SMPTE 6-1998
Revision of
ANSI/SMPTE 6-1993

SMPTE STANDARD

for Video Recording — 2-in Quadruplex Tape — Video, Audio and Tracking-Control Records

1 Scope

This standard specifies both the locations for 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 at 15 and 7.5 in/s on 2-in quadruplex video magnetic tape.

2 Definitions

2.1 transverse: Pertaining to dimensions or motions perpendicular to the tape travel.

2.2 longitudinal: Pertaining to dimensions or motions 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 the direction opposite to tape travel.

2.5 reference edge: On a video tape containing quadruplex-recorded information, that longitudinal tape edge nearest the tracking-control record.

2.6 trailing edge, video track: The upstream edge of the video track.

2.7 transverse reference line: A line perpendicular to the reference edge and passing through a video track trailing edge at its lowest end (point T_0) as in figure 1.

3 General

3.1 References

The transverse reference line and reference edge shall be the references for all dimensions in this standard.

3.2 Measurement conditions

The dimensions specified in this standard are measured with no transverse or longitudinal tension applied to the tape (see annex A.4).

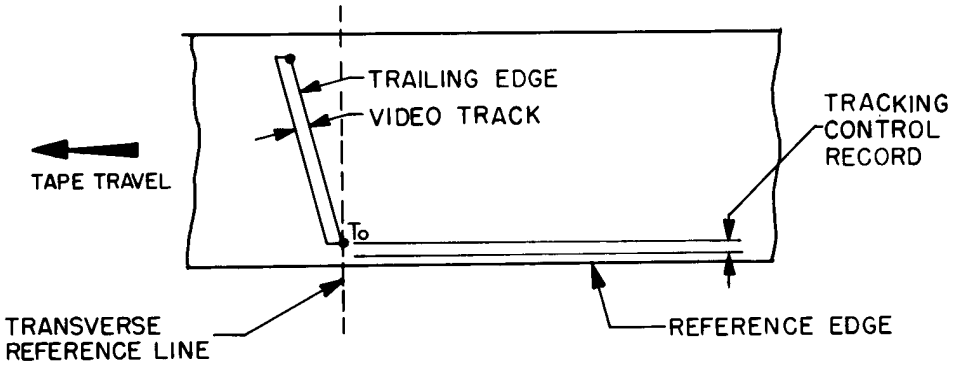

Figure 1 – Definitions

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3.3 Magnetic coating

With the direction of tape travel as shown in all figures in this standard, the magnetic coating is on the surface facing the observer.

4 Longitudinal dimensions

4.1 Average video track pitch

For a tape recorded at 15 in/s (381 mm/s), the longitudinal distance, R, from a transverse reference line to a point, T_4, four tracks away (see figure 2), shall be greater than 0.062438 in (1.58593 mm) and less than 0.062562 in (1.58907 mm). (An acceptable method for obtaining the accuracy required by the above dimensions is to measure the span occupied by 3072 tracks, which should be greater than 47.952 in (1217.98 mm) and less than 48.048 in (1220.42 mm).) See annexes A.2 and A.3.

For a tape recorded at 7.5 in/s (190.5 mm/s), the longitudinal distance from a transverse reference line to a point, T_4, four tracks away shall be greater than 0.031219 in (0.79296 mm) and less than 0.031281 in (0.79454 mm). (An acceptable method for obtaining the accuracy required by the above dimensions is to measure the span occupied by 3072 tracks, which should be greater than 23.976 in (608.99 mm) and less than 24.024 in (610.21 mm).) See annexes A.2 and A.3.

4.2 Video track spacing

The longitudinal distance from any transverse reference line to points T_1, T_2, and T_3 shall be R/4, R/2, and 3R/4, respectively, with a tolerance of ± 0.00015 in (0.0038 mm), where R is the average video track pitch as determined in 4.1 for the tape being measured (see figure 2). (The tolerance indicated cannot be readily measured on a prerecorded tape by methods presently available. At the present state of the art, these dimensions are controlled by the head wheel manufacturer's ability to achieve coplanarity of the recording pole tips.) See annexes A.2 and A.3.

4.3 Video track curvature and angle

The trailing edge of any video track shall fall between two parallel lines spaced apart by 0.001 in (0.03 mm).

For a tape recorded at 15 in/s, the two parallel lines shall make, with the reference edge, a possible angle no greater than 90° 36′ and no less than 90° 30′, when positioned so as to enclose the entire length of the video track trailing edge.

For a tape recorded at 7.5 in/s, the two parallel lines shall make, with the reference edge, a possible angle no greater than 90° 19′ 30″ and no less than 90° 13′ 30″, when positioned so as to enclose the entire length of the video track trailing edge.

4.4 Video track width

For a tape recorded at 15 in/s, the longitudinal width of any video track shall lie between 0.0095 in (0.241 mm) and 0.0105 in (0.267 mm), measured at any and all points along its transverse direction. For a tape recorded at 7.5 in/s, the video track width shall lie between 0.0050 in (0.127 mm) and 0.0060 in (0.152 mm).

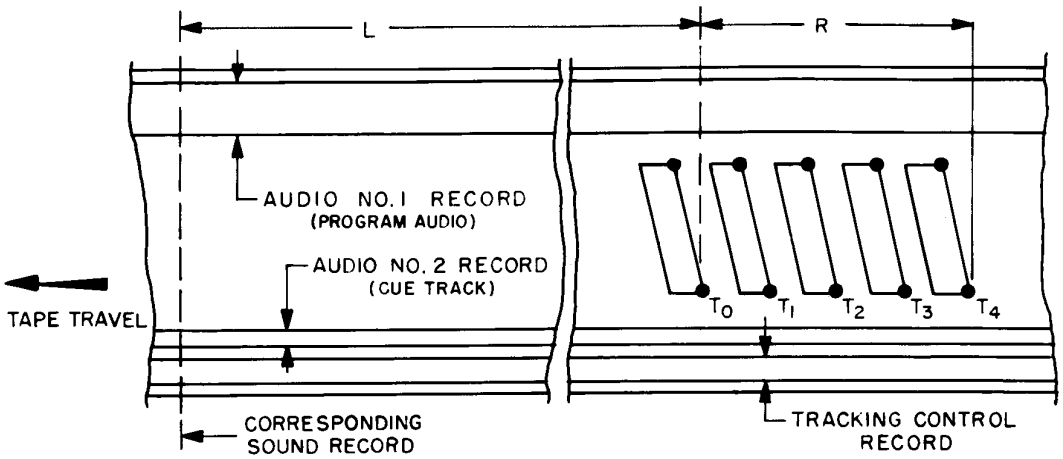

Figure 2 — Longitudinal dimensions

4.5 Audio record displacement

Audio or other information which is time-coincident with video information recorded at a point, T, of any video track shall be recorded in audio record No. 1 (program audio) or audio record No. 2 (cue track), at a distance, L, downstream from that point, T, where L shall be at least 9.200 in (233.68 mm) and no more than 9.300 in (236.22 mm).

5 Transverse dimensions

The transverse dimensions shall be as specified in figure 3 and table 1.

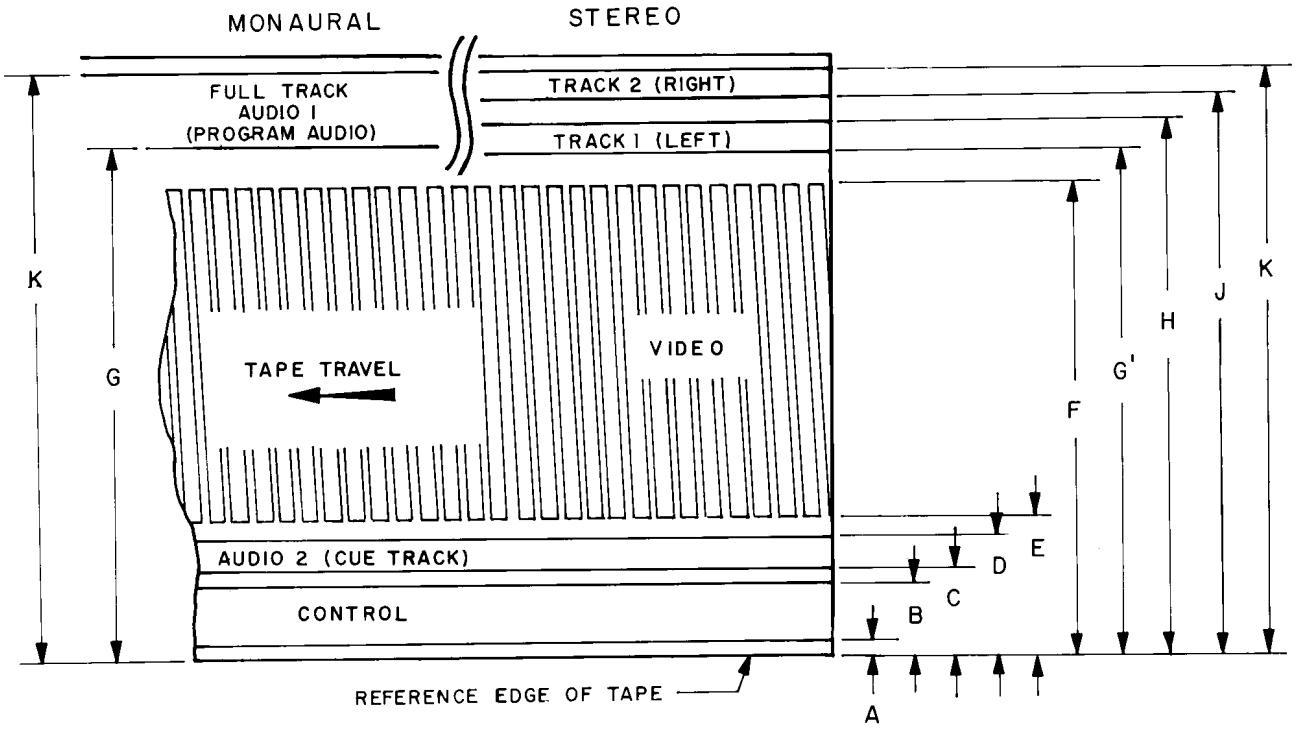

Figure 3 – Transverse dimensions

Table 1 – Dimensions

	Inches		Millimeters	
Dimensions	Minimum	Maximum	Minimum	Maximum
A	0.000	0.004	0.00	0.10
B	0.040	0.049	1.02	1.24
C	0.058	0.062	1.47	1.57
D	0.078	0.085	1.98	2.16
E	0.087	0.094	2.21	2.39
F	1.902	1.914	48.31	48.62
G	1.921	1.930	48.79	49.02
G′	1.920	1.928	48.77	48.97
H	1.945	1.951	49.40	49.56
J	1.965	1.971	49.91	50.06
K	1.988	1.996	50.50	50.70

6 Program audio (see figure 3)

6.1 Monaural recording mode

The usual method for recording a monaural audio program shall be by means of a recording head producing an audio 1 pattern of dimensions G-K (full track).

6.2 Stereo recording mode

Recording of stereo shall be by means of a split recording head producing an audio 1 pattern of dimensions G′-H for track 1 (left) and J-K for track 2 (right).

6.2.1 Program audio head position

In addition to the required dimensions for the mechanical separation of the simultaneously recorded information of the video and audio records (see 4.5), the record/reproducer gaps of the two stereo program audio heads shall lie on a common straight line.

6.2.2 Relative polarity

For stereo program material, the relative polarity of the audio signals at the inputs to a stereo television magnetic tape recorder shall be such that any monophonic component of the progam shall have the same polarity in the magnetic records of both channels.

6.2.3 Monaural program (while in stereo mode)

If there is to be only one audio program recorded by a machine with the stereo recording track record (of 6.2), then both tracks 1 and 2 shall be utilized for that single program.

Annex A (informative)
Additional data

A.1 A magnetic record is that area in which magnetization conveying the intended signal exists. A common technique for measurement of record locations and dimensions is the use of carbonyl iron to make them visible.

A.2 Since all recorded tapes exhibit wow and flutter to some degree, the span of measured tracks should be long enough to average out variations in video track pitch arising from wow or flutter. If other measuring methods are employed, appropriate averaging must be included in the measurement.

A.3 The track pattern specified in 4.1 and 4.2 results when the tape speed in inches per second and the head wheel rotational rate in revolutions per second are in the ratio of 0.0625:1 for 15 in/s recording prctice, and in the ratio of 0.03125:1 for 7.5 in/s recording practice. Since both the head wheel rotational speed and the capstan metering rate are locked to the television frame rate, the speed of the tape will vary with the television frame rate. This speed variation will not alter the pattern placed on the tape. Replay rate of any recording, as well as the replay rate of the information contained in the record, will be determined solely by the reference frequency to which the replay capstan and head wheel are synchronized.

Primary causes of departures from the video track pitch specified in 4.1 are incorrect capstan diameter, capstan slippage, and incorrect longitudinal tape stretch.

The tolerances specified in 4.1 reflect the magnitude of allowable changes in the ratio of tape speed to head wheel rotational speed. Variations in excess of those specified will not only result in improper video track pitch, but will also result in an incorrectly placed control track on tapes recorded on machines having the control track head displaced from the plane of rotation of the video pole tips by approximately 0.7 in (18 mm), as is common practice in present-day transports. (See SMPTE RP 16 for a description of the tracking-control record.)

A.4 Although, with sufficient care, measurements of track dimensions may be made with no transverse or longitudinal tension applied to the tape, tape-handling problems during measurements may be lessened by making two sets of measurements at two different longitudinal tensions and extrapolating data thus obtained to the zero-tension condition.

A.5 Current technology restricts the application of this standard to those applications, such as stereo, which can tolerate a moderate amount of crosstalk between channels or tracks.

Annex B (informative)
Bibliography

SMPTE RP 16-1993 (R1997), Specifications of Tracking Control Record for 2-in Quadruplex Video Magnetic Tape Recordings