SMPTE 224M-2003
Revision of
ANSI/SMPTE 224M-1996

SMPTE STANDARD

for Television Digital Component Recording — 19-mm Type D-1 — Tape Record

1 Scope

This standard specifies the dimensions and location of the audio, video, and auxiliary data, analog cue track, time code, and control track records for 19-mm type D-1 television digital component recording, operating on the 525/60 television system encoded according to ANSI/SMPTE 125M.

2 General specifications

2.1 Dimensions are in the metric system.

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

- Temperature: 20°C ± 1°C
- Relative humidity: (50 ± 2)%
- Barometric pressure: 96 kPa ± 10 kPa
- Tape tension: 0.80 N ± 0.05 N

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

- Storage conditioning: Not less than 24 hours
- Environmental: Stabilized to the conditions specified in 2.2
- Tape tension: Wound on a reel at a tension of 0.6 N to 1.5 N

2.4 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 figure 1, is on the side facing the
observer.

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2.4.1 All dimensions in table 1 and the figures are to be measured from an equivalent reference edge. The tape reference edge is a line through three points on the edge of the tape separated by 115 mm and constrained to lie in one straight line. This constraint may be a physical deformation or an equivalent mathematical transformation. The program area reference point lies on a perpendicular to the reference edge through the center point of the reference edge (see annex A and figure 2). All edge measurements are based on an average length of 10 mm.

3 Tape speed

The tape speed shall be 286.588 mm/s ± 0.2%.

4 Record location and dimensions

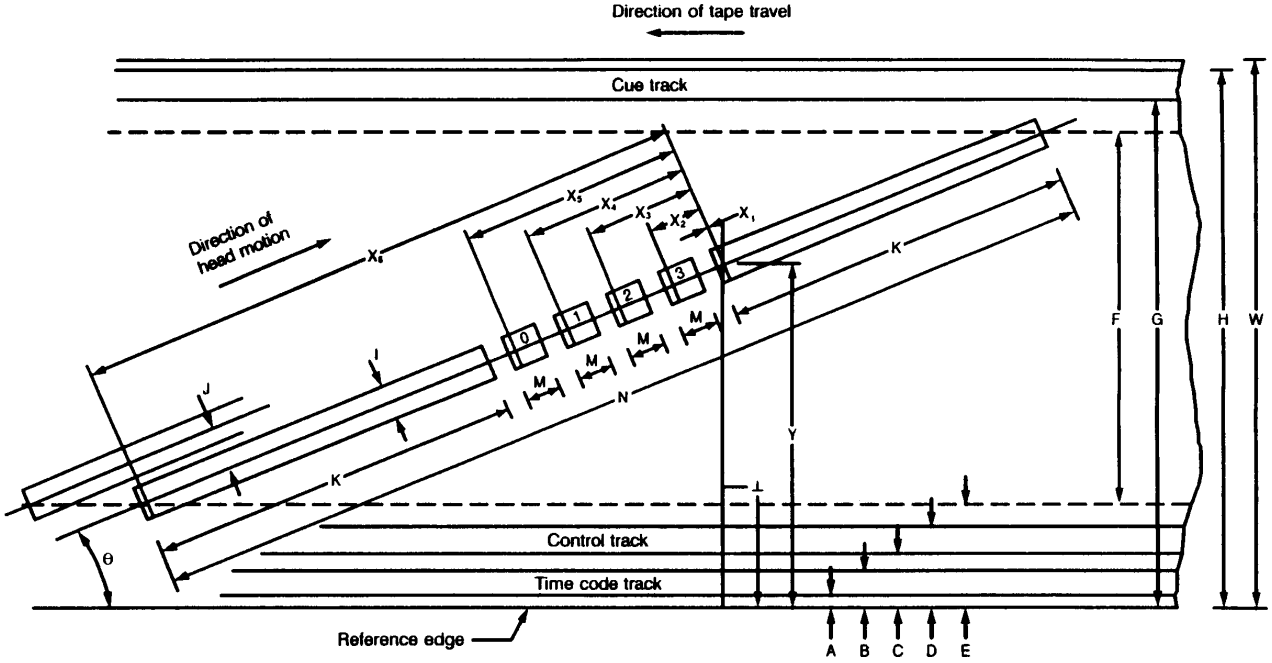
4.1 Record location and dimensions shall be as specified in figures 1 and 3 and table 1.

4.2 In recording, including editing, sector locations on each helical track shall be contained within the tolerance specified in table 1 and figure 1.

Table 1 - Record location and dimensions for 525/60 standard

		Millimeters	
	Dimensions	Nominal	Tolerance
A	Time code track lower edge	0.2	± 0.1
B	Time code track upper edge	0.7	± 0.1
C	Control track lower edge	1.0	± 0.1
D	Control track upper edge	1.5	± 0.05
E	Program area lower edge	1.8	derived
F	Program area width	16/1.001	derived
G	Audio cue track lower edge	18.1	± 0.15
H	Audio cue track upper edge	18.8	± 0.2
I	Helical track width	0.04	+ 0 – 0.005
J	Program track pitch	0.045	basic
L	Video sector length	77.71	derived
M	Audio sector length	2.55	derived
N	Helical track total length	170/1.001	derived
P	Cue audio/time code (see note 2)	211.9	± 0.5
R	Recording tolerance		± 0.1
T	Control pulse location	0	± 0.1
θ	Track angle	Sin^{-1} (16/170)	basic
W	Tape width	19.01	± 0.015
X_1	Location of start of upper video sector	0	± 0.1
X_2	Location of start of audio sector 3	3.39	± 0.1
X_3	Location of start of audio sector 2	6.79	± 0.1
X_4	Location of start of audio sector 1	10.18	± 0.1
X_5	Location of start of audio sector 0	13.58	± 0.1
X_6	Location of start of lower video sector	92.12	± 0.1
Y	Program area reference	10.49	basic

NOTES
1 Above measurements shall be made under the conditions specified in 2.2
2 Dimension P is a physical “on tape” dimension, not a transport dimension.



NOTE – X dimensions (X_1-X_6) are determined by the end of preamble location, as defined in ANSI/SMPTE 227M.

Figure 1 - Location and dimensions of recorded tracks (tape viewed from magnetic coating)

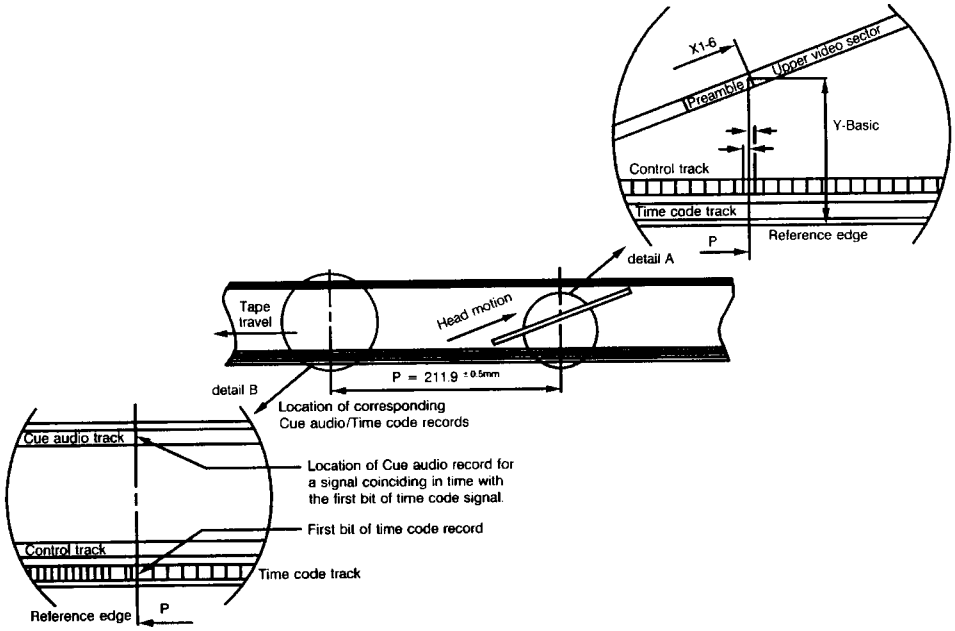
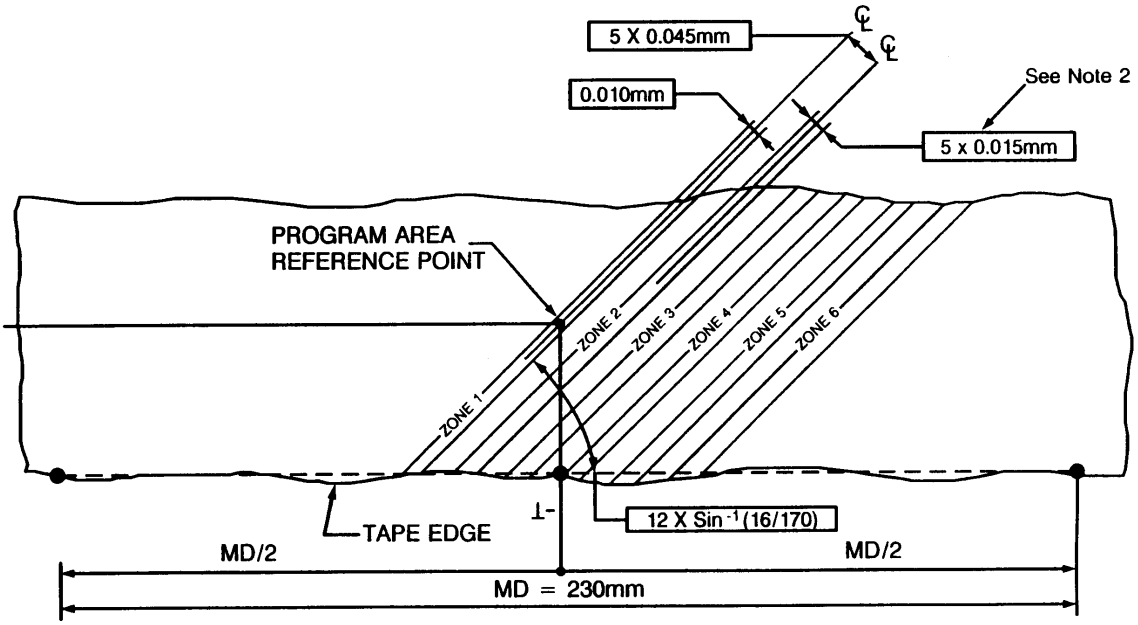


Figure 2 – Location of control track, cue and time code records



NOTES
1 The centerline of any 6 consecutive tracks shall be contained within each zone given.
2 [ ] = mechanical dimensions repeated 5 times.

Figure 3 – Location and dimensions of tolerance zones of helical track record

5 Helical track record curvature

5.1 The centerlines of any six consecutive tracks shall be contained within the pattern of the six tolerance zones established in figure 2.

5.2 Each zone is defined by two parallel lines which are inclined at an angle of SIN^{-1} (16/170) basic with respect to the tape reference edge.

5.3 The centerlines of all zones shall be spaced 0.045 mm basic apart. The width of the first zone shall be 0.01 mm basic. The width of zones 2 through 6 shall be 0.015 mm basic. These zones are established to contain track angle errors, track straightness errors, and track pitch errors.

6 Relative positions of recorded signals

6.1 Audio, video, auxiliary data, tracking control, time code, and cue track, with information intended to be time coincident, shall be positioned as shown in figures 1 and 3.

6.2 The spatial relationship between the control track record and helical tracks are specified in figures 1 and 3.

6.3 The program area reference point is defined as a point corresponding to the end of the preamble in the upper video sector. This point is determined by a line parallel to the reference edge of the tape 10.49 mm apart given as Y in the table, intersecting the track centerline as shown in figures 1 and 3. The relationship between sectors and contents of each sector is specified by ANSI/SMPTE 227M.

7 Gap azimuth

7.1 The azimuth angle of the cue audio, control track, and time code head gaps used to produce longitudinal track records shall be perpendicular to the track record.

7.2 The azimuth angle of the head gaps used for the helical track recording shall be perpendicular to the helical track record within a tolerance of ± 10 minutes.

Annex A (informative)
Tape data

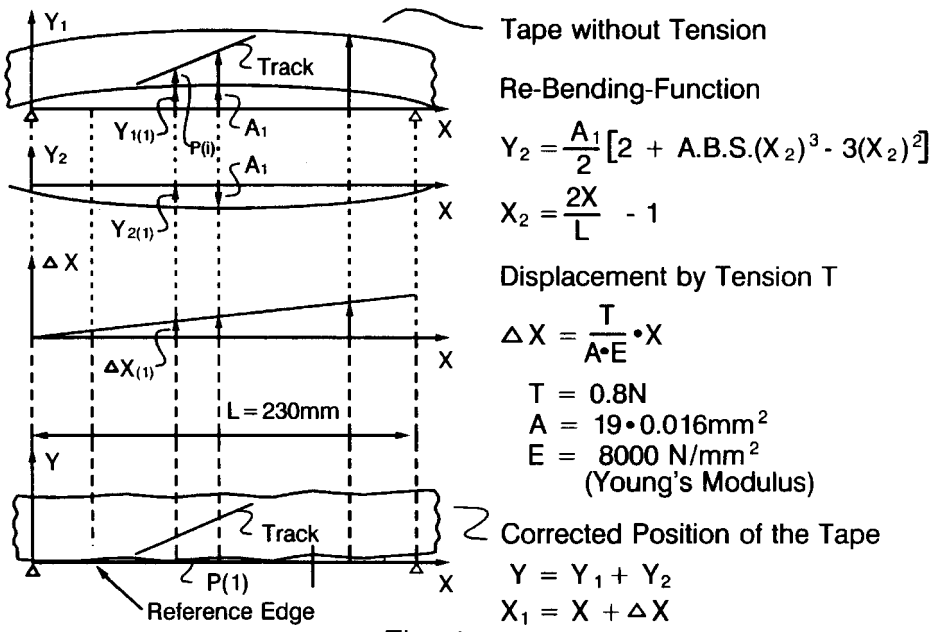


Figure A.1 – Mathematically processed measured tape data

Annex B (informative)
Bibliography

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ANSI/SMPTE 226M-1996, Television Digital Recording - 19-mm Tape Cassettes

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SMPTE EG 10-2003, Tape Transport Geometry Parameters for 19-mm Type D-1 Television Digital Component Recording

SMPTE EG 21-1997, Nomenclature for Television Digital Recording of 19-mm Type D-1 Component and Type D-2 Composite Formats