

# ConvexOS Tape System User's Guide

*Fourth Edition*



CONVEX

CONVEX COMPUTER CORPORATION

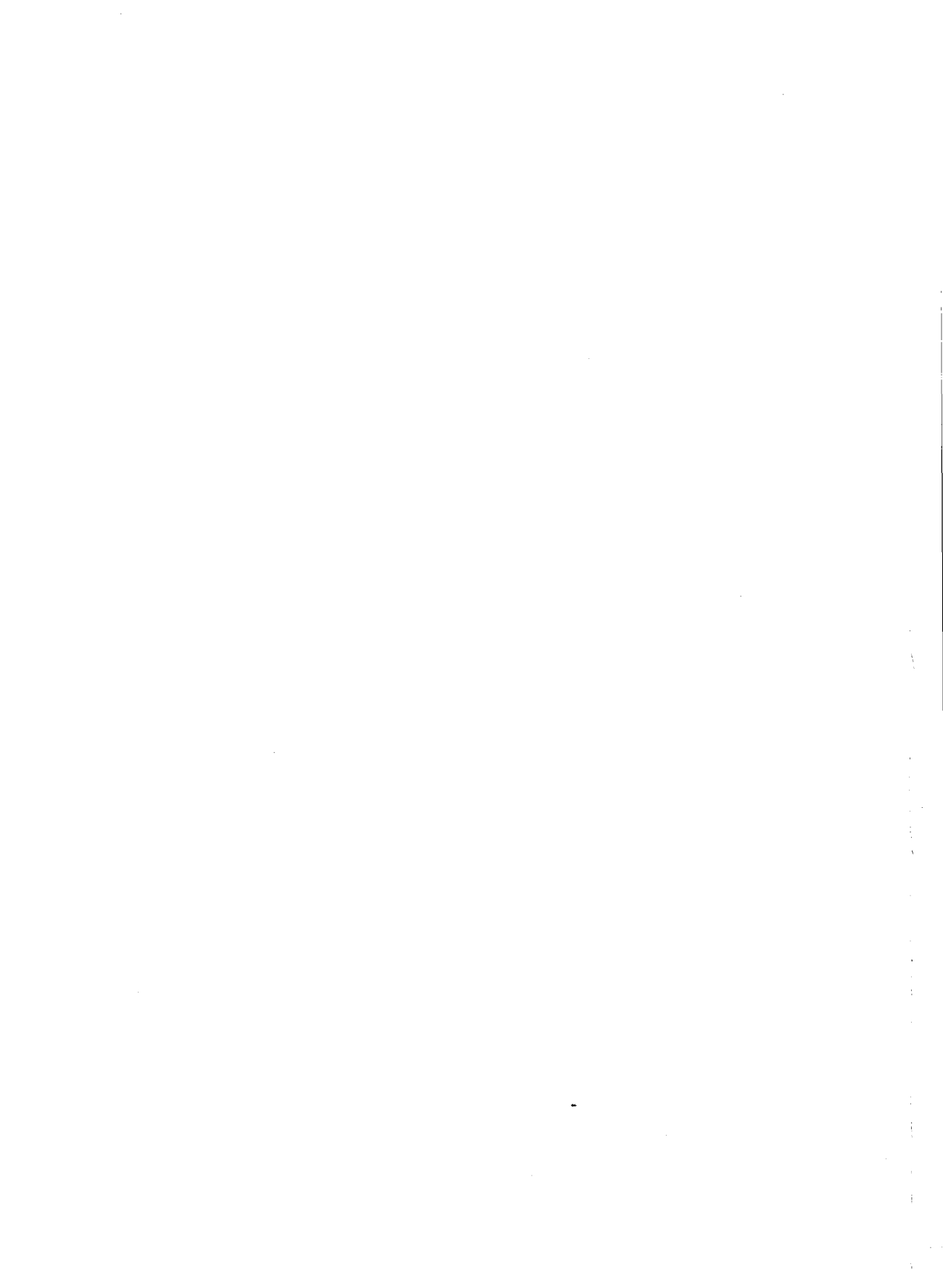
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**CONVEX Computer Corporation**  
3000 Waterview Parkway  
P.O. Box 833851  
Richardson, TX 75083-3851  
United States of America  
(214)497-4000



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# ConvexOS Tape System User's Guide



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Order No. DSW-018

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July 1992

**CONVEX Press**  
Richardson, Texas  
United States of America

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Order No. DSW-018

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# Using this guide

The *ConvexOS Tape System User's Guide* is a guide and reference for anyone who uses the ConvexOS Tape System. None of the commands described in this guide require special authorization.

---

## Notational conventions

This section describes notational conventions used in this guide. These conventions include:

- Typographical conventions, or what various typefaces mean
- Command syntax and how to distinguish requirements for commands and examples
- Difference between entering and typing commands
- Identifying cautions and references

---

## Typographical conventions

The following typefaces have special meaning and are used in this guide:

<b>Bold courier</b>	Identifies user input in examples.
<i>Courier</i>	Identifies input and output, including: <ul style="list-style-type: none"><li>• Command names</li><li>• System calls</li><li>• Data structures and types</li><li>• Error messages</li></ul>
<i>Italic</i>	Identifies: <ul style="list-style-type: none"><li>• User-supplied variables in a command-line example</li><li>• New and important terms</li><li>• Titles of documents</li></ul>
<b>KEYCAP</b>	Indicates keyboard keys to be pressed. For example, <b>RETURN</b> refers to the carriage return key. Two <b>KEYCAP</b> terms separated by a hyphen indicate two keys that you must press simultaneously. For example, <b>CTRL-d</b> indicates that you must press the <b>d</b> key while holding down the <b>CTRL</b> key.

---

## Entering versus typing commands

In this guide there is a distinction between entering a command and typing a command. This distinction is:

<i>type</i>	Type in the command at the keyboard without pressing the <b>RETURN</b> key.
<i>enter</i>	Type in the command at the keyboard and follow by pressing the <b>RETURN</b> key.

---

## Command syntax and example conventions

In the following example:

**command**    *[options...]*    {*a* | *b*}    *filename[...]*    \

①                      ②                      ③                      ④                      ⑤

⑥ :

- ① `command` must be typed as it appears.
- ② Brackets indicate a part of a command that is optional. Ellipsis indicate that the preceding term can be repeated. The brackets and ellipsis are not typed.
- ③ Braces indicate a part of a command that is necessary, but that there may be a choice in what is supplied. In this example, values for either variable *a* or *b* must be supplied, but not both. The braces and vertical line are not typed.
- ④ In this example, *filename* is a variable that must be supplied. The ellipsis enclosed in brackets indicates additional arguments of the same type can be supplied, but are not necessary. Again, neither the brackets nor the ellipsis is typed.
- ⑤ A backslash (\) at the end of a line indicates that an example continues on the next line of text. If the example is to be entered, do not press RETURN until the entire example is typed.
- ⑥ A vertical ellipsis indicates that part of an example has been omitted. The vertical ellipsis is not typed.

---

## Identifying cautions

“Caution” tags are used frequently throughout this guide. They are of this format and have the following meaning:

---

### Caution

---

A “Caution” tag and this typeface highlight procedures or information necessary to avoid damage to equipment, software, or data.

---

## Accessing associated documentation

Using this software may require information not specific to the tasks described in this document. This section describes where to find additional information and assistance.

---

### Accessing man pages

For more information on ConvexOS, use the online man pages. To view a man page enter:

```
man command
```

where *command* is any valid ConvexOS command.

References to man pages throughout this document are in the form:

```
cat(1)
```

where the man page's section number, enclosed in parentheses, follows.

---

### Accessing paper documentation

For more in-depth information on ConvexOS, you can order these books from CONVEX Computer Corporation:

- *ConvexOS Man Pages for Programmers* (DSW-332) and *ConvexOS Man Pages for Users* (DSW-331), hard copy versions of the ConvexOS man pages
- *ConvexOS Primer* (DSW-133), an introduction to ConvexOS for new users
- *ConvexOS Tape System Quick Reference* (DSW-391), a quick reference for the ConvexOS Tape System
- *ConvexOS dump and restore Quick Reference* (DSW-392), a quick reference for dumping and restoring file systems
- *Managing ConvexOS: Configuration Guide* (DSW-030), a guide for configuring ConvexOS
- *Managing ConvexOS: Operations Guide* (DSW-031), a guide for ConvexOS maintenance and operations

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Richardson, TX 75083-3851 USA

If possible, please include the order number (DSW number) or the exact title of the document you are ordering.

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## Acquiring technical assistance

If you have questions that are not answered in this book, contact the CONVEX Technical Assistance Center (TAC) at the following locations:

- Within the continental U.S., call: 1 (800) 952-0379.
- From Canada, call: 1 (800) 345-2384.
- All other locations, contact the local CONVEX office.

You can also use the `contact` utility, if you would like to report any problems you may have with ConvexOS or its associated documentation. For more information refer to the `contact(1)` man page in *ConvexOS Man Pages for Users*, or the appendix "Reporting Problems" in the *ConvexOS Primer* or *Managing ConvexOS: Operations Guide*.

---

# Tape system concepts

# 1

This chapter contains general information about the tape system and addresses the following topics:

- Basic organization and function of tape systems
- Fundamentals of tape drives, devices, and nodes; and what it means to mount a tape
- What tape labels are and how to select labeled-tape attributes
- How files, blocks, and records are arranged on tape and how tape movement is managed
- Organization and function of tape volume labels, both ANSI and IBM standards
- What tape sets are, how they are handled by the tape system, and how to select the type you need
- Tape system daemons and what they do

---

## Tape system organization

Tape system software is distributed as part of CONVEX operating systems.

With the tape system you can manipulate and use data that have larger storage requirements than those you wish to keep on your disk. This section describes the parts of the tape system and how you interact with it.

The following are all parts of the tape system:

- 9-track reel, 3480 cartridge, or DAT cartridge tape
- Physical tape drives
- Tape devices
- Tape utilities:
  - mt commands
  - tpatrr
  - tpconfig show
  - tplabel and tpunlabel
  - tplist
  - tpmount and tpunmount
  - tpqueue
  - tpswitchvol
  - tpwait
- System utilities:
  - cat and cp
  - tar and cpio
- Tape system daemons:
  - ansidaemon
  - ibmdaemon
  - nldaemon
  - opreq\_daemon
  - stkdaemon
  - tpdaemon
- Tape operators, both human and mechanical

---

## Tape drives, devices, and nodes

The following terms are often used when discussing tape drives and devices:

<i>node</i>	A tape device that is associated with a drive through the tape system.
<i>tape device</i>	A special file through which a tape drive is accessed. Also referred to as <i>special file</i> or <i>device file</i> .
<i>tape drive</i>	The I/O apparatus on which a physical tape is mounted.

---

### Attributes of drives, devices, and nodes

Tape I/O operates through a tape device. When a tape device is assigned to a tape drive in the tape system, it makes use of specific attributes of the tape drive and adheres to tape system controls. Once a tape device is assigned to a drive in the tape system, it is called a node of the tape drive. Several nodes are defined for one tape drive to differentiate various attributes. These attributes specify:

- Whether the tape is labeled
- Tape speed (ips)
- Tape density (1600 or 6250 bpi)
- Whether the tape is automatically rewound on close of a write call to the tape
- Whether the tape requires block or character I/O
- Whether the tape contains or is to contain compressed data

When you or the tape system selects a device, it is because that particular device has one or many desired attributes.

A node is associated with only one drive, so there is at least one node for each tape drive on the system. Usually there are many for each tape drive.

CONVEX tape drives generally have six mt and six rmt devices that can control a tape drive. A tape drive that is controlled by a tape device (or node) is considered controlled by the tape system and can be accessed using tape system utilities. A drive that is not controlled cannot be accessed by tape system utilities, but can be accessed through appropriate tape devices.

---

## Location and names of ordinary tape devices

Ordinary tape system devices are located in the /dev directory. Their names may vary from site to site and are configurable. To display devices defined for your system, enter:

```
% tpconfig show nodes
```

Generally, devices have the form

<i>mt</i> <i>n</i>	Block I/O, 9-track tape devices
<i>tc</i> <i>n</i>	Block I/O, cartridge tape devices
<i>rmt</i> <i>n</i>	Character I/O, 9-track tape devices
<i>rtc</i> <i>n</i>	Character I/O, cartridge tape devices

where *n* is an integer or integer-character combination as in:

```
/dev/mt0
```

```
/dev/rmt20
```

```
/dev/rtc0nu
```

“*mt*” and “*tc*” devices, in this case, are used for block I/O:

*block I/O*      I/O is buffered until it reaches a certain block size, then the block is written to tape. Data is read from tape in blocks as well.

“*rmt*” and “*rtc*” devices, in this case, are used for character I/O:

*character I/O*      I/O is written and read as you direct.

It is recommended that you use character I/O devices whenever possible. To display a listing of character I/O devices defined for your system, enter:

```
% tpconfig show nodes | grep Char
```

---

## Location and names of labeled-tape devices

Labeled-tape devices are located in the `/dev/lt` directory. Their names have the form

*cn*

or

*un*

where *n* is an integer as in:

`/dev/lt/c1`

`/dev/lt/u1`

`/dev/lt/c2`

`/dev/lt/u2`

Each pair of *cn* and *un* files constitutes one labeled-tape device. For example, files `c5` and `u5` make up labeled-tape device `lt5`. The *cn* and *un* files are used in the following way:

*un*                      Receives input from the tape system user. I/O can be written to, or read from tape, through this file.

*cn*                      For internal use by the tape system.

At least one labeled-tape device is defined for each tape drive.

## Mounting a tape

A tape device and tape drive are reserved for your exclusive use when you mount a tape with a mount request. A symbolic link is created to your tape device from the directory from which you issued your mount request.

Example 1 shows the creation of a symbolic link that links a file name to a tape device. In this example:

- ① Files and directories in the current directory are listed.
- ② A mount request is made with the `tpmount` command. If a symbolic-link name is not specified, the symbolic link to the tape device is named "TAPE."
- ③ Files and directories in the current directory are listed after the symbolic link to the tape device has been made.
- ④ This listing shows that TAPE is linked to the tape device `/dev/rmt20`.

### Example 1 Mount request resulting in a symbolic link to a tape device

```
① % ls -l
total 21
drwx-----2 sunny          512 Jan  9 10:19 Mail/
drwx-----5 sunny        1024 Mar 21 20:36 bin/
drwx-----6 sunny          512 Mar 12 15:20 news/
② % tpmount
③ % ls -l
total 22
drwx-----2 sunny          512 Jan  9 10:19 Mail/
④ lrwxrwxrwx1 sunny          10 Mar 25 12:00 TAPE@ -> /dev/rmt20
drwx-----5 sunny        1024 Mar 21 20:36 bin/
drwx-----6 sunny          512 Mar 12 15:20 news/
% █
```

As long as `tpdaemon` is running and a tape is mounted, the tape system's tape device driver will reject anyone else's request to directly access a tape device that is already in use.

## Using a default tape device

If you don't specify a particular tape drive or tape device when mounting a tape, the tape system automatically selects them for you. They have default characteristics your system manager has defined. You can view tape system defaults by entering:

```
% tpconfig show defaults
```

If you do not want the default characteristics, you need to select another device by specifying it in your mount request.

Example 2 shows how to display all configured defaults with the `tpconfig show de` command. The output indicates:

- ① You can read the tape configuration database, but cannot change it unless you have root privileges on your system.
- ② `opreq` queueing is disabled. Tape operators will not enqueue your mount requests.
- ③ Default tape density is 6250 bpi.
- ④ No default tape speed has been specified.
- ⑤ Tape drive is of type "mt."
- ⑥ Access mode is character, and there is no automatic rewind on close.

### Example 2 Displaying default information

```
% tpconfig show de
```

```
① Database access is read-only.
```

```
② Queueing is: Disabled
```

```
Defaults:
```

```
③ Density: 6250
```

```
④ Speed: No default
```

```
⑤ Drive type: mt
```

```
⑥ Mount flags: Character special, No-rewind
```

```
% █
```

---

## Selecting a tape device other than the default

Your system manager has defined default characteristics for the tape system. If you need a characteristic other than the default, you can specify a particular:

- Device you want to use that has all the characteristics you want
- Characteristic that you want your device to have (specified with your mount request)

If you specify a device you want to use with your mount request, the tape system uses that device if the following conditions hold:

- The specified device is available.
- You have not specified any characteristics that conflict with the specified device.

If the specified device is not available, the request fails, unless it is being queued. If your request is enqueued, the specified device is allocated as soon as it is free.

If you do not specify a device name with your mount request, the tape system selects a device based on the criteria:

- Access mode
- Compression
- Rewind status
- Speed
- Tape density

You can specify any or all of these four criteria when you mount your tape. The tape system selects any available device that has characteristics that fit the ones you have specified.

To display resources that can assist you in selecting a proper tape device when mounting a tape, use the `tpconfig show all` command.

Example 3 shows abridged output of the `tpconfig show all` command:

- ① Tape system configurations are read-only. You can only change them if you have superuser privileges.
- ② The defined drives for the tape system. In this example, the information about the defined drives has been omitted.
- ③ This lists labels that are defined for use with the tape system. In this example, information about the defined labels has been omitted.
- ④ Indication whether `opreq` is enabled or disabled.
- ⑤ Defaults that are defined for the tape system. If you do not specify different attributes from these in your mount request, these are the attributes that are used by the tape system in allocating your tape device.

### Example 3 Displaying tape system configuration information

```
% tpconfig show all
```

```
① Database access is read-only.
```

```
② Drives:
```

```
mt:0      timeout: 60      Controlled
```

```
      .
      .
      .
```

```
tc:0      timeout: 30      Controlled
```

```
      .
      .
      .
```

```
③ Labels:
```

```
      .
      .
      .
```

```
④ Queueing is: Disabled
```

```
⑤ Defaults:
```

```
      .
      .
      .
```

```
% █
```

---

## Using tape labels

A tape label is a block of information that tells about information contained on a tape and how the tape is accessed. When access is requested for a labeled tape, label information is verified by the tape system before tape access is established.

Tape labels come in two different types: header labels (for ANSI-standard labeled tapes), which label tape volumes, and file labels (for both ANSI- and IBM-standard labels), which label individual files on tapes.

Since the introduction of ConvexOS V8.0, the tape system supports reading and writing tapes labeled according to ANSI standard X3.27-1978. Because of adherence to the ANSI standard, you can interchange tapes among CONVEX machines and other systems that support this standard tape format.

Since the introduction of CONVEX IBM-standard Label Software, the tape system also supports reading and writing tapes labeled according to IBM standards.

Using labeled tape you can:

- Set access permissions for an entire tape and for each file on it (ANSI-standard labels only)
- Name files on a tape
- List information about each file on a tape
- Set an expiration date for each file on a tape
- Write header and trailer information for each file on a tape

Example 4 shows how to display information that makes up labels on a tape:

- ① Mount a labeled tape in labeled mode, specifying a symbolic-link name and a VSN. In this case the symbolic-link name is "tape1," and the VSN is "26."
- ② List the contents of a tape label with the `tplist` command.
- ③ This is the volume label, which contains:
  - A VSN, which in this case is "26"
  - The owner's login, which in this case is "sunny"
  - Access restrictions (for ANSI-standard labels only), which in this case is "Unrestricted"
- ④ File labels showing:
  - Sequence number "SeqNum"
  - The file ID "FileId"
  - The creation date of the file
  - Access permission for the file. For the file "fuzzy," the access permission is read-only, and for the file "hstry," the access permission is readable and writable.

#### Example 4 Displaying tape volume and file labels

```

① % tpmount -m label -s tape1 26
② % tplist
③ VolumeId: 26          Owner: SUNNY          Access: Unrestricted
④ SeqNum: 0001  FileId: FUZZ          Created: Mar 10, 1991  Access: R-
④ SeqNum: 0002  FileId: HSTRY         Created: Apr 12, 1991  Access: RW
% █

```

---

## Labeled-tape attributes

Four attributes that govern the way data is written to and read from tape are:

<i>Block size</i>	Total size of a group of records that is read from or written to tape
<i>Record size</i>	Size of a single chunk of data defined as your record, if the records are all of uniform size. If the record lengths vary, record size is the maximum size of a record.
<i>Record delimiter</i>	Tells the tape system when to put together a record. For instance, if the record delimiter is blocked newline (the tape system default), a record is defined and added to the current block every time a newline character is encountered.
<i>Record format</i>	Whether records are of a fixed size, variable (known) sizes, or are unformatted (unknown sizes)

Specify these attributes by setting labeled-tape attributes with the `tattr` command.

Tape attributes are set when you first write to a file on a labeled tape. When you read from a labeled-tape file, the values established when the file was originally written are automatically used.

Tape attributes must be coordinated properly in order to successfully write to and read from a labeled tape. In the following sections, each of these attributes are described in greater detail.

---

## Selecting a block size

A tape block is a chunk of data that is written to tape. The size of this tape block is the *block size*. You can select a block size by using the `tpattr` command with the `-b` option

```
tpattr -b block_size
```

where *block\_size* is an integer representing the number of bytes. For example, entering

```
% tpattr -b 64000
```

sets the block size to 64,000 bytes.

ANSI standard specifies a maximum block size of 2 kilobytes (the `tpattr` default), but the tape system allows blocks up to 128 kilobytes.

When selecting a block size, it is good to know that a large block size taxes system resources less because it is more efficient to write large amounts of data less often than to write small amounts frequently. However, since a large block size causes data to be written to tape less frequently, the likelihood of data loss increases if there is any abnormal termination such as a program or system crash.

To use storage media more efficiently, set your block size (especially for records formatted fixed-length) to a multiple of the record size. In general, when you set a block size equal to the record size, you minimize I/O buffering.

Some utilities, such as `cp`, `cat`, and `tar`, function only with specific block sizes on labeled tape and must have tape attributes set properly. Recommended block sizes are specified in this guide wherever examples of such commands are given.

---

## Selecting a record size

A record is a chunk of data that makes up a tape block on labeled tape. The number of bytes in a record is the *record size*. You can specify record size for records in fixed-length format, or you can specify a maximum record length for records in variable-length format. Set the record size with the `tpattr` command and the `-r` option as follows:

```
tpattr -r record_size
```

*record\_size* is in bytes. For example, entering

```
% tpattr -r 32000
```

sets the record size to 32,000 bytes.

When selecting a record size, ensure that it is an even factor of the block size.

---

## Selecting a record delimiter

A record delimiter signifies the end of a record to the tape system. When a record delimiter is encountered, the tape system writes the data contained in the record into a tape block. The number of records that can fit into a tape block depends on the size of the record and its record delimiter.

You can specify three types of record delimiters for records formatted in fixed and variable-length. Specify a record delimiter with the `tpattr` command and the `-d` option as follows:

```
tpattr -d option
```

*option* is any one of the following record delimiters:

`blocknl` Blocked newline

`newline` Newline character

`syscall` System call

These record delimiters are described in greater detail in the remainder of this section.

### **Blocked newline record delimiter**

The blocked newline record delimiter, the tape system default, defines a record each time the tape system encounters a newline character.

When the blocked newline record delimiter is used, a record is written to a tape block in the following manner:

- If the record format is variable-length, the tape system prefixes the number of bytes in the record.
- If the record format is fixed-length, the tape system pads the record with spaces if it contains fewer bytes than the specified record size.

Using blocked newline has the same effect as specifying newline delimiter when writing data to tape, but substantially enhances the efficiency of read operations. With blocked newline, the label daemon fills the read buffer to its capacity with records before writing the block to its destination.

Newline characters are not written to tape, but are restored when the record is read from a tape.

### **Newline record delimiter**

The newline record delimiter defines a record each time the tape system encounters a newline character.

When the newline record delimiter is used, a record is written to a tape block in the following manner:

- If the record format is variable-length, the tape system prefixes the number of bytes in the record.
- If the record format is fixed-length, the tape system pads the record with spaces if it contains fewer bytes than the specified record size.

Newline-delimited records are read from tape differently than blocked-newline-delimited records. With newline, only one record is written to the read buffer before the label daemon writes the block to its destination. Thus, one record equals one block.

Newline characters are not written to tape, but are restored when the record is read from a tape.

## System call record delimiter

The system call record delimiter defines a record after a write call. A write call is issued by any system command that writes data. Newline characters do not have any special meaning and are not removed.

When the system call record delimiter is used, a record is written to a tape block in the following manner:

- If the record type is variable-length, the tape system prefixes the number of bytes in the record.
- If the record type is fixed-length, the tape system pads the record with spaces if it contains fewer bytes than the specified record size.

For quicker write-through (if it is important to write data as soon as possible after a write system call), specify system call and set the block size equal to the record size.

The number of bytes written by system calls can vary. However, write system calls issued by the `cp` or `cat` commands write 64-kilobyte buffers. Thus, any `cp` command writes one or more 64-kilobyte records to the tape block if you use the system call record delimiter.

Use fixed-length or unformatted records with the system call record delimiter. Variable-length records cannot contain more than 9,999 bytes.

---

## Selecting a record format

A record format is how a record is put together before it is written to a tape block.

You can specify a record format with the `tpattr` command and the `-f` option as follows:

```
tpattr -f option
```

*option* is any one of the following:

F	Fixed-length records
D	ANSI-standard variable-length records
U	Unformatted records
V	IBM-standard variable-length records
VBS	IBM-standard variable-length blocked and spanned records

These five formats are described in the sections that follow.

### Fixed-length records

When you specify fixed-length as the record format, the tape system pads a record to the record size you have specified after reaching the record delimiter you have specified and writes it to a tape block.

If you try to write a record longer than the record size you have specified, the tape system returns an error message "ETPTRUNC," indicating the record has not been written.

When you read a fixed-length record from a tape, the tape system deletes all the padding (spaces) it inserted when it originally wrote the file to tape. The tape system also deletes *all* spaces at the end of a record, even if they were present in the original.

## Variable-length records

For greater storage efficiency, you can write records to tape that are all of different lengths. These are called *variable-length* records.

Variable-length records are from 4 to 9,999 bytes each for ANSI-standard labeled tapes, and from 4 to 32,700 bytes each for IBM-standard labeled tapes. A variable-length record contains an index at its beginning that indicates its total length in bytes. This total also includes the length of its index, which is 4 bytes. Thus, the maximum amount of data that you can store in a variable-length record is:

- (9,999 - 4) bytes for ANSI-standard labeled tapes
- (32,700 - 4) bytes for IBM-standard labeled tapes (if portability is an issue)
- (64,000 - 5) bytes for IBM-standard labeled tapes (if portability is not an issue)

The maximum record size you can *specify* when setting attributes with ANSI-standard variable-length records is 9,999 bytes. The maximum size you can specify when setting attributes with IBM-standard variable-length records is 64,000 bytes if portability is not an issue, or 32,700 bytes if portability is an issue.

When the tape system encounters an end-of-record mark in a record while writing it to tape, it prefixes the record-length index to it. With ANSI-standard, this index is an ASCII-encoded decimal integer. With IBM-standard, it is a binary integer. When you later read this variable-length record, its record-length index is used to locate the end of the record. The tape system does not pad variable-length records, nor does it strip trailing spaces when it reads them.

## Unformatted records

*Unformatted* records have no record structure. Use this record type with binary files containing executable code. This prevents the tape system from adding blank characters or record length indexes to your file.

Because there is no ANSI standard for this record type, you may experience compatibility problems if the tape is ever read on a non-CONVEX system.

If a record type is unformatted, the tape system writes a block of data to tape whenever you initiate a write system call. Using the unformatted record type is similar to using the system call record delimiter. However, the block size vary depending on the amount of data sent with each system call, and the tape system does not write record sizes or delimiters.

### Variable-length blocked and spanned records

When you specify *variable-length blocked and spanned* records, the tape system constructs file headers as if tape blocks are of variable length and spanned. However, the tape system treats the data as “unformatted.” The tape system does not form blocks, nor does it span the records across blocks. This is the responsibility of the user application that is writing to the tape.

Variable-length blocked and spanned records can only be used with IBM-standard labeled tapes.

## How files, blocks, and records are arranged on tape

This section describes how records and files are arranged on unlabeled and labeled tape.

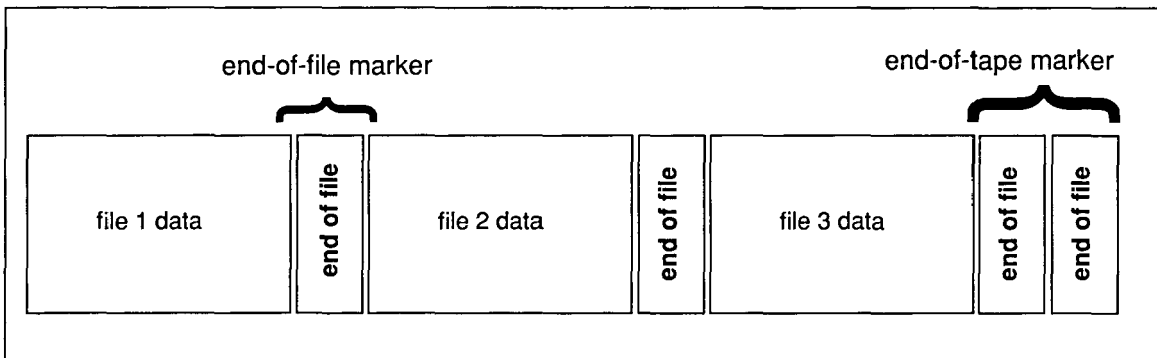
### How files are arranged on unlabeled tape

Information on tape is arranged sequentially. When you copy a file to tape, *end-of-file markers* are written along with the file so you can distinguish where one file ends and the next begins.

After the last file on the tape, two, consecutive, end-of-file markers signify the end of tape. These two end-of-file markers are also referred to as an *end-of-tape marker*.

An arrangement of files on tape is similar to that in Figure 1.

**Figure 1** How files are arranged on tape

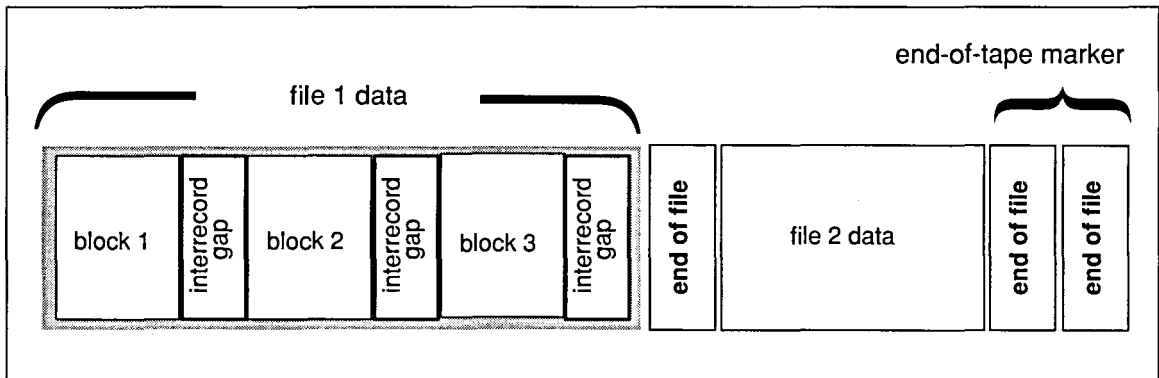


## How files and blocks are arranged on unlabeled tape

On unlabeled tape, one or more *blocks* make up a file. Blocks are finite groupings of information, which can be of uniform or variable size. To distinguish the start of one block and the end of another, an *interrecord gap* is written to the tape when a block is written.

Figure 2 shows how files and blocks are arranged sequentially on tape. Using tape movement commands, or `mt` commands, you can space forward or backward through the tape by block or by file.

Figure 2 How files and blocks are arranged on unlabeled tape

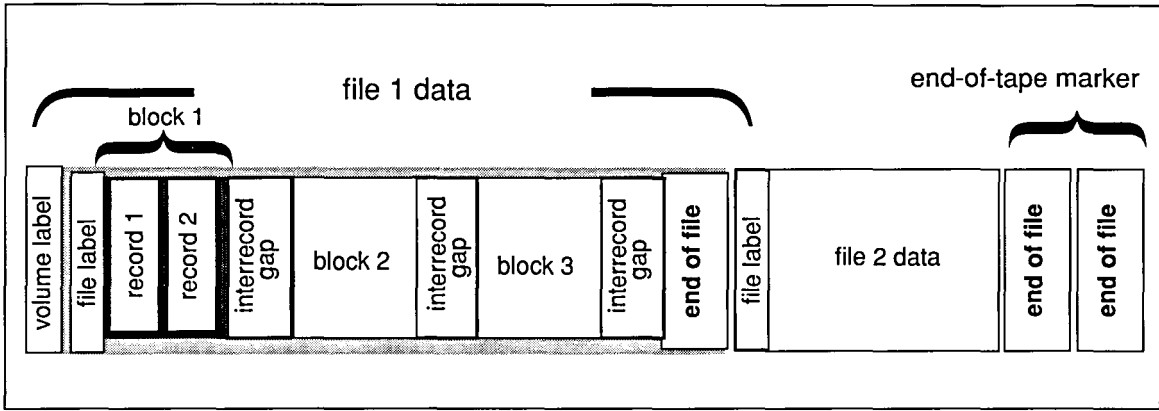


## How files, blocks and records are arranged on labeled tape

Unlike unlabeled tape, labeled-tape blocks are composed of *records*.

Figure 3 shows how files, blocks, and records are sequentially arranged on tape. Using `mt` commands, you can space forward or backward on the tape by record or by file, but not by block as with unlabeled tape.

**Figure 3** How files, blocks, and records are arranged on labeled tape



## Moving from file to file on tape

The tape movement commands, or `mt` commands, work similarly for labeled and unlabeled tape. Even though labels and tape marks that separate files, blocks, and records are different for labeled tape and unlabeled tape, `mt` commands have the same results in both cases.

Two of the most used `mt` commands are `mt rew` and `mt fsf`. The `mt rew` command rewinds the tape. The `mt fsf` command moves the tape forward until a specified number of end-of-file markers have passed by the tape head. The tape is stopped just after the last marker.

For example, suppose the tape head is currently positioned at file 3, as in Figure 4, and you want to read from the beginning of file 2. Enter:

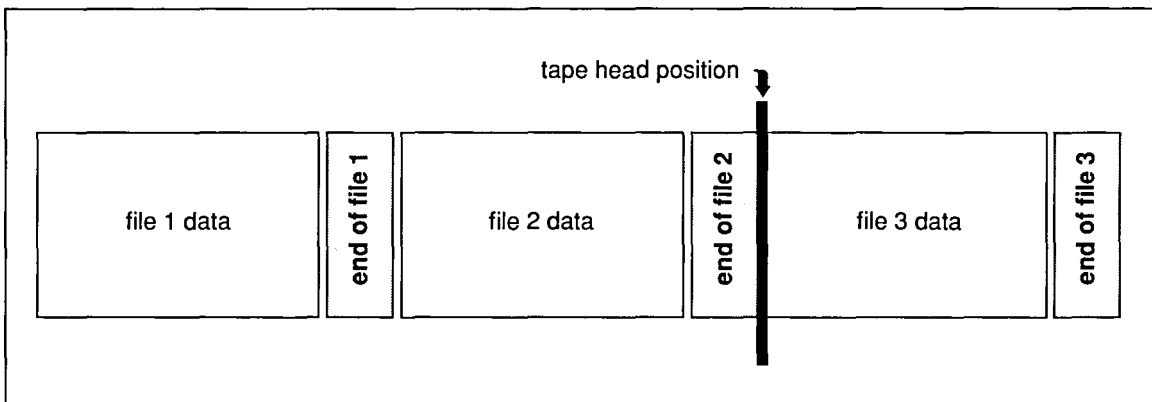
```
% mt rew
```

then enter:

```
% mt fsf 1
```

Figure 4 shows files and end-of-file markers as well as the initial position of the tape. The tape head is at the beginning of file 3.

**Figure 4** Tape positioned at the beginning of file 3

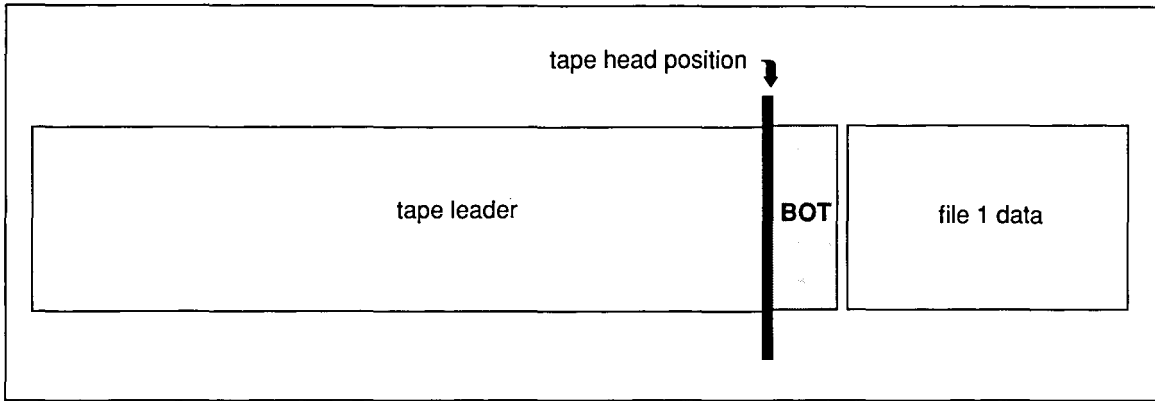


As shown in Figure 5, entering

```
% mt rew
```

moves the tape backward until the tape head is at beginning-of-tape.

**Figure 5** Tape positioned at beginning-of-tape (BOT)

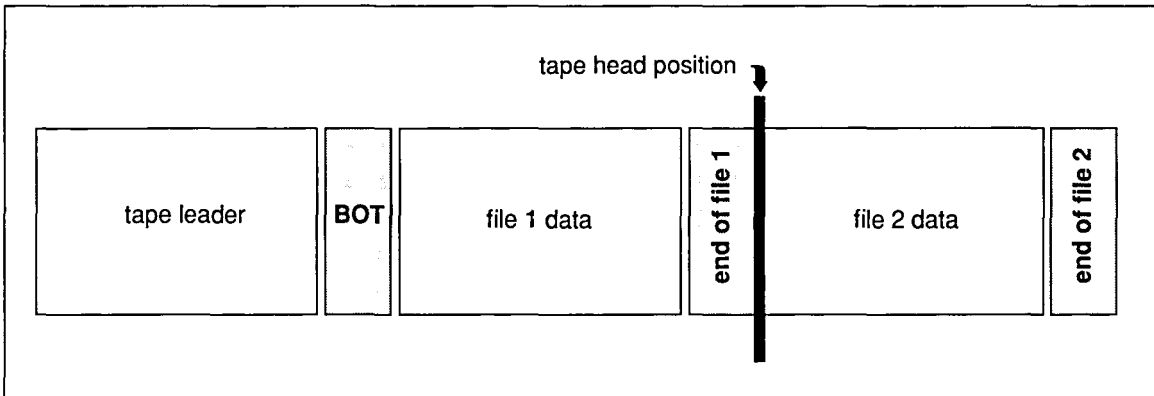


As shown in Figure 6, entering

```
% mt fsf 1
```

moves the tape forward one file. The tape head is now positioned at the beginning of file 2.

**Figure 6** Tape positioned at the beginning of file 2



Attempts to read past the end-of-tape marker on ANSI-labeled tape fails. On unlabeled tape, attempts to read past the end-of-tape marker return spurious data.

---

## Tape sets

A *tape set* consists of one or more tapes associated together as volumes by either the IBM- or ANSI-header label of a labeled-tape set, or by `nldaemon`, the non-labeled tape set daemon.

---

### Automatic Volume Recognition (AVR)

When a volume from a tape set is placed on a tape drive, its VSN is read by the automatic volume recognition (AVR) utility. The tape must match the subsequent VSN or VSNs specified in the subsequent mount request, or the mount request fails.

If the operator request management (`opreq`) utility is active, the system automatically issues requests to the operator to switch tape volumes when the tape reaches end-of-volume (EOV). If you are using a system without an operator, you receive the messages by electronic mail to change the tape.

---

### Labeled-tape sets

The tape system supports both ANSI and IBM-labeled tape sets.

When mounting a labeled-tape set, all VSNs must be specified in the mount request with the `tpmount -s` option. When creating a tape set, all the VSNs (which represent volumes) you intend to include in the tape set must be listed in your mount request as well. After creating a labeled-tape set, each volume must be subsequently mounted and labeled in order.

Labeled-tape set volumes can only be accessed sequentially. For example, if you need to use the third volume of a tape set, you must mount the first tape and forward through it, mount the second tape and forward through it, and then mount the third tape. This is so because the tape system considers the tape set to be one giant tape.

When unlabeled a tape set, each volume must be subsequently mounted and unlabeled in order, similar to how the volumes were labeled.

---

## Unlabeled-tape sets

When mounting an unlabeled-tape set, volume serial numbers must be specified in the mount request with the `tpmount -s` option for all volumes being accessed. Because there are no VSNs written to unlabeled tapes, VSNs are not verified.

When creating a tape set, all the volumes you intend to include in the tape set must be listed in your mount request. The number of VSNs in your mount request should match the number of volumes in the tape set.

Depending on how an unlabeled tape set is mounted, its volumes can be accessed either sequentially or randomly.

### Sequential access of an unlabeled-tape set

If a unlabeled-tape set is mounted in unlabeled mode with the `tpmount -m nl` option, its volumes must be accessed sequentially. Labeled-tape set volumes can be accessed sequentially only. For example, if you need to use the third volume of an unlabeled-tape set, you must mount the first tape and forward through it, mount the second tape and forward through it, and then mount the third tape.

### Random access of an unlabeled-tape set

If an unlabeled-tape set is mounted in character mode with the `tpmount -m char` option, its volumes can be accessed randomly. You can switch from one volume to any other with the `tpswitchvol` command. This command is only valid with unlabeled-tape sets mounted in character mode.

## Tape system daemons

The tape system will not function unless certain processes, or daemons, are running. These daemons are described in Table 1.

**Table 1** Tape system daemons

Daemon	Description
ansidaemon	ANSI-standard labeled-tape daemon; its path name is /usr/lib/tape/ansidaemon. Started automatically by the tape system when needed. ANSI is the default tape label type.
ibmdaemon	IBM-standard labeled-tape daemon; its path name is /usr/lib/tape/ibmdaemon. Started automatically by the tape system when it detects an IBM-standard label. If the tape or tape set is being labeled, ibmdaemon must be invoked in the mount request.
nldaemon	Unlabeled tape set daemon; its path name is /usr/lib/tape/nldaemon. nldaemon is invoked with the tpmount -m nl option or when VSNs are supplied when a tape is mounted with the -m char option. nldaemon handles both sequential and random access of unlabeled-tape set volumes.
opreq_daemon	opreq queuing daemon; its path name is /usr/lib/opreq/opreq_daemon. Tape mount requests "wait in line" until the necessary resources are available. The opreq utility can be used to manage tape requests queued by opreq_daemon.
stkdaemon	Automatic Cartridge Loader (ACL) stacker daemon; its path name is /usr/lib/tape/stkdaemon. stkdaemon is invoked when using the CONVEX ACL system.
tpdaemon	The main tape system daemon; its path name is /usr/lib/tape/tpdaemon. tpdaemon services mount requests, allocates tape devices, controls tape drives, and enforces label-access restrictions.



Before mounting tapes, you may want to display information about the tape queue or default values and configurations of the tape system. This helps you select tape system facilities to suit your needs.

This chapter describes how to display:

- Default values for `tpmount`
- Label types
- Queue information
- Drive and node information
- Tape volume and file label information

---

## Displaying tape queue information

Display tape queue information by using the `tpqueue` command. `tpqueue` can display:

- Tape drives in use
- Tape devices in use
- Names of users who have devices allocated
- Volume serial numbers (VSNs) of tapes that are currently on line
- Symbolic-link names of devices in use

---

### Syntax for displaying tape queue information

Use the `tpqueue` command to display tape queue information. It has the syntax

```
tpqueue [-l]
```

where the `-l` option indicates to display in long format.

Long format includes all the information normally displayed with `tpqueue` as well as user devices that are reserved and symbolic-link names associated with these devices.

---

### Examples of displaying tape queue information

The `tpqueue` command displays tape queue information as shown in Example 8:

- ① `tpqueue` command and output
- ② `tpqueue -l` command and output

#### Example 5 `tpqueue` command output in regular and long format

```
① % tpqueue
Drive      Tape Device      User      VSN
mt:0       /dev/rmt20         SUNNY     none

② % tpqueue -l
Drive      Tape Device      User Device  User      VSN      Symbolic Link
mt:0       /dev/rmt20         /dev/rmt20  SUNNY     none     /tmp/TAPE13646
%#
```

## Displaying tape system configuration

Although the `tpconfig` command is usually used by system managers to configure the tape system, you can use `tpconfig` to display read-only information about tape system configuration.

The information displayed by `tpconfig show` commands can be very useful in helping you select a tape device. If you have more than one tape drive and want to use multiple tapes simultaneously, you need to specify devices with your mount request. Use `tpconfig show` commands to view the devices available.

### Syntaxes of `tpconfig show` commands

Syntaxes of the `tpconfig show` commands are described in Table 2.

**Table 2** `tpconfig show` commands

Command	Description
<code>tpconfig show all</code>	Show all tape system configuration values.
<code>tpconfig show de</code>	Show default values for mounting tapes.
<code>tpconfig show dr [drive]</code>	Show information about a drive, where <i>drive</i> is the name of the drive you specify. For example, % <code>tpconfig show dr mt:0</code> displays information about the tape drive <code>mt:0</code> . If you do not specify a tape drive, you receive information about all tape drives.
<code>tpconfig show labels</code>	Show defined label types (IBM and ANSI standards, and non-labeled).
<code>tpconfig show node [node]</code>	Show information about a specific node (tape device), where <i>node</i> is the path name of the node you specify. For example, % <code>tpconfig show node /dev/rmt20</code> shows information about the <code>/dev/rmt20</code> device. If you do not specify a node, you receive information about all nodes.

---

## Examples of displaying information on tape system configurations

In the following sections are several examples of how to use each `tpconfig show` command, and what the output represents.

### Displaying all tape system configuration information

Example 6 shows how to display all tape system configurations using the `tpconfig show all` command:

- ① Tape drive type `mt` and unit `0`.
- ② Number of minutes that can elapse before the idle drive is declared unused. After this interval elapses, the tape system automatically unmounts your tape.
- ③ This drive, `mt:0`, is controlled by the tape system. If the drive is uncontrolled, the control status is shown as "Not controlled." For more information on controlled and uncontrolled drives refer to the section "Tape drives, devices, and nodes," on page 3.
- ④ All users and groups can use this drive.
- ⑤ All users and groups can mount tapes on this drive without specifying a volume serial number (VSN).
- ⑥ No users or groups can bypass tape-label processing. (root is an exception. If you have root privileges, you can always bypass label processing.)
- ⑦ Defined devices associated with the drive. Each of these devices is called a "node" of the drive.
- ⑧ IBM and ANSI-standard labels, and non-labeled type for unlabeled tape sets, are recognized.
- ⑨ `opreq` queuing is disabled.
- ⑩ The default settings:
  - Density is 6250 bpi.
  - No default speed has been defined.
  - Drive type is `mt`.
  - Mount mode is `character`, no automatic rewind.

## Example 6 tpconfig show all command output

```
% tpconfig show all
Database access is read-only.
Drives:
① mt:0    ② timeout: 60③ Controlled
④ Access:
      Users:    All
      Groups:   All
⑤ Alloc access:
      Users:    All
      Groups:   All
⑥ Bypass access:
      Users:    None
      Groups:   None
⑦ Nodes:
      /dev/rmt8    speed:    density: 1600    Rewind    Char
      /dev/rmt12   speed:    density: 1600    No rewind Char
      /dev/rmt16   speed:    density: 6250    Rewind    Char
      /dev/rmt20   speed:    density: 6250    No rewind Char
      /dev/mt8     speed:    density: 1600    Rewind    Block
      /dev/mt12    speed:    density: 1600    No rewind Block
      /dev/mt20    speed:    density: 6250    No rewind Block
⑧ Labels:
      nl daemon: /usr/lib/tape/nldaemon
      ibm daemon: /usr/lib/tape/ibmdaemon
      ansi daemon: /usr/lib/tape/ansidaemon
⑨ Queueing is: Disabled
⑩ Defaults:
      Density: 6250
      Speed: No default
      Drive type: mt
      Mount flags: Character special, No-rewind
% █
```

## Displaying tape system defaults

Example 7 exhibits how to display all configured defaults by using the `tpconfig show de` command:

- ① You can read the tape configuration database, but cannot change it unless you have root privileges on your system.
- ② `opreq` queueing is disabled. Tape operators will not enqueue your mount requests.
- ③ Default tape density is 6250 bpi.
- ④ No default tape speed has been specified.
- ⑤ Tape drive is of type `mt`.
- ⑥ Access mode is character, and there is no automatic rewind on close.

### Example 7 `tpconfig show de` command output

```
% tpconfig show de
① Database access is read-only.
② Queueing is: Disabled

Defaults:
③ Density: 6250
④ Speed: No default
⑤ Drive type: mt
⑥ Mount flags: Character special, No-rewind
% █
```

## Displaying valid label types

Example 8 exhibits how to show all valid label types by using the `tpconfig show labels` command:

- ① You can read the tape configuration database, but cannot change it unless you have root privileges on your system.
- ② Only IBM and ANSI-standard labels, and non-labeled type (for unlabeled tape sets), are recognized.
- ③ Complete path names for the label daemons

### Example 8 `tpconfig show labels` command output

```
% tpconfig show labels
```

```
Database access is read-only. ①
```

```
Labels:
```

```
②      nl daemon: /usr/lib/tape/nldaemon ③  
      ibm daemon: /usr/lib/tape/ibmdaemon  
      ansi daemon: /usr/lib/tape/ansidaemon
```

```
% █
```

## Displaying information on all tape drive configurations

Example 9 exhibits how to show all configured drives by using the `tpconfig show dr` command:

- ① Type `tpconfig show dr` and specify the drive type and unit number of the tape drive. If you do not specify a drive type and unit number, information about all the tape drives is displayed.
- ② You can read the tape configuration database, but cannot change it unless you have root privileges on your system.
- ③ Drive type and unit number
- ④ Number of minutes that can elapse before the idle drive is declared unused. After this interval elapses, the tape system automatically unmounts the tape drive.
- ⑤ Access to the tape drive is controlled by the tape system.
- ⑥ Any user can mount drives without specifying a tape VSN.
- ⑦ No users or groups can bypass label processing.
- ⑧ Tape devices that are associated with the tape drive. Each of these tape devices is called a "node" of the drive.

### Example 9 `tpconfig show dr` command output

```
① % tpconfig show dr mt:0
② Database access is read-only.
Drives:
  ③ mt:0          ④ timeout: 60    ⑤ Controlled
⑥      Alloc access:
          Users:    All
          Groups:   All
⑦      Bypass access:
          Users:    None
          Groups:   None
⑧      Nodes:
          /dev/rmt8    speed:    density: 1600  Rewind    Char
          /dev/rmt12   speed:    density: 1600  No rewind Char
          /dev/rmt16   speed:    density: 6250  Rewind    Char
          /dev/rmt20   speed:    density: 6250  No rewind Char
          /dev/mt8     speed:    density: 1600  Rewind    Block
          /dev/mt12    speed:    density: 1600  No rewind Block
          /dev/mt16    speed:    density: 6250  Rewind    Block
          /dev/mt20    speed:    density: 6250  No rewind Block

% █
```

## Displaying information on all defined nodes

Example 10 exhibits how to show all defined node configurations by using the `tpconfig show node` command:

- ① The `tpconfig show node` command displays information about all defined tape devices for all drives, unless a node is specified (refer to step ⑨).
- ② You can read the tape configuration database, but cannot change it unless you have root privileges on your system.
- ③ The tape drive to which each tape device (node) is associated
- ④ Tape devices (nodes) associated with the tape drive
- ⑤ Tape speed for each tape device
- ⑥ Tape density requirements, in bpi, for each tape device
- ⑦ Whether the tape device automatically rewinds on close
- ⑧ Whether the tape device requires block or character mode input
- ⑨ The `tpconfig show node` command specifying a tape device (node)

### Example 10 `tpconfig show node` command output

```

① % tpconfig show node
② Database access is read-only.
Nodes: ③ ④ ⑤ ⑥⑦⑧
    mt:0 /dev/rmt8      speed:      density: 1600  Rewind    Char
    mt:0 /dev/rmt12     speed:      density: 1600  No rewind Char
    mt:0 /dev/rmt16     speed:      density: 6250  Rewind    Char
    mt:0 /dev/rmt20     speed:      density: 6250  No rewind Char
    mt:0 /dev/mt12      speed:      density: 1600  No rewind Block
    mt:0 /dev/mt8       speed:      density: 1600  Rewind    Block
    mt:0 /dev/mt16      speed:      density: 6250  Rewind    Block
    mt:0 /dev/mt20      speed:      density: 6250  No rewind Block
⑨ % tpconfig show node /dev/rmt20
Database access is read-only.
    mt:0 /dev/rmt20     speed:      density: 6250  No rewind Char
% █

```

## Displaying tape labels

Once a labeled tape is mounted, view tape volume and file labels with the `tplist` command.

### Syntax and options for displaying tape labels

The syntax for `tplist` is

```
tplist [options]
```

where *options* are any described in Table 3.

**Table 3** `tplist` options

Option	Description
-a	Display active file attributes.
-c	Display current file label.
-d	Display detailed printout, which includes: <ul style="list-style-type: none"><li>• Tape owner's ID</li><li>• Standard used</li><li>• Tape access permissions</li><li>• Volume ID</li></ul> and file-label information: <ul style="list-style-type: none"><li>• Block size and count</li><li>• Creation date</li><li>• Expiration date</li><li>• File access</li><li>• File ID</li><li>• Format</li><li>• Header and trailer information</li><li>• Record size</li><li>• Section number</li><li>• System code</li></ul>
-f	Display all file labels. Suppress display of the volume label.
-r	Display raw volume label. The label is displayed as written on the tape.

**Table 3** `tplist` options

<b>Option</b>	<b>Description</b>
<code>-s link</code>	Specify the name of the symbolic link to your tape device. You need this if you have more than one tape mounted.
<code>-v</code>	Show only the volume label. Suppress display of file labels.

---

## Listing tape volume and file labels

Example 11 shows how to use the `tplist` command and its options:

- ① Mount the tape in labeled mode. Specify a symbolic-link name and all VSNs. If you are using a tape set, you must specify all the VSNs defined in the set.
- ② List volume and file labels.
- ③ The `tpattr` command sets tape attributes that are used when a file is written to or read from a tape. The `tplist -a` command displays tape attributes that have been set, but may not have been used yet. The next file that is written to the tape receives these attributes.
- ④ `mt` commands move the tape. Display tape attributes of the file currently positioned at the tape head. In this example the tape has been moved so that the attributes of the second file, "names," are displayed.  
If you attempt to execute `tplist -c` when at EOT, you receive an error message.
- ⑤ Display detailed listing of all tape labels.
- ⑥ List file labels only.
- ⑦ Display the raw label.
- ⑧ Display volume label only.

## Example 11 Examples of how to use `tplist`

```
① % tpmount -m label -s tape1 260
Tape 260 mounted. Device: /dev/lt/u0

② % tplist
VolumeId: 260      Owner: SUNNY      Access: Unrestricted
SeqNum: 0001  FileId: FUZZY      Created: Aug 12, 1991  Access: R-

VolumeId: 260      Owner: SUNNY      Access: Unrestricted
SeqNum: 0002  FileId: NAMES      Created: Aug 12, 1991  Access: R-

③ % tpattr -i kings -b 64000 -a rw
% tplist -a
Currently defined attributes are:
Block Size = 64000 Record Size = 00128 Format = F (Fixed length records)
File Name: kings      Expiration Date: Jan 1, 1900  Access: RW

④ % mt rew
% mt fsf 1
% tplist -c
SeqNum: 0002  FileId: NAMES      Created: Mar 10, 1991  Access: R-

⑤ % tplist -d
VolumeId: 260      Owner: SUNNY      Access: Unrestricted  Standard: 3

SeqNum: 0001  FileId: FUZZY      Created: Mar 10, 1991  Access: R-
SecNum: 0001  GenNum: 0001  GenVer: 00  Expires: Jan 1, 1900  SetId: 260
Format: U (System dependent)  Blocksize: 0000  Recordsize: 00080
BlockCount: 000001  System code: CONVEX

⑥ % tplist -f
SeqNum: 0001  FileId: FUZZY      Created: Mar 10, 1991  Access: R-

⑦ % tplist -r
VOL260
SUNNY
HDR1FUZZY      26      00010001000100 91069 000014000000CONVEX

⑧ % tplist -v
VolumeId: 260  Owner: FUZZY      Access: Unrestricted
% █
```



Before you can use a tape, you must allocate a tape device and reserve a tape drive. There are different ways of doing these tasks, depending on the number and type of tapes you're using, and whether you want to run your mount request in the foreground or background.

This chapter describes how to do these tasks:

- Mount labeled tapes:
  - Single volume using ANSI- or IBM-standard labels
  - Multivolume set using ANSI- and IBM-standard labels
- Mount unlabeled tapes:
  - Single volume
  - Multivolume set for sequential access of its volumes
  - Multivolume set for random access of its volumes
- Mount multiple tapes simultaneously
- Move a mount request between the foreground and background
- Unmount a tape:
  - When you have only one tape mounted
  - When you have multiple tapes mounted

---

## Mounting tapes

The `tpmount` command reserves a tape drive and allocates a tape device. To mount a tape or a tape set, use the `tpmount` command. If you do not specify any options, it invokes default values defined by your system manager.

There are three basic kinds of `tpmount` commands:

- Simple `tpmount` requests, which specify only one labeled or unlabeled tape to be mounted. (This is the most common use of `tpmount`.)
- Multivolume `tpmount` requests, which specify a labeled or unlabeled-tape set to be mounted.
- Multiple `tpmount` requests, which specify two or more tapes, of any combination of labeled or unlabeled, be simultaneously mounted.

Before using the `tpmount` command, you may want to check the default tape system values.

---

## Syntax and options for mounting tapes

The `tpmount` command has the syntax

```
tpmount [option...]
```

where *option* can be any of the options listed in Table 4.

Table 4 `tpmount` options

Option	Description
-a <i>device</i>	Link to the specified tape device, where <i>device</i> is one of the tape devices in the <code>/dev</code> directory.
-B	Place the <code>tpmount</code> request in the background.
-c " <i>comment</i> "	Send a comment to the tape operator, where <i>comment</i> is the comment you want to relay. This option is used primarily to tell the tape operator whether a mount request is for a tape that is to be labeled or for a tape that is already labeled. This only functions if <code>opreq</code> queuing is enabled. Comments must be delimited by double quotes.

Table 4 tpmount options (continued)

Option	Description
-d <i>density</i>	Specify desired tape density, where <i>density</i> can be any of the following density selections:  1600 Standard density in bytes-per-inch (bpi)  6250 Standard density in bpi  comp Data compression
-f <i>n</i>	Skip forward <i>n</i> number of files on the tape when it is first accessed. Valid only for labeled tapes.
-i <i>speed</i>	Specify desired tape speed, where <i>speed</i> is the tape speed you need in inches-per-second (ips).
-l <i>label_type</i>	Specify label type, where <i>label_type</i> is the label type of your tape. Currently, the valid label types are:  ansi ANSI-standard labels  ibm IBM-standard labels
-m <i>mode</i>	Specify access mode, where <i>mode</i> can be any one of the following:  block Block mode  char Character mode  label Labeled-tape mode  nl Unlabeled-tape mode
-q	Queue the request. Has no effect if <code>opreq</code> queuing is enabled.
+q	Disable queuing. Used in compound <code>tpmount</code> commands requesting simultaneous access to multiple tape devices. (Refer to the section, Mounting multiple tapes in one mount request, on page 53.)
-R	Read-only access. Informs the operator that the write ring should be removed from the tape.
+R	Reverses <code>-R</code> option. Used in compound <code>tpmount</code> commands requesting simultaneous access to multiple tape devices. (Refer to the section Mounting multiple tapes in one mount request, on page 53.)
-r	Automatic rewind of tape on close. Do not use when mounting a labeled tape.

**Table 4** tpmount options (continued)

Option	Description
+r	Disables automatic rewind of tape on close previously set on the same command line. Used in compound tpmount commands requesting simultaneous access to multiple tape devices. (Refer to the section Mounting multiple tapes in one mount request, on page 53.)
-s <i>link</i> <i>VSN</i> [, <i>VSN</i> ,...]	<p>Specify a name for the symbolic link associated with the tape device and list appropriate volume serial numbers (VSNs). <i>link</i> is the name you want to give the symbolic link.</p> <p><i>VSN</i> is the VSN recorded on the tape. When mounting a tape, <i>VSN</i>, which is specified in the tpmount command, must match the VSN recorded on the tape.</p> <p>The tape system recognizes VSNs up to six characters long. A VSN longer than six characters can be specified in a tpmount request, but only the first six characters are compared against the VSN recorded on the tape.</p> <p>When mounting a tape set, you must specify all the VSNs in the set. Multiple VSNs must be delimited by commas and have no embedded spaces among them:</p> <p><i>vsn1</i>, <i>vsn2</i>, <i>vsn3</i></p>
-t <i>drive_type</i>	<p>Specify drive type, where <i>drive_type</i> is one of the drive types defined by your system manager. <i>drive_type</i> can be any one of the following:</p> <p><i>dat</i>      DAT drive</p> <p><i>mt</i>        9-track drive</p> <p><i>tc</i>        3480 tape cartridge drive</p>
-u	<p>Select internally buffered device (for tape cartridges only).</p> <p>Certain tape drives, such as the 3480 tape drive, have internal hardware buffers. It is faster to write to this internal hardware buffer than to the tape itself. The tape device periodically flushes the buffer to the tape.</p>

---

## Mounting a labeled tape

This section describes how to mount labeled tapes with ANSI- and IBM-standard labels.

### Mounting an ANSI-labeled tape

Example 12 shows how to mount an ANSI-labeled tape. Enter `tpmount` with the options to:

- ① Specify labeled mode, even if the tape is not yet labeled.
- ② Specify a symbolic-link name and a VSN.

#### Example 12 Mounting an ANSI-labeled tape

```
      ①      ②
% tpmount -m label -s tape1 vol1
Tape vol1 mounted. Device: /dev/lt/u0
% █
```

### Mounting an IBM-labeled tape

Example 13 shows how to mount an IBM-labeled tape. Enter `tpmount` with the options to:

- ① Specify labeled mode, even if the tape is not yet labeled.
- ② Invoke the `ibmdaemon` label daemon.
- ③ Specify a symbolic-link name and a VSN.

#### Example 13 Mounting an IBM-labeled tape

```
      ①      ②      ③
% tpmount -m label -l ibm -s tape1 vol1
Tape vol1 mounted. Device: /dev/lt/u0
% █
```

---

## Mounting a labeled-tape set

This section describes how to mount a labeled-tape set with ANSI- and IBM-standard labels.

### Mounting an ANSI-labeled tape set

When mounting a tape set, all of the volumes in the tape set must be specified in the mount request.

When creating a labeled-tape set, all the volumes in the set must be listed in your mount request, and then mounted and labeled in order.

Example 14 shows how to enter the `tpmount` command in order to mount an ANSI-labeled tape set:

- ① Specify labeled mode, even if the tape is not yet labeled.
- ② Specify a symbolic-link name.
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

#### Example 14 Mounting an ANSI-labeled tape set

```
      ①          ②          ③  
% tpmount -m label -s tape1 test1,test2,test3  
Tape test1 mounted. Device: /dev/lt/u0  
% █
```

## Mounting an IBM-labeled tape set

When mounting tape set, all of the volumes must be specified in the mount request.

When creating a labeled-tape set, all the volumes must be listed in your mount request, and then mounted and labeled in order.

Example 15 shows how to enter the `tpmount` command in order to mount an IBM-labeled tape set:

- ① Specify labeled mode, even if the tapes are not yet labeled.
- ② Invoke the `ibmdaemon` label daemon.
- ③ Specify a symbolic-link name.
- ④ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

### Example 15 Mounting an IBM-labeled tape set

```
    ①      ②      ③      ④  
% tpmount -m label -l ibm -s tapel test1,test2,test3  
Tape test1 mounted. Device: /dev/lt/u0  
% █
```

---

## Mounting an unlabeled tape

Example 16 shows how to mount an unlabeled tape:

- ① Enter `tpmount`. In this example, a symbolic-link name has been specified, and tape system defaults are used.
- ② The system responds by either telling you a tape device is allocated or by giving you an error message.
- ③ You can display the settings for the node `/dev/rmt20` by entering the `tpconfig show node` command.
- ④ The allocated tape device, `/dev/rmt20`, which is a node for the tape drive `mt:0`, has the following characteristics:
  - No defined tape speed
  - A density of 6250 bpi
  - No automatic rewind on close
  - Character I/O

### Example 16 Mounting an unlabeled tape

```
① % tpmount -s tape1
② Tape device /dev/rmt20 allocated.
③ % tpconfig show node /dev/rmt20
Database access is read-only.
④ mt:0 /dev/rmt20      speed:          density: 6250      No rewind      Char
% █
```

---

## Mounting an unlabeled-tape set

There are two ways to mount an unlabeled-tape set, depending on whether its volumes are to be accessed sequentially or randomly.

This section describes:

- How to mount an unlabeled-tape set so that all the volumes in the set appear to be combined to form one long tape, and volumes must be accessed sequentially.
- How to mount an unlabeled-tape set so that all the volumes in the set are kept distinct, and volumes can be randomly accessed

### Mounting an unlabeled-tape set for sequential access

Example 17 shows how to mount an unlabeled-tape set for sequential access of its volumes:

- ① Specify unlabeled mode.
- ② Specify a symbolic-link name.
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

#### Example 17 Mounting an unlabeled-tape set for sequential access

```
      ①      ②      ③
% tpmount -m nl -s tape1 test1,test2,test3
Tape test1 mounted. Device: /dev/rmt20
% █
```

## Mounting an unlabeled-tape set for random access

Example 18 shows how to mount an unlabeled-tape set for random access of its volumes:

- ① Specify character mode.
- ② Specify a symbolic-link name.
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

### Example 18 Mounting an unlabeled-tape set for random access

```
          ①          ②          ③  
% tpmount -m char -s tape1 test1,test2,test3  
Tape test1 mounted. Device: /dev/rmt20  
% █
```

## Mounting multiple tapes in one mount request

Example 19 shows how to enter a `tpmount` command in order to mount two tapes (one unlabeled and one labeled) in one mount request:

- ① Activate automatic rewind of tape after closing a write operation.
- ② Link to a tape device. To select a tape device, look at your tape system configuration with the `tpconfig show nodes` command. If you do not specify a tape device, the system default is allocated.
- ③ Name the first symbolic link and specify all VSNs in the tape set. When allocating multiple tape devices in the one mount request, be sure to specify unique symbolic-link names (“one” and “two” in Example 19).
- ④ Deactivate automatic rewind upon closing after a read or write operation.
- ⑤ Set access mode to “label.” All access permissions recorded in the volume and file labels are enforced.
- ⑥ Specify the tape device `/dev/rmt21`.
- ⑦ Name the second symbolic link. The second symbolic-link name must be different than the first. In this example, the backslash indicates that the example continues on the next line. Do not type the backslash.
- ⑧ Specify all VSNs in the tape set, if you are mounting one. The VSNs you specify here must match the VSNs on the tape.

### Example 19 Mounting two tapes in one mount request

```

      ① ②          ③      ④ ⑤          ⑥          ⑦
% tpmount -r -a /dev/rmt16 -s one +r -m label -a /dev/rmt21 -s two \
⑧ vol1,vol2,vol3
Tape device /dev/rmt20 allocated.
Tape vol1 mounted. Device: /dev/lt/u0
% █

```

---

## Using data compression on 3480 cartridge and DAT drives

If you have a SCSI 3480 cartridge or DAT tape drive that offers data compression, you can select it for use in your mount request with the `tpmount` command. This section describes how to reserve a compression drive and allocate a compression node when using either unlabeled or labeled tapes.

---

### Selecting a compression drive in your mount request

In all modes (`block`, `char`, `label`, and `n1`) data compression can be selected by using any of the following `tpmount` options in your mount request:

- a *comp\_node* Is a compression node associated with one specific compression drive.
- d `comp` Reserves the next available compression drive.

In the following example, the `tc:0` drive is reserved because its compression node is specifically requested with the `-a` option:

```
% tpmount -a rtc0ni
```

In the next example, the first available DAT drive with compression is reserved because compression density is specified with the `-d` option, and the "dat" drive type is specified with the `-t` option:

```
% tpmount -d comp -t dat
```

---

## Setting labeled tape attributes for data compression

If you select a compression drive in your mount request and are using IBM-standard label utilities, you can use the following command to specify compression of tape files only:

```
% tpattr -c
```

File header labels will not be compressed when written to IBM-standard labeled tape as long as this attribute is set.

If you do not select the compression attribute before writing a file to an IBM-standard labeled tape, both the file header label and the file data are compressed.

If you do not select a compression drive in your mount request of an IBM-standard labeled tape and attempt to use the `tpattr -c` command, you receive an error message.

If you select a compression drive in your mount request and are using ANSI-standard label utilities, both your header labels and the tape files are written to the tape with compression. There is currently no ANSI standard governing compression of file header labels or files.

---

## Unmounting tapes

Unmount a tape with the `tpunmount` command. `tpunmount` unlinks the tape device you have allocated and frees the tape drive for other users.

You can also use the `tpunmount` command to cancel a queued request.

---

### Syntax and options for unmounting tapes

The `tpunmount` command has the syntax

```
tpunmount [option...]
```

where *option* is any of the options in Table 5.

**Table 5** `tpunmount` options

Option	Description
-k	Keep drive online. The tape device is unlinked and tape rewinds, but the tape remains physically mounted in the tape drive. This option is ignored if <code>opreq</code> queuing is enabled.
-s <i>link</i>	Specify the symbolic-link name of the tape you want to unmount, where <i>link</i> is the symbolic-link name. If the symbolic-link name does not match any allocated device, the error message, "no such request" is displayed, and the request is not fulfilled.

---

## Examples of unmounting tapes

This section describes and gives examples of how to unmount tapes when only one tape is mounted and when multiple tapes are mounted.

### Unmounting a tape when it is the only one mounted

Example 20 shows how to unmount a tape when you have only a single tape mounted:

- ① Mount an unlabeled tape.
- ② List the current working directory. In this example, a link to the tape device has been created using the default symbolic-link name, "TAPE."
- ③ Enter an unmount request. The symbolic-link name of the tape device is not needed if there is only a single tape device allocated. The `-k` option keeps the tape online after the tape device is unlinked.
- ④ List the current working directory again. The tape device has been unlinked, and the symbolic link has been deleted.

#### Example 20 Mounting and unmounting a single tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % ls -l
total 3
lrwxrwxrwx  1 sunny          10 Mar 23 14:17 TAPE@ -> /dev/rmt20
drwxr-xr-x  2 sunny          512 Mar 10  9:16 bin/
drwxr-xr-x  2 sunny          512 Mar 15 14:05 test/
③ % tpunmount -k
④ % ls -l
drwxr-xr-x  2 sunny          512 Mar 10  9:16 bin/
drwxr-xr-x  2 sunny          512 Mar 15 14:05 test/
% █
```

## Unmounting a tape when multiple tapes are mounted

Example 21 shows how to unmount a tape when you have more than one mounted:

- ① Mount two tapes. You must specify symbolic-link names for the tape devices to be used with the tapes.
- ② List the current working directory. Two links have been created for the tape devices.
- ③ Issue an unmount request. Indicate the tape to be unmounted by specifying the symbolic-link name of its tape device.
- ④ List the current working directory. Only one symbolic link remains.
- ⑤ Unmount your remaining tape. Because there is now only one tape mounted, you do not need to specify the symbolic-link name of the tape device.
- ⑥ List the current working directory. The remaining tape device is unlinked.

### Example 21 Mounting and unmounting multiple tapes

```
① % tpmount -a /dev/rmt20 -s tape1 -a /dev/rmt21 -s tape2
Tape device /dev/rmt20 allocated.
Tape device /dev/rmt21 allocated.
② % ls -l
total 4
lrwxrwxrwx 1 sunny          10 Mar 23 14:45 tape1@ -> /dev/rmt20
lrwxrwxrwx 1 sunny          10 Mar 23 14:17 tape2@ -> /dev/rmt21
drwxr-xr-x 2 sunny         512 Mar 10  9:16 bin/
drwxr-xr-x 2 sunny         512 Mar 15 14:05 test/
③ % tpunmount -s tape1
④ % ls -l
total 3
lrwxrwxrwx 1 sunny          10 Mar 23 14:17 tape2@ -> /dev/rmt21
drwxr-xr-x 2 sunny         512 Mar 10  9:16 bin/
drwxr-xr-x 2 sunny         512 Mar 15 14:05 test/
⑤ % tpunmount
⑥ % ls -l
total 2
drwxr-xr-x 2 sunny         512 Mar 10  9:16 bin/
drwxr-xr-x 2 sunny         512 Mar 15 14:05 test/
% █
```

---

## Queuing mount requests

The following sections describe how to queue mount requests with and without the assistance of a tape operator.

---

### Queuing a mount request with an operator

If `opreq` queuing is enabled, `tpmount` does not immediately mount the requested tape drive. Instead, the tape system notifies the tape operator, via the `opreq` utility, that a mount request has been made.

The tape system mounts the tape drive either when the operator notifies it to do so (for example, when the correct tape is on the tape drive), or when Automatic Volume Recognition (AVR) detects the presence of the tape specified in the `tpmount` request.

---

## Queuing a mount request without an operator

If your `tpmount` request cannot be executed because a requested tape drive is busy, you can queue your `tpmount` request by using the `-q` and `-B` options.

Queuing with the `-q` option is not the same as `opreq` queuing. Queuing with `-q` does not require `opreq` or operator intervention. If `opreq` is enabled, the `-q` flag has no effect.

Example 22 shows how to queue a mount request without using a tape operator:

- ① Submit the first mount request, specifying all the appropriate options for the tape you are mounting. Specify a symbolic-link name and appropriate VSNs.
- ② Submit another mount request:
  - Place the request in the background with the `-B` option.
  - Queue the request with the `-q` option.
  - Specify a symbolic-link name, which must be different from any others you have specified in any other active tape mounts, and appropriate VSNs.
- ③ Submit a third mount request:
  - Place the request in the background with the `-B` option.
  - Queue the request with the `-q` option.
  - Specify a symbolic-link name, which must be different from any others you have specified in any other active tape mounts, and appropriate VSNs.
- ④ Display the tape queue in long format.
- ⑤ Unmount the first tape that was mounted. The symbolic-link name for that tape device, which, in this case, is "tape1," must be specified.
- ⑥ Again, the tape queue is displayed. Note that the tape with the VSN of "A1" is gone, and "B1" is now mounted. "C1" remains queued.

**Example 22** Queuing a tpmount request

```

① % tpmount -m label -s tape1 A1,A2,A3
Tape test1 mounted. Device: /dev/rmt20
② % tpmount -m label -B -q -s tape2 B1,B2,B3
③ % tpmount -m label -B -q -s tape3 C1,C2,C3
④ % tpqueue -l
Drive  Tape Device    User Device  User    VSN     Symbolic Link
mt:0   /dev/rmt20  /dev/rmt20  sunny   A1      /mnt/sunny/tape1
                               sunny   B1      /mnt/sunny/tape2
                               sunny   C1      /mnt/sunny/tape3
⑤ % tpunmount -s tape1
⑥ % tpqueue -l
Drive  Tape Device    User Device  User    VSN     Symbolic Link
mt:0   /dev/rmt20  /dev/rmt20  sunny   B1      /mnt/sunny/tape2
                               sunny   C1      /mnt/sunny/tape3
% █

```

---

## Moving mount requests to the background and foreground

The following sections describe how to move a mount request to background execution and how to bring it to the foreground.

---

### Moving a mount request to the background

There are four ways to put a mount request in the background, as shown in Example 23:

- Use the `-B` and `-q` options in your mount request.
- Use `&` with your mount request.
- After entering your mount request, press **CTRL-c**.
- After entering your mount request, press **CTRL-z** and enter `bg`.

In Example 23, `tpunmount` is not needed to put `tpmount` requests into the background. The `tpunmount` command is included for completeness.

---

### Caution

---

If you run `tpmount` in the background by using `-B` or **CTRL-c**, you do not receive error messages that pertain to the mount request until you invoke `tpwait`.

- ① Use the `-B` and `-q` options in your mount request.
- ② End your mount request with `"&"`.
- ③ Press **CTRL-c** after entering your mount request. Move your mount request to the background with **CTRL-c** only if `opreq` is enabled on your system.
- ④ Press **CTRL-z** after entering your mount request to stop it and enter `bg` to put it in the background.

**Example 23** Putting a `tpmount` request in the background

```
① % tpmount -B -q
   % tpunmount -k
② % tpmount &
   [1]          11139
   Tape device /dev/rmt20 allocated.

   [1] + Done                                tpmount &
   % tpunmount -k
   % tpmount
③ ^C
   % tpunmount -k
   % tpmount
④ ^Z[1] + Stopped                            tpmount
   bg
   % █
```

---

## Moving a mount request to the foreground

After placing a mount request in the background, you may find it necessary to bring it to the foreground. You can do this with the `tpwait` command.

The `tpwait` command has the following syntax:

```
tpwait [-s link]
```

*link* is the name of the symbolic link you specified in your mount request. If you have more than one mount request, you must use the `-s` option.

Example 24 shows how to move a mount request to the foreground using the `tpwait` command:

- ① Enter a mount request, and place it in the background. If `opreq` queuing is not enabled, use the queuing option, `-q`, and the background option, `-B`, with your mount request to place it in the background.
- ② Enter a second mount request, and place it in the background. If `opreq` queuing is not enabled, use the queuing option, `-q`, and the background option, `-B`, with your mount request to place it in the background.
- ③ Examine the tape queue. Note that the second request is queued.
- ④ Bring the first mount request to the foreground. Use the `-s` option because more than one mount request has been issued.
- ⑤ When you enter `tpwait`, you suspend your shell until the mount is complete. When the mount completes, you receive a message to that effect, and your prompt returns.
- ⑥ Unmount the first tape.
- ⑦ Use `tpwait` to bring the second mount request to the foreground and see any system messages.
- ⑧ Inspect the tape queue again. Note that the remaining request has been fulfilled.

## Example 24 Bringing a tpmount request to the foreground

```
① % tpmount -B -q -s MYLINK1
② % tpmount -B -q -s MYLINK2
③ % tpqueue
Drive      Tape Device    User   VSN
mt:0      /dev/rmt20    sunny None
                sunny None
④ % tpwait -s MYLINK1
⑤ Tape mounted/Drive allocated. Device: /dev/rmt20
⑥ % tpunmount -s MYLINK1
⑦ % tpwait
Tape mounted/Drive allocated. Device: /dev/rmt20
⑧ % tpqueue
Drive      Tape Device    User   VSN
mt:0      /dev/rmt20    sunny None
% █
```



---

# Labeling, unlabeled, and relabeling tapes

# 4

The tape system supports ANSI-standard and IBM-standard tape labels. This chapter describes how to:

- Label a single tape with ANSI or IBM-standard labels
- Label a tape set with ANSI or IBM-standard labels
- Unlabel a tape or a tape set
- Relabel tapes

---

## Labeling tapes

Label a tape with the `tplabel` command. You can only create labels on tapes that are not already labeled. If you need to alter a label or relabel a tape, refer to the section, "Relabeling tapes," on page 74.

---

### Syntax and options for labeling tapes

The `tplabel` command has the syntax

```
tplabel options
```

where *options* are the options described in Table 6.

**Table 6** `tpunlabel` options

Option	Description
<code>-a</code>	Restrict tape access. Only the owner of the tape can read or write to it. For ANSI-standard labels only.
<code>-s link</code>	Specify the symbolic-link name for your tape device, where <i>link</i> is the name of the symbolic link to the tape device associated with the tape you want to label. You only need this if you have more than one tape mounted or are using a tape set.

---

### Labeling a tape with an ANSI-standard label

Example 25 shows how to label a tape with an ANSI-standard label:

- ① Mount an unlabeled tape; specify:
  - Labeled mode
  - A symbolic-link name to your device and a volume label. In this example the symbolic-link name is "tape1" and the VSN is "vol1."
- ② The system prompts you to label the tape.
- ③ Label the tape using the `tplabel` command. In this example, access is restricted, and a symbolic-link name, "tape1," is specified.
- ④ Show the new tape volume label. In this example:
  - The volume ID is "vol1."
  - The owner of the tape is "sunny."
  - Tape access is restricted to the owner ("sunny").

## Example 25 Labeling a tape with an ANSI-standard label

```
① % tpmount -m label -s tapel voll
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel -a -s tapel
④ % tplist -v
VolumeId:VOL1      Owner: SUNNY      Access: Restricted
% █
```

---

## Labeling a tape with an IBM-standard label

Example 26 shows how to label a tape with an IBM-standard label:

- ① Mount an unlabeled tape:
  - Specify labeled mode.
  - Invoke the `ibmdaemon` label daemon.
  - Specify a symbolic-link name and a VSN. In this example, the symbolic link is named “tapel” and the VSN is set to “voll.”
- ② The system prompts you to label the tape.
- ③ Label the tape using the `tplabel` command.
- ④ You can display volume-label information on the tape by using the `tplist -v` command. The output in this example shows:
  - A volume ID of “voll”
  - The owner’s name. (In this case it’s “sunny.”)

## Example 26 Labeling a tape with an IBM-standard label

```
① % tpmount -m label -l ibm -s tapel voll
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel
④ % tplist -v
VolumeId:VOL1      Owner: SUNNY
% █
```

---

## Labeling a tape set with ANSI-standard labels

Example 27 shows how to mount and label a tape set with ANSI-standard labels:

- ① Mount an unlabeled tape; specify:
  - Labeled mode.
  - A symbolic-link name (in this example, “tape1”)
  - All the VSNs in the tape set, even if the set has not been labeled yet.
- ② The system prompts you to label the tape set.
- ③ Label the tape using the `tplabel` command. In this example access is limited to read-only, except for the owner and root.
- ④ If your tape system does not use a tape operator, you are prompted to place each volume on the tape drive.
- ⑤ You can display volume-label information on the tape by using the `tplist -v` command. The output in this example shows:
  - Volume ID of “vol1”
  - The owner’s name (In this case, “sunny”)
  - Restricted tape access

### Example 27 Labeling a tape set with ANSI-standard labels

```
① % tpmount -m label -s tape1 vol1,vol2,vol3
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel -a
④ Please replace tape vol1 with tape vol2 and press RETURN
Please replace tape vol2 with tape vol3 and press RETURN
Please replace tape vol3 with tape vol1
⑤ % tplist -v
VolumeId:VOL1 Owner: SUNNY Access: Restricted
% █
```

---

## Labeling a tape set with IBM-standard labels

Example 28 shows how to label a tape set with IBM-standard labels:

- ① Mount a tape using the `tpmount` command:
  - Specify labeled mode
  - Invoke `ibmdaemon`
  - Specify a symbolic-link name of “tape1”
  - Specify all the VSNs that are to be in the tape set
- ② The system prompts you to label your tape.
- ③ Label the tape using the `tplabel` command.
- ④ If your tape system does not use a tape operator, you are prompted to place each volume on the tape drive.
- ⑤ Show only volume-label information:
  - Volume ID of “vol1”
  - The owner’s name. (In this case it’s “sunny.”)

### Example 28 Labeling a tape set with IBM-standard labels

```
① % tpmount -m label -l ibm -s tape1 vol1,vol2,vol3
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel
④ Please replace tape vol1 with tape vol2 and press RETURN
Please replace tape vol2 with tape vol3 and press RETURN
Please replace tape vol3 with tape vol1
⑤ % tplist -v
VolumeId:VOL1      Owner: SUNNY
% █
```

---

## Unlabeling tapes

Remove tape labels with the `tpunlabel` command. You can only remove a tape label as root or if you are the owner of the tape.

---

### Caution

---

`tpunlabel` makes all files on a tape inaccessible. If you want to unlabel a tape, but need to save the files, refer to the section, "Relabeling tapes while saving their contents," on page 75.

---

### Syntax for unlabeling a tape or tape set

The syntax of `tpunlabel` is

```
tpunlabel [-s link]
```

where

`-s link` Specifies the symbolic link to the tape device, and, consequently, the tape you want to unlabel, where *link* is the same symbolic-link name that you used when you first mounted the tape.

You only need to use the `-s` option if you have more than one tape mounted.

---

### Examples of unlabeling tapes

This section describes how to unlabel both a single-volume tape and the volumes in a tape set.

#### Unlabeling a single-volume tape

Example 29 shows how to unlabel a tape that is not part of a labeled-tape set:

- ① Mount a labeled tape in labeled mode using the `tpmount` command.
- ② The system responds that the tape is mounted and displays the tape device you are using.

---

### Caution

---

After you remove a tape label, you can no longer access any files or other information remaining on the tape.

- ③ Remove the tape label by using the `tpunlabel` command.

## Example 29 Removing a tape label

```
① % tpmount -m label -s tapel vol1
② Tape vol1 mounted. Device: /dev/rmt20
③ % tpunlabel
% █
```

### Unlabeling a tape set

Example 30 shows how to unlabel a tape set:

- ① Mount a labeled tape with the `tpmount` command:
  - Specify labeled mode. The appropriate label daemon is invoked automatically.
  - Specify a symbolic-link name.
  - Specify all the VSNs in the tape set.
- ② The system responds that the tape is mounted and displays the device you are using.

---

### Caution

---

**After you remove a tape label, you can no longer access any files or other information remaining on the tape.**

- ③ Remove the tape labels by using the `tpunlabel` command. If you are using a system with more than one tape drive, you must specify the symbolic-link name that was specified in your mount request (step ①).
- ④ If your system does not use a tape operator, you are prompted to place each successive tape in the set on the tape drive.

## Example 30 Unlabeling a tape set

```
① % tpmount -m label -s tapel vol1,vol2,vol3
② Tape vol1 mounted. Device: /dev/rmt20
③ % tpunlabel
Please replace tape vol 1 with tape vol2
Please replace tape vol 2 with tape vol3
% █
```

---

## Relabeling tapes

There are two methods of relabeling tapes depending on whether or not you need the data on the tape you wish to relabel.

---

### Relabeling tapes without saving their contents

Example 31 shows how to relabel a tape without saving the tape's contents:

- ① Mount the tape in labeled mode. (If you are using tapes labeled with IBM-standard labels, `ibmdaemon` automatically starts.)
- ② Look at the contents of the label to ensure you have mounted the correct tape and to view the current label.

---

### Caution

---

**After you remove a tape label, you can no longer access any files or other information remaining on the tape.**

- ③ Remove the existing label. If you are not listed as the owner of the label, you cannot remove it. In this case you should contact your system manager to remove the label as root. If you have root privileges, you can remove the label yourself as root.
- ④ Create a new label on the tape. In this case, the `-a` option changes access from unrestricted to restricted. (The `-a` option is for use with ANSI-standard labels only.)
- ⑤ Inspect the new label.

### Example 31 Relabeling a tape without saving its contents

```
① % tpmount -m label -s tape1 voll
Tape voll mounted. Device: /dev/rmt20
② % tplist -v
VolumeID:VOL1          Owner: SUNNY          Access: Unrestricted
③ % tpunlabel
④ % tplabel -a
⑤ % tplist -v
VolumeID:VOL1          Owner: SUNNY          Access: Restricted
% █
```

---

## Relabeling tapes while saving their contents

There are two different methods of relabeling a tape while saving its contents. The two methods are for systems with:

- One tape drive, which involves copying the files you want to save to your disk
- Multiple tape drives, which involves copying the files you want to save directly to a relabeled tape

Because relabeling a tape involves removing the tape label, which makes the contents of the tape inaccessible, both of the methods listed below require copying the contents of the tape to another location.

The examples in the following sections describe both of these methods, step-by-step.

## Relabeling tapes while saving files on systems with one tape drive

Example 32 shows how to relabel a tape, which contains files you want to save, on a system with only one tape drive available:

- ① Mount the tape in labeled mode, specify a symbolic-link name and the appropriate VSNs. If you are using a labeled-tape set, you must specify all of the VSNs defined in the set.
- ② Look at the contents of the label to ensure it is the correct tape, and the label needs to be altered. Also, inspect the file labels to see what files, if not all, you want to save.
- ③ Set your tape attributes for use with `cp` or `cat`:
  - Set the buffer size to the same as the buffer size for `cp` or `cat`.
  - Set the record format to unformatted.
- ④ Position the tape so that you are at the first file you want to save. In this example, the first file is saved.
- ⑤ Copy the file you have selected to disk or another tape. (In this case, the file is copied to disk.) If you are dealing with large files, be certain you have enough disk space or tape to copy the file.
- ⑥ Move to the next file you want to save. (In this case, the third file on the tape is copied.)
- ⑦ Copy that file to your secondary storage media (disk or tape).
- ⑧ Check to ensure that your files were properly saved to your secondary storage.
- ⑨ After you have the files you want to save, remove the label.
- ⑩ Relabel the tape. In this case access restrictions are enabled (for ANSI-standard labels only).

### Example 32 Relabeling a tape while saving files on a system with one tape drive

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist
VolumeID:VOL1 Owner: SUNNY Access: Unrestricted Standard: 3
SecNum: 0001 FileId: FILE1 Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: FILE2 Created: Feb 28, 1991 Access: RW
SecNum: 0003 FileId: FILE3 Created: Feb 28, 1991 Access: RW
③ % tpattr -b 64000 -f U
④ % mt rew
⑤ % cp tapel /tmp/tape/file1
⑥ % mt fsf 1
⑦ % cat TAPE > /tmp/tape/file2
⑧ % cat /tmp/tape/file1
Fuzzy-wuzzy was a bear,
Fuzzy-wuzzy had no hair.
⑧ % cat /tmp/tape/file2
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
⑨ % tpunlabel
⑩ % tplabel -a
% █
```

This example is continued on the next page.

## Relabeling tapes while saving files on systems with one tape drive (continued)

- ① Inspect your label.
- ② Set tape attributes for the first file. (You only need to set the new file name because blocksize and record format were set earlier.)
- ③ Copy the first file from secondary storage back to your tape.
- ④ Inspect the file label to ensure that the file is on the tape.
- ⑤ Set tape attributes for the next file.
- ⑥ Copy the next file from secondary storage back to the tape.
- ⑦ Inspect the file labels. The `tplist -f` command displays a listing of file labels.
- ⑧ Rewind your tape if you wish to view the files.
- ⑨ View the files in succession with the `cat` command.
- ⑩ Once you have verified the files on the tape, remove the temporary versions from secondary storage.

Example 32 (continued) Relabeling a tape while saving files on a system with one tape drive

```
① % tplist -v
VolumeID:      Owner: SUNNY           Access: Restricted
② % tpattr -i fuzzy
③ % cp /tmp/tape/file1 tape1
④ % tplist -f
SecNum: 0001  FileId: FUZZY           Created: Mar  1, 1991  Access: R-
⑤ % tpattr -i history
⑥ % cat /tmp/tape/file2 > tape1
⑦ % tplist -f
SecNum: 0001  FileId: FUZZY           Created: Mar  1, 1991  Access: R-
SecNum: 0002  FileId: HISTORY          Created: Mar  1, 1991  Access: RW
⑧ % mt rew
⑨ % cat tape1
Fuzzy-wuzzy was a bear,
Fuzzy-wuzzy had no hair.
⑩ % cat tape1
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
⑪ % rm /tmp/tape/file1 /tmp/tape/file2
% █
```

## Relabeling tapes while saving files on systems with multiple tape drives

Example 33 shows how to relabel a tape, which contains files that you want to save, on a system with multiple tape drives available:

- ① Mount the tape from which you want to copy, "old," and a tape, "new," which will contain a new label and the files you want to save. Specify:
  - The tape device you want to use
  - Labeled mode
  - Symbolic-link name and VSNs
- ② Create a label on your "new" tape:
  - Change access permissions to "restricted."
  - Because two tapes are mounted, you need to specify the symbolic-link name of "new."
- ③ Look at the file labels on the "old" tape:
  - Because two tapes have been mounted simultaneously, specify the tape's symbolic-link name "old."
  - Look only at the file labels.
- ④ Position the tape so that you are at the first file you want to save. In this example the first file is saved:
  - Specify symbolic-link name "old."
  - Specify action, which is rewind. (Rewind is needed because `tplist`, used in step ③, advances the tape to EOT.)
- ⑤ Set tape attributes of the first file of "new" tape for `cp` or `cat`:
  - Specify the file name.
  - Set read and write permissions for the file (for ANSI-labeled tapes only).
  - Set the buffer size to the same as the buffer size for `cp` or `cat`.
  - Set record format to unformatted.
  - Specify symbolic-link name of your tape device.
- ⑥ Copy the file from the old tape to the new tape.
- ⑦ Position the "old" tape so that you are at the next file you want to save. In this example the third file is saved:
  - Specify symbolic-link name "old."
  - Specify action. (In this case, it's `fsf 1`, or forward-space-file 1, which skips past "file2" and positions the tape at "file3.")

### Example 33 Relabeling a tape while saving files on a system with multiple tape drives

```
① % tpmount -a /dev/rmt20 -m label -s old vol1
Tape vol1 mounted. Device: /dev/lt/u1
① % tpmount -a /dev/rmt21 -m label -s new vol2
tpmount: Warning:tape is not labeled;use tplabel to label tape
② % tplabel -a -s new
③ % tplist -s old -f
SecNum: 0001 FileId: FUZZY Created: Feb 10, 1991 Access: RW
SecNum: 0002 FileId: NOTES Created: Feb 10, 1991 Access: RW
SecNum: 0003 FileId: HSTRY Created: Feb 12, 1991 Access: RW
④ % mt -f old rew
⑤ % tpatrr -i fuzzy -a rw -b 64000 -f U -s new
⑥ % cp old new
⑦ % mt -f old fsf 1
```

This example is continued on the next page.

## Relabeling tapes while saving files on systems with multiple tape drives (continued)

- ① Set tape attributes of the next file of "new" tape for `cp` or `cat`. There is no need to set any more tape attributes except for the file name, "hstry."
- ② Copy the file from "old" to "new."
- ③ List all the labels on the "new" tape.
- ④ Unmount your "old" tape.
- ⑤ Rewind your "new" tape:
  - If this is the only tape mounted, you do not need to specify the symbolic-link name.
  - You must rewind the tape because the `tplist` command advances the tape to EOT.
- ⑥ View your first file on the tape with the `cat` command. This positions the tape at the end of the first file.
- ⑦ View your next file on the tape with the `cat` command.
- ⑧ After you are certain you have all the files you want on the tape, unmount the tape. Note that because this is the only tape mounted, there is no need to specify the symbolic-link name.)

**Example 33 (continued)** Relabeling a tape while saving files on a system with multiple tape drives

```
① % tpattr -s new -i hstry
② % cp old new
③ % tplist -s new
VolumeId:VOL2   Owner:SUNNY   Access: Restricted   Standard: 3
SecNum: 0001   FileId: FUZZY   Created: Mar  3, 1991   Access: RW
SecNum: 0002   FileId: HSTRY   Created: Mar  3, 1991   Access: RW
④ % tpunmount -s old
⑤ % mt rew
⑥ % cat new
Fuzzy-wuzzy was a bear,
Fuzzy-wuzzy had no hair.
⑦ % cat new
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
⑧ % tpunmount
% █
```



---

# Setting labeled-tape attributes

# 5

This chapter contains information on setting attributes for writing to and reading from labeled-tape. Labeled-tape attributes are:

- Access permissions (ANSI-labeled tapes only)
- Block size
- Compression of data
- Expiration date
- File identifier
- Header and trailer information
- Record format
- Record size
- Types of logical record delimiter

These can all be altered using the `tpattr` command with the appropriate options.

## Syntax and options for setting labeled-tape attributes

Set labeled-tape attributes before writing files to or reading files from tape with the `tpattr` command. `tpattr` has the syntax `tpattr options` where *options* are any of the options described in Table 7.

Table 7 `tpattr` options

Option	Description
<code>-a access</code>	<p>Set file accessibility for users other than the tape owner, where <i>access</i> is any of the following:</p> <ul style="list-style-type: none"> <li><code>r</code> Other users have only read privileges.</li> <li><code>w</code> Other users have only write privileges.</li> <li><code>rw</code> Other users have both read and write privileges.</li> <li><code>""</code> Other users have no access privileges to the file.</li> </ul> <p>The default access permission is read-only. This option is only for ANSI-labeled tapes.</p>
<code>-b blocksize</code>	<p>Define physical block size for the file, where <i>blocksize</i> is the block size in bytes. The default block size is 2048 bytes.</p> <p>Data compression is not available for block sizes greater than 120 kbytes on the 3480 stacker-loader cartridge drives (rack mounted).</p>
<code>-c</code>	<p>Compress data.</p> <p>If you are using an ANSI labeled tape, both file header and file data are compressed.</p> <p>If you are using an IBM labeled tape, only file data is compressed. The header is not compressed.</p> <p>For more information on using data compression, refer to Chapter 1.</p>
<code>-d delimiter</code>	<p>Define record delimiter. <i>delimiter</i> can be one of the following:</p> <ul style="list-style-type: none"> <li><code>blocknl</code> Blocked newline</li> <li><code>newline</code> Newline character</li> <li><code>syscall</code> System call</li> </ul> <p>The default record delimiter is "blocked newline."</p>

**Table 7** `tpattr` options (continued)

Option	Description
-e <i>dd-mm-[yy]yy</i>	Set expiration date for the file, where <i>dd</i> is the day, <i>mm</i> is the month, and <i>[yy]yy</i> is the year. For example, March 1st, 1992 can be written:  01-03-92 or 01-03-1992
-f <i>format</i>	Specify record format. <i>format</i> can be one of the following:  F Fixed length  D Variable length (decimal-based, for ANSI-standard labels only)  U Unformatted  V Variable length (binary-based, for IBM-standard labels only)  VBS Variable blocked and spanned (for IBM-standard labels only)  The default record format is "fixed."
-h <i>header</i>	Write header information, where <i>header</i> is a string as long as 76 characters. If the string has any blanks in it, it must be enclosed in quotes. For example:  % <code>tpattr -h "This is a header."</code>
-i <i>identifier</i>	Specify an identifier for the file. <i>identifier</i> can be no longer than 17 characters. Alphabetic characters are stored and read in uppercase, even if they entered in lowercase.
-r <i>record_size</i>	Specify record size, <i>record_size</i> , in bytes. The default record size is 128 bytes.
-s <i>link</i>	Specify name of the symbolic link that points to the tape device, where <i>link</i> , is the symbolic-link name. This option is only needed when you have more than one tape mounted.
-t <i>trailer</i>	Write trailer information, where <i>trailer</i> is a string as long as 76 characters. If the string has any blanks in it, it must be enclosed in quotes, such as:  % <code>tpattr -t "This is a trailer."</code>

---

## Examples of setting labeled-tape

This section describes and gives examples of how to set labeled-tape attributes for copying and archiving files to tape, and copying and extracting files from tape.

---

### Setting labeled-tape attributes for copying files

Example 34 shows how to set labeled-tape attributes for copying a file to a labeled tape:

- ① Mount a tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name and the VSNs with the `-s` option. In this example, the symbolic-link is named “tape1,” and the VSN is “vol1.”
- ② Set your labeled-tape attributes for use with `cp` or `cat` with the `tpattr` command. In this example:
  - The file on the tape is named “test” with the `-i` option.
  - The block size is set for use with the `cp` and `cat` commands with the `-b` option.
  - The record format is set to unformatted with the `-f U` option.
- ③ Copy the file to tape with the `cp` or `cat` command. In this example the `cp` command is used.

#### Example 34 Setting labeled-tape attributes for `cp` and `cat` operations

```
① % tpmount -m label -s tape1 vol1
Tape vol1 mounted. Device: /dev/rmt20
② % tpattr -i hstry -b 64000 -f U
③ % cp hstry tape1
% █
```

---

## Setting labeled-tape attributes for tar

Example 35 shows how to set labeled-tape attributes for creating an archive with `tar`:

- ① Mount a tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name and the VSNs with the `-s` option. In this example, the symbolic-link is named “tape1,” and the VSN is “vol1.”
- ② Set labeled-tape attributes for use with `tar`. In this example:
  - The archive is named “test” with the `-i` option.
  - The block size is set to 8192 bytes for use for the `tar` command with the `-b` option.
  - The record format is set to unformatted with the `-f U` option.
- ③ Archive with the `tar` command. In this example:
  - Verbose mode is set with the `v` option.
  - Blocking factor is set to 16 with the `b` option. This matches the block size set with the `tpattr` command in step ②.
  - The names of the directories or files are last on the command line. In this example all the files in the directory “test” are archived.

### Example 35 Setting labeled-tape attributes for use with `tar` operations

```
① % tpmount -m label -s tape1 vol1
Tape vol1 mounted. Device: /dev/rmt20
② % tpattr -i test -b 8192 -f U
③ % tar -cvb 16 test
a test/fuzzy 2 Blocks
a test/hstry 10 Blocks
a test/notes 1 Blocks
% █
```

---

## Setting labeled-tape attributes for `cpio`

Example 36 shows how to set labeled-tape attributes for creating an archive using the `cpio` command:

- ① Mount a tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name and the VSNs with the `-s` option. In this example, the symbolic-link is named “tape1,” and the VSN is “vol1.”
- ② Set your labeled-tape attributes for the `cpio` command with the `tpattr` command. In this example:
  - The archive is named “test” with the `-i` option.
  - The record format is set to unformatted with the `-f U` option.
- ③ Archive the directories or files you want by using the `ls` command in conjunction with the `cpio` command. In this example:
  - Files and directories are listed with the `ls` command.
  - The names of the files and directories are piped into the `cpio` command.
  - Verbose mode is set with the `v` option, and set blocking factor is set with the `B` option.
  - The output is directed to the symbolic link to the tape device. Be sure to use the complete path name to the symbolic link.

### Example 36 Setting labeled-tape attributes for use with `cpio` operations

```
① % tpmount -m label -s tape1 vol1
Tape vol1 mounted. Device: /dev/rmt20
② % tpattr -i test -f U
③ % ls test | cpio -ovB > /mnt/sunny/tape1
fuzzy
hstry
notes
12 Blocks
% █
```

## 6

---

# Using tape sets

The tape system supports unlabeled, as well as ANSI-standard and IBM-standard labeled, tape sets. These tape sets each consist of multiple volumes and contain information that cannot be contained on a single tape.

This chapter describes:

- Using labeled-tape sets:
  - Mounting a labeled-tape set using ANSI-standard labels
  - Labeling a tape set with ANSI-standard labels
  - Mounting a labeled-tape set using IBM-standard labels
  - Labeling a tape set with IBM-standard labels
  - Unlabeling a tape set
- Using an unlabeled-tape set as if all the volumes are in one tape (sequential access of volumes)
- Using an unlabeled-tape set while keeping each volume distinct (random access of volumes):
  - Mounting an unlabeled-tape set while keeping each volume distinct
  - Switching volumes of an unlabeled-tape set that has distinct volumes

---

## Using labeled-tape sets

The tape system supports the labeling of tape sets using two different standards, ANSI and IBM. This section describes:

- Mounting an ANSI-labeled tape set
- Labeling a tape set with ANSI-standard labels
- Mounting an IBM-labeled tape set
- Labeling a tape set with IBM-standard labels

---

### Using an ANSI-labeled tape set

This section describes how to mount and label an ANSI-standard labeled-tape set.

#### Mounting an ANSI-labeled tape set

When mounting a tape set, all of the volumes in the tape set must be specified in the mount request.

When creating a labeled-tape set, all the volumes in the set must be listed in your mount request, and then mounted and labeled in order.

Example 37 shows how to enter the `tpmount` command in order to mount an ANSI-labeled tape set:

- ① Specify labeled mode, even if the tape is not yet labeled.
- ② Specify a symbolic-link name.
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

#### Example 37 Mounting an ANSI-labeled tape set

```
      ①      ②      ③  
% tpmount -m label -s tapel test1,test2,test3  
Tape test1 mounted. Device: /dev/lt/u0  
% █
```

## Labeling a tape set with ANSI-standard labels

Example 38 shows how to mount and label a tape set with ANSI-standard labels:

- ① Mount the tape set with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name with the `-s` option. In this example, the symbolic link is named “`tape1`.”
  - Specify all the VSNs that are to be in the tape set.
- ② The system prompts you to label your tape.
- ③ Label the tape with the `tplabel` command. In this example access is limited to read-only (except for the owner and root) with the `-a` option.
- ④ If your tape system does not use a tape operator, you are prompted to place each volume on the tape drive.

### Example 38 Labeling a tape set with ANSI-standard labels

```

① % tpmount -m label -s tape1 vol1,vol2,vol3
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel -a
④ Please replace tape vol1      with tape vol2 and press RETURN
   Please replace tape vol2      with tape vol3 and press RETURN
   Please replace tape vol3      with tape vol1
   % █

```

---

## Using an IBM-labeled tape set

### Mounting an IBM-labeled tape set

When mounting tape set, all of the volumes must be specified in the mount request.

When creating a labeled tape set, all the volumes must be listed in your mount request, and then mounted and labeled in order.

Example 39 shows how to enter the `tpmount` command in order to mount an IBM-labeled tape set:

- ① Specify labeled mode with the `-m label` option, even if the tapes are not yet labeled.
- ② Invoke the `ibmdaemon` label daemon with the `-l ibm` option.
- ③ Specify a symbolic-link name with the `-s` option.
- ④ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set.

#### Example 39 Mounting an IBM-labeled tape set

```
      ①      ②      ③      ④  
% tpmount -m label -l ibm -s tapel test1,test2,test3  
Tape test1 mounted. Device: /dev/lt/u0  
% █
```

## Labeling a tape set with IBM-standard labels

Example 40 shows how to label a tape set with IBM-standard labels:

- ① Mount the tape set with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Invoke `ibmdaemon` with the `-l ibm` option.
  - Specify a symbolic-link name with the `-s` option. In this example the symbolic link is named “`tape1`.”
  - Specify all the VSNs that are to be in the tape set.
- ② The system prompts you to label your tape.
- ③ Label the tape set with the `tplabel` command.
- ④ If your tape system does not use a tape operator, you are prompted to place each volume on the tape drive.

### Example 40 Labeling a tape set with IBM-standard labels

```
① % tpmount -m label -l ibm -s tape1 vol1,vol2,vol3
② tpmount: Warning:tape is not labeled;use tplabel to label tape
③ % tplabel
④ Please replace tape vol1      with tape vol2 and press RETURN
   Please replace tape vol2      with tape vol3and press RETURN
   Please replace tape vol3      with tape vol1
   % █
```

---

## Unlabeling a tape set

Example 41 shows how to unlabel a tape set:

- ① Mount a tape set with the `tpmount` command:
  - Specify labeled mode with the `-m label` option. The appropriate label daemon is invoked automatically.
  - Specify a symbolic-link name with the `-s` option.
  - Specify all the VSNs in the tape set.
- ② The system responds that the tape is mounted and displays the device you are using.

---

### Caution

---

**After you unlabel a tape set, you can no longer access any files or other information remaining on the set.**

- ③ Remove the tape labels with the `tpunlabel` command. If you are using a system with more than one tape drive, you must specify the symbolic-link name that you specified in the mount request (step ①).
- ④ If your system does not use a tape operator, you are prompted to place each successive tape in the set on the tape drive.

### Example 41 Unlabeling a tape set

```
① % tpmount -m label -s tapel vol1,vol2,vol3
② Tape vol1 mounted. Device: /dev/rmt20
③ % tpunlabel
④ Please replace tape vol1      with tape vol2
   Please replace tape vol2      with tape vol3
   %
```

## Using unlabeled-tape sets

There are two ways to use mount unlabeled-tape sets, depending on whether their volumes are to be accessed sequentially or randomly.

This section describes:

- How to mount an unlabeled-tape set:
  - So that all the volumes in the set appear to be combined to form one long tape. (Tape set volumes must be accessed sequentially.)
  - So that all the volumes in the set are kept distinct. (Volumes can be randomly accessed.)
- How to randomly access volumes in a tape set, if the tape set is mounted so that the volumes are kept distinct

---

### Mounting an unlabeled-tape set for sequential access

Example 42 shows how to mount an unlabeled-tape set for sequential access of its volumes with the `tpmount` command:

- ① Specify unlabeled mode with the `-m n1` option.
- ② Specify a symbolic-link name with the `-s` option. In this example, “tape1” is specified.
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set. In this example, the VSNs are “test1,” “test2,” and “test3.”

#### Example 42 Mounting an unlabeled-tape set for sequential access

```
      ①      ②      ③
% tpmount -m n1 -s tape1 test1,test2,test3
Tape test1 mounted. Device: /dev/rmt20
% █
```

---

## Using an unlabeled-tape set through random access

This section describes:

- How to mount an unlabeled-tape set in order to randomly access its volumes
- How to switch from one tape volume to another by using the `tpswitchvol` command.

### Mounting an unlabeled-tape set for random access

Example 43 shows how to mount an unlabeled-tape set for random access of its volumes with the `tpmount` command:

- ① Specify character mode with the `-m char` option.
- ② Specify a symbolic-link name with the `-s` option. In this example the symbolic-link has been named "tape1."
- ③ Specify all the VSNs in the tape set. If you are creating a tape set, you must specify all the VSNs that are to be in the set. In this example the VSNs are "test1," "test2," and "test3".

#### Example 43 Mounting an unlabeled-tape set for random access

```
    ①      ②      ③
% tpmount -m char -s tape1 test1,test2,test3
Tape test1 mounted. Device: /dev/rmt20
% █
```

### Switching volumes of an unlabeled-tape set

Once you have an unlabeled-tape set mounted, you can mount any volume in the tape set by using the `tpswitchvol` command.

The `tpswitchvol` command can only be used with unlabeled-tape sets mounted for random access of its volumes.

The syntax of `tpswitchvol` is:

```
tpswitchvol [-s link] [[-v VSN] | -relative | -absolute]
```

Each of the options to the `tpswitchvol` command is described in Table 8.

**Table 8** `tpswitchvol` options

Option	Description
<code>-s link</code>	Specifies the symbolic-link name associated with the tape device. <i>link</i> is the same symbolic-link name that you used when you first mounted the tape set.
<code>-v VSN</code>	Specifies the volume serial number (VSN) associated with a tape set volume to be switched to. <i>VSN</i> is the VSN specified when the tape set was first mounted. You cannot use this option with either the <code>-relative</code> or <code>-absolute</code> options.
<code>-relative</code>	Specifies the relative position of a volume to switch to. <i>relative</i> can be only <i>one</i> of the following: <ul style="list-style-type: none"> <li><code>first</code>            The first volume as listed in the tape set</li> <li><code>next</code>             The tape after the current volume as listed in the tape set. This is the default.</li> <li><code>previous</code>        The tape previous to the current volume as listed in the tape set.</li> </ul> You cannot use this option with either the <code>-v</code> or <code>-absolute</code> options.
<code>-absolute</code>	Indicates the absolute position of the VSN associated with the volume to switch to. <i>absolute</i> is a number associated with the position of a VSN, sequentially numbered starting with 1, which is associated with the first VSN, to <i>n</i> , which is associated with the <i>n</i> th VSN. You cannot use this option with either the <code>-v</code> or <code>-relative</code> options.

## Examples of switching volumes of an unlabeled-tape set

The `tpswitchvol` command can only be used with unlabeled-tape sets that are mounted for random access (mounted in character mode).

Example 44 shows how to mount an unlabeled-tape set and switch to various volumes in the set:

- ① Mount the unlabeled-tape set with the `tpmount` command:
  - Specify character mode with the `-m char` option.
  - Specify a symbolic-link name with the `-s` option. In this example it is “tape1.”
  - Specify all the volumes in the tape set. In this example, “vol1” through “vol4” are specified.
- ② The system responds that the first volume is mounted and displays the tape device you are using.
- ③ Switch to the next volume in the tape set, which is “vol2” in this example.
- ④ Switch to the fourth volume in the tape set, which is “vol4” in this example (*-absolute*).
- ⑤ Switch to the specified volume in the tape set, which is “vol3” in this example (*-v VSN*).
- ⑥ Switch to the next volume in the tape set, which is “vol4” in this example (*-relative*).
- ⑦ Switch to the previous volume in the tape set, which is “vol3” in this example (*-relative*).
- ⑧ Switch back to the first volume in the tape set, which is “vol1” in this example (*-relative*).

**Example 44** Switching volumes while using an unlabeled-tape set

```
① % tpmount -m char -s tapel vol1,vol2,vol3,vol4
② Tape vol1 mounted. Device: /dev/rmt20
③ % tpswitchvol
Tape vol2 mounted.
④ % tpswitchvol -4
Tape vol4 mounted.
⑤ % tpswitchvol -v vol3
Tape vol3 mounted.
⑥ % tpswitchvol -next
Tape vol4 mounted.
⑦ % tpswitchvol -previous
Tape vol3 mounted.
⑧ % tpswitchvol -first
Tape vol1 mounted.
% █
```



This chapter describes how to manipulate tapes using `mt` commands. With `mt` commands you can:

- Report tape status
- Rewind the tape
- Space forward through a tape by file
- Space forward through a tape by record
- Take a tape off-line

## Syntax and options for manipulating tape

You execute `mt` commands using the syntax

```
mt [-f link] command
```

where *link* is the symbolic link to the tape device associated with the tape you want to manipulate (when more than one tape is mounted), and *command* is any one of the commands in Table 9.

The effects of some `mt` commands differ depending on whether the tape is labeled. Table 9 lists some `mt` commands, along with their effects on both labeled and unlabeled tapes.

`mt` commands only function on tapes mounted in character or labeled mode. They do not function on tapes mounted in block mode.

**Table 9** Unlabeled and labeled mode descriptions of `mt` commands

<b>mt command</b>	<b>Unlabeled-mode description</b>	<b>Labeled-mode description</b>
<code>fsf n</code>	Forward space <i>n</i> number of files.	Forward space <i>n</i> number of files.
<code>fsr n</code>	Forward space <i>n</i> number of blocks.	Forward space <i>n</i> number of records.
<code>rew</code>	Rewind the tape.	Rewind the tape.
<code>off-line</code>	Take the tape off-line.	Invalid. Use the <code>tpunmount</code> command.
<code>status</code>	Report tape status.	Report tape status.

## Moving from file to file on a tape

There are two different ways to move from file to file on tape, depending on whether your tape is labeled. Following are examples of how to move around on both unlabeled and labeled tapes.

### Moving from file to file on an unlabeled tape

Example 45 shows how to manipulate unlabeled tape:

- ① A tape is mounted in unlabeled mode with the `tpmount` command.
- ② Files are viewed on the tape by entering successive `cat` commands. In this example, three files are viewed.
- ③ The tape is rewound so the tape head is at the first file.
- ④ The first file is displayed with the `cat` command.
- ⑤ The tape is moved forward so the tape head is at the third file.
- ⑥ The third file is displayed with the `cat` command

#### Example 45 Moving from file to file on an unlabeled tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % cat TAPE
This is the contents of the first file.
% cat TAPE
This is the contents of the second file.
% cat TAPE
This is the contents of the third file.
③ % mt rew
④ % cat TAPE
This is the contents of the first file.
⑤ % mt fsf 1
⑥ % cat TAPE
This is the contents of the third file.
% █
```

---

## Moving from file to file on a labeled tape

Example 46 shows how to manipulate a labeled tape:

- ① A tape is mounted with the `tpmount` command, in labeled mode, specifying symbolic-link name and the appropriate VSN or VSNs.
- ② Tape labels are displayed using the `tplist` command.
- ③ Labeled-tape attributes for the `cat` command are set with the `tpattr` command.
- ④ The tape is rewound with the `mt rewind` command. In this example the symbolic-link name "tapel" is specified.
- ⑤ The contents of the first file are viewed with the `cat` command.
- ⑥ The tape is moved forward with the `mt fsf` command so that the tape head is positioned at the third file.
- ⑦ The contents of the third file are viewed with the `cat` command.

### Example 46 Moving from file to file on a labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/lt/u1
② % tplist
VolumeID:      Owner: SUNNY      Access: Unrestricted
SecNum: 0001  FileId: FILE1     Created: Oct 15, 1991  Access: R-
SecNum: 0002  FileId: FILE2     Created: Oct 18, 1991  Access: RW
SecNum: 0003  FileId: FILE3     Created: Oct 18, 1991  Access: RW
③ % tpattr -b 64000 -f U
④ % mt -f tapel rew
⑤ % cat tapel
This is the contents of the first file.
⑥ % mt -f tapel fsf 1
⑦ % cat tapel
This is the contents of the third file.
% █
```

---

# Copying files to and from tape

# 8

You can copy files to and from tape using either the `cp` or `cat` commands. There are a few preliminary steps you need to take before using these commands with tape. These steps are described in this chapter:

- Mounting your tape
- Setting tape file attributes for use with `cp` or `cat`
- Listing files that are on the tape
- Positioning the tape in order to select files you want to copy
- Copying files to tape
- Copying files from tape
- Copying files from one tape to another

---

## Copying files to tape

Copy files to tape using the `cp` (copy) or `cat` (catenate and print) command. The following sections describe the syntaxes of the `cp` and `cat` commands, and how to use them with tape.

If you are accustomed to using `cp`, you will find there are some restrictions when using it with tape.

---

### **cp** syntax for copying files to tape

The `cp` command has this syntax when copying a file to tape:

```
cp filename link
```

where

*filename* is the name of the file you want to copy to tape.

*link* is the symbolic-link name you are using with your tape device. If you do not specify a symbolic-link name when you mounted your tape, the default is TAPE.

---

### **cat** syntax for copying files to tape

`cat` has this syntax when copying a file to tape:

```
cat filename > link
```

where

*filename* is the name of the file you want to copy to tape.

*link* is the symbolic-link name you are using with your tape device. If you did not specify a symbolic-link name when you mounted your tape, the default is TAPE.

---

### **cat** syntax for viewing files on tape

`cat` is not good for viewing large files. Only use it with text files.

To view a file on tape, use the syntax

```
cat link
```

where *link* is the symbolic-link name you are using with your tape device. If you did not specify a symbolic-link name when you mounted your tape, the default is TAPE.

---

## Copying a file to an unlabeled tape

Example 47 shows how to copy a file to unlabeled tape.

- ① Mount a tape in unlabeled mode using the `tpmount` command.
- ② Copy the file to the unlabeled tape using the `cp` command. In this example the file named “hstry” is copied to the unlabeled tape.
- ③ To view the file, if it is small, first rewind the tape using the `mt rew` command.
- ④ View the file with the `cat` command. Do not use the `cat` command on large files.

### Example 47 Copying a file to an unlabeled tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % cp hstry TAPE
③ % mt rew
④ % cat TAPE
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
% █
```

---

## Copying a file to a labeled tape

Example 48 shows how to copy a file to labeled tape:

- ① Mount a tape using the `tpmount` command:
  - Specify labeled mode.
  - Specify a symbolic-link name and all the VSNs defined in the label. In this example the symbolic link is named “tape1” and the VSN “vol1” is specified.
  - If the tape is not labeled, you must label it with the `tplabel` command. If you are labeling a tape set, before continuing, you must label all the volumes defined in the set.
- ② Tape volume and file labels are displayed with the `tplist` command, which advances the tape to EOT.
- ③ Set labeled-tape attributes. In this example:
  - A file identifier is specified.
  - Block size (64000 bytes) is specified for use with the `cp` and `cat` commands.
  - Record format is set to unformatted.
- ④ Copy a file with the `cp` command. In this example, the file “hstry” is copied to the tape.
- ⑤ Tape volume and file labels can be displayed with the `tplist` command.
- ⑥ Rewind a tape with the `mt rew` command.
- ⑦ The tape is positioned with `mt fsf` command so that the tape head is at the second file, “hstry.”
- ⑧ The contents of the file “hstry” are displayed by using the `cat` command.

## Example 48 Copying a file to a labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist
VolumeId:           Owner: SUNNY Access: Unrestricted Standard: 3
SecNum: 0001  FileId: NOTES Created: Feb 27, 1991  Access: R-
③ % tpattr -i hstry -b 64000 -f U
④ % cp hstry tapel
⑤ % tplist
VolumeID:  Owner: SUNNY           Access: Unrestricted Standard: 3
SecNum: 0001  FileId: NOTES       Created: Feb 27, 1991  Access: R-
SecNum: 0002  FileId: HSTRY       Created: May  5, 1991  Access: R-
⑥ % mt rew
⑦ % mt fsf 1
⑧ % cat tapel
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
% █
```

---

## Copying files from tape

Copy files from tape using the `cp` (copy) or `cat` (catenate and print) command. The following sections describe the syntaxes of the `cp` and `cat` commands, and how to use them with tape.

If you are accustomed to using the `cp` command, you'll find there are some restrictions when using it with tape.

---

### `cp` syntax for copying a file from tape

The `cp` command has the following syntax when copying a file from tape:

```
cp link filename
```

where

*link* is the name of the symbolic-link name you are using with your tape device. If you did not specify a symbolic-link name when you mounted your tape, the default is TAPE.

*filename* is the name you want to call the file once it is copied from tape.

---

### `cat` syntax for copying a file from tape

The `cat` command has the following syntax when copying a file from tape:

```
cat link > filename
```

where

*link* is the name of the symbolic-link name you are using with your tape device. If you did not specify a symbolic-link name when you mounted your tape, the default is TAPE.

*filename* is the name you want to call the file once it is copied from tape.

---

### `cat` syntax for viewing files on tape

The `cat` command is not good for viewing large files. Only use it with text files.

To view a file on tape use the following syntax:

```
cat link
```

where *link* is the symbolic-link name you are using with your tape device. If you did not specify a symbolic-link name when you mounted your tape, the default is TAPE.

---

## Copying a file from an unlabeled tape

Example 49 shows how to copy a file from an unlabeled tape:

- ① Mount an unlabeled tape with the `tpmount` command.
- ② Position the tape so the tape head is at the file you want to copy with the `mt fsf 2` command. In this example, the third file on the tape is positioned at the tape head.
- ③ Copy the file from tape with the `cp` command.
- ④ One way of viewing the file that was copied is with the `cat` command.

### Example 49 Copying a file from an unlabeled tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % mt fsf 2
③ % cp TAPE /tmp/hstry
④ % cat /tmp/hstry
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
% █
```

---

## Copying a file from a labeled tape

Example 50 shows how to copy a file from a labeled tape:

- ① Mount a tape with the `tpmount` command:
  - Specify labeled mode.
  - Specify a symbolic-link name and the appropriate VSN or VSNs.
- ② You can list tape file labels with the `tplist` command, which advances the tape to EOT. Use this to locate the file you want to copy.
- ③ The tape is rewound using the `mt rew` command.
- ④ Move the tape forward with the `mt fsf` command. In this case the first file is skipped and the tape is stopped so that the second file is at the tape head.
- ⑤ Copy a file from tape with the `cp` command.
- ⑥ One way of viewing the file that was copied is with the `cat` command.

## Example 50 Copying a file from a labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist -f
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: HSTRY Created: Mar 5, 1991 Access: R-
③ % mt rew
④ % mt fsf 1
⑤ % cp tapel /tmp/hstry
⑥ % cat /tmp/hstry
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
% █
```

---

## Copying a file from one tape to another on a system with multiple tape drives

Example 51 shows how to copy a file from one tape to another:

- ① Mount a tape from which you want to copy a file. Specify:
  - A tape device. In this example the tape device is `/dev/rmt20`, and a node of that device specifically for labeled-tape use, `/dev/lt/u0`, is allocated.
  - Labeled mode, if the tape is labeled, as in this example
  - A symbolic-link name. In this example the symbolic-link name is “old.” The appropriate VSN or VSNs must be specified if the tape is labeled, or if a tape set is being mounted. In this example, the VSN is “vol1.”
- ② Mount a tape to which you want to copy a file. Specify:
  - A tape device. In this example the tape device is `/dev/rmt21`, and a node of that device specifically for labeled-tape use, `/dev/lt/u1`, is allocated.
  - Labeled mode, if the tape is labeled, as in this example
  - A symbolic-link name. In this example the symbolic-link name is “new.” The appropriate VSN or VSNs must be specified if the tape is labeled, or if a tape set is being mounted. In this example, the VSN is “vol1.”
- ③ View the file labels on the tapes with the `tplist` command:
  - Because two tapes are mounted simultaneously, specify the tape’s symbolic-link name. In this example, the file labels on the tape mounted through the symbolic link “new” are listed.
  - You can specify display of file labels only with the `-f` option.
  - The `tplist` command, which is also used in step ④, advances the tape to EOT. The tape must be rewound for further access to any files on it.
- ④ View the file labels on the tapes with the `tplist` command:
  - Because two tapes are mounted simultaneously, specify the tape’s symbolic-link name. In this example, the file labels on the tape mounted through the symbolic link “old” are listed.
  - You can specify display of file labels only with the `-f` option.
  - The `tplist` command, which was also used in step ③, advances the tape to EOT. The tape must be rewound for further access to any files on it.
- ⑤ Rewind a tape with the `mt rew` command. Because two

tapes are mounted simultaneously, you must specify the tape's symbolic-link name. In this example, the tape mounted through the symbolic link "old" is rewound.

- ⑥ Space forward files on a tape with the `mt fsf` command.
  - When multiple tapes are mounted simultaneously, you must use the `-f` option. In this example, the tape mounted through the symbolic link "old" is specified.
  - In this example, the tape is advanced so that the second file is at the tape head.

**Example 51** Copying a file from one tape to another on a system with multiple tape drives

```
① % tpmount -a /dev/rmt20 -m label -s old vol1
Tape vol1 mounted. Device: /dev/lt/u0
② % tpmount -a /dev/rmt21 -m label -s new vol2
Tape vol1 mounted. Device: /dev/lt/u1
③ % tplist -s new -f
SecNum: 0001 FileId: FILE1 Created: Feb 10, 1991 Access: RW
④ % tplist -s old -f
SecNum: 0001 FileId: FUZZY Created: Feb 10, 1991 Access: RW
SecNum: 0002 FileId: NOTES Created: Feb 10, 1991 Access: RW
SecNum: 0003 FileId: HSTRY Created: Feb 12, 1991 Access: RW
⑤ % mt -f old rew
⑥ % mt -f old fsf 2
% █
```

This example is continued on the next page.

---

## Copying a file from one labeled tape to another on a system with multiple tape drives (continued)

- ① Set tape attributes with the `tpattr` command. In this example:
  - The file identifier “hstry” is specified.
  - Read and write permissions for the file are set. This is valid on ANSI-labeled tapes only.
  - A block size for use with the `cp` and `cat` commands (64000 bytes) is set.
  - The record format is set to unformatted.
  - The symbolic-link name of the tape device is specified. In this example, attributes for the tape associated with the symbolic link “new” are being set.
- ② Copy from one tape to another with the `cp` command. In this example, a file from the tape associated with the symbolic link named “old” is copied to the tape associated with the symbolic link named “new.”
- ③ View the file labels on a tape with the `tplist` command:
  - Because two tapes are mounted simultaneously, specify the tape’s symbolic-link name with the `-s` option. In this example, the file labels on the tape mounted through the symbolic link “new” are listed.
  - You can specify display of file labels only with the `-f` option.
- ④ Rewind a tape with the `mt rew` command. Because two tapes are mounted simultaneously, it is necessary to specify the tape’s symbolic-link name. In this example, the tape mounted through the symbolic link “new” is rewound.
- ⑤ Space forward files on a tape with the `mt fsf` command.
  - When multiple tapes are mounted simultaneously, you must use the `-f` option. In this example, the tape mounted through the symbolic link “new” is specified.
  - In this example, the tape is advanced so that the second file is at the tape head.
- ⑥ View a file on a tape with the `cat` command. In this example, a file from the tape associated with the symbolic link named “new” is displayed.

**Example 51 (continued)** Copying a file from one tape to another on a system with multiple tape drives

```
① % tpatrr -i hstry -a rw -b 64000 -f U -s new
② % cp old new
③ % tplist -s new -f
   SecNum: 0001  FileId: FILE1      Created: Feb 10, 1991  Access: RW
   SecNum: 0002  FileId: HSTRY     Created: May  5, 1991  Access: RW
④ % mt -f new rew
⑤ % mt -f new fsf 1
⑥ % cat new
In Bosworth Field, East Anglia, Richard III
lost his crown to Henry Tudor, thus ending
the War of the Roses.
% █
```



This chapter describes how to use the `tar` and `cpio` commands to:

- Create archives on labeled and unlabeled tape
- List files in archives on labeled and unlabeled tape
- Extract archives on labeled and unlabeled tape

The procedures for using the `tar` and `cpio` utilities are described under separate sections for each utility. These sections also contain task-oriented examples.

This chapter does not address copying files to or from tape. If you need information on how to copy files to or from tape without converting them to an archived format, refer to Chapter 8, “Copying files to and from tape,” page 107.

---

## Working with tar archives

There are two different utilities for creating a tape archive: `tar` and `cpio`. This section describes how to use the `tar` command with both labeled and unlabeled tapes:

- Creating a `tar` archive
- Listing files in a `tar` archive
- Extracting files from a `tar` archive

If you are working with `cpio` archives, refer to the section, Working with `cpio` archives, on page 134.

---

### Creating a tar archive

Create a `tar` archive on tape for files or directories by using the `tar` command, which has the following syntax:

```
tar -c[bfhlvwBI args] [-C dirname] [filenames]
```

The above components are described in Table 10.

**Table 10** Components for creating a `tar` archive

Component	Description
<code>-c</code>	Create an archive
<code>bfhlvwhBI</code>	Options are described in Table 11.
<i>args</i>	Arguments associated with options. Arguments should be in the same order as the options with which they are associated. Refer to Table 11.
<code>[-C dirname]</code>	Optional change of directory. <i>dirname</i> is the name of the directory to which you want to move.
<i>filenames</i>	The names of the files you want to archive to tape. If you do not specify any file names, all files in the current directory are archived.

**Table 11** Options for creating a `tar` archive

Option	Description
<code>b blocks</code>	Use the next argument in the argument list as the blocking factor for tape records. The default is 20. Only use this option with raw magnetic tape ( <code>rmt</code> ) archives.
<code>f links</code>	Use the next argument in the argument list as symbolic-link name, where <i>link</i> is the symbolic-link name of the tape device associated with the tape on which you are archiving. The default is the tape device that is currently allocated. This option is only needed when more than one tape is mounted.
<code>h</code>	Follow symbolic links. <code>tar</code> follows symbolic links and archives those files in the linked directories
<code>l</code>	Report unresolved links. Write error messages to standard output for any unresolved links while archiving.
<code>v</code>	Verbose mode. Display file names as files are processed.
<code>w</code>	Wait for confirmation. <code>tar</code> prompts before each action. You can then respond by entering "y" or any word beginning with y, and <code>tar</code> proceeds with the action. If you respond with a word not beginning with the letter y, <code>tar</code> aborts the action and prompts for the next operation.
<code>B</code>	Force input and output blocking to 20 blocks per record. This is so that <code>tar</code> can work across communications channels where the blocking may not be maintained.
<code>I</code>	Put tape drive in 100 ips mode. The default is 50 ips.

---

## Creating a tar archive on labeled tape

Example 52 shows how to use `tar` to create an archive on labeled tape:

- ① Mount a tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name and all appropriate VSNs.
  - If the tape is not labeled, label it with the `tplabel` command.
- ② You can list volume and file labels with the `tplist` command, which advances the tape to EOT.
- ③ Set tape attributes with the `tpattr` command. In this example:
  - A file identifier, “test,” is specified with the `-i` option.
  - The record format is set to unformatted with the `-f` option.
  - The block size of 8192 is set for the `tar` command with the `-b` option.
- ④ Archive files and directories with the `tar -c` command. In this example:
  - Verbose mode is set with the `v` option.
  - Blocking factor is set with the `b` option. A blocking factor of 16 is recommended and matches the block size of 8192 set in step ③.
  - The test directory is archived.
- ⑤ Rewind the tape with the `mt rew` command.
- ⑤ Position a tape at so that a specific archive is at the tape head with the `mt fsf` command. In this example, the first file is skipped.
- ⑦ You can list files in a `tar` archive with the `tar -t` command. If you receive the message `tar: tape forward error`, the archive is probably the last file on the tape. This is normal.
- ⑧ You can view volume and files labels again with the `tplist` command.

## Example 52 Creating a tar archive on labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist
VolumeId:VOL1 Owner: SUNNY Access: Unrestricted Standard: 3
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
③ % tpattr -i test -f U -b 8192
④ % tar -cvb 16 test
a test/fuzzy 2 Blocks
a test/hstry 10 Blocks
a test/notes 1 Blocks
⑤ % mt rew
⑥ % mt fsf 1
⑦ % tar -t
tar: blocksize = 262144 blocking = 16
test
test/fuzzy
test/hstry
test/notes
tar: tape forward error
⑧ % tplist
VolumeID:VOL1 Owner: SUNNY Access: Unrestricted Standard: 3
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: TEST Created: May 7, 1991 Access: R-
% █
```

---

## Using tar to create an archive on unlabeled tape

Example 53 shows how to use `tar` to create an archive on unlabeled tape:

- ① Mount a tape with the `tpmount` command. In this example a symbolic-link name “`tape1`” is specified with the `-s` option.
- ② Archive files and directories with the `tar -c` command. In this example:
  - Verbose mode is specified with the `v` option.
  - The directory “`test`” and its files are archived.
- ③ Rewind the tape with the `mt rew` command.
- ④ You can list files in a `tar` archive with the `tar -t` command.
- ⑤ If you receive a message such as the one in this example, you are at EOT.

### Example 53 Creating a tar archive on unlabeled tape

```
① % tpmount -s tape1
Tape device /dev/rmt0 allocated.
② % tar -cv test
a test/fuzzy 1 Blocks
a test/hstry 1 Blocks
a test/notes 1 Blocks
③ % mt rew
④ % tar -t
test
test/fuzzy
test/hstry
test/notes
⑤ % tar -t
tar: No input
% █
```

---

## Listing files in a tar archive

To list files in a tar archive, you must use the `tar -t` command. For information on how to list files in a `cpio` archive, refer to the section, Listing files in a `cpio` archive, on page 139.

The `tar -t` command has the following syntax:

```
tar -t[vBI[f link]]
```

The options above are described in Table 12.

**Table 12** Options for listing files in a tar archive

Option	Description
<code>f link</code>	Specify the symbolic-link name, where <i>link</i> is the symbolic-link name of the tape device associated with the tape on which you are listing archived files. The default is the tape device that's currently allocated. This option is only needed when more than one tape is mounted.
<code>v</code>	Verbose mode. Display file names as files are processed.
<code>B</code>	Force input and output blocking to 20 blocks per record. This is so that <code>tar</code> can work across communications channels where the blocking may not be maintained.
<code>I</code>	Put tape drive in 100 ips mode. The default is 50 ips.

---

## Listing files in a tar archive on labeled tape

Example 54 shows how use the `tar -t` command to list the contents of a tar archive on labeled tape:

- ① Mount the labeled tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` command.
  - Specify a symbolic-link name and all VSNs with the `-s` option.
- ② You can list the volume and file labels with the `tplist` command.
- ③ Because the `tplist` command advances the tape to EOT, the tape must be rewound. Use the `mt rew` command.
- ④ The `mt fsf` command moves the tape forward by file. In this example, the second file is the tar archive whose contents are to be listed.
- ⑤ Set labeled-tape attributes for use with `tar -t` with the `tpattr` command. In this example:
  - Record format is set to unformatted with the `-f` option.
  - Block size is set with the `-b` option. For use with the `tar` command, it is recommended that you set the block size to 8192 bytes.
- ⑥ You can list files in an archive by using the `tar -t` command.

### Example 54 Listing files in a tar archive on a labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist
VolumeID:VOL1 Owner: SUNNY Access: Unrestricted
SecNum: 0001 FileId: ARCHIVE1 Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: TESTARCH1 Created: Mar 7, 1991 Access: R-
SecNum: 0003 FileId: TESTARCH2 Created: May 12, 1991 Access: R-
③ % mt rew
④ % mt fsf 1
⑤ % tpattr -f U -b 8192
⑥ % tpattr tar -t
tar: blocksize = 262144 blocking = 16
test
test/fuzzy
test/hstry
test/notes
% █
```

---

## Listing files in a tar archive on unlabeled tape

Example 55 shows how to use the `tar -t` command to list the contents of a tar archive on unlabeled tape:

- ① Mount an unlabeled tape with the `tpmount` command.
- ② The `mt fsf 2` command moves the tape forward by file. In this example, the third file is the tar archive that is to be listed.
- ③ You can list files in an archive by using the `tar -t` command.

### Example 55 Listing files in a tar archive on an unlabeled tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % mt fsf 2
③ % tar -t
test
test/fuzzy
test/hstry
test/notes
% █
```

---

## Extracting files from a tar archive

Extract files or directories from a tar archive by using the tar -x command. If you need to extract files from a cpio archive, refer to the section, Extracting files from a cpio archive, on page 142.

The tar -x command has the following syntax:

```
tar -x[lmopvwBI[f link]] [filenames...]
```

The above components are described in Table 13 and Table 14.

**Table 13** Components for the tar -x command

Component	Description
-x	Extract files and directories.
fmopvwBI	Options are described in Table 14.
link	Symbolic-link name of the tape device associated with the tape from which you are extracting archived files. Used with the f option. Refer to Table 14.
filenames	The names of the files you want to extract from tape. If you do not specify any file names, all files in the archive are extracted.

**Table 14** Options for the `tar -x` command

Option	Description
f <i>link</i>	Specify a symbolic-link name, where <i>link</i> is the symbolic-link name of the tape device associated with the tape from which you are extracting archived files. The default is the tape device that is currently allocated. This option is only needed when more than one tape is mounted.
l	Tells <code>tar</code> to report if it cannot resolve all of the links to the files being archived. If <code>-l</code> is not specified, no error messages are written to the standard output.
m	Do not restore original modification time of the file upon extraction. Set modification time of the file to the time of the extraction.
o	Set user and group ownerships of the file to those of the user doing the extraction.
p	Restore original file protections upon extraction. Ignore current <code>umask</code> .
v	Verbose mode. Display file names as files are processed.
w	Wait for confirmation. <code>tar</code> prompts before each action. You can then respond by entering "y" or any word beginning with y, and <code>tar</code> proceeds with the action. If you respond with a word not beginning with the letter y, <code>tar</code> aborts the action and prompts for the next operation.
B	Force input and output blocking to 20 blocks per record. This is so that <code>tar</code> can work across communications channels where the blocking may not be maintained.
I	Put tape drive in 100 ips mode. The default is 50 ips.

---

## Extracting files from a tar archive on a labeled tape

Example 59 shows how to extract files from a tar archive on labeled tape:

- ① Mount the tape with the `tpmount` command:
  - Specify labeled mode with the `-m` option.
  - Specify a symbolic-link name and all VSNs with the `-s` option. In this example, the symbolic link is named “tape1,” and the VSN is “vol1.”
- ② You can look at the volume and file labels with the `tplist` command, which advances the tape to EOT.
- ③ Set tape attributes for use with `tar` with the `tpattr` command:
  - Record format is set to unformatted with the `-f` option.
  - Block size is set to 8192 bytes with the `-b` option.
- ④ Rewind a tape with the `mt rew` command.
- ⑤ Move a tape forward file by file with the `mt fsf` command. In this example, the tar archive to be extracted is the second file on the tape.

---

### Caution

---

**Be certain you are in the directory where you want the files extracted.**

- ⑥ Extract files from a tar archive with the `tar -x` command. In this example:
  - Verbose mode is set with the `v` option.
  - Blocking factor is set to 16 (to match the block size of 8192 bytes set in step ③) with the `b` option.

### Example 56 Extracting files from a tar archive on labeled tape

```
① % tpmount -m label -s tape1
Tape vol1 mounted. Device: /dev/rmt20
② % tplist
VolumeID:VOL1 Owner: SUNNY Access: Unrestricted
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: TEST Created: Mar 7, 1991 Access: R-
③ % tpatrr -f U -b 8192
④ % mt rew
⑤ % mt fsf 1
⑥ % tar -xvb 16
x test/fuzzy 2 Blocks
x test/hstry 10 Blocks
x test/notes 1 Blocks
% █
```

---

## Extracting files from a tar archive on an unlabeled tape

Example 57 shows how to extract files from a tar archive on unlabeled tape:

- ① Mount the tape with the `tpmount` command. In this example a symbolic-link name "tape1" is specified.
- ② You can list the files and directories in an archive with the `tar -t` command.

---

**Be certain you are in the directory where you want the files extracted.**

- ③ Extract files from a tar archive with the `tar -x` command. In this example, files are extracted from the directory archived as "test."

---

### Caution

---

**Example 57** Extracting files from a tar archive on unlabeled tape

```
① % tpmount -s tape1
Tape device /dev/rmt20 allocated
② % tar -t
test
test/fuzzy
test/hstry
test/notes
③ % tar -xv test
x test/fuzzy 1 Blocks
x test/hstry 1 Blocks
x test/notes 1 Blocks
% █
```

---

## Working with `cpio` archives

There are two different utilities for creating a tape archive: `tar` and `cpio`. This section describes how to use the `cpio` utility with both labeled and unlabeled tapes:

- Creating a `cpio` archive
- Listing files in a `cpio` archive
- Extracting files from a `cpio` archive

If you are working with `tar` archives, refer to the section, *Working with tar archives*, on page 122.

---

### Creating a `cpio` archive

Create an archive on tape for files or directories by using the `cpio` command with the following syntax:

```
filelist_command | cpio -o[acvB] > link
```

The above components are described in Table 15 and Table 16.

**Table 15** Components of the `cpio -o` command

Component	Description
<i>filelist_command</i>	Any command whose output is a list of file names. These file names are piped into <code>cpio</code> as the files you want to archive.
<code>-o</code>	Indicates "out" or create an archive.
<code>acvB</code>	Options described in Table 16.
<i>link</i>	Full path name of the symbolic link specified when the tape was mounted. If you did not specify a symbolic-link name when you mounted the tape, the default symbolic-link name is TAPE.

**Table 16** Options of the `cpio -o` command

Option	Description
a	Reset access time of the input files.
c	Write header information in ASCII characters (for portability)
v	Verbose mode. Display file names as files are processed.
B	Set blocking to 512 bytes/record.

---

## Creating a `cpio` archive on labeled tape

Example 58 shows you how to use the `cpio -o` command to create an archive on labeled tape:

- ① Mount a labeled tape with the `tpmount` command:
  - Specify labeled mode.
  - Specify a symbolic-link name and all appropriate VSNs. In this example, the symbolic-link name is “tape1,” and the VSN is “vol1.”
  - If the tape is not labeled, you must label it with the `tplabel` command.
- ② You can display tape volume and file labels with the `tplist` command, which also advances the tape to EOT.
- ③ Set tape attributes for use with the `cpio` command with the `tpattr` command. In this example:
  - The file identifier (name) is specified as “test.”
  - The record format is set to unformatted.
- ④ Move to the directory that contains the files you want to archive with the `cd` command.
- ⑤ Archive files with the `cpio -o` command in conjunction with a command whose output is a list file names. In this example:
  - The `ls` command lists all the files in the current directory.
  - The output is piped into the `cpio -o` command.
  - Verbose mode is specified with the `v` option.
  - Block size is set to 512 bytes with the `B` option.
  - The output is directed to the symbolic link `/mnt/sunny/tape1`, which was specified in step ①. Specify the complete path name to the symbolic link.
- ⑥ You can display tape volume and file labels again with the `tplist` command, which also advances the tape to EOT.

## Example 58 Creating a cpio archive on labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device /dev/rmt20
② % tplist
VolumeId:          Owner: SUNNY Access: Unrestricted
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
③ % tpattr -i test -f U
④ % cd test
⑤ % ls | cpio -ovB > /mnt/sunny/tapel
fuzzy
hstry
notes
12 Blocks
⑥ % tplist
VolumeID:          Owner: SUNNY Access: Unrestricted
SecNum: 0001 FileId: NOTES Created: Feb 27, 1991 Access: R-
SecNum: 0002 FileId: TEST Created: Mar 27, 1991 Access: R-
% █
```

---

## Creating a `cpio` archive on unlabeled tape

Example 59 shows you how use the `cpio -o` command to create an archive on unlabeled tape:

- ① Mount the tape with the `tpmount` command. In this example a symbolic-link name is specified.
- ② Move to the directory that contains the files you want to archive with the `cd` command.
- ③ Archive the files in a directory by using a command that lists file names and pipe the output into the `cpio -o` command. In this example:
  - The `ls` command is used to list files in the current directory, and the output is piped into the `cpio -o` command.
  - Verbose mode is set so that file names are displayed as the files are extracted.
  - Block size is set to 512 bytes with the `B` option.
  - The output is directed to the symbolic link `/mnt/sunny/tape1`, which was specified in step ①. The complete path name to the symbolic link is always used.
  - Total size of archive, in blocks, is displayed.

### Example 59 Creating a `cpio` archive on unlabeled tape

```
① % tpmount -s tape1
Tape device /dev/rmt20 allocated.
② % cd test
③ % ls | cpio -ovB > /mnt/sunny/tape1
fuzzy
hstry
notes
12 Blocks
% █
```

---

## Listing files in a `cpio` archive

To list files in a `cpio` archive, you must use the `cpio -it` command. For information on how to list files in a `tar` archive, refer to the section, [Listing files in a tar archive](#), on page 127.

List the contents of a `cpio` archive by using the `cpio -it` command with the following syntax:

```
cpio -it[fB] [pattern] < link
```

The above components are described in Table 17 and Table 18.

**Table 17** Components of the `cpio -it` command

Component	Description
<code>-it</code>	Displays the table of contents for the archive
<code>fB</code>	Options described in Table 18.
<i>pattern</i>	Optional pattern specification, where <i>pattern</i> is a simple regular expression that is shell-dependent. Files are extracted depending on whether they match or do not match the pattern.
<i>link</i>	Symbolic-link name you specified in your mount command.

**Table 18** Options for the `cpio -it` command

Option	Description
<code>f</code>	Only list the names of files in the archive that do not match <i>pattern</i> .
<code>B</code>	Set blocking to 5120 bytes per record

---

## Listing files in a `cpio` archive on labeled tape

Example 60 shows how to use the `cpio -it` command to list the contents of a `tar` archive on labeled tape:

- ① Mount a labeled tape with the `tpmount` command:
  - Specify labeled mode with the `-m label` option.
  - Specify a symbolic-link name and all appropriate VSNs with the `-s` option.
- ② List the contents of the current archive with the `cpio -it` command. In this example:
  - Names of files in a `cpio` archive are displayed without extracting them with the `-it` option.
  - Block size is set to 512 bytes with the `B` option.
  - To match all file names, the asterisk pattern is specified.
  - The tape device `/mnt/sunny/tape1` is specified.
- ③ The names of the files that were specified by *pattern* are listed in the order that they were archived.
- ④ Finally, the total size of the archive, in blocks, is displayed.

### Example 60 Listing files in a `cpio` archive on labeled tape

```
① % tpmount -m label -s tape1 voll
Tape voll mounted. Device: /dev/lt/u0
② % cpio -itB * < /mnt/sunny/tape1
③ file1
file2
file3
out1
out2
prog1
prog2
prog3
④ 170 Blocks
% █
```

---

## Listing files in a `cpio` archive on unlabeled tape

Example 61 shows how use the `cpio -it` command to list the contents of a `cpio` archive on an unlabeled tape:

- ① Mount a tape with the `tpmount` command.
- ② List the contents of the current archive with the `cpio -it` command. In this example:
  - Names of files in a `cpio` archive are displayed without extracting them with the `-it` option.
  - To match all file names, the asterisk pattern is specified.
  - The tape device `/mnt/sunny/TAPE` is specified.
- ③ The names of the files that were specified by *pattern* are listed in the order that they were archived.
- ④ Finally, the total size of the archive, in blocks, is displayed.

### Example 61 Listing files in a `cpio` archive on unlabeled tape

```
① % tpmount
Tape device /dev/rmt20 allocated.
② % cpio -it * < /mnt/sunny/TAPE
③ file1
file2
file3
out1
out2
prog1
prog2
prog3
④ 170 Blocks
% █
```

---

## Extracting files from a `cpio` archive

Extract files from a `cpio` archive by using the following syntax:

```
cpio -i[acdfmrtuvB] [pattern] < link
```

The above components are described in Table 19 and Table 20.

**Table 19** Components of the `cpio -i` command

Component	Description
<code>-i</code>	Indicates “out” or create the archive.
<code>acdfmrtuvB</code>	Options described in Table 20.
<i>pattern</i>	Optional pattern specification, where <i>pattern</i> is a simple regular expression that is shell-dependent. Files are extracted depending on whether they match or do not match the pattern.
<i>link</i>	Symbolic-link name you specified in your mount command.

Table 20 Options for the `cpio -i` command

Option	Description
a	Reset access time of the input files.
c	Write header information in ASCII characters (for portability).
d	Create directories as needed.
f	Extract files that do not match the pattern specified by <i>pattern</i> .
m	Retain modification times of files. For files only, not directories.
r	Rename files. <code>cpio</code> prompts for a name change for each file that is extracted. If you do not want a file name changed, press RETURN without typing anything.
t	Print table of contents. No files are extracted.
u	Unconditionally extract files. Older files overwrite newer files because modification dates are not checked.
v	Verbose mode. Display file names as files are processed.
B	Set blocking to 5120 bytes per record.

---

## Extracting files from a `cpio` archive on a labeled tape

Example 62 shows you how to use the `cpio -i` command to extract files from a `cpio` archive on labeled tape:

- ① Mount the labeled tape with the `tpmount` command:
  - In labeled mode with the `-m label` option.
  - Specify a symbolic-link name and all appropriate VSNs with the `-s` option. In this example, the symbolic link is named “tape1,” and the VSN is “vol1.”
- ② List tape volume and file labels with the `tplist` command, which advances the tape to EOT.
- ③ Set tape attributes for use with the `cpio` command with the `tattr` command. Set the record format to unformatted with the `-f` option.
- ④ Rewind the tape with the `mt rew` command.
- ⑤ Change to the directory where you want to place the extracted files with the `cd` command. In this case, the current directory is changed to the “test” directory.

---

### Caution

---

**Be certain you are in the directory where you want the files extracted.**

- ⑥ Extract files from a `cpio` archive with the `cpio -i` command. In this example:
  - Verbose mode is set with the `v` option.
  - A pattern, “\*c”, is specified, which matches all archived files ending in “c”.
  - Input from the full path name of the symbolic link to the tape device is directed to the `cpio -i` command. In this case `/mnt/sunny/tape1` is linked to the tape device, so that path name is specified.
- ⑦ The `ls` command shows that the files were extracted from the tape.

## Example 62 Extracting files from a cpio archive on labeled tape

```
① % tpmount -m label -s tapel voll
Tape voll mounted. Device: /dev/rmt20
② % tplist
VolumeID:VOL1 Owner: SUNNYAccess: Unrestricted
SecNum: 0001 FileId: ARCHIVECreated: Feb 27, 1991 Access: R-
③ % tpattr -f U
④ % mt rew
⑤ % cd test
⑥ % cpio -ivB *c < /mnt/sunny/tapel
fuzzy.c
notes.c
12 Blocks
⑦ % ls
bin/          fuzzy.c      notes.c
% █
```

---

## Extracting files from a `cpio` archive on an unlabeled tape

Example 63 shows you how to use `cpio` to extract files from a `cpio` archive on an unlabeled tape:

- ① Mount the unlabeled tape with the `tpmount` command. In this example the symbolic link is named with the `-s` option.
- ② Change to the directory where you want to place the extracted files with the `cd` command. In this example, files are being extracted to the “test” directory.

---

### Caution

---

**Be certain you are in the directory where you want the files extracted.**

- ③ Extract files from a `cpio` archive with the `cpio -i` command. In this example:
  - Verbose mode is set with the `v` option.
  - A pattern, “\*c”, is specified, which matches all archived files ending in “c”.
  - Input from the full path name of the symbolic link to the tape device is directed to the `cpio -i` command. In this case, `/mnt/sunny/tape1` is linked to the tape device, so that path name is specified.
- ④ The `ls` command shows that the appropriate files were extracted from the tape.

### Example 63 Extracting files from a `cpio` archive on an unlabeled tape

```
① % tpmount -s tape1
    Tape device /dev/rmt20 allocated.
② % cd test
③ % cpio -iv *c < /mnt/sunny/tape1
    fuzzy.c
    notes.c
    12 Blocks
④ % ls
    fuzzy.c  notes.c
% █
```

---

# Tape system error messages

# A

This appendix alphabetically lists and describes some of the error messages you may receive when encountering problems while using the tape system. Error messages may be sent by the tape system to your terminal screen or to a log file in the form:

*command: error\_message*

*command* is the command you were using when the error occurred, and *error\_message* is the reason the error occurred.

Each error message entry suggests a possible solution. This solution is provided for the most common occurrences and may not be valid in all situations.

---

**A** ambiguous request  
The tape system cannot distinguish the tape and drive on which to take action. Specify the symbolic-link name of the device with the appropriate option.

---

**C** can't create symbolic link  
You may not have write permissions for the directory from which you have invoked `tpmount`, or a file exists with same name as the requested symbolic link to the tape device.

You must change to a directory that you can write to or change the permissions of the current working directory, or specify a unique symbolic-link name with the `tpmount -s` option.

can't establish connection with \label daemon

The label daemon for the label type you have requested is probably dead. Contact the system manager.

can't get current working directory

The directory you are currently in has been deleted. Change to another directory to issue your mount request.

---

**D** device is opened by another process  
The device you have attempted to deallocate is currently in use by a process. You must wait until the process closes the tape device to deallocate it.

---

**E** empty request  
You have not specified a tape in your `tpmount` library call.

EOT seen

The utility you are using has encountered the end of the tape. If there is still more tape, this indicates there is a bad spot on it.

---

---

**F** file exists  
The symbolic link displayed with this error message exists, so it cannot be created as you have specified in your mount request. Specify a unique symbolic-link name with the `tpmount -s` option.

---

**I** internal tape system error  
There is currently an internal problem with the tape system. Contact the system manager.

invalid drive name specified

You have specified a drive name in your `tpmount` request that is not defined for your system.

Use the `tpconfig show drives` command to list defined drives.

invalid drive type

You have specified a drive type in your `tpmount` request that is not defined for your system.

To display defined drives, enter

% **tpconfig show drives**

invalid label type

You have specified a label in your `tpmount` request that is not defined for your system.

Use the `tpconfig show labels` command to list defined label types. Contact your system manager if you must bypass a tape label.

invalid path to symbolic link

The path you have specified to your symbolic link is not a valid path. One or more of the directories in the path do not exist.

Reissue your mount request after determining a proper path for the symbolic link.

---

---

**M** magnetic vsn doesn't match visual  
 \ vsn

The VSN or VSNs you have specified in your mount request do not match the VSN or VSNs on the tape.

If you do not know the proper VSN or VSNs for the tape, and you are the owner, remount the tape in unlabeled mode and bypass the label with the `tpmount -b` option. View the first file on the tape, which contains a field listing the proper VSNs. If you are not the owner of the tape, contact your system manager for assistance.

If you are using a tape set, you must list all the VSNs in the set with the `tpmount -s` option.

mount not yet complete

You have entered a command before your tape has been mounted.

If you placed your mount request in the background with the `tpmount -B` option, use the `tpwait` command to bring it to the foreground.

If you have not placed your mount request in the background, wait until the mount is complete.

mount request failed

You have passed a null pointer as an option in your `tpmount` library request.

mount request failed - tape is \ labeled

You have probably tried to mount a labeled tape with a block device or tried to mount a labeled tape in character or block mode without bypassing the label.

To display character devices you should use with labeled tapes, enter:

```
% tpcnfig show nodes | grep \  
"rewind Char"
```

To bypass a tape label (if you are the owner of the tape or have superuser privileges only) mount the labeled tape with the `tpmount -b` option. Otherwise, mount the

labeled tape in labeled mode with the `tpmount -m` option.

---

**N** no authorization

The drive you have selected is not controlled, or you have attempted to unmount a tape without proper authorization. You must either select a controlled tape drive or unmount the tape as the appropriate user, respectively.

For help in selecting a proper drive that is controlled, enter:

```
% tpcnfig show drives | grep \  
Cont
```

To display a list of tape devices that have been allocated locally and by whom, enter:

```
% tpqueue -l
```

no drives meet the required speed density and type

You have specified attributes that do not correspond to a defined device. For help in selecting a proper device enter:

```
% tpcnfig show nodes
```

no entry in password file

You are not authorized to execute the command you have issued. Contact your system manager.

no input

You have attempted to use `tar -t` to list files in an archive on a tape that is at EOT.

Reposition the tape using `mt` commands.

no matching drives are available at this time

You have specified attributes that correspond to a defined device that is currently in use.

To display a list of tape devices that have been allocated locally and by whom, enter:

```
% tpqueue -l
```

For help in selecting a proper device enter:

```
% tpcnfig show nodes
```

no such file or directory

The file you are trying to read from an archive doesn't exist.

Use a command to list the files on the labeled tape, if using a labeled tape, or use a command to list the files in the archive, if trying to access an archive. If you are trying to read from disk, list the directory you are trying to read from.

no such request

You have issued a tape command that is invalid either for the type of tape you have mounted or for the current situation.

no such tape

You have requested a tape to be mounted that is not currently included in the tape library. Contact your system manager or tape operator to have the proper tape entered.

---

**Q** queueing is disabled - please \ specify device with tpmount -a \ option

A device cannot be selected for you by the tape operator. You must select your own device with the tpmount option -a. For help in selecting a proper device enter:

**% tpmount show nodes**

---

**R** Read error

The utility you are using cannot read from the tape. This is probably because you do not have the proper device mounted, or you have not selected the proper tape attributes (if you are using a labeled tape).

---

**S** server didn't respond  
tpdaemon has not responded to your request due to network problems. This message is accompanied by an RPC (remote procedure call) error message.

---

**T** tape cannot be labeled  
You have attempted to label a tape not mounted in labeled mode.

First, be certain the correct tape is on the tape drive. If it is the correct tape, unmount it, remount it in labeled mode, and then label it. Any information that is on a tape at the time of labeling is no longer accessible after labeling.

tape cannot be unlabeled  
You have attempted to unlabel a tape not mounted in labeled mode.

First, be certain the correct tape is on the tape drive. If it is the correct tape, unmount it, remount it in labeled mode, and then unlabel it. Any information that is on a tape at the time of labeling is no longer accessible after labeling.

tape change in progress  
The tape operator is changing the tapes. Wait until the change operation is complete to continue.

tape forward error  
When using the tar -t command to view files in an archive, this message means that the tape is at EOT. This happens when listing files in the last archive on a tape.

tape device must be no-rewind for \ labeled tapes  
You have requested a rewind device for a labeled tape, which are not compatible.

Select a device that is no-rewind. For help in selecting a proper no-rewind device, enter the following:

**% tpmount show nodes | grep No**

tape drive is not on-line or not \ ready  
The tape drive is probably not on-line yet; or, you have issued a mount request for a

labeled tape without an operator, and the tape has not yet been placed on the drive.

For 9-track tape drives, the online button on the tape drive probably needs to be pressed. For cartridge tapes, ensure the tape has been inserted properly.

If you are using labeled tapes, you must place the tape on the drive and put the drive online before issuing a mount request.

tape is already in use

You have specified a tape that is already in use.

To display a list of tape devices that have been allocated locally and by whom, enter:

```
% tpqueue -l
```

tape is already labeled

You have attempted to label a tape that is already labeled.

First, be certain the correct tape is on the tape drive. If it is the correct tape, use `tpunlabel` to unlabel it and then relabel it. Any information that is on a tape at the time of labeling is no longer accessible after labeling.

tape is already unlabeled

You have attempted to unlabel a tape that is not labeled, but is mounted in labeled mode.

tape is mounted read only

The tape you have mounted as read-and-write is physically set for reading only.

The tape should be unmounted, taken from the drive, and have its write authorization affixed. You can then remount it with read and write permissions.

tape is mounted read/write

The tape you have mounted as read-only is physically set for reading and writing.

The tape should be unmounted, taken from the drive, and have its write authorization removed. You can then remount it as read-only.

tape is not known to tape system

You have requested a tape that is not currently in the tape library. Contact your tape operator or your system manager to enter the proper tape.

tape is not labeled; use `tplabel \` to label tape

You have mounted an unlabeled tape in labeled mode.

First, be certain you have mounted the correct tape. Once you label a tape, any information on it is lost. If you get this message, you must label the tape in order to use it further.

tape mount canceled by operator

There is a problem with your tape, tape drive, or request. This message may be followed by a comment from a tape operator. If not, contact them.

tape must be mounted as labeled \ to use this command

You have attempted to use labeled-tape utilities on an unlabeled tape.

First, be certain the correct tape is on the tape drive. If the correct tape is on the tape drive, you must unmount the tape, remount it in labeled mode, and label it before using labeled-tape utilities. Any information that is on a tape at the time of labeling is no longer accessible after labeling.

---

**U** unable to connect to server

There is a problem connecting to your server. Contact your system manager.

unable to set attributes

You have attempted to set attributes on a tape that is not labeled. You must label the tape first with the `tplabel` command. Any information that is on an unlabeled tape at the time of its labeling is not accessible after it is labeled.

---

**W** Warning: tape is not labeled; use  
 \ tplabel to label tape  
 You have mounted an unlabeled tape in  
 labeled mode.

First, be certain you have mounted the  
 correct tape. Once you label a tape, any  
 information on it is lost. If you get this  
 message, you must label the tape in order to  
 use it further.

Write error

The utility you are using cannot write to the  
 tape. This is probably because you do not  
 have the proper device mounted, or you  
 have not selected the proper tape attributes  
 (if you are using a labeled tape).

# Tape drives and nodes

# B

Tape device files, which are associated as nodes to tape drives, are located in the /dev directory. Their names may vary from site to site and are configurable. To display tape devices defined as nodes of drives on your system, enter at your shell prompt:

```
% tpconfig show nodes
```

Table 21 describes standard CONVEX tape drive names and their associated nodes.

**Table 21** Standard CONVEX names of tape drives and node names and their attributes

Tape drives and their allocated nodes						Node attributes			
dat:0 <sup>†</sup>	mt:0	tc:0 <sup>†</sup>	dat:1 <sup>†</sup>	mt:1	tc:1 <sup>†</sup>	Density	Rewind Status	Mode	Buffered?
	mt8			mt9		1600	Rewind	Block	
	mt12			mt13		1600	No rewind	Block	
dat0u	mt16	tc0u	dat1u	mt17	tc1u	6250	Rewind	Block	
dat0nu	mt20	tc0nu	dat1nu	mt21	tc1nu	6250	No rewind	Block	
dat0		tc0	dat1		tc1	6250	Rewind	Block	Buffered
dat0n		tc0n	dat1n		tc1n	6250	No rewind	Block	Buffered
	rmt8			rmt9		1600	Rewind	Char	
	rmt12			rmt13		1600	No rewind	Char	
rdat0u	rmt16	rtc0u	rdat1u	rmt17	rtc1u	6250	Rewind	Char	
rdat0nu	rmt20	rtc0nu	rdat1nu	rmt21	rtc1nu	6250	No rewind	Char	
rdat0		rtc0	rdat1		rtc1	6250	Rewind	Char	Buffered
rdat0n		rtc0n	rdat1n		rtc1n	6250	No rewind	Char	Buffered

<sup>†</sup> When an "i" is appended to these node names, it indicates that data compression is offered.



# Glossary

---

**A access**  
Read or write data through a tape device and drive, and to a tape.

**allocate**  
Operation of establishing a symbolic link to a tape device (and, by extension, to a tape drive) and changing its ownership so that it can be accessed.

**attribute**  
A characteristic of a tape drive, device, or labeled tape that affects how data is written to and retrieved from the tape.

**AVR**  
An acronym for "automatic volume recognition," the capability of the tape system to recognize a labeled tape when it is placed on a drive.

---

**B block**  
A chunk of data containing a predetermined number of bytes. See also *tape block*.

**block newline record delimiter**  
A record delimiter that indicates to the tape system to write a record to a tape block every time a newline character is encountered and to fit as many of these records as possible into a block before writing the block to a tape.

**block size**  
An integer representing the number of bytes in a block.

**blocking factor**  
Integer representing the number of blocks as defined by a utility that fits into a tape block.

---

**C cat**  
Catenate and print. Command that catenates one or more files. Can also be used to view a short file.

**close**  
Storing a file after reading from or writing to it. In order for a file to be read from or written to, it must first be opened. After reading from or writing to it, it is then closed.

**controlled tape drive**  
A tape drive that is configured to respond to the tape system.

**cp**  
Command that copies one or more files.

**cpio**  
Copy files in and out. Command that archives files to tape or extracts files from a cpio archive.

---

**D decimal-based variable record format**  
See *variable-length record format*.

**density**  
Integer representing the number of bytes-per-inch of information recorded on a tape.

**device**  
Logical device, device file, or special file such as `/dev/mt4`, through which a mechanical tape drive, and consequently a tape, is accessed. Not to be confused with a mechanical device, such as a tape drive. See also *node*.

**drive**

Mechanical device on which a tape is placed. A tape drive contains the physical apparatuses used to move, read from, and write to a tape.

---

**E end-of-file (EOF)**

A marker that indicates the end of a file.

**end-of-tape (EOT)**

A marker that indicates the end of a tape.

---

**F fixed-length record format**

A record that is always of a size specified by *record size*. When a specified record delimiter is encountered, the fixed-length record is padded with blanks until it is the proper record size and then is written to the tape block.

---

**I input**

Data read from tape.

**ips**

Inches-per-second.

---

**L label**

Configuration information recorded on the tape header. This is also sometimes referred to as a *magnetic label*. References to paper labels on the tape reel are explicitly *paper labels*.

**logical link**

See *symbolic link*.

---

**M magnetic label**

See *label*.

**mt commands**

A set of commands by which a tape can be advanced forward file by file, rewound, taken offline, or have its status reported.

---

**mount**

Operation of establishing a symbolic link to a device file and changing its ownership so that you can access it.

A tape drive is also *mounted* when a tape device that controls it is allocated, and a tape on a mounted tape drive is also mounted.

To avoid confusion, *mount* is not used in this guide as referring to placing a tape on a tape drive, even though popular use of this word encompasses this meaning.

---

**N newline record delimiter**

A record delimiter that indicates to the tape system to write a record to a tape block every time a newline character is encountered and to write only one record into a block before writing the block to a tape.

**node**

A minor device that has been defined (with the `tpconfig` command) to be associated with a tape device.

**no-rewind**

An attribute of a tape device that directs not to rewind a magnetic tape once it is closed. Also refer to *close*.

---

**O open**

To retrieve and prepare a file for reading and writing.

**operator**

A human or robot who allocates tape devices, and handles and places tapes on tape drives.

**option**

A nonessential switch used with a command to perform a specific task.

**output**

Data written to tape.

---

**R record**

Chunks of data that make up a tape block on labeled tapes. A record is defined by a *record delimiter* and a *record format*. A record may be of a specified *record size* as well.

---

**record delimiter**

Determines when a record is written to a tape block. When the tape system encounters a particular record delimiter, it writes the record to a tape block. Record delimiters are *block newline*, *newline*, and *syscall*.

**record format**

A type of record that indicates how a record is to be written to a tape block. The record formats are *fixed length*, *unformatted*, and *variable length*.

**record size**

A variable representing the number of bytes in a record of *fixed-length* format or the maximum size of a record of *variable-length* format.

**rewind device**

A tape device that directs the tape drive to rewind the magnetic tape upon closing a file. See also *close*.

**S set**

See *tape set*.

**speed**

Integer representing inches-per-second of tape that passes under the tape head.

**symbolic link**

A connection that associates a file with a tape device.

**syscall record delimiter**

A record delimiter that indicates to the tape system to write a record to a tape block every time a write call is closed by a utility.

**T tape attribute**

See *attribute*.

**tape block**

A chunk of data that consists of a defined number of bytes and is stored in a buffer until written to tape in its entirety. With labeled tapes, a tape block consist of records.

**tape density**

See *density*.

**tape device**

See *device*.

**tape drive**

See *drive*.

**tape operator**

See *operator*.

**tape set**

Two or more tapes that are defined as a set on the tape header or label. Information can span from one volume to another. Tape sets can be either labeled or unlabeled.

**tape speed**

See *speed*.

**tar**

Program that archives files to and extracts files from *tar* archives.

**tpattr**

Program that sets or changes tape attributes.

**tpconfig**

Program that system manages can use to configure the tape system, and that users can use to display information about the tape systems and its default settings.

**tplabel**

Program that labels and sets tape labels and access attributes.

**tplist**

Program that lists tape volume and file labels.

**tpmount**

Program that allocates tape devices, reserves tape drives, and prepares the tape system for using single or multiple tapes.

**tpqueue**

Program that displays tape queues.

**tpunlabel**

Program that removes tape labels.

**tpunmount**

Program that deallocates, frees, and unmounts tape drives.

---

**U** **unformatted records**

A record that does not have a defined structure. The tape system does not pad an unformatted record or prefix a record length to it. Generally, unformatted records are used when working with binary files and when working with system calls.

---

**V** **variable-length record format**

A record that is not of a fixed size, but has a maximum size defined by *record size*. When a specified record delimiter is encountered, the variable-length record is prefixed with an index containing its record size. It is then written to the tape block. Variable-length records are not padded with blanks.

**VSN**

An acronym representing "volume serial number," an identifier for a tape. A VSN can be "paper," an identifier recorded on the paper label on a tape for the convenience of the operator, or it can be "magnetic." Magnetic VSNs are part of the information recorded in the label of ANSI-labeled tapes.

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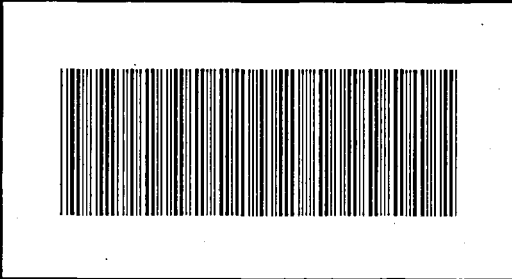
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