMT_FSF	Moves tape forward 1 file
FEMT_BSF	Moves tape back 1 file
FEMT_FSR	Moves tape forward 1 block
FEMT_BSR	Moves tape back 1 block
FEMT_WTM	Writes one tape mark
FEMT_EFL	Erases a fixed length of tape
FEMT_EEOT	Erases to EOT
FEMT_FAST	Sets tape drive to FAST setting
FEMT_SLOW	Sets tape drive to SLOW setting
FEMT_LONG	Sets tape drive for LONG inter-record gaps
FEMT_SHORT	Sets tape drive for SHORT inter-record gaps
FEMT_1600	Sets tape drive for low-density, 1600bpi operation
FEMT_3200	Sets tape drive for high-density, 3200bpi operation
FEMT_ABORT	Aborts the current tape drive operation
FEMT_WRRETRY	Sets maximum number of write retries to XXX.P1
FEMT_RDRETRY	Sets maximum number of read retries to XXX.P1
FEMT_WRRERS	Returns the number of recoverable write errors to XXX.P1
FEMT_RDERRS	Returns the number of recoverable read errors to XXX.P1
FEMT_CLRERRS	Clears the read and write error counts

* And therefore cannot be aborted.

Sample code

```
#include <femt.h> /* Our #defines and
                 structures for IOCTL calls */
#include <fcntl.h> /* open/close/read/write
                 prototypes and #defines */
#include <errno.h> /* errno #defines */
```

```
main()
{
int fd,n;
struct mtioctlblk mt;
char buf[65536];

/* Open the tape device */
fd = open("/dev/rmt0",O_RDWR);
if (fd == -1)
    exit(errno);

/* Read up to 65536 bytes from tape */
n = read(fd,buf,65536);
if (n == -1) {
    close(fd);
    exit(errno);
}

/* Skip to end of tape file */
if (ioctl(fd,FEMTFSF,&mt) == -1) {
    close(fd);
    exit(errno);
}
if (mt.status & TS_EOT) {
    print("Whoops, we went off the end of the tape\n");
    close(fd);
    exit(999);
}

/* Write the block previously read */
if (write(fd,buf,n) == -1) {
    close(fd);
    exit(errno);
}

/* Close tape device and exit */
close(fd);
exit(0);
}
```

What?!

page contents

5-2 Symptoms and Cures

5-4 Technical Support

5-6 Index

Symptoms and Cures

Can't start tapetest or individual utilities.

If tapetest or the individual utilities won't run at all, chances are the program or drive was improperly installed or the system configuration has been changed since installation. Check the installation of your tape drive and controller card, then reinstall the XENIX Tape Utilities software (see Section 2).

Can't find or open device, or device busy.

If a XENIX Tape Utility cannot locate the tape drive, check that the XENIX device name for the drive is correct (see page 3-6 or 4-6). On a multi-user system, XENIX will also be unable to open a device if another user is accessing it.

If an invalid device name has been specified, tapetest will ask for another name. Press <ESC> in response to this prompt to exit tapetest and return to XENIX.

Tape drive not on-line.

Put the tape drive on-line, then try again.

Read/write error.

This error message is displayed when tapetest detects an unrecoverable error during a test of tape drive operation. The total of these errors is displayed at the conclusion of the test. tapetest will also inform you of block length and data mismatch errors. Unrecoverable errors may indicate a bad tape — repeat the test with another tape to check this.

Test failed.

tapetest displays this message whenever a tape operation test has failed. Check the installation of your tape drive and controller card. If they are properly installed, contact our Technical Support Group (see page 5-4).

Beginning or end of tape.

If you did not move to the beginning or end of the tape intentionally, you probably got there by trying to move forward or back by too many blocks or files.

Positioning stopped by file mark.

Movement by block is limited to the current file. Encountering a file marker indicates that you have tried to move by block beyond the beginning or end of the file.

Tape write-protected.

The write-protect ring has been removed from the tape, or your tape drive is in write-protect mode. Replace the write-protect ring, or turn off write-protect mode, as appropriate. (Not all tape drives have a write-protect mode — see your tape drive's manual.)

Illegal input value.

You have entered a number outside the allowed range. The number before a movement command can be in the range 1 through 99999 (see page 3-7). For the USER-DEFINED TEST, values for both number of blocks and bytes per block are limited to the range 1 through 65,536.

Invalid command.

This error message appears when you attempt the impossible (changing the density setting anywhere except at the beginning of the tape, for example). If the mistake isn't obvious, review Section 3 of this manual and the capabilities section of your tape drive manual.

Technical Support

Before calling Flagstaff Engineering's Technical Support Group, please:

- Check that this software is properly installed.
- Read the troubleshooting information in this section and follow the suggestions for your problem.

If they don't help, be ready to describe exactly what *did* happen — we need that information to help you.

For on-line technical support, log onto the flageng conference on BYTE magazine's BIX network.

flageng is a kind of practical database of technical information about Flagstaff Engineering products. XENIX Tape Utilities users ask technical questions, share experiences about specific applications, and make suggestions for product improvements. We answer technical and troubleshooting questions not covered by our product documentation, provide any information we can in support of unusual applications, and post bulletins about new developments in data conversion technology. Because all this information can be readily accessed by BIX's search commands, you will get an immediate answer on any topic previously discussed.

Many of our customers find this on-line support more convenient than a call to our Technical Support Group. We monitor BIX daily, and new questions and suggestions receive prompt replies.

For technical support by telephone:

- Be able to clearly describe the problem and your system set-up.
- Know the version and serial numbers of your copy of the Flagstaff XENIX Tape Utilities. Both numbers are printed on the Program Diskette; the version number also appears on the main menu.

- Have your purchase information available: invoice number, date of purchase, and the name of your salesperson or dealer.
- Call:

XENIX Tape Utilities Technical Support (602) 774-9414

Address: 1120 Kaibab Lane
Flagstaff, Arizona 86001

Main telephone: (602) 779-3341

Telex: 705609

FAX: (602) 779-5998

RETURNING FLAGSTAFF ENGINEERING PRODUCTS:

Always contact Technical Support before returning a product. Often, a problem is due to misunderstanding, or is relatively simple and can be quickly fixed after telephone consultation. Returned products will be accepted *only* after Technical Support has issued a Returned Merchandise Authorization (RMA) number.

Return products in their original packaging. If the original packaging is not available, use professional packaging materials to carefully wrap the product for shipment. Flagstaff Engineering cannot accept responsibility for product damage resulting from inadequate packaging.

The outside of the package must be clearly marked with the RMA number.

Index

- [#] 1-3
- <ESC> 3-2
- <F2> 3-2
- 9-track tape 4-3
- alternate keys 3-12
- ASCII 3-8
- /bin 4-6
- BIX 5-4
- blocks 4-3
 - current 3-8
 - movement 3-7, 4-7
- BOT 4-3
- capital letters 3-12
- CLOSE 4-10
- code, sample 4-11
- command line 4-6
- computer requirements 2-2
- controller card 2-2
- CPIO 4-9
- current block number 3-8
- customer service 5-4
- data inspection 3-8
- data screen 3-9
- density 3-6
- device name 3-5,6
- device number 2-4
- EBCDIC 3-8
- end-of-file labels 4-4
- EOT 4-3
- ERRNO.H 4-11
- errors
 - recoverable 4-2
 - unrecoverable 4-2
- FCNTL.H 4-11
- FEMT.H 4-10
- files 4-3
 - header 4-4
 - mark 3-11, 4-3, 4-9
 - movement 3-7, 4-7
- flageng 5-4
- functions 1-2
- help 1-2, 3-2
- input fields 3-3
- inspect data 3-8
- installation 2-3
- inter-record gaps 4-3
- interrupting 3-2, 3-5
- IOCTL commands 4-10,11
- IRG 4-3
- kernel 2-4
- keyboards 2-2, 3-12
- keys, alternate 3-12
- labeled tape 4-3
- manual, how organized 1-3
- menu screen 3-4
- move by block 3-7, 4-7
- move by file 3-7, 4-7
- move tape 4-7
- on-line technical support 5-4
- OPEN 4-10
- operating system 2-2
- parity bit 4-3
- Pertec 2-2, 3-8, 4-8
- problems 5-2
- Program Diskette 2-3
- programmer's reference 4-10
- READ 4-10
- records 4-3
- rewind 3-7, 4-7
- RMA 5-5
- sample listing 4-11
- screens
 - data 3-9
 - menu 3-4
- service 5-4
- shipping 5-5
- speed 3-6
- status bytes 3-3, 4-5, 4-8
- system requirements 2-2

- Table 1: Alternate keys 3-12
- Table 2: Status Bytes 4-5
- Table 3: IOCTL Commands 4-11
- tape 4-3
 - density 3-6
 - labeled 4-3
 - movement 3-7, 4-7
 - unlabeled 4-3
 - unload 3-7
- tape drive 2-2
 - settings 3-6
 - speed 3-6
 - tests 3-5, 4-2
- TAPEDUMP 4-9
- tapetest 1-2, 3-2
- TAR 4-9
- technical data 4-10
- technical support 5-4
- terminfo 2-2
- testing tape drive 3-5, 4-2, 4-6
 - interrupt 3-5
- tries 3-6
- troubleshooting 5-1
- unlabeled tape 4-3
- unload 3-7, 4-7
- /usr/bin 4-6
- view data 3-8
- volume label 4-4
- write file mark 3-11, 4-9
- WRITE 4-10
- write/read attempts 3-6
- XENIX 2-2

5-8

Notes: