Identification

Multics Standard Magnetic Tape Format

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Purpose

This section describes the standard physical format to be used on 7-track
and 9-track magnetic tapes on Multics. Any magnetic tape not written in
the standard format described here is not a Multics standard tape. A
magnetic tape device interface module which reads and writes tape in the
standard format is described in section BF.6.05.

Density and Parity

Both nine-track and seven-track standard tapes will be recorded in binary
mode with odd ones lateral parity. Standard tape density is 800 bits per
inch (bpi).

Standard Record Format

Each physical record contains a eight-word header and an eight-word trailer
enclosing a 256-word (9216-bit) data space. The total record length is then 272
words long (9792 bits). The header and trailer are each 288 bits. This phy-
sical record will require 1224 frames on nine-track tape and 1632 frames on
seven-track tape. This is approximately 1.54 inches on nine-track tape and
2.04 inches on seven-track tape, not including interrecord gaps. Record gaps
on nine-track tapes are approximately 0.6 inches and on seven-track tapes are
approximately 0.75 inches.

Physical Record Header

The following is the format of the physical record header:

word 1:   constant with octal representation 670314355245.

words 2 and 3:   Multics standard unique identifier (right adjusted). Each
                 record will have a different "unique identifier". (See MSPM
                 section BY.15.01).

word 4:   bits 0-17 number of this physical record in this physical file;
                 bits 18-35 number of this physical file on this physical reel.

word 5:   bits 0-17 number of data bits not including padding;   bits
                 18-35 number of bits following the header up to but not in-
                 cluding the trailer: this should be a constant equal to
                 9216.

word 6:   flags indicating the type of record. Bits are assigned con-
                 sidering the left most bit to be bit 1 and the rightmost bit
                 to be bit 36. Word 6 also contains a count of the re-write
                 attempt, if any:

Bit	Meaning if Bit is 1
1	this is a label record
2	error-indicator record
3	rewritten record whose data space is identical to a previously written record for which a trans-mission, parity, or other data alert occurred.
4	this is an EOR record
5	unassigned

6	one of bits 1 to 5 is 1
7	record contains padding
8	record was written following detection of end-of-tape (EOT) mark
9	record was forced out by drain
10-27	unassigned
28-35	if bit 3 is 1: number of the attempt to rewrite

word 7:   contains the checksum of the header and trailer excluding word 7, i.e., excluding the checksum word.

word 8:   constant with octal representation 512556146073.

Physical Record Trailer

The following is the format of the trailer:

word 1:   constant with octal representation 107463422532

word 2 and 3: standard Multics unique identification (duplicate of header).

word 4:   total accumulative number of data bits for this logical tape (not including padding).

word 5:   padding bit pattern.

word 6:   bits 0-11: reserved; bits 12-17: reel sequence number (multi-reel number); bits 18-35: physical file number starting with physical file 1 of reel 1.

word 7:   the number of the physical record for this physical reel.

word 8:   constant with octal representation 265221631704.

Note: The octal constants listed above were chosen to form elements of a single-error-correcting code whether read as eight-bit tape characters (nine-track tape), or as six-bit tape characters (seven-track tape).

The standard tape format permits three types of administrative records:

> tape label
>
> EOR record
>
> error-indicator record

Except for the error-indicator record, all administrative records are of standard length: 8-word header, 256-word data area, and 8-word trailer.

Standard Tape Format

The first record on the tape following the beginning of tape (BOT) mark will be the tape label record.

The tape label record is written in the standard record format. The data space of the tape label record contains:

words 1-8   32 character ASCII installation code. This identifies the installation which labelled the tape.

words 9-16   32 character ASCII reel identification. This is the reel identification by which the operator stores and retrieves the tape.

remaining words   Padding pattern.

Following the tape label record will be an end-of-file record (EOF).

An EOF is the standard sequence of bits on a tape which is recognized as an end-of-file by the hardware. (See BF.6.04 for description of standard EOF.) An EOF will be written after every 128 data records with the objective of increasing reliability and efficiency of reading and positioning within a logical tape. Error records and records which are repeated because of transmission, parity, or other data alerts are not included in the count of 128 records. The first record following the EOF will have a physical record count of 0 mod 128.

AN end-of-reel (EOR) sequence will be written at the end of recorded data. An EOR sequence is:

EOF

EOR record

EOF

EOF

The EOR record contains only padding bits in its data space. The standard record header of the EOR record contains the information which identifies it as an EOR record. (Word six, bit four is one).

Write Error Recovery

Multics standard tape error recovery procedures differ from the past standard technique in that an attempt is made to keep from backing up the tape. If a data alert occurs while writing, an error indicator record will be written next. If this record is written without error, the previous data record will again be written. If an error occurs while writing the error indicator record, that record will be rewritten. Nine attempts will be made to write the error indicator record. If an error indicator record is written successfully, then

the data record is rewritten. Failure to rewrite the data record will again generate up to nine attempts to write the error-indicator record. This procedure ends with:

(a) The successful transmission of a data record, or

(b) when there have been nine consecutive failures on one error record, or

(c) when nine attempts to write the data record have failed.

No backspace record is issued.

The above write error recovery procedure may be applied to any administrative record (excluding error records, which are written as part of the recovery procedure) as well as any data record.