120th SMPTE Technical Conference and Equipment Exhibit

29 October–2 November 1978, Americana Hotel, New York City

Papers for the New York Conference are now being accepted for review according to **John Zeman,** Program Chairman. The procedure for submission of papers is as follows. Write to Program Chairman Zeman, or one of the Associate Chairmen at the addresses given below, or to the Conference Programs Secretary **(Lynne Robinson)** at SMPTE Headquarters.

The required forms, plus a 500-700 word synopsis of each paper, are due at Headquarters by 1 June. Before 14 August, the original manuscript must be sent to Headquarters for evaluation by the Program Chairman.

Program Chairman: John R. Zeman, Eastman Kodak Co., 1133 Avenue of the Americas, New York, NY 10036, (212) 262-7130.

All Film Subjects: Edward J. Messina, Jr., ABC-TV, 67 West 66 St., New York, NY 10023, (212) LT 1-7777 x 7271.

Audio in Post Production; Stereo Sound in Video Broadcasting and Theatrical Applications; Production Techniques; Special Effects in Film and Video; and Film to Tape and Tape to Film: C. Robert Fine, Fine Communications, 570 North St., Harrison, NY 10528, (914) 967-1317.

Electronic Editing; Video Processing; Satellites; and Status Reports on Standards: L. Merle Thomas, Public Broadcasting Service, 472 L'Enfant Plaza West SW, Washington, DC 20024, (202) 488-5000.

Standards & Recommended Practices

Draft American National Standards and Proposed SMPTE Recommended Practices

Two Draft American National Standards and an accompanying Proposed SMPTE Recommended Practice specifying the ¾-in Type A helical-scan magnetic video tape systems are published here for public review and comment. Developed by the Subcommittee on Video Tape Helical-Scan Systems, under the chairmanship of Mr. G. P. Mc Ginty, the proposals specify the format introduced as U-Matic by Sony: C98.21, Dimensions and Location of Records for ¾-in Type A Helical-Scan Video Tape Cassette Recording; C98.22, Dimensions of Video Cassette for ¾-in Type A Helical-Scan Video Tape Recording; and RP 87, Reference Carrier Frequencies, Pre-emphasis Characteristic and Audio and Control Signals for ¾-in Type A Helical-Scan Video Tape Cassette Recording.

A Draft American National Standard and an accompanying Proposed SMPTE Recommended Practice specifying the ½-in Type A helical-scan magnetic video tape system are also published here for public review and comment. Developed by the Subcommittee on Video Tape Helical-Scan Systems, under the chairmanship of Mr. G. P. Mc Ginty, the proposals specify the format introduced by EIA-J (Electrical Industries Association of Japan): C98.23, Dimensions and Location of Records and Basic Electrical Parameters for ½-in Type A Helical-Scan Video Tape Recording; and RP 88, Reference Carrier Frequencies and Pre-emphasis Characteristic for ½-in Type A Helical-Scan Video Tape Recording.

Comments on the proposals should be addressed to Alex E. Alden at Society Headquarters prior to 1 June 1978. The draft standards have been submitted to American National Standards Committee C98. All comments received through *Journal* publication will be reviewed before conclusion of action by that committee. If no adverse criticism is received, the proposed practices will be submitted to the Society's Board of Governors for approval. — Alex E. Alden, *Manager of Engineering Services.*

Approved International Standard

The International Organization for Standardization (ISO) recently approved an International Standard, the technical content of which is published here for your information. ISO 26-1977, Cinematography — Projector Usage of 16 mm Motion-Picture Films for Direct Front Projection — Specifications, is in agreement with American National Standard Specifications for Projector Usage of 16-mm Motion-Picture Film, PH22.10-1973.

This material is reproduced with permission from the ISO and is copyrighted by the American National Standards Institute, 1430 Broadway, New York, NY 10018, from which complete copies are available. — Alex E. Alden, *Manager of Engineering Services.*

SMPTE Working Groups Formed

Several SMPTE Engineering Committees have formed working groups. Prospective members are invited to contact Alex E. Alden at Society Headquarters: (a) Equalization of Television Audio, a working group to consider the need to develop an equalization practice for motion-picture audio recording intended specifically for television broadcast; and (b) Reference Tapes for Magnetic Video Tape Systems.

Preliminary Exchange of Experimental Interchange Tapes for Types B and C Helical Video Tape Recorders

The Helical Recording Subcommittee of SMPTE's Committee on Video Recording and Reproduction Technology is organizing a preliminary exchange of tapes to verify the recording format parameters of the Types B and C one-inch helical-scan video tape recorders. These tapes are intended to be used in early interchange experiments by manufacturers of video tape recorders or other interested parties with evaluation facilities for these formats. Tapes used in this preliminary exchange are definitely not alignment tapes and will be of no value to potential users of these formats.

Information obtained from the evaluation of these preliminary tapes will be made available to the Helical Recording Subcommittee members to be used in their ongoing activities. The subcommittee is charged with the responsibility of revising or writing new draft ANSI Standards and Proposed SMPTE Recommended Practices for the Types A, B, and C one-inch and other helical-scan video tape recorder formats. If you are interested in this preliminary exchange of tapes, or would like to become a member of the Helical Recording Subcommittee, please contact the subcommittee chairman: David K. Fibush, Ampex Corporation, Mail Stop 3-59, 401 Broadway, Redwood City, CA 94063. Telephone: (415) 367-3157.

Draft American National Standard

Dimensions and Location of Records for ¾-in Type A Helical-Scan Video Tape Cassette Recording

C98.21

1. Scope

This standard specifies the location of the edges for 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 ¾-in Type A 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 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 nearest the reference plane of the cassette.

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 20± 2°C (68 ± 4°F) with a relative humidity of 50 ± 5 percent.

3.4 Magnetic Coating. With the direction of 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 95.3 mm/s (3.752 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 ± 0.01 mm (4.3307 ± 0.0004 in).

4. Dimensions

The transverse and longitudinal dimensions shall be as specified in Fig. 1 and Table 1.

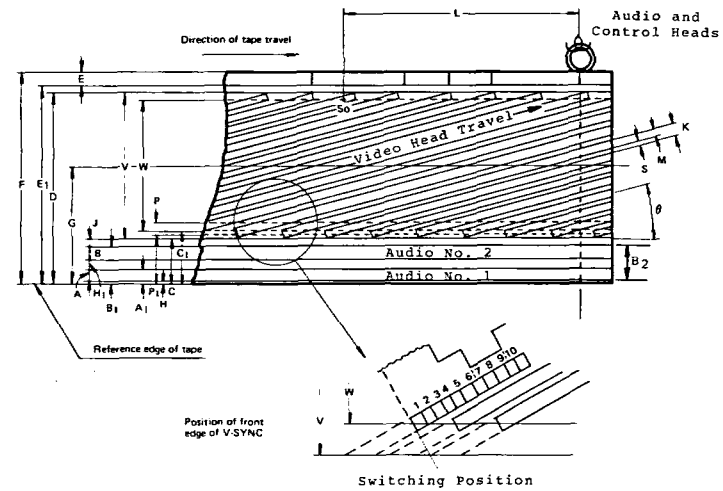

Fig. 1
Track Configuration and Dimensions from Magneto-Sensitive Side

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 ± 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 nom	2.913 nom
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_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	14.8 nom	0.583 nom
θ	Video track angle, moving tape	4° 57′ 33.2″	
	stationary tape	4° 54′ 49.1″	

*See Section 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 to the audio and control head position is 74.0 mm (2.913 in), as shown in Fig. 1.

6. Audio Record Displacement

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

8. Tape Back-Tension

The tape back-tension in the record mode shall be 0.686 ± 0.098 N (70 ± 10 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.

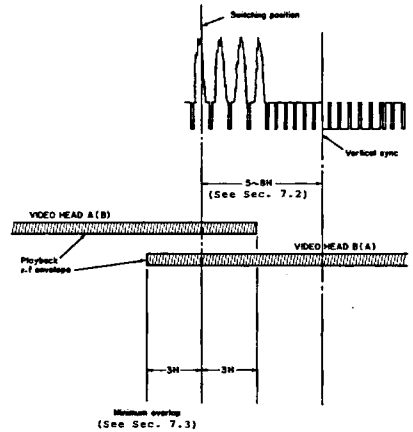

Fig. 2
Switching Position of Two Video Heads

NOTE: In addition to this standard, there are available the following documents relating to ¾-in Type A helical-scan video tape recording:

C98.22, Draft American National Standard Dimensions of Video Cassette for ¾-in Type A Helical-Scan Video Tape Recording

RP 87, Proposed SMPTE Recommended Practice on Reference Carrier Frequencies, Pre-emphasis Characteristic and Audio and Control Signals for ¾-in Type A Helical-Scan Video Tape Cassette Recording

Figure for Illustration Only

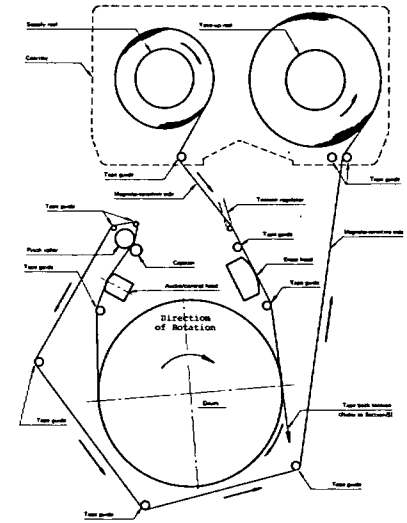

Fig. 3
Tape Path and Guidance

Draft American National Standard

Dimensions of Video Cassette for ¾-in Type A Helical-Scan Video Tape Recording

C98.22

1. Scope

This standard specifies the dimensions of a video cassette for use with a ¾-in Type A helical-scan video tape recording cassette system, operating at a tape speed of 95.3 mm/s (3.752 in/s).

2. Datum Planes

2.1 Datum Plane A is the plane determined by points A, B, and C in Fig. 5.

2.2 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.

2.3 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 ± 2°C (68 ± 4°F) with a relative humidity of 50 ± 5 percent.

NOTE: In addition to this standard, there is available Draft American National Standard Dimensions and Location of Records for ¾-in Type A Helical-Scan Video Tape Cassette Recording, C98.21.

Table 1
Dimensional Tolerances Not Otherwise Specified

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

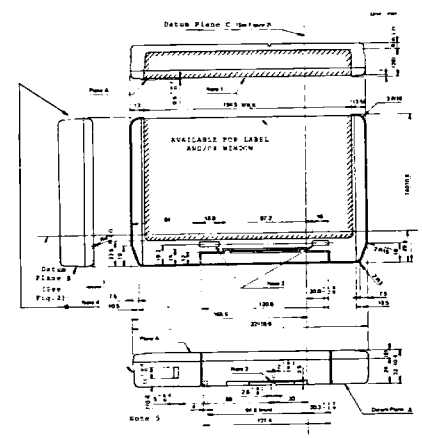

Fig. 1
Top View of Video Cassette

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, but not more than 4° from vertical.
5. This dimension is measured from Datum Plane A.

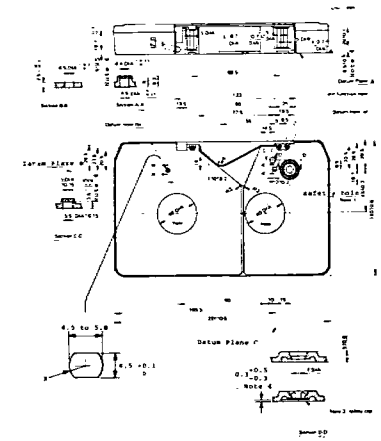

Fig. 2
Bottom View of Video Cassette

Notes:

1. Recording is possible when the safety hole is covered.
2. The cap must not protrude but should be indented from Datum Plane A.
3. Datum Hole (a) is primary.
4. These dimensions are measured from Datum Plane A.

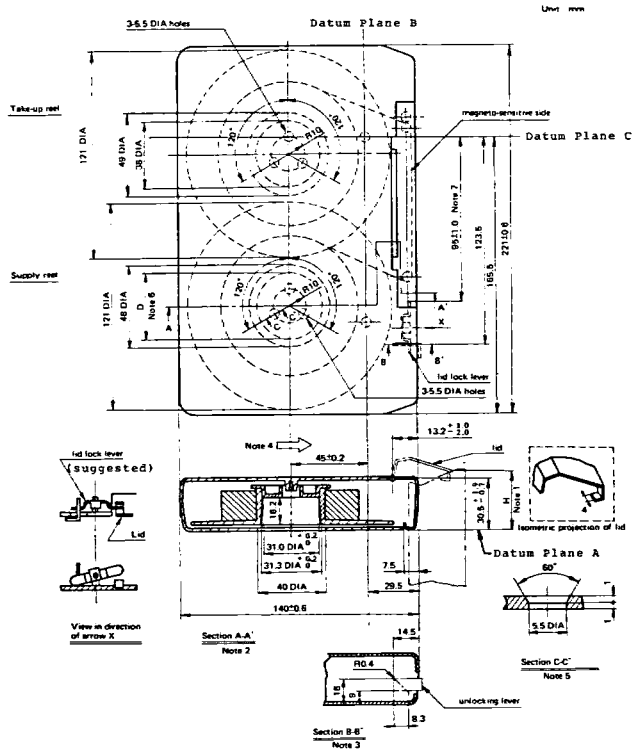

Fig. 3
Location of Reels and Protecting Lid

Notes:

1. (a) The protecting lid of the cassette shall open (height H) more than 35 mm (1.38 in). Height H is measured from Datum Plane A.

   (b) Recorder/player unit shall be designed to open the protecting lid (height H) between 30 and 35 mm (1.18 and 1.38 in) during operation.

2. The protecting lid opens as shown in Section A-A' 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. The arrow shows the direction of cassette insertion.

5. Hole for drive pin.

6. The supply reel is of two types as follows:

   Hub diameter (D) of supply reel Type I:
   38 mm (1.50 in)

   Hub diameter (D) of supply reel Type II:
   80 mm (3.15 in)

   A minimum distance of 1.5 mm (0.059 in) is required between the outer edge of a full reel pack and the edge of the reel flange.

7. Distance when the lock lever is parallel to Datum Plane C.

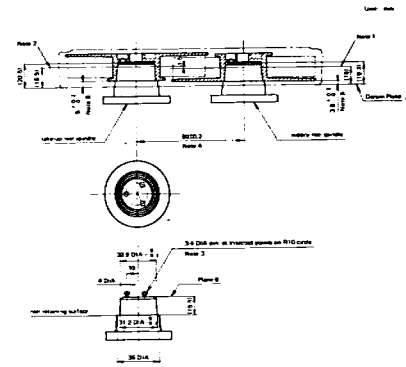

Fig. 4
Relationship between Reels and Reel Spindles

Notes:

1. Center of tape on supply reel when cassette is inserted in recorder/player.

2. Center of tape on take-up reel when cassette is inserted in recorder/player.

3. Pins of the reel spindle drive the reel and can be pressed down to the level of Plane B.

4. Distance between centers of two reel spindles.

5. Distance between contact plane to supply reel and Datum Plane A of the cassette.

6. Distance between contact plane to take-up reel and Datum Plane A of the cassette.

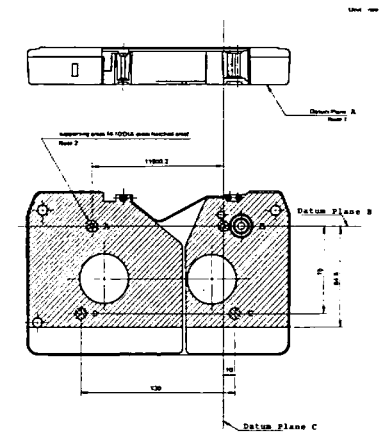

Fig. 5
Cassette Datum Plane

Notes:

1. Datum Plane A is determined by Datum Points A, B, and C.

2. Flatness of the four cross-hatched areas shall be coplanar within 0.2 mm (0.008 in).

3. Flatness of the hatched area shall be coplanar within + 0.5 — 0.6 mm (+ 0.020 — 0.024 in) of Datum Plane A. The positive deviation is measured upward from the bottom plane.

Draft American National Standard

Dimensions and Location of Records and Basic Electrical Parameters for ½-in Type A Helical-Scan Video Tape Recording

C98.23

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 recorded on ½-in Type A helical-scan video tape operating at a nominal speed of 190.5 mm/s (7.5 in/s).

2. Definitions

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

2.2 Longitudinal. Pertaining to dimensions parallel to the 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 a direction opposite tape travel.

2.5 Trailing End of Video Track. The upstream end 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 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 ± 2°C (68 ± 4°F) with a relative humidity of 50 ± 5 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 ± 0.010 mm (4.55984 ± 0.00039 in).

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 ± 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) ± 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 3 horizontal lines to provide ± 3 horizontal lines of overlap.

4. Dimensions

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

5. Position of Audio and Control-Track Heads

The position of the audio and control-track heads shall be as shown in Fig. 1 for optimum tracking. Optimum tracking provides maximum output from the heads when playing back a reference tape.

6. Audio Record Displacement

Program audio or other information which is time-coincident with video information recorded at a point, S_o, of any video track shall be recorded on Audio Record No. 1 at a distance, L, upstream from that point, S_o (see Fig. 1).

7. Tape Back-Tension

The tape back-tension shall be 0.441 ± 0.049 N (45 ± 5 gf) when measured as specified below. The tension shall be measured as indicated in Fig. 6 as the tape comes off the entrance guide post. A 177.8-mm (7-in) reel, filled with tape to a diameter of 132 ± 1 mm (5.20 ± 0.04 in), shall be inserted in the recorder, and the tape threaded past the entrance guide post. The tension shall be measured with a suitable spring balance as the tape is smoothly pulled off the reel at a uniform speed approximately equal to normal tape speed.

NOTE: In addition to this standard, there is available Proposed SMPTE Recommended Practice on Reference Carrier Frequencies and Pre-emphasis Characteristic for ½-in Type A Helical-Scan Video Tape Recording, RP 88.

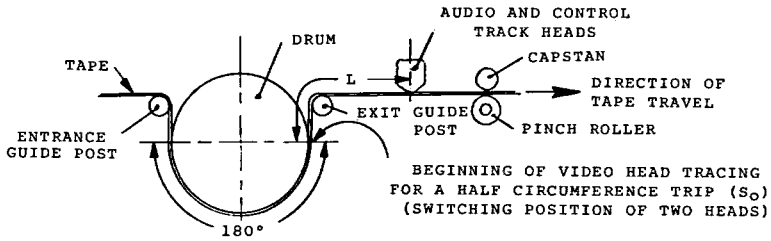

Fig. 1
Position of Audio and Control Track Heads as Viewed from Top of Drums

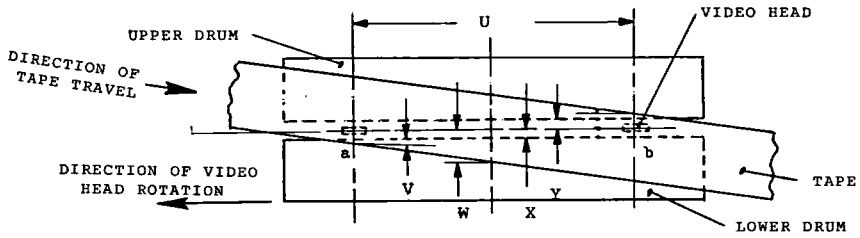

Fig. 2
Relationship among Upper and Lower Drum, Video Heads and Tape

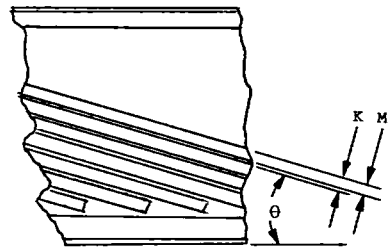

Fig. 3
Track Angle, Pitch and Width

	Dimensions	Millimeters	Inches
K	Video track pitch	0.173 ± 0.003	0.00681 ± 0.00012
L	Audio and control head position	81.0 ± 0.03	3.189 ± 0.012
M	Video track width	0.10 min	0.0039 min
U		180° on circumference of drum	
V		0.73 ± 0.05	0.0287 ± 0.0020
W		6.23 ± 0.05	0.2453 ± 0.0020
X		0.75 ± 0.25	0.0295 ± 0.0098
Y		1.00 nom	0.0394 nom
θ		3° 7′ 43″	

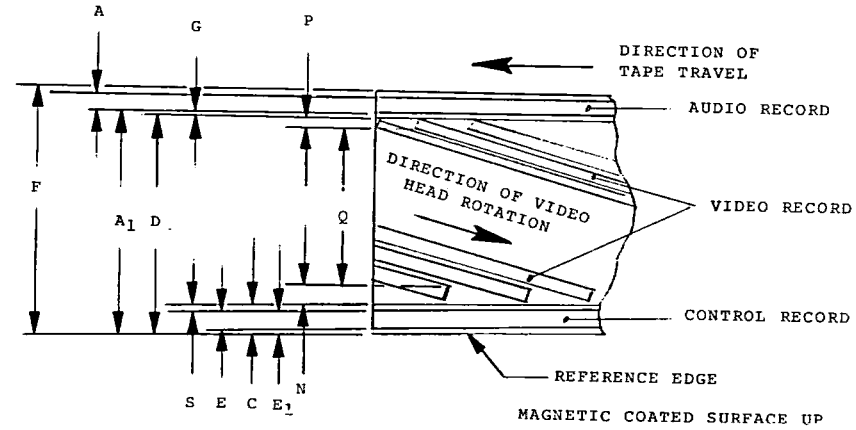

Fig. 4
Tape Dimensions and Track Configuration

	Dimensions	Millimeters	Inches
A	Audio track width	0.94 ± 0.05	0.0370 ± 0.0020
A_1	Audio reference	11.61 min	0.4571 min
C	Lower limit video area	0.86 min	0.0339 min
D	Upper limit video area	11.51 max	0.4531 max
E	Control track width	0.76 ± 0.05	0.0299 ± 0.0020
E_1	Control track reference	0.81 max	0.0319 max
F	Tape width	12.70 $^{+0.00}_{-0.10}$	0.5000 $^{+0.0000}_{-0.0039}$
G	Control track to video guard band	0.15 ± 0.02	0.0059 ± 0.0008
N*	Scan end overlap	0.275 nom	0.01083 nom
P*	Scan start overlap	0.275 nom	0.01083 nom
Q*	Video area width	10.10 min	0.3976 min
S	Audio to video guard band	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 video track; but the range of the video width (Q) must be correct.

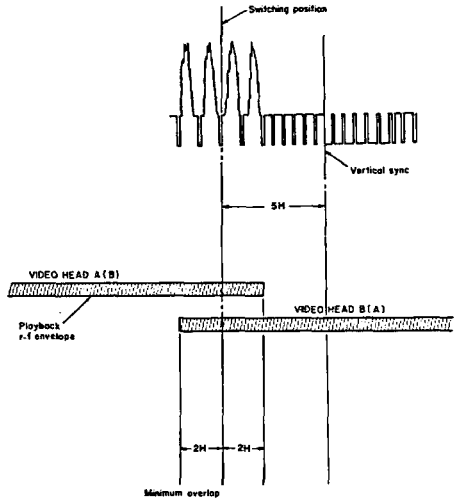

Fig. 5
Switching Position of Two Video Heads

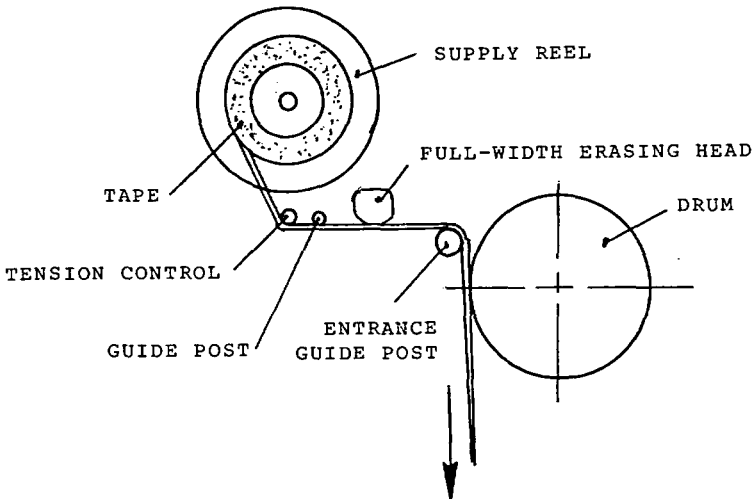

Fig. 6
Tape Back-Tension as Seen from Top of Supply Reel and Drums

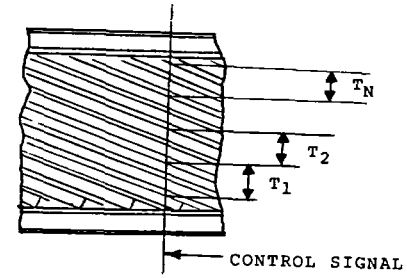

Fig. 7
Video Track Straightness on Magnetic Coated Surface Side of Tape

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).

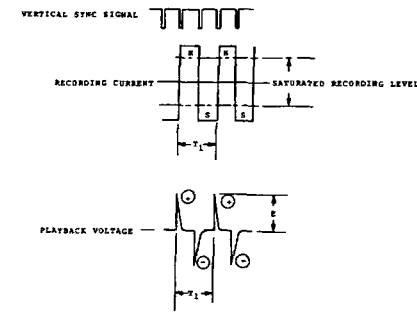

Fig. 8
Waveform and Polarity of Control Signals

Notes:

1. $n_f = 60$ nominal
2. $n_H = 262.5$
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.