STANDARDS AND RECOMMENDED PRACTICES

Approved American National Standards

Two American National Standards were approved by the American National Standards Institute on April 29, 1983: ANSI V98.27M-1983, Video Recording – 1-in. Type-C Reference Recorders — Basic System and Transport Geometry Parameters; and ANSI V98.28M-1983, Video Recording – 1-in. Type-C Reference Tapes Records. Copies of the standards are available for a nominal fee from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Approved SMPTE Recommended Practices

The Society's Board of Governors approved two new SMPTE Recommended Practices on February 3, 1983: RP 99-1983, Video and Audio Reference Tape for 1-in. Type-C Helical-Scan Video Tape Recorders; and RP 100-1983, Interchange Reference Tape for 1-in. Type-C Helical-Scan Video Tape Recorders. SMPTE Recommended Practices are available from Society Headquarters for $1.50 each.

Proposed American National Standards

Two Proposed American National Standards are published here for a trial period and public review: PH22.214M, Motion-Picture Film (35-mm) Photographic Audio Reproduction Characteristic; and PH22.215, Motion-Picture Film (65-mm) — Camera Aperture Image. Copies of the proposals are available from Society Headquarters for $1.00 each. The proposals have been submitted to American National Standards Committee PH22. Consequently, all comments received from *Journal* publication will be reviewed prior to conclusion of action by the committee. Comments should be addressed to Stan Dickinson prior to February 1, 1984. — *Alex E. Alden, Manager of Engineering*

ANSI V98.27M-1983

American National Standard for video recording— 1-in type C reference recorders— basic system and transport geometry parameters

Approved April 29, 1983

Secretariat: Society of Motion Picture and Television Engineers

1. Scope

This standard specifies test conditions, general video record system, video pole-tip locations, scanner parameters, scanner guide locations, and the tape tension for 1-in Type C helical-scan video tape reference recorders operating on the 525/60 monochrome or NTSC color systems.

2. Reference Documents

The following documents are intended to be used in conjunction with this standard:

ANSI C98.19M-1979, Dimensions and Location of Records for 1-in Type C Helical-Scan Video Tape Recording

ANSI V98.26M-1982, Specifications and Conditioning of Raw Tape Stock Used to Record Reference Tapes for 1-in Helical-Scan Video Tape Recorders

ANSI V98.28M-1983, Video Recording — 1-in Type C Reference Tapes — Records

SMPTE RP 85-1979, Tracking Control Record for 1-in Type C Helical-Scan Video Tape Recording (available from the Society of Motion Picture and Television Engineers, 862 Scarsdale Ave., Scarsdale, NY 10583), except that the tolerance in 3.1 is tightened to ± 0.1 milliseconds.

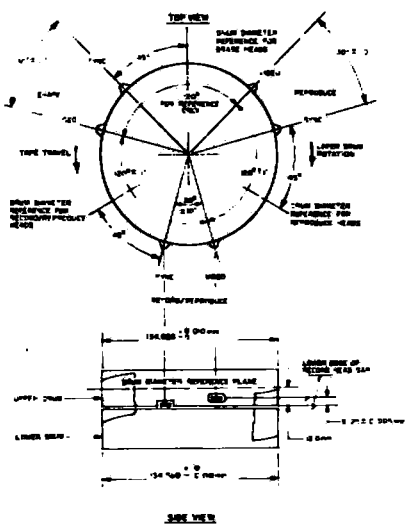

Fig. 1
Pole Tip Locations and Drum Dimensions

SMPTE RP 86-1979, Video Record Parameters for 1-in Type C Helical-Scan Video Tape Recording, except that the tolerances in Sec. 5 are tightened to ± 0.02 MHz. Other values shall be held as close as possible.

SMPTE RP 99-1983, Video and Audio Reference Tape for 1-in Type C Helical-Scan Video Tape Recorders

SMPTE RP 100-1983, Interchange Reference Tape for 1-in Type C Helical-Scan Video Tape Recorders

3. General Specifications

3.1 Dimensions in the metric system are primary.

3.2 Tests and measurements made on the recorder to check the requirements of this standard shall be made under the following atmospheric conditions:

Temperature of drum diameter	23 ± 0.5°C
Temperature for all other tests	23 ± 1°C
Relative humidity	50 ± 2 percent
Barometric pressure	86 to 106 kPa (860 to 1060 mbar)
Conditioning before testing	24 h

4. Video Record System

4.1 Exactly one field of video shall be recorded during each scanner revolution. The record shall be divided into two parts, video and sync.

4.2 The video record shall contain all active picture lines and sufficient vertical sync information for playback VTR synchronizing. Information not contained in the video record is defined as the vertical interval dropout. (See ANSI C98.19M-1979.)

4.3 The sync record shall contain a number of horizontal TV lines during the vertical interval, including those of the vertical interval dropout, and sufficient overlap of information for playback switching. (See ANSI C98.19M-1979.)

4.4 Provision shall be made for recording with and without the sync record. During those times when no sync recording is performed, no other information shall be recorded in the allotted tape area.

5. Scanner Pole Tips

5.1 There shall be six circumferential pole tip locations. The angular relationship shall be as follows:

Video/sync	30° ± 10″
Video/video erase	120° ± 1′
Video/video check	120° ± 1′
Video erase/sync erase	30° ± 30″
Video check/sync check	30° ± 10″

In the event that an operational pole tip is not required, a suitable nonfunctional tip shall be placed in the same location.

5.2 The tip projection of all six heads shall be 0.06 ± 0.01 mm, measured from the outer surface of the upper drum to the end of the pole tip. The outer drum reference shall be located midway between each of the three head groupings 13 mm above the lower edge of the sync record head gap. (See Fig. 1.)

5.3 The vertical displacement of the video head above its associated sync head on the drum shall be 3.125 ± 0.005 mm.

6. Scanner Guides

6.1 Location of the tape entrance and tape exit guides shall provide a tape wrap angle such that the video record vertical interval dropout is 10.00 ± 0.25 horizontal lines (which reflects the tip projection of 0.060 mm due to loss of head-to-tape contact with no electronic switching of the recording signal. Start and end of the vertical interval dropout shall be measured at 50 percent amplitude points of the RF envelope.

6.2 Location of the tape entrance and exit guides shall produce a helix angle of 2°35′29″ ± 2″.

7. Drum Diameter and Tape Tension

7.1 Effective drum diameter, tape tension, helix angle, and tape speed completely determine the video record track angle. Different methods of design and/or minor variations in drum diameter and tape tension will produce equivalent recording for interchange purposes. Values and operating conditions specified in this standard will produce the reference value of track angle. (See ANSI C98.19M-1979.)

7.2 The upper drum diameter shall be 134.620 + 0.010 —0.000 mm.

7.3 The lower drum diameter shall be 134.580 − 0.000 —0.010 mm.

7.4 The upper drum section shall rotate in synchronism with the video tips.

7.5 The center span tape tension shall be 1.7 ± 0.3 N.

8. Gap Azimuth and Alignment

8.1 The azimuth of all head gaps used to produce longitudinal track records shall be 90° ± 2′ to the direction of relative head-to-tape motion.

8.2 The gap of the head for audio channel 2 shall not deviate more than 0.001 mm from a line drawn through the gap of the head for audio channel 1, perpendicular to the edge of the tape (gap scatter).

8.3 The azimuth of the video and sync head gaps shall be perpendicular to the direction of head motion.

Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

The following definitions of terms ensure the correct understanding of this standard:

Center Span Tension. A calculated value of tape tension at a point midway between tape entrance and exit guides of the scanner in a video tape recording system.

Drum. A cylindrical column around which tape is at least partially wrapped in order to form the head-to-tape interface of a video tape recording system.

Lower Drum. That part of the drum in a helical-scan video tape recording system which contacts the reference edge of the tape and usually contains tape guiding elements. (See ANSI C98.19M-1979.)

Upper Drum. That part of the drum in a helical-scan video tape recording system that does not contact the reference edge of the tape. (See ANSI C98.19M-1979.)

Effective Drum Diameter. A value of drum diameter which when used in theoretical calculations will correspond to the actual video record produced in a helical-scan video tape recording system. The effective value is equal to or greater than the actual drum diameter.

Helix Angle. The angle formed between the path of the rotating pole tips and the tape reference edge guiding system on the scanner of a helical-scan video tape recording system.

Scanner. A mechanical assembly containing a drum, rotating pole tips, and tape guiding elements used to record and reproduce video tape recordings.

Track Angle. The angle of the video record with respect to the reference edge of the tape in a helical video tape recording. (See ANSI C98.19M-1979.)

American National Standard for video recording— 1-in type C reference tapes— records

Approved April 29, 1983

Secretariat: Society of Motion Picture and Television Engineers

1. Scope

This standard specifies the dimensions and location of video, audio, and tracking control records on reference tapes for 1-in Type C helical-scan video tape recorders operating on the 525/60 monochrome or NTSC color systems.

2. Reference Standards

The following American National Standards are intended to be used in conjunction with this standard:

ANSI V98.18M-1983, Video Recording — 1-in Type C Helical Scan — Basic System and Transport Geometry Parameters

ANSI V98.27M-1983, Video Recording — 1-in Type C Reference Recorders — Basic System and Transport Geometry Parameters

3. General Specifications

3.1 Dimensions in the metric system are primary. The English equivalents are derived and may deviate from established conversion practices.

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 specified:

Temperature	23 ± 1 °C
Relative humidity	50 ± 2 percent
Barometric pressure	86 to 106 kPa
Tape tension	1.7 ± 0.3 N

3.3 Conditioning before recording and testing shall be as follows:

Environmental	Stabilized at the measurement conditions
Tape tension	Wound on a reel at 2.0 ± 0.5 N

3.4 The reference edge of the tape for dimensions in this standard shall be the lower edge as shown in Fig. 1. The magnetic coating is on the side facing the observer in both figures.

4. Tape Speed

The tape speed shall be 244.0 ± 0.2 mm/s.

5. Record Location and Dimensions

5.1 Record location and dimensions shall be as specified in Fig. 1 and Table 1.

5.2 Dimensions P, Q, R, and θ are for reference purposes only. The parameters given in ANSI V98.27M-1983 and the tape speed completely determine these values and their tolerances. The nominal values given are based on tensioned tape; therefore, direct measurement without tension must take into account the elasticity of the tape.

6. Video Record Curvature

The edge of the video record shall be contained within two parallel straight lines 0.025 mm apart.

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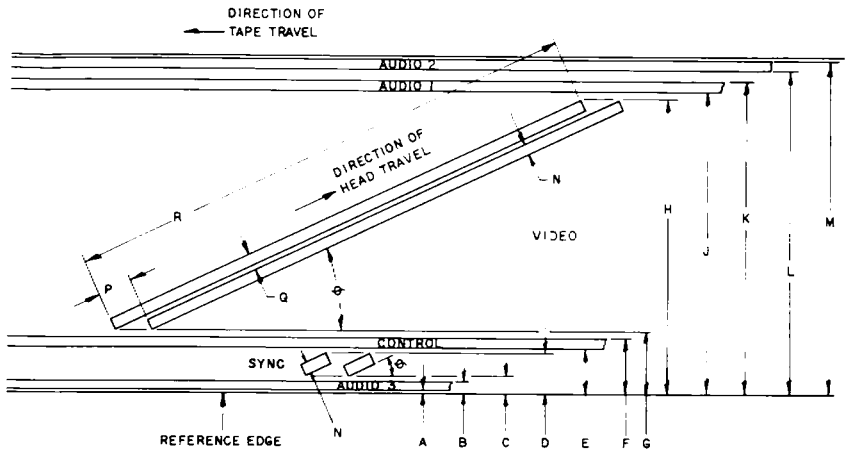

Fig. 1
Record Location and Dimensions

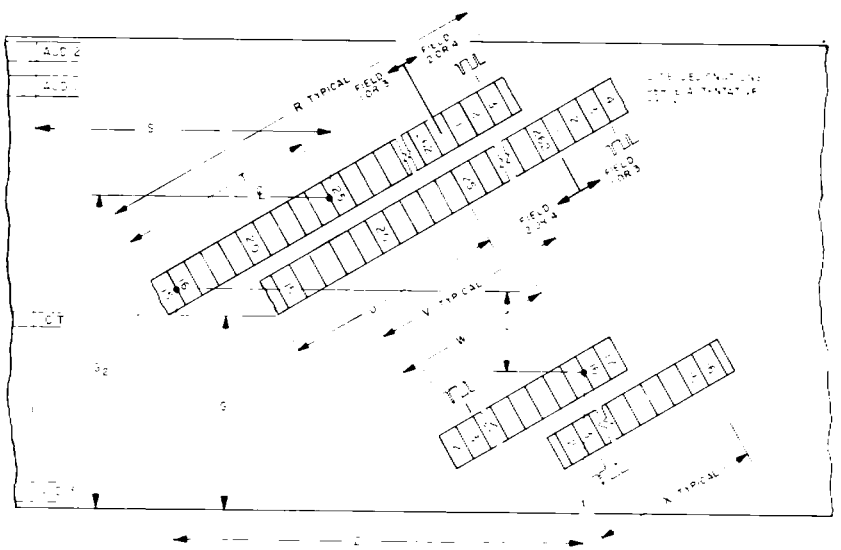

Fig. 2
Video and Sync Record Location

Table 1
Record Location and Dimensions

	Dimensions	Millimeters Minimum	Millimeters Maximum	Inches Minimum	Inches Maximum
A	Audio 3 lower edge	0.050	0.150	0.0020	0.0059
B	Audio 3 upper edge	0.825	0.975	0.0325	0.0384
C	Sync track lower edge	1.385	1.445	0.0545	0.0569
D	Sync track upper edge	2.680	2.740	0.1055	0.1079
E	Control track lower edge	2.870	3.130	0.1130	0.1232
F	Control track upper edge	3.430	3.770	0.1350	0.1484
G_1	Video track lower edge	3.870	3.910	0.1524	0.1539
G_2	Video line 25 start	4.660	4.700	0.1835	0.1850
H	Video track upper edge	22.385	22.445	0.8813	0.8837
J	Audio 1 lower edge	22.770	22.830	0.8937	0.8988
K	Audio 1 upper edge	23.525	23.675	0.9262	0.9321
L	Audio 2 lower edge	24.325	24.475	0.9577	0.9636
M	Audio 2 upper edge	25.150	25.250	0.9902	0.9941
N	Video and sync track width	0.128	0.132	0.0050	0.0052
P	Video offset	4.067 ref (2.5H)		0.0601 ref	
Q	Video track pitch	0.1823 ref		0.0078 ref	
R	Video track length	410.764 ref (252.5H)		16.1718 ref	
S	Control track head distance	116.43	116.83	4.584	4.600
T	Vertical position, odd field	16.270 ref (10.0H)		0.6406 ref	
U	Vertical position, even field	17.080 ref (10.5H)		0.6724 ref	
V	Sync track length	25.620 (15.75H)	26.420 (16.25H)	1.0087	1.0402
W	Vertical position, odd sync field	22.360 (13.75H)	23.170 (14.25H)	0.8803	0.9122
X	Vertical position, even sync field	23.170 (14.25H)	23.980 (14.75H)	0.9122	0.9441
Y	Vertical head offset	1.529 ref		0.0602 ref	
Z	Horizontal head offset	35.350 ref		1.3917 ref	
θ	Track angle	2°34′ ref			

7. Relative Position of Recorded Signals

7.1 Video, sync, tracking control, and audio signals with information intended to be time coincident shall be positioned as shown in Fig. 2. Dimensions T, U, Y, and Z are for reference purposes only.

7.2 The start of the video record is that location on the video record which would be produced by scanner and guide locations with no electronic switching of the recording signal.

7.3 The vertical interval dropout location with respect to a television frame is determined by the phase dimension, T, measured from the start of video to the negative-going edge of line 25 H-sync in odd-numbered fields.

7.4 The start and end of the sync record must be produced by electronic switching of the recording signal due to geometric constraints. (See ANSI V98.18M-1983.) Phasing of the sync record electronic switching shall be as per phase dimensions V and W in odd-numbered fields.

7.5 Even-numbered fields have a different video and sync phasing (Dimensions U and X) due to the odd number of lines in a television frame.

SMPTE RECOMMENDED PRACTICE — RP 99-1983

Video and Audio Reference Tape for 1-in Type C Helical-Scan Video Tape Recorders

1. *Scope*

1.1 This practice specifies a video and audio reference tape to be used with 1-in Type C helical-scan video tape recorders, as defined in American National Standard for Video Recording — 1-in Type C Helical Scan — Basic System and Transport Geometry Parameters, ANSI V98.18M-1983. It is to be used for the following:

1.1.1 Indication of video frequency response characteristics for both main and sync channels of the reproducing system

1.1.2 Adjustment of gain of the video reproducing system

1.1.3 Comparison of carrier frequencies of the video recording system

1.1.4 Verification of level and phase of the control track recording system

1.1.5 Adjustment of the gain of the program audio reproducing system

1.1.6 Indication of the audio frequency response of the audio reproducing system

1.1.7 Comparison of the audio recording gain and frequency response characteristics of the audio recording system

1.1.8 Verification of level and other parameters of the time code information recorded on Audio Record No. Three

2. *General Specifications*

2.1 Record VTR. The recorder used to record this tape shall comply with American National Standard for Video Recording — 1-in Type C Reference Recorders — Basic System and Transport Geometry Parameters, ANSI V98.27M-1983.

2.2 Record Dimensions. The dimensions of pertinent records making up this reference tape shall conform to American National Standard for Video Recording — 1-in Type C Reference Tapes — Records, ANSI V98.28M-1983.

2.3 Tape Stock. The tape stock shall be as specified in American National Standard Specifications and Conditioning of Raw Tape Stock Used to Record Reference Tapes for 1-in Helical-Scan Video Tape Recorders, ANSI V98.26M-1982.

2.4 Tracking Control Signal. The tracking control signal shall conform to SMPTE Recommended Practice on Tracking-Control Record for 1-in Type C Helical-Scan Video Tape Recording, RP 85-1979, except that the tolerance specified in Sec. 3.1 shall be tightened to ± 0.1 ms.

2.5 Recorded Video Parameters. The recorded video parameters shall conform to those specified in SMPTE Recommended Practice for Video Record Parameters for 1-in Type C Helical-Scan Video Tape Recording, RP 86-1979, except that the tolerances specified in Sec. 5 shall be tightened to ± 0.02 MHz and the nominal values specified in other sections shall be held as close as possible.

2.6 Video Signals. Video synchronizing waveforms and video amplitudes shall conform to EIA Industrial Electronics Tentative Standard No. 1, Color Television Studio Picture Line Amplifier Output Drawing, to ensure proper color framing. Blanking widths shall be 10.7 μs horizontal and 20 lines vertical.

2.7 Recorded Audio Flux Levels. The record reference level and the record flux level versus frequency shall conform to American National Standard Frequency Response and Reference Level of Recorders and Reproducers for Audio Records for 1-in Type C Helical-Scan Video Tape Recording, ANSI C98.20M-1979, except that the short circuit flux recorded on the tape at each frequency shall be within ± 0.5 dB of the level specified. The tolerance, ± 0.5 dB, may be extended to ± 2 dB, provided that the manufacturer supplies a calibration chart with the reference tape.

2.8 Audio Test Calibration. The calibration values in decibels furnished with the reference tape shall represent the levels to be added algebraically to the reproducer output level when the particular reference tape is reproduced. With the addition of these values, the output level of the reproducer will be that which would have resulted if the short circuit flux on the reference tape at a given frequency had been exactly as specified in ANSI C98.20M-1979.

2.9 Audio Flutter. The unweighted flutter content of this recording shall not exceed 0.1 percent RMS, measured in accordance with NAB Standard for Magnetic Tape Recording and Reproducing (Reel-to-Reel), April 1965.

3. *Recorded Signals*

3.1 Voice Announcements. Voice announcements at the beginning of this tape shall reference this practice. Voice announcements shall be recorded at a level approximately 5 dB below reference level. These announcements shall be recorded on Audio Record No. One and Audio Record No. Two. A video identification signal may be included during the voice announcement section. If no video identification signal is used, sync, burst, and setup or video signal shall be recorded on the video channel during the voice announcement.

3.2 Video Signals. Seven types of video signals, as specified in Secs. 3.2.1 through 3.2.7, shall be recorded on the tape.

3.2.1 Color Bars. 100-percent saturated 75-percent amplitude color bar signal conforming to EIA Standard RS-189-A, Encoded Color Bar Signal

3.2.2 Multiburst. A white pulse, followed by a series of six sine wave bursts. The white pulse width and the width of each sine wave burst should be one seventh the width of the scan line between the end of H blanking and the start of H blanking. The white bar level shall be at 100 ± 1 IRE units. The axis of the burst shall be at a level of 55 ± 1 IRE units. The peak-to-peak amplitude of the bursts shall be 90 ± 1 IRE units. The frequencies of the bursts in time sequence shall be 500 kHz, 1.5 MHz, 2.0 MHz, 3.0 MHz, 3.58 MHz, and 4.2 MHz.

3.2.3 Ramp. A continuous ramp extending from 0 to 100 IRE units and repeating at line rate. Color subcarrier having a peak-to-peak amplitude of 40 ± 2 IRE units shall be added to the ramp signal.

3.2.4 Window and Pulses. A window signal, a modulated 12.5T (1.56 μs) pulse, and a 2T (0.25 μs) sine-squared pulse. All signals shall extend from 7.5 ± 2.5 to 100 ± 1 IRE units. The window shall have a 1T rise time.

3.2.5 Chroma Field. A flat, full field signal corresponding to the cyan bar of EIA RS-189-A color bars at 75 percent amplitude.

3.2.6 Gray Field. A flat, full field signal at 50 IRE units.

3.2.7 Vertical Interval Test Signals. Vertical interval test signals will be added to both fields as follows:

Line 10	2T and 12.5T pulses and 1T bar
Line 11	linearity
Line 12	linearity
Line 13	linearity
Line 14	multiburst
Line 15	color bars
Line 17	2T and 12.5T pulses and 1T bar
Line 19	multiburst

3.3 Audio Signals. Audio signals as specified in Secs. 3.3.1 through 3.3.3 shall be recorded on the tape.

3.3.1 Frequency Response. This section shall be used to calibrate the frequency response of the audio reproducing system of a video magnetic tape recorder. The 1-kHz signal shall be recorded at a flux level corresponding to 10 dB below reference level. The segment frequencies shall be recorded as follows: 1 kHz (reference), 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz, 4 kHz, 8 kHz, 10 kHz, 12.5 kHz, 16 kHz, and 1 kHz (secondary reference). The frequency of each recording shall be ± 3 percent of its specified value when the tape is reproduced at exactly 244.0 mm/s. Each frequency shall be preceded by a voice announcement identifying that frequency.

3.3.2 Stereo Phase. A 4-kHz tone shall be recorded at reference level on each channel. The recorded stereo phase error between channels 1 and 2 shall be less than 5°.

3.3.3 Crosstalk. Tones of 63 Hz, 1 kHz, and 16 kHz shall be recorded on channel one only and then channel two only for a test of audio channel crosstalk. These signals shall be recorded at + 8 dB above the reference level. A recorded cross-talk calibration shall be supplied with the reference tape.

3.3.4 SMPTE Time and Control Code. SMPTE time and control code complying with American National Standard Time and Control Code for Video and Audio Tape for 525 Line, 60 Field Television Systems, ANSI V98.12M-1981, and SMPTE Recommended Practice on Requirements for Recording American National Standard Time and Control Code on 1-in Types B and C Helical-Scan Video Tape Recorders, RP 93-1980, shall be recorded on Audio Record No. Three.

3.4 Sequence. The video and audio reference signals shall be recorded in the sequence and for the duration shown in Table 1. The vertical interval test signals of Sec. 3.2.7 shall be added to the video from the start 00:00 to 06:00 minutes. The sync record channel shall be turned off so there is no recording from 06:00 to 10:00 minutes.

Approved 3 February 1983