

*Reference Carrier Frequencies, Pre-emphasis Characteristic and Audio and Control Signals for 3/4-in Type E Helical-Scan Video Tape Cassette Recording*



Page 1 of 2 pages

1. Scope

This practice specifies the reference frequencies for deviation of the frequency modulated carrier and the associated video pre-emphasis characteristic for 3/4-in Type E helical-scan video tape cassette recording of 525-line NTSC monochrome and color television signals at a tape speed of 95.3 mm/s (3.752 in./s). In addition, the characteristics of the audio and control signals are specified.

2. Video Signal

2.1 Luminance Carrier Frequencies

- 2.1.1 Reference white level  $5.4 \pm 0.1$  MHz
- 2.1.2 Reference sync level  $3.8 \pm 0.2$  MHz
- 2.1.3 Reference white to sync level deviation  $1.6 \pm 0.1$  MHz

2.2 Recording Current Characteristics

- 2.2.1 FM luminance carrier recording current shall be adjusted to produce maximum playback level. A high-pass filter having the characteristic shown in Fig. 1 shall be inserted into the FM signal path.
- 2.2.2 The down-converted chrominance signal of the AM chrominance carrier recording shall be  $688.374 \pm 0.200$  kHz. The recording current shall be that at which the playback signal level is 10 to 14 dB below the peak luminance level of color bars at 75% color saturation.

2.3 Luminance Signal Pre-emphasis Characteristics

- 2.3.1 The pre-emphasis is shown in Graph A and defined as the impedance response of the four-terminal network in Fig. 2.
- 2.3.2 Pre-emphasis is introduced to the video signal prior to the modulator.

3. Audio Signal

3.1 Recording Characteristics

- 3.1.1 High-frequency time constant of 50  $\mu$ s

- 3.1.2 Low-frequency time constant of 3180  $\mu$ s

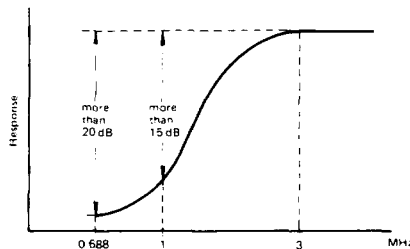
3.2 Bias Current. With a sine-wave recording signal of 1 kHz, the bias current shall be increased from the value producing maximum reproduced signal output to a level which results in the signal output dropping 0.5 dB.

3.3 Reproducer Operating Level. The reproducing volume indicator (vu meter) shall deflect to the scale reference level (0 dB) when playing back a tape recorded with a 1000 Hz sine-wave short-circuit tape flux per unit track width of 100 nWb/m.

4. Control Signal

- 4.1 Polarity. A positive-going pulse shall be obtained at the plus terminal of the control-track head on playback where there is a change from south to north in the polarity of the magnetic tape. The reference pulse shall be the positive-going pulse as shown in Fig. 3.
- 4.2 Recording Current Waveform. The rise time shall be less than 200  $\mu$ s.

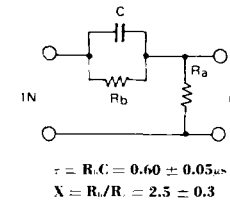
NOTE: In addition to this practice, there is available American National Standard Dimensions and Location of Records for 3/4-in Type E Helical-Scan Video Tape Cassette Recording, ANSI C98.21M-1980.



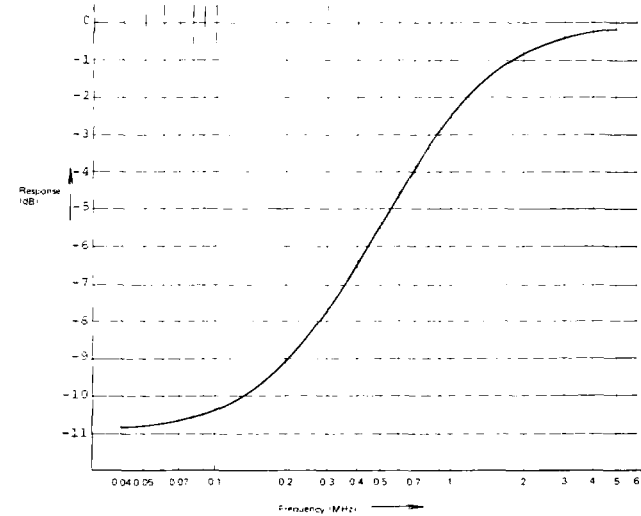
**Fig. 1**  
FM High-Pass Filter

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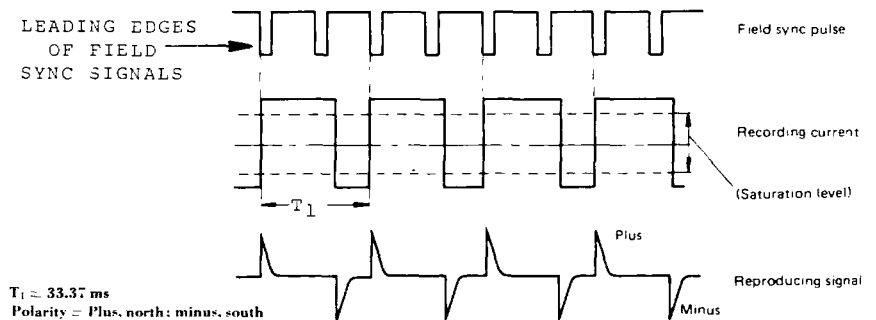
RP 87-1980



**Fig. 2**



**Graph A**  
Video Pre-emphasis Characteristic Response for Fig. 2



**Fig. 3**  
Control Signals Waveform and Polarity

**SMPTE RECOMMENDED PRACTICE** **RP 88-1980**  
*Reference Carrier Frequencies and Pre-emphasis Characteristic for 1/2-in Type F Helical-Scan Video Tape Recording*



Page 1 of 2 pages

1. *Scope*

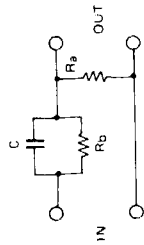
This practice specifies the reference frequencies for deviation of the frequency modulated carrier and the associated video pre-emphasis characteristic for 1/2-in Type F helical-scan video tape recording of 525-line NTSC monochrome and color television signals. (The relationship between the pre-emphasis characteristic of the recording circuit and the de-emphasis characteristic of the playback circuit shall be such that the overall video signal frequency characteristics of input and output (recording and playback) are flat.)

2. *Carrier Reference Frequencies*

- 2.1 This practice is suitable for both color and monochrome signals.
- 2.2 Recorded FM carrier frequencies for reference video signal levels:
  - (a) Reference white level 1.5 +0.2 -0.1 MHz
  - (b) Sync tip level 3.1 -0.2 -0.1 MHz

3. *Pre-emphasis Characteristic*

- 3.1 The characteristic is described in the figure and defined as the normalized transfer characteristic of the following four-terminal network:



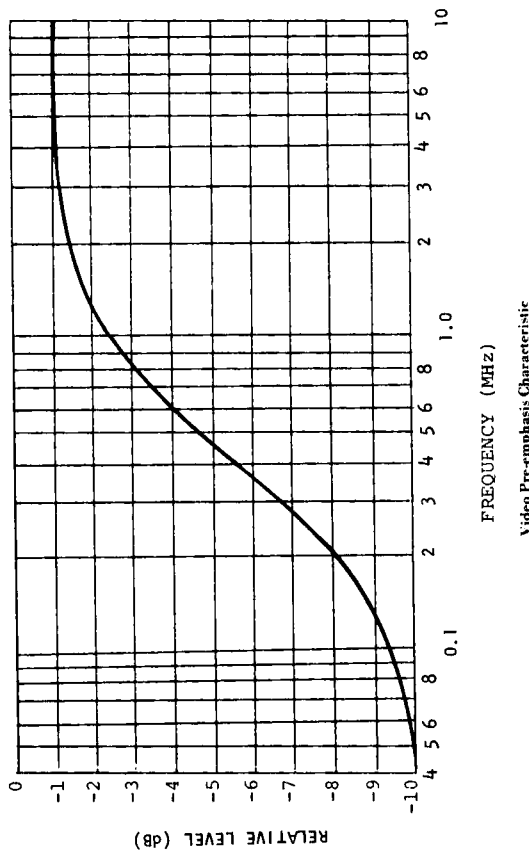
$$\tau = RC = 0.65 \pm \mu s$$

$$X = \frac{R_a}{R_b} = 1.8 \pm 0.3$$

where C is capacitance in farads, R is resistance in ohms,  $\tau$  is time constant in seconds, and X is high-frequency emphasis.

- 3.2 The pre-emphasis shall be inserted prior to the modulator in the recording circuit. Both the pre-emphasis and de-emphasis circuits for video signals shall be provided in the video signal circuits and the characteristics of the circuits are assumed to be flat within the passband. If the circuit characteristics are not flat, the emphasis may be changed to a value which is considered equivalent to the above-mentioned value.

NOTE: In addition to this practice, there is available American National Standard Dimensions and Location of Records and Base Electrical Parameters for 1/2-in Type F Helical-Scan Video Tape Recording, ANSI C98.23M-1980.



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PROPOSED  
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SPE RECOMMENDED PRACTICE

Label Specifications for Quadruplex and  
Helical-Scan Video Magnetic Tape Recordings

RP 26  
Revision of  
RP 26-1968

This practice specifies the minimum information required on labels attached to reels and containers of quadruplex and helical-scan video tape recordings.

Specifications

The following represents the minimum information required on a video tape label. The label shall be affixed to both the reel and the container.

Quadruplex Recordings

(a) Name of company or studio

- (b) Name of program or commercial
- (c) Number of program or commercial
- (d) Modulation practice (SHB, HB, LBM, LBC)
- (e) Note if black and white
- (f) Original or dupe
- (g) Playing time

2.2 Helical-Scan Recordings

- (a) Name of company or studio
- (b) Name of program or commercial
- (c) Number of program or commercial
- (d) Format type
- (e) Note if black and white
- (f) Original or dupe
- (g) Playing time

# American National Standard dimensions and location of recording marks on 3/4-in type E helical-scan video tape recording cassette recording

Approved December 17, 1979

Secretariat: Society of Motion Picture and Television Engineers

## 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 Transverse.** Pertaining to dimensions perpendicular to the direction of tape travel.
- 2.2 Longitudinal.** Pertaining to dimensions parallel to the direction of tape travel.
- 2.3 Downstream.** Pertaining to locations on the tape longitudinally displaced from a given reference point in the direction of tape travel.
- 2.4 Upstream.** Pertaining to locations on the tape longitudinally displaced from a given reference point in the direction opposite tape travel.
- 2.5 Trailing Edge of Video Track.** The upstream edge of the video track.
- 2.6 Transverse Reference Line.** An imaginary line on the magnetically recorded tape perpendicular to the reference edge and passing through

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## 3. General Specifications

- 3.1 Dimensions.** Metric dimensions shall be used.
- 3.2 Measurement Conditions.** Measurements shall be measured with no transverse tension applied to the tape.
- 3.3 Measurement Environment.** Temperature shall be  $20 \pm 1^\circ\text{C}$  ( $68 \pm 2^\circ\text{F}$ ) and relative humidity of  $50 \pm 2$  percent.
- 3.4 Magnetic Coating.** With the tape travel as shown in Fig. 1, the magnetic coating is on the surface facing the observer.
- 3.5 Tape Speed.** The tape speed shall be  $0.2 \text{ mm/s}$  ( $3.752 \pm 0.008 \text{ in/s}$ ).
- 3.6 Video Writing Speed.** The video writing speed shall be  $10.26 \text{ m/s}$  ( $404 \text{ in/s}$ ).
- 3.7 Video Head Drum Diameter.** The video head drum diameter shall be  $110.00 \text{ mm}$  ( $4.3307 \pm 0.0004 \text{ in}$ ).

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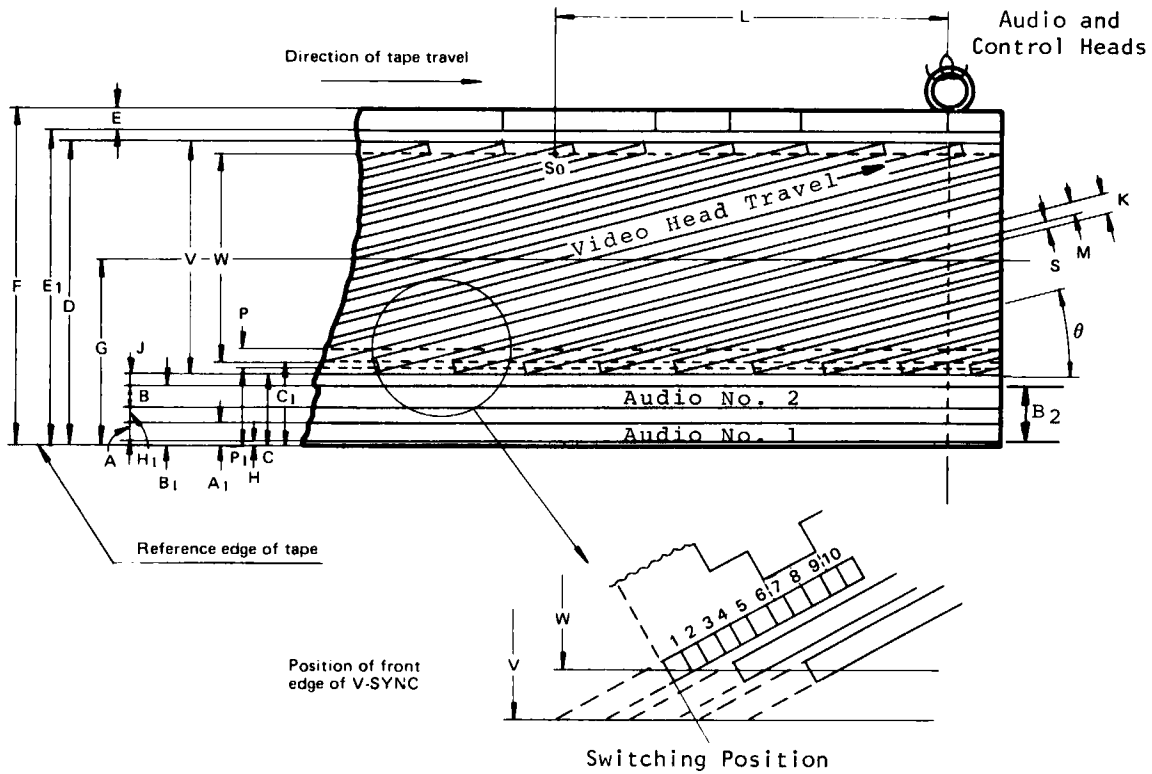


Fig. 1  
Track Configuration and Dimensions from Magneto-Sensitive Side

Table 1  
Recorded Magnetic Tape Records

Dimensions	Millimeters		Inches	
	Value	Tolerance	Value	Tolerance
A Audio No. 1 width	0.80	± 0.05	0.0315	± 0.0020
A <sub>1</sub> Audio No. 1 reference	1.00	nom	0.0394	nom
B Audio No. 2 width	0.80	+ 0.05	0.0315	± 0.0020
B <sub>1</sub> Audio No. 2 reference	2.50	nom	0.0984	nom
B <sub>2</sub> Audio track total width	2.30	± 0.08	0.0906	± 0.0031
C Video area lower limit	2.70	min	0.1063	min
C <sub>1</sub> 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 <sub>1</sub> 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	± 0.004
H <sub>1</sub> 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	± 0.020
M Video track width	0.085	± 0.007	0.00335	± 0.00028
P* Address track width	0.50	± 0.05	0.0197	± 0.0020
P <sub>1</sub> 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	4° 57' 33.2"			
stationary tape	4° 54' 49.1"			

\*See Section 7.2.

#### 4. Dimensions

Transverse and longitudinal dimensions specified in Fig. 1 and Table 1.

#### 5. Audio- and Control-Head Position

Distance (L) on the tape pattern from the 180° scan of a video head (S<sub>v</sub>) to the control head position is 74.0 ± 0.5 mm (2.91 ± 0.02 in), as shown in Fig. 1.

#### 6. Audio Record Displacement

Audio or other information which is present with video information recorded on any video track shall be recorded

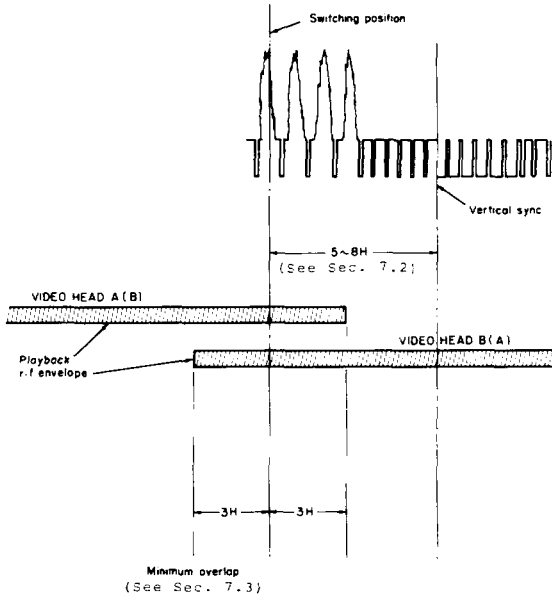
on Audio No. 2 at a distance, L, downstream from that point (S<sub>v</sub>). (See Fig. 1.)

#### 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 Fig. 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 Fig. 2.)

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



**Fig. 2**  
Switching Position of Two Video Heads

#### 8. Tape Back-Tension

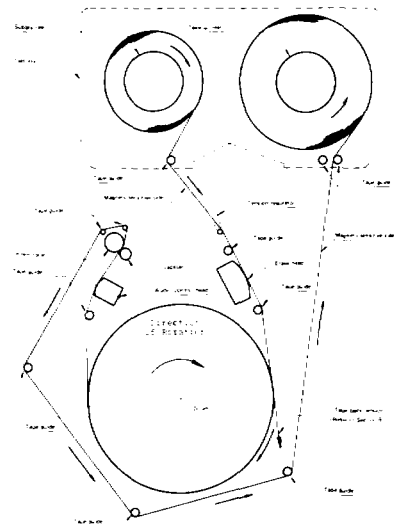
The tape back-tension in the record mode shall be 0.60 to 0.80 N (61 to 82 gf) when measured at the entrance of the drum, as shown in Fig. 3. A full-supply cassette (60 minutes) shall be inserted in the recorder and the tape threaded past the entrance guide post. Tension shall be measured with a suitable 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.

NOTE: In addition to this standard the following documents relating to scan video tape recording:

American National Standard Dimensional Specifications for 3/4-in Type E Helical-Scan Video Cassette, ANSI C98.22M-1980.

SMPTE Recommended Practice on Recording Characteristics, Pre-emphasis Characteristics, and Control Signals for 3/4-in Type E Helical-Scan Video Cassette Recording, RP 87-1980.

Figure for Illustration Only



**Fig. 3**  
Tape Path and Guidance

# American National Standard Dimensions of video cassette for 3/4-in Type E helical-scan video tape recording

December 17, 1979

Secretariat: Society of Motion Picture and Television Engineers

Page 1 of 6 pages

## 1. Scope

This standard specifies the dimensions of a video cassette for use with 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. Datum Planes

Datum Plane A is the plane determined by Datum Holes (a), (b), and (c) in Fig. 5.

Datum Plane B is the plane that includes the center of Datum Holes (a) and (b) and is orthogonal to both Datum Planes A and B.

Datum Plane C includes Datum Hole (a) and is orthogonal to both Datum Planes A and B.

## 3. Dimensions

3.1 The dimensions necessary for the interface of equipment shall be as specified in the figures and table.

3.2 The metric dimensions are primary.

## 4. Measurement Environment

The temperature shall be  $20 \pm 1^\circ\text{C}$  ( $68 \pm 2^\circ\text{F}$ ) with a relative humidity of  $50 \pm 2$  percent.

NOTE: In addition to this standard, there is available American National Standard Dimensions and Location of Records for 3/4-in Type E Helical-Scan Video Tape Cassette Recording, ANSI C98.21M-1980.

Table 1  
Dimensional Tolerances Not Otherwise Specified

Millimeters			Inches		
Over	To	Tolerances	Over	To	Tolerances
0.0	4.0	$\pm 0.2$	0.000	0.157	$\pm 0.008$
4.0	16.0	$\pm 0.3$	0.157	0.630	$\pm 0.012$
16.0	63.0	$\pm 0.4$	0.630	2.480	$\pm 0.016$
63.0	250.0	$\pm 0.5$	2.480	9.843	$\pm 0.020$

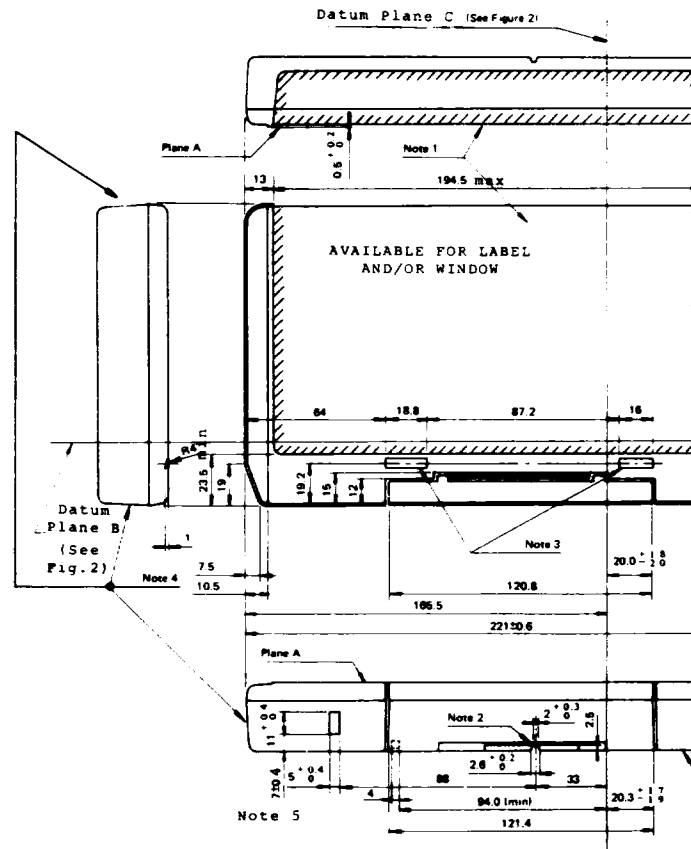


Fig. 1  
Top View of Video Cassette

### Notes:

1. Hatched area shows the label area and/or window area. The surface of the glued label should be indented from Plane A.
2. Guide groove.
3. Holding groove.
4. The outer edges should be slanted  $4^\circ$  from vertical.
5. This dimension is measured from Datum Plane B.

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1. The arrow shows the direction of the supply reel is of two types a and b.
2. The protecting lid (height H) shall be designed to open when the cassette is inserted into the recorder/player. Maximum force to open the lid shall be 0.981 N (100 gf).
3. Section B-B' shows the relationship between the cassette and the unlocking lever of the recorder/player.
4. These dimensions are measured from Datum Plane A.
5. Datum Hole (a) is primary.
6. It is possible when the safety hole is covered.
7. The lid must not protrude but should be indented.

Fig. 2  
Bottom View of Video Cassette

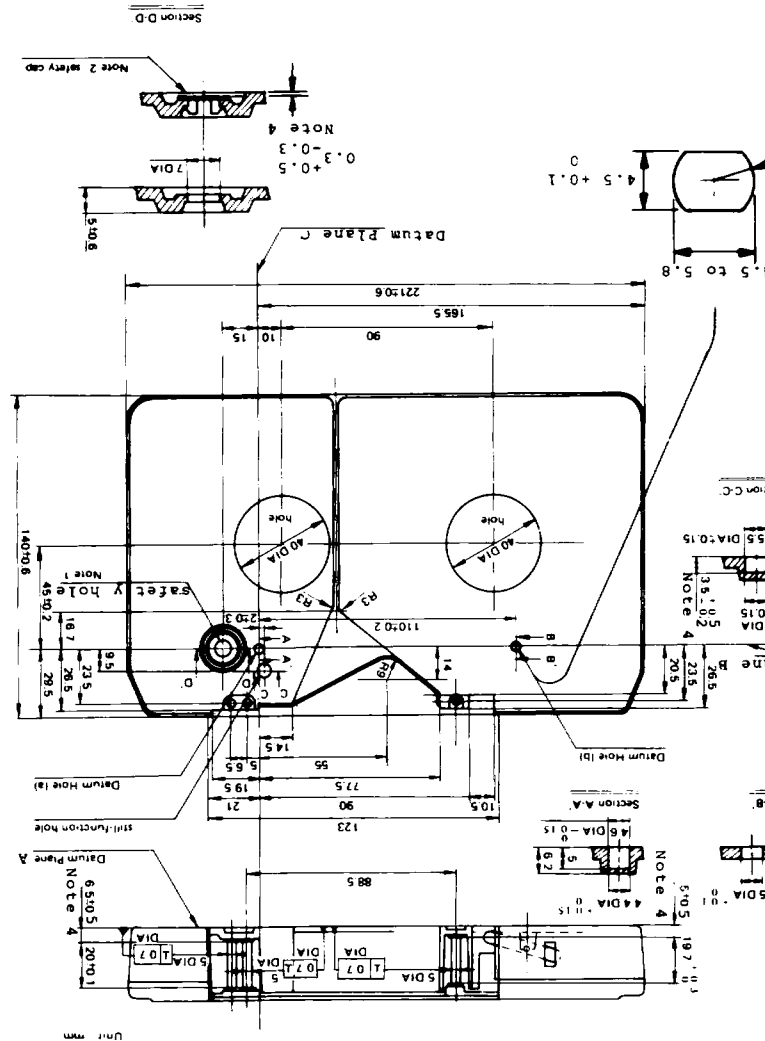
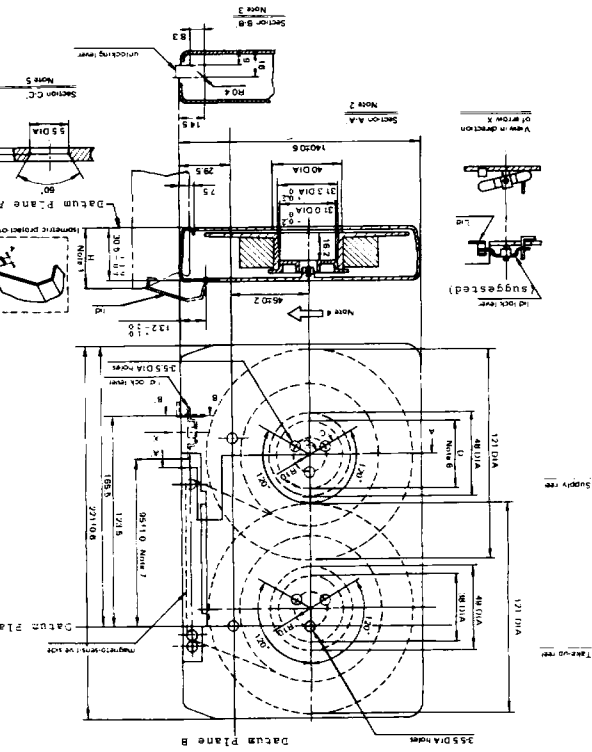


Fig. 3  
Location of Reels and Protecting Lid





# American National Standard Dimensions and location of records and basic electrical parameters for 1/2-in type F helical-scan video tape recording

December 17, 1979

Secretariat: Society of Motion Picture and Television Engineers

Page 1 of 6 pages

## 1. Scope

This standard specifies the location of the edges of the video, audio, and tracking-control records, the mechanical separation of the simultaneously recorded information of the video and audio records, and the basic electrical parameters as required for 1/2-in Type F helical-scan video tape recording at a nominal speed of 190.5 mm/s (7.11 in/s).

## 2. Definitions

**Transverse.** Pertaining to dimensions perpendicular to the tape travel.

**Longitudinal.** Pertaining to dimensions parallel to the tape travel.

**Downstream.** Pertaining to locations on the tape longitudinally displaced from a given reference point in the direction of tape travel.

**Upstream.** Pertaining to locations on the tape longitudinally displaced from a given reference point in a direction opposite tape travel.

**Trailing End of Video Track.** The upstream end of the video track.

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**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 Reference Edge.** The lower edge of the magnetic tape.

## 3. General

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

**3.2 Measurement Environment.** The temperature shall be  $20 \pm 1$  C ( $68 \pm 2$  F) with a relative humidity of  $50 \pm 2$  percent.

**3.3 Tape Speed.** The tape speed shall be 189.55 mm/s (7.4626 in/s) min and 191.45 mm/s (7.5374 in/s) max.

**3.4 Video Writing Speed.** The video writing speed shall be 11.1 m/s (437 in/s).

**3.5 Video Head Drum Diameter.** The video head drum diameter shall be  $115.820 \pm 0.010$  mm ( $4.55984 \pm 0.00039$  in).

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**3.6 Video Heads.** The video scanning operation shall consist of a two-head helical scanning system.

**3.7 Control Track.** The control track shall be recorded on a single track (see Fig. 2) by a repeating waveform of nominally 30 Hz.

**3.8 Television Signal System.** The system of the television signal shall be as follows: The number of fields per second ( $n_f$ ) is nominally 60 and the number of scanning lines per field ( $n_H$ ) is 262.5.

**3.9 Recording System.** Audio signals shall be directly recorded on the audio track at the specified recording level by the alternating-current bias system. The video head recording current for the FM signal should be  $\pm 1.5$  dB at the optimum record current at 4 MHz. The carrier frequency for recording video signals by FM shall be assigned as follows: The higher frequency shall be assigned to white in the picture and the lower frequency to sync tip. Control signals shall be directly recorded on the control track at more than the saturated recording level. The waveform and polarity of control signals shall conform to Fig. 8.

**3.10 Video Head Switching.** The switching position of two heads, as shown in Fig. 5, lies within 5 horizontal scanning lines (H)  $\pm 5$  from the front edge of the vertical sync signal. The rf output of both video heads shall extend past the switching point by approximately 2 horizontal lines to provide  $\pm 2$  horizontal lines of overlap.

## 4. Dimensions

The transverse and longitudinal dimensions shall be as specified in the figures.

## 5. Position of Audio and Control-Track Records

The position of the audio and control-track records shall be as shown in Fig. 1. Optimum tracking performance is obtained from the heads when used on reference tape.

## 6. Audio Record Displacement

Program audio or other information recorded time-coincident with video information at a point,  $S_1$ , of any video track shall be displaced on Audio Record No. 1 at a distance,  $S_2$ , from that point,  $S_1$  (see Fig. 1).

## 7. Tape Back-Tension

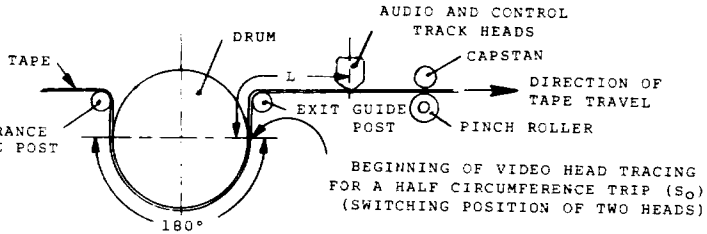
The tape back-tension shall be  $46 \pm 5$  gf when measured at the entrance guide post. The tension shall be measured at the entrance guide post as the tape comes off the entrance guide post of a 177.8-mm (7-in) reel, filled with tape of a diameter of  $132 \pm 1$  mm ( $5.20 \pm 0.04$  in), inserted in the recorder, and measured just past the entrance guide post. The tape shall be measured with a suitable spring scale. The tape is smoothly pulled off the reel at a speed approximately equal to the recording speed.

NOTE: In addition to this standard, the user should refer to SMPTE Recommended Practice on Recording Levels, Frequencies and Pre-emphasis Characteristics for 1/2-in Type F Helical-Scan Video Tape Recording.

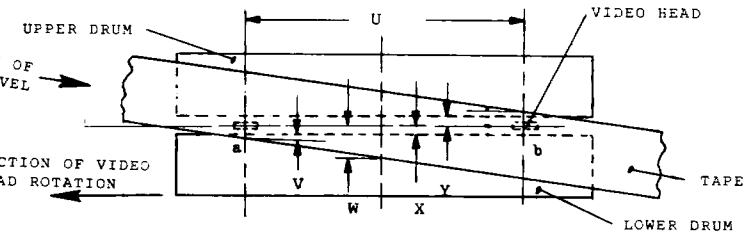
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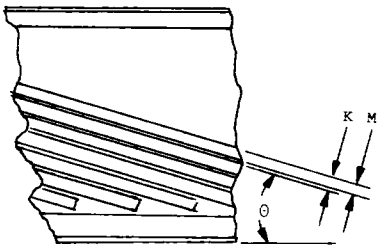
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**Fig. 1**  
Position of Audio and Control Track Heads as Viewed from Top of Drums



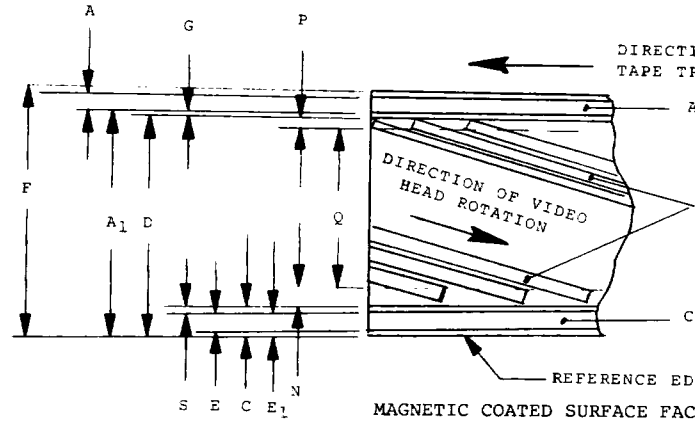
**Fig. 2**  
Relationship among Upper and Lower Drum, Video Heads and Tape



**Fig. 3**  
Track Angle, Pitch and Width

Dimensions	Millimeters	Inches
Video track pitch	0.173 ± 0.003	0.00681 ± 0.00012
Audio and control head position	81.0 ± 0.1	3.189 ± 0.004
Video track width	0.10 min	0.0039 min
	180° on circumference of drum	
	0.73 ± 0.05	0.0287 ± 0.0020
Video width center	6.23 ± 0.05	0.2453 ± 0.0020
	0.75 ± 0.25	0.0295 ± 0.0098
	1.00 nom	0.0394 nom
	3° 7' 43"	

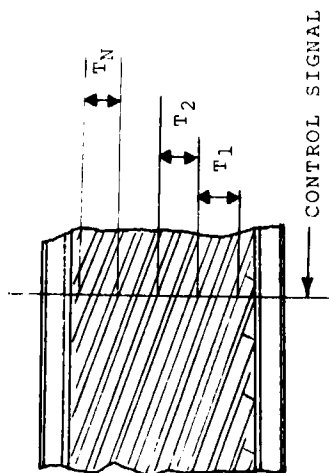
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**Fig. 4**  
Tape Dimensions and Track Configuration

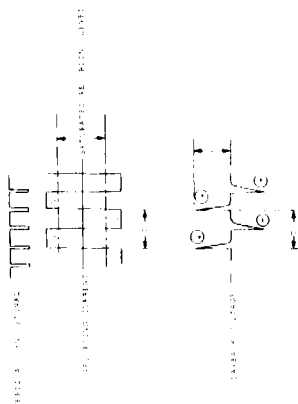
Dimensions	Millimeters	Inches
A	0.94 ± 0.05	0.0370 ± 0.0020
A <sub>1</sub>	11.61 min	0.4571 min
C	0.86 min	0.0339 min
D	11.51 max	0.4531 max
E	0.8 ± 0.1	0.031 ± 0.004
E <sub>1</sub>	0.81 max	0.0319 max
F	12.65 ± 0.05	0.4980 ± 0.0020
G	0.15 ± 0.02	0.0059 ± 0.0008
N*	0.275 nom	0.01083 nom
P*	0.275 nom	0.01083 nom
Q*	10.10 ± 0.01	0.3976 ± 0.0004
S	0.10 ± 0.02	0.0039 ± 0.0008

\*It is acceptable if a part of the scan start overlap width (P) or scan end overlap width (N) is missing from the tape, but the range of the video width (Q) must be correct.



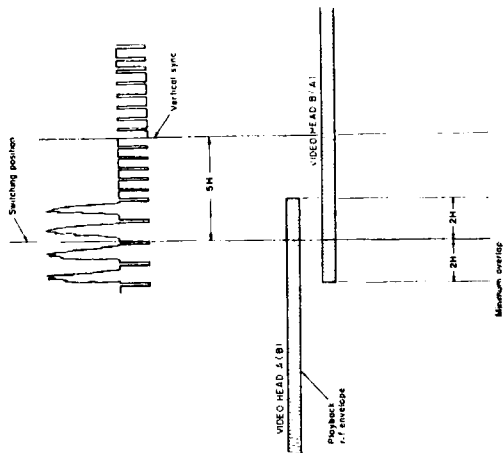
**Fig. 7**  
Video Track Straightness on  
Magnetic Coated Surface of Tape

NOTE: Video track pitch in the tape-width direction is represented by  $T_1$  through  $T_N$ . If  $T_0$  is given as a theoretical value, then  $T_0 = 0.3474$  mm (0.013677 in) when the number of fields per second is 59.94 and the nominal tape speed is 190.5 mm/s (7.5 in/s).

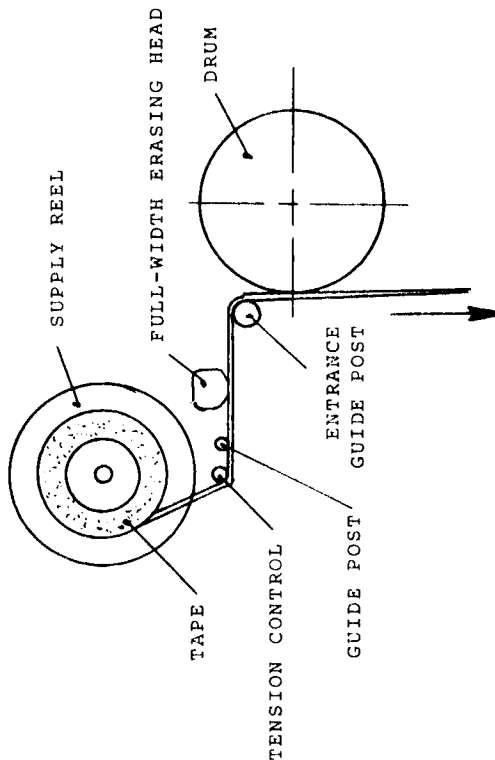


**Fig. 8**  
Waveform and Polarity of Control Signals

- Notes:
1.  $n_T = 60$  nominal
  2.  $n_K = 262.5$
  3.  $T_1 = 33.3$  ms nominal
  4. When the polarity changes from the S pole to the N pole, a positive pulse voltage shall be obtained.
  5. The reference pulse shall be of a positive pulse voltage.
  6. The waveform of the recording current need not be a square wave, if it is considered that interchangeability of recorded tapes can be maintained.



**Fig. 5**  
Switching Position of Two Video Heads



**Fig. 6**  
Tape Back-Tension as Seen from  
Top of Supply Reel and Drums