ANSI/SMPTE 229M-1996
Revision of
ANSI/SMPTE 229M-1991

SMPTE STANDARD

for Television Analog Recording — 1/2-in Type L — Records

1 Scope

This standard specifies the dimensions and location of the video, audio, time code, and tracking-control records, as recorded by 1/2-in type L helical-scan video tape recorders operating with video signals having a typical scanning structure of 525 lines, 59.94 fields per second, and 2:1 interlace. Use is made of the video cassette and tape specified in ANSI/SMPTE 35M for type G format or ANSI/SMPTE 238M for type L format.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI/SMPTE 35M-1991, Television Analog Recording — 1/2-in Type G — Cassette and Tape

ANSI/SMPTE 238M-1992, Television Analog Recording — 1/2-in Type L — Tapes and Cassettes

3 General specifications

3.1 Dimensions are in the metric system.

3.2 Tests and measurements made on the tape record to check the requirements of this standard shall be made under the following conditions unless otherwise stated:

- Temperature 20°C ± 1°C
- Relative humidity (50 ± 2)%
- Barometric pressure 86 kPa to 106 kPa
- Tape tension 0.46 N ± 0.05 N

3.3 Conditioning of the tape stock before recording and testing shall be as follows:

-- Environmental: Stabilized to the conditions specified in 3.2

-- Tape tension: Wound on a reel at a tension of 0.56 N ± 0.20 N

-- Conditioning time: 24 hours

3.4 The reference edge of the tape for dimensions specified in this standard shall be the lower edge as shown in figure 1. The magnetic coating, with the direction of tape travel as shown in figures 1 and 2, is on the side facing the observer.

4 Tape speed

The tape speed shall be 118.582 mm/s, basic, and shall result in dimension “O” as shown.

5 Record locations and dimensions

5.1 Record locations and dimensions shall be as specified in figures 1 and 2 and table 1.

5.2 Dimensions P, Q, R, and W are shown for reference purposes only. The actual value of these dimensions is determined by the transport parameters, the tape speed, and their tolerances. The nominal values given are based on tensioned tape; therefore, direct measurements without tension must take into account tape elasticity.

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American National Standard

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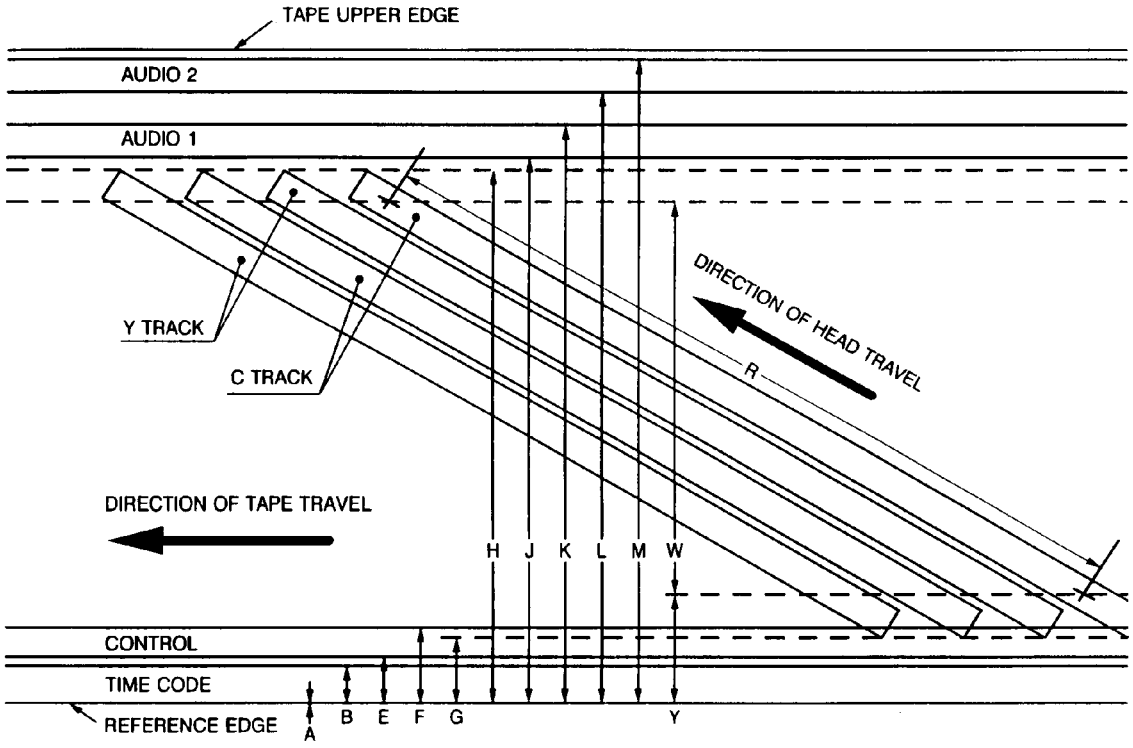


Figure 1 – Record locations and dimensions

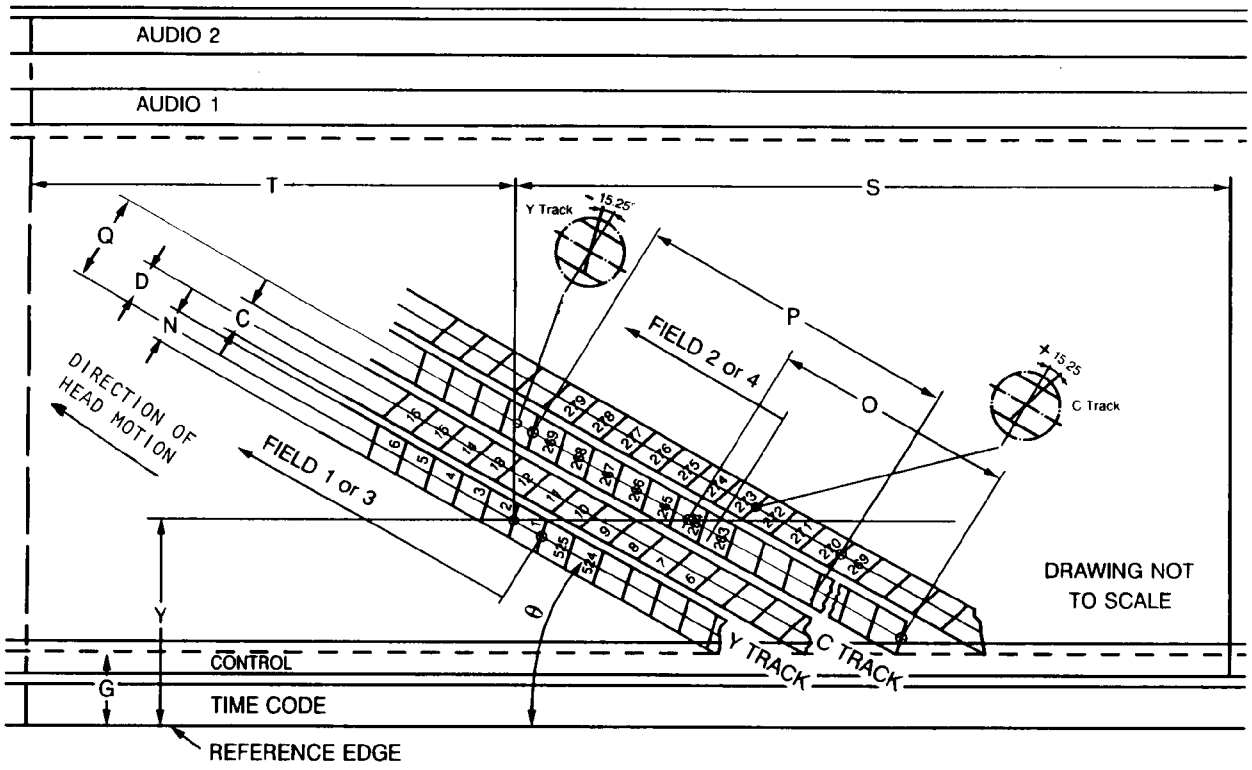


Figure 2 – Video record location (525/60)

Table 1 – Record locations and dimensions

	Dimensions	Micrometers Minimum	Nominal	Maximum
A	Time code track lower edge	0	0	0
B	Time code track upper edge	330	400	470
C	Color track width	68	73	78
D	Y-C track pitch	77.5	80.5	83.5
E	Control track lower edge	635	700	765
F	Control track upper edge	1035	1100	1165
G	Video track lower edge	880	950	1020
H	Video track upper edge	10720	10720	10805
J	Audio 1 track lower edge	10805	10850	10895
K	Audio 1 track upper edge	11390	11450	11510
L	Audio 2 track lower edge	11790	11850	11910
M	Audio 2 track upper edge	12405	12450	12495
N	Y track width	83	86	89
O	Lead signal overlap			8.3H ref
P	Y-C track offset		4399 (= 10H) ref	
Q	Video track pitch	161.0	161.4	161.8
R	Video track length		115032	(262.5H) basic
S	Control track record offset	36600	36700	36800
T	Audio and time code record offset	180681	180918	181155
W	Video area effective width		9384 ref	
Y	Lower limit of W	1238	1248	1258
θ	Track angle (degrees)		4.6790 (basic)	

NOTE -- Ref indicates those measurements which are fixed by other parameters and are given for reference purposes only.

6 Video record curvature

The edge of any video record contained within an area defined by dimension W shall lay within two parallel straight lines 0.010 mm apart (see annex A for preferred measurement technique).

7 Relative positions of recorded signals

7.1 Video luminance, color difference, tracking control, audio, and time code signals, with information intended to be time coincident, shall be positioned as shown in figure 2.

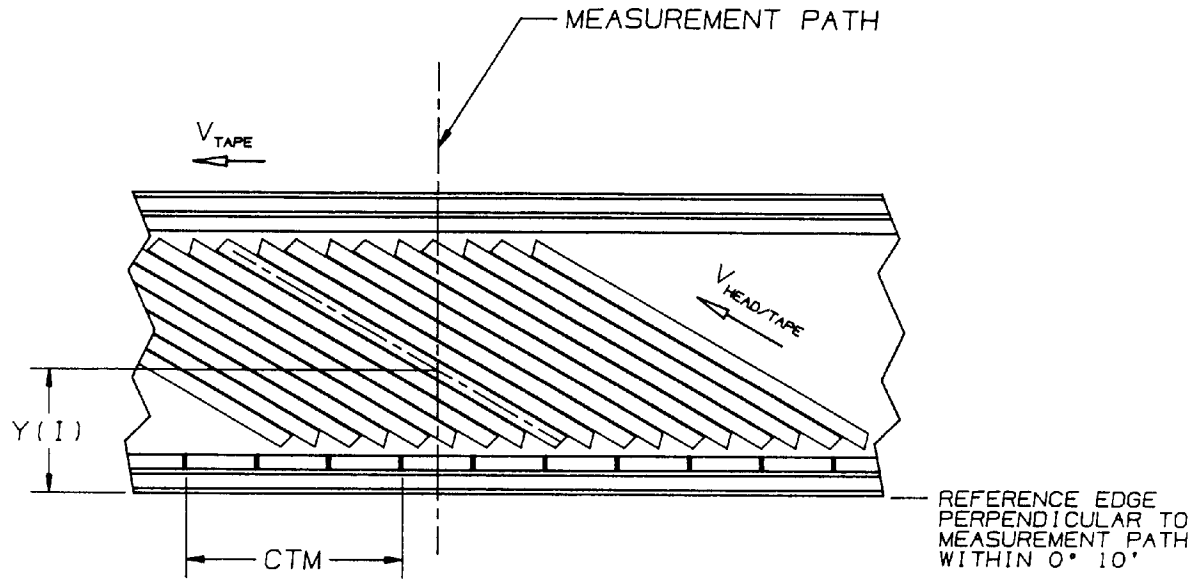
7.2 Luminance and color-difference records for fields 2 and 4 are offset by one-half line with respect to fields 1 and 3 (see figure 2).

8 Gap azimuth

8.1 The azimuth of the audio, tracking control, and time code head gaps used to produce longitudinal track records shall be perpendicular to the direction of relative head-to-tape motion (see figure 2).

8.2 The azimuth of the video head gaps for the luminance signal shall be –15.25° and for the color-difference signals +15.25° to the perpendicular of the direction of head motion.

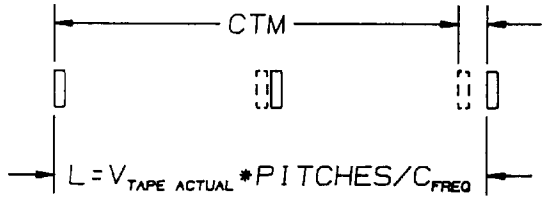
Annex A (informative)
Measurement technique



Y(I) MUST USE SAME HEAD FOR EACH MEASUREMENT (i.e. EVERY 2nd TRACK)

CTM = CONTROL TRACK PULSES (UNTENSIONED TAPE)

CORRECTION FACTORS ACTUAL TAPE SPEED, TENSION



F = TENSION (0.46 N)

E = YOUNG'S MODULUS (8000 N/mm²)

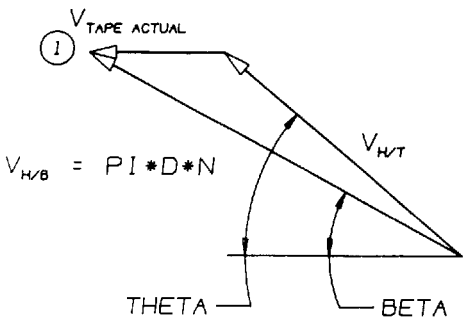
A = CROSS SECTIONAL AREA (THICKNESS X WIDTH)

C_{FREQ} = CONTROL TRACK FREQUENCY (59.94 Hz)

L = CORRECTED DISTANCE

$$V_{TAPE\ ACTUAL} = CTM * C_{FREQ} / ((1 - F/(E * A)) * PITCHES)$$

MODEL



$V_{H/B}$ = VELOCITY OF HEAD wrt BAND

$V_{TAPE\ ACTUAL}$ = ACTUAL VELOCITY of TAPE

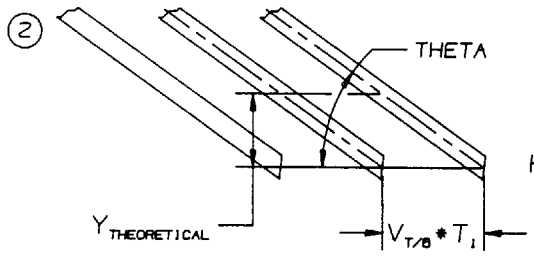
$V_{H/T}$ = VELOCITY of HEAD wrt TAPE

D = EFFECTIVE SCANNER DIAMETER

N = SCANNER SPEED ($\frac{REV}{S}$)

THETA = TRACK ANGLE

BETA = SCANNER HELIX ANGLE



T_I = TIME BETWEEN HEAD PASSES

$$= \frac{1}{N * HPPR}$$

HPPR = HEAD PASSES per REVOLUTION

FROM (1)

$$TAN\ (THETA) = \frac{PI * D * N * SIN(BETA)}{PI * D * N * COS(BETA) - V_{TAPE\ ACTUAL}}$$

FROM (2)

$$TAN\ (THETA) = \frac{Y_{THEORETICAL}}{V_{TAPE\ ACTUAL} * T_I}$$

THEREFORE:

$$Y_{THEORETICAL} = \frac{PI * D * N * SIN(BETA)}{PI * D * N * COS(BETA) - V_{TAPE\ ACTUAL}} * V_{TAPE\ ACTUAL} * T_I$$

$$TRACK\ LOCATION\ ERROR = Y(I) - Y(I)_{THEORETICAL}$$

Annex B (informative)
Bibliography

ANSI/SMPTE 230M-1996, Television Analog Recording — 1/2-in Type L — Electrical Parameters, Control Code and Tracking Control

SMPTE RP 144-1995, Basic System and Transport Geometry Parameters for 1/2-in Type L Format