Table 1

Dimensions		Millimeters Minimum	Maximum
A_b	Control track bottom edge	23.54	23.64
A_t	Control track top edge	23.94	24.04
B_b	Audio 1 track bottom edge	24.34	24.44
B_t	Audio 1 track top edge	25.14	25.24
C_b	Audio 2 track bottom edge	22.34	22.44
C_t	Audio 2 track top edge	23.14	23.24
F_b	Audio 3 track bottom edge	0.16	0.24
F_t	Audio 3 track top edge	0.96	1.04
G	Center of video tape	12.70 ref	
J	Position of audio heads	232.2	232.8
K_b	Full video width bottom edge	1.18	1.18
K_t	Full video width top edge	22.19	22.19
L_b	Video width (180°) bottom edge	1.82 ref	
L_t	Video width (180°) top edge	21.55 ref	
N	Video track pitch	0.200 ref	
O	Video track width	0.156	0.164
P	Position of control track head	2.845	2.875
Q_e	Switch point distance video 2 track	82.096	82.121
Q_o	Switch point distance video 1 track	5.523	5.533
S	Distance between control track head gap and center edit pulse at 180° switch point	0.040 ref	
α_s	Scanning angle (Helix angle)	14.434° ± 10″	
α_T	Video track angle (525/60)	14.288°	

SMPTE RECOMMENDED PRACTICE

RP 107–1982

Video and Audio Reference Tape for 1-in Type B Helical-Scan Format

1. *Scope*

1.1 This practice specifies a video and audio reference tape to be used with 1-in Type B helical-scan video tape recorders as defined in American National Standard Basic System Parameters for 1-in Type B Helical-Scan Video Tape Recording, ANSI C98.15M-1980. It is to be used for:

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 levels and timings of time code information recorded on audio 3 record.

2. *General Specifications*

2.1 Recorder. The recorder used to record this tape shall comply with American National Standard Basic System and Transport Geometry Parameters for 1-in Type B Helical-Scan Video Tape Reference Recorders for Video and Audio Reference Tapes, ANSI V98.29M-1982.

2.2 Dimensions of Records. The dimensions of pertinent records making up this test tape shall conform to American National Standard Dimensions and Location of Records on Video and Audio Reference Tape for 1-in Type B Helical-Scan Video Tape Recorders, ANSI V98.30M-1982.

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 Specifications of Tracking Control Record for 1-in Type B Helical-Scan Video Tape Recording, RP 83-1980, and ANSI V98.30M-1982.

2.5 Recorded Video Parameters. The recorded video parameters shall conform to those specified in SMPTE Recommended Practice on Video Reference Carrier Frequencies and Pre-emphasis Characteristics for 1-in Type B Helical-Scan Video Tape Recording, RP 84-1980, except that the tolerances in Table 1 are tightened to ± 0.025 MHz and the nominal values 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 μsec 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 Operating Level of Recorders and Reproducers for Audio Records for 1-in Type B Helical-Scan Video Tape Recording, ANSI C98.17M-1980, 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 of ± 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 C98.17M-1980.

2.9 Audio Flutter. The unweighted flutter of this recording shall not exceed 0.1 percent RMS, measured in accordance with National Association of Broadcasters Standard on Magnetic Tape Recording and Reproducing (Reel-to-Reel).

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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 1 record and audio 2 record. A video identification signal may be included during the voice announcement section. If no video identification signal is used, sync, burst, and setup or test 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 frequecies 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 μsec) pulse, and a 2T (0.25 μsec) sine-squared pulse. All signals shall extend from 7.5 ± 2.5 IRE units 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 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 is to be used to calibrate the frequency response of the audio reproducing system of a video magnetic tape recorder. The test signals shall be recorded at a flux level corresponding to 10 dB below the reference level. The test segment frequencies shall be recorded as follows: 1 kHz (reference), 63 Hz, 125 Hz, 250 Hz, 500 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 245 mm/s. Each frequency shall be preceded by a voice announcement identifying that frequency.

3.3.2 Stereo Phase Test. 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 Test. Tones of 63 Hz, 1 kHz, and 16 kHz shall be recorded on channel 1 only and then channel 2 only for a test of audio channel crosstalk. These signals shall be recorded at 8 dB above the reference level. A recorded crosstalk calibration shall be supplied with the reference tape.

3.3.4 SMPTE Time and Control Code Test. 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 3 channel.

3.4 Sequence. The video and audio reference signals shall be recorded in the sequence and for the duration shown in Table 1.

3.4.1 Time Tolerance. The tolerance of all start and end times shown in Table 1 shall be ± 5.0 sec.

4. *Calibration*

4.1 Video Calibration.

4.1.1 Video Level Measurements. All video measurements of luminance level shall be made in accordance with American National Standard Method of Measurement of Television Luminance Signal Levels, ANSI/IEEE Std 205-1958 (R 1976).

4.2 Audio Calibration.

4.2.1 Calibration of Short Circuit Tape Flux. The short circuit tape flux on the test tape shall be determined by means of the calibrated short-gap ferromagnetic core reproducer technique. This technique is described in the following references:

American National Standard Method of Measuring Recorded Flux of Magnetic Sound Records at Medium Wavelengths, ANSI/IEEE Std 347-1972.

McKnight, J. G. Flux and flux-frequency response measurements and standardization in magnetic recording. Jour. SMPTE. 78:457-472; 1969 June.

Lovick, R. C.; Bartow, R. E.; and Scheg, R. F. Recording and calibration of super-8 magnetic reproducer test films. Jour. SMPTE. 78: 473-481; 1969 June.

Table 1
Reference Signal Sequence

Video	Audio 1	Audio 2	Audio 3	Start	End
Multibursts	1 kHz	1 kHz	1 kHz	00:00	01:00
Ramp	63 Hz	63 Hz	63 Hz	01:00	02:00
Window and Pulses	4 kHz	4 kHz	4 kHz	02:00	03:00
Color Bars	16 kHz	16 kHz	16 kHz	03:00	04:00
Chroma Field	Silent	Silent	Silent	04:00	05:00
• Multiburst	1 kHz (+8dB) •	Silent	Time Code	05:00	05:15
• Multiburst	63 Hz (+8dB) •	Silent	Time Code	05:15	05:30
• Multiburst	16 kHz (+8dB) •	Silent	Time Code	05:30	05:45
Multiburst	Silent	1 kHz (+8dB) •	Time Code	05:45	06:00
Ramp	• Silent	63 Hz (+8dB) •	Time Code	06:00	06:15
Ramp	Silent	16 kHz (+8dB) •	Time Code	06:15	06:30
Ramp	Silent	Silent	Time Code	06:30	07:00
• Window and Pulses •	Frequency Response (—10dB) • •	Frequency Response (—10dB) •	Frequency Response (—10dB) •	07:00	08:00
• Color Bars •	Frequency Response (—10dB) •	Frequency Response (—10dB) •	Frequency Response (—10dB) •	08:00	09:00
• 50 IRE Gray Field •	Frequency Response (—10dB) • •	Frequency Response (—10dB) •	Frequency Response (—10dB) •	09:00	10:00

•Relative to reference level.

Note: Frequency response sequence: 1 kHz (reference), 30 seconds; each tone, 12 seconds; and final 1 kHz (secondary reference), 18 seconds.