ANSI/SMPTE 21M-1997
Revision of
ANSI/SMPTE 21M-1986

SMPTE STANDARD

for Video Recording — 3/4-in Type E Helical Scan — Records

1 Scope

This standard specifies the location of the edges of the video, audio, and tracking-control records and the mechanical separation of the simultaneously recorded information of the video and audio records, as recorded on a 3/4-in type E helical-scan video tape recording cassette system, operating at a tape speed of 95.3 mm/s (3.752 in/s).

2 Definitions

2.1 downstream: Pertaining to locations on the tape longitudinally displaced from a given reference point in the direction of tape travel.

2.2 longitudinal: Pertaining to dimensions parallel to the direction of tape travel.

2.3 reference edge: The lower edge of the magnetic tape nearest the reference plane of the cassette.

2.4 trailing edge of video track: The upstream edge of the video track.

2.5 transverse: Pertaining to dimensions perpendicular to the direction of tape travel.

2.6 transverse reference line: An imaginary line on the magnetically recorded tape perpendicular to the reference edge and passing through the trailing edge of the video track at its highest point (trailing edge at the end of the video track).

2.7 upstream: Pertaining to locations on the tape longitudinally displaced from a given reference point in the direction opposite tape travel.

3 General specifications

3.1 Dimensions

Metric dimensions are primary.

3.2 Measurement conditions

The dimensions shall be measured with no transverse or longitudinal tension applied to the tape.

3.3 Measurement environment

The temperature shall be 23°C ± 1°C (73°F ± 2°F) with a relative humidity of (50 ± 2)%.

3.4 Magnetic coating

With the direction of tape travel as shown in figure 1, the magnetic coating is on the surface facing the observer.

Approved
October 2, 1997

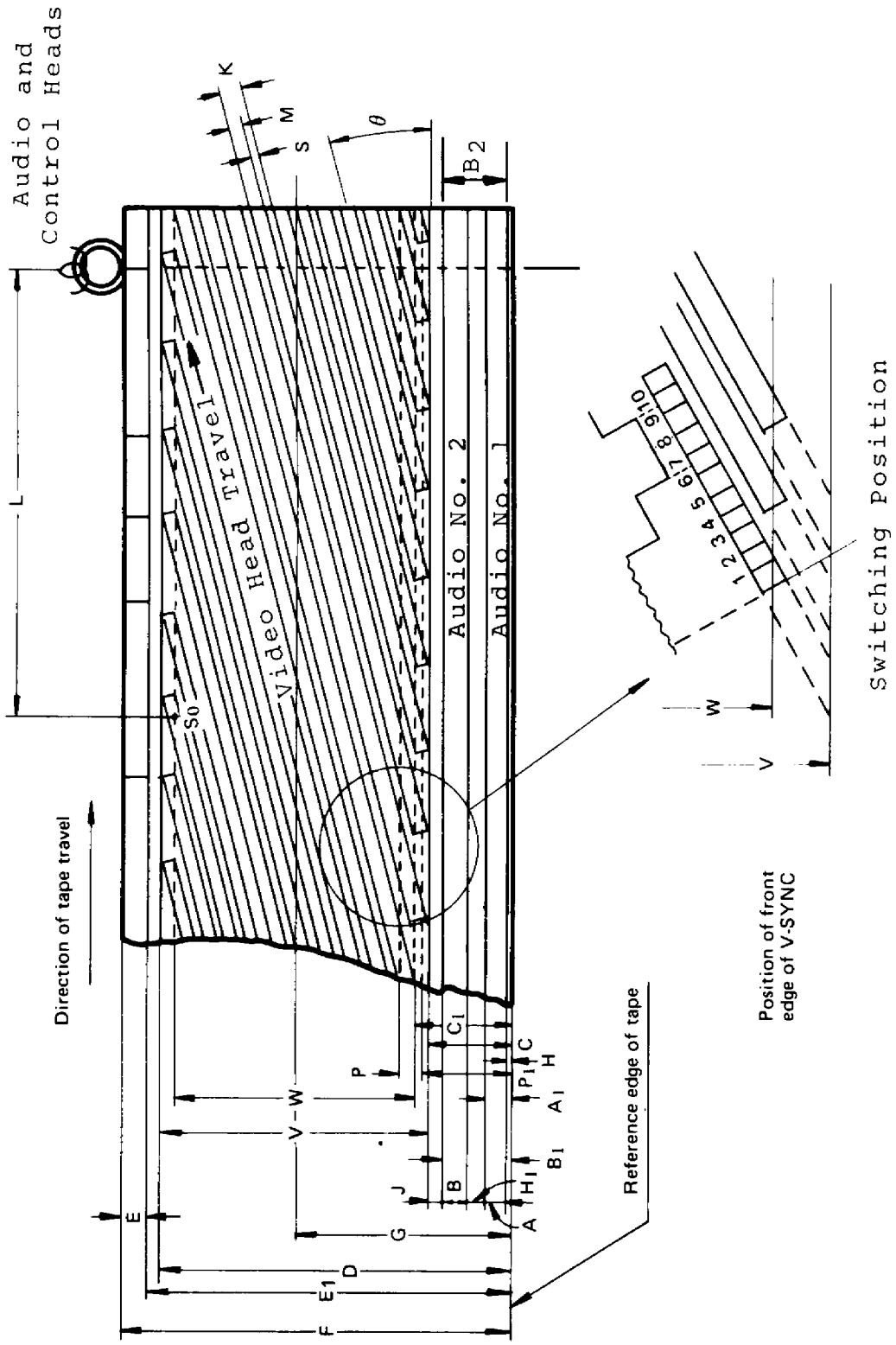

Figure 1 - -Track configuration and dimensions from magneto-sensitive side

3.5 Tape speed

The tape speed shall be 95.3 mm/s ± 0.2 mm/s (3.752 in/s ± 0.008 in/s).

3.6 Video writing speed

The video writing speed shall be 10.26 m/s (404 in/s).

3.7 Video head drum diameter

The video head drum diameter shall be 110.00 mm ± 0.01 mm (4.3307 in ± 0.0004 in).

4 Dimensions

The transverse and longitudinal dimensions shall be as specified in figure 1 and table 1.

Table 1 – Recorded magnetic tape records

Dimensions		Millimeters	Inches
A	Audio No. 1 width	0.80 ± 0.05	0.0315 ± 0.0020
A_1	Audio No. 1 reference	1.00 nom	0.0394 nom
B	Audio No. 2 width	0.80 ± 0.05	0.0315 ± 0.0020
B_1	Audio No. 2 reference	2.50 nom	0.0984 nom
B_2	Audio track total width	2.30 ± 0.08	0.0906 ± 0.0031
C	Video area lower limit	2.70 min	0.1063 min
C_1	Video effective area lower limit	3.05 min	0.1201 min
D	Video area upper limit	18.20 max	0.7165 max
E	Control track width	0.60 nom	0.0236 nom
E_1	Control track reference	18.40 + 0.28 -- 0.18	0.7244 + 0.0110 -- 0.0071
F	Tape width	19.00 ± 0.03	0.7480 ± 0.0012
G	Video track center from reference edge	10.45 ± 0.05	0.4114 ± 0.0020
H	Audio guard band to tape edge	0.2 ± 0.1	0.008 æ 0.004
H_1	Audio-to-audio guard band	0.7 nom	0.028 nom
J	Audio-to-video guard band	0.2 nom	0.008 nom
K	Video track pitch (calculated)	0.137 nom	0.00539 nom
L	Audio and control head position from end of 180° scan	74.0 ± 0.5	2.913 æ 0.020
M	Video track width	0.085 ± 0.007	0.00335 ± 0.00028
P[1)]	Address track width	0.50 ± 0.05	0.0197 ± 0.0020
P_1	Address track lower limit	2.90 ± 0.15	0.1142 ± 0.0059
S	Video guard band width	0.052 nom	0.00205 nom
V	Video width	15.5 nom	0.610 nom
W	Video effective width	14.80 ± 0.01	0.5827 ± 0.0004
Θ	Video track angle, moving tape stationary tape	4° 57′ 33.2″ 4° 54′ 49.1″	

[1)] See clause 7.2.

5 Audio- and control-head position

The distance (L) on the tape pattern from the end of the 180° scan of a video head (S_0) to the audio and control head position is 74.0 mm ± 0.5 mm (2.913 in ± 0.020 in), as shown in figure 1.

6 Audio record displacement

Program audio or other information which is time coincident with video information recorded at a point, S_0, of any vide track shall be recorded on audio No. 2 at a distance, L, downstream from that point (S_0). (See figure 2.)

7 Video head switching

7.1 The switching position between the two heads during playback shall lie between the 5th and 8th horizontal lines before the leading edge of the vertical sync signal, as shown in figure 2.

7.2 When the address track (dimension P) is used, the video head switching position ahead of the vertical sync signal shall be between 0.5 and 3 horizontal lines (see figure 2).

7.3 The rf output of both video heads shall extend past the switching point by approximately 3 horizontal lines to provide approximately 6 horizontal lines of overlap.

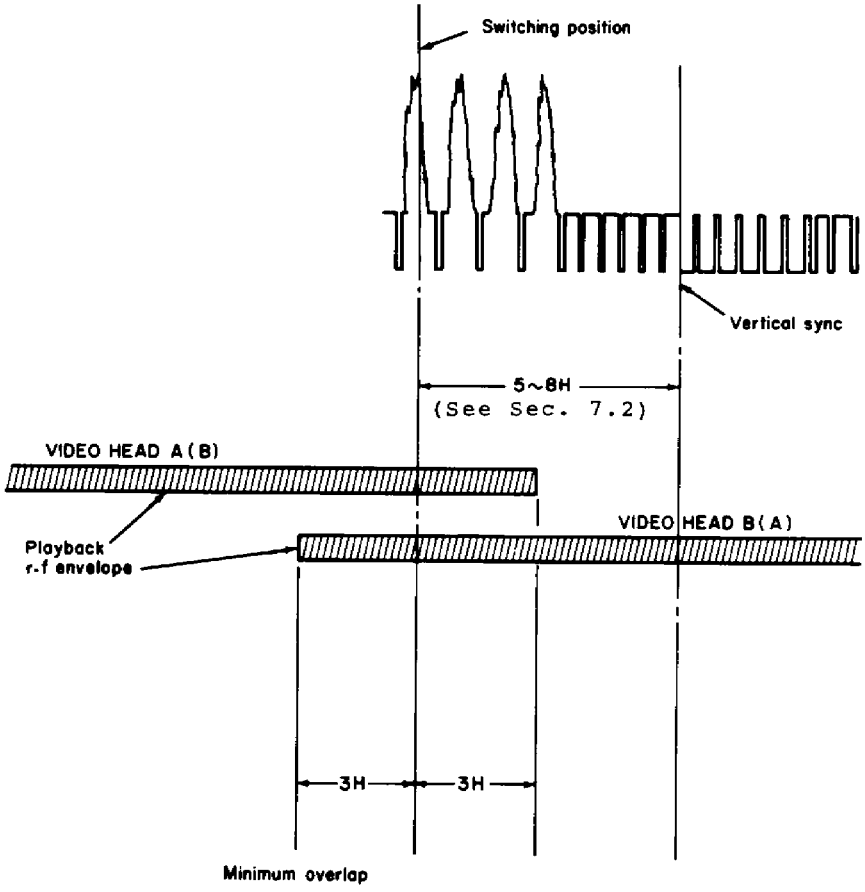

Figure 2 – Switching position of two video heads

8 Tape back-tension

The tape back-tension in the record mode shall be 0.60 N to 0.80 N (61 gf to 82 gf) when measured at the entrance of the drum, as shown in figure 3. A full-supply cassette (60 minutes) shall be inserted in the recorder and the tape threaded past the entrance guide post. Tension shall be measured with a suitable spring balance as the tape is pulled off the reel at normal tape speed. The nominal ratio of tension between the maximum tape pack diameter of 118 mm (4.64 in) and the minimum tape pack diameter of 38 mm (1.50 in) on a 60-minute cassette shall be 3:1.

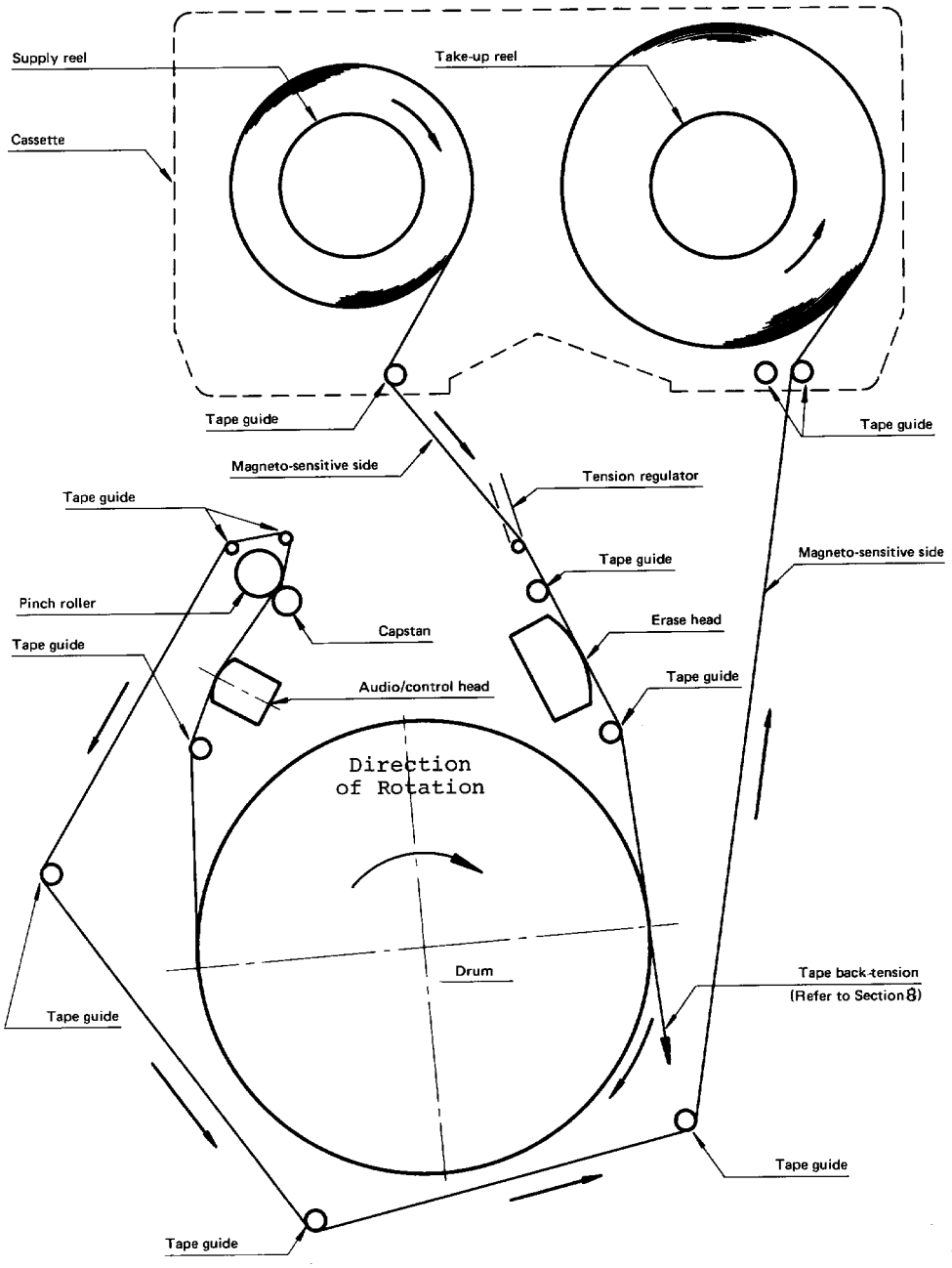

Figure 3 – Tape path and guidance

Annex A (informative)
Bibliography

ANSI/SMPTE 22M-1997, Video Recording — 3/4-in Type E Helical Scan — Cassette

SMPTE RP 87-1995, Reference Carrier Frequencies, Preemphasis Characteristic and Audio and Control Signals for 3/4-in Type E Helical-Scan Television Tape Cassette Recording