



John M. Calhoun

tection Association. Dr. Calhoun was Chairman of Sub-Committee PH1-3, Characteristics of Films, Plates and Papers of the United States of America Standards Institute from 1952 through 1967. He also served as the USA Member of IWG-F of the International Standards Organization, Committee TC-42 Photography from 1960-1967.

While at Kodak, Dr. Calhoun's area of work included the physical characteristics of plastics, gelatin and photographic film. He has published extensively on the dimensional stability and storage behavior of these materials. His first paper on this subject appeared in the *Journal of the SMPE* in October 1944

and it provided much useful information for the many users of photographic materials during the war years. The paper included discussions on the mechanical properties of film, such as tensile strength, elongation, modulus of elasticity, cold flow, folding endurance and tearing resistance. He described the effects of relative humidity and temperature on brittleness, temporary and permanent film shrinkage and physical changes that occur during processing and storage.

In the February 1955 issue of the *Journal of the SMPTE*, Dr. Calhoun published further data on shrinkage behavior of film giving information on the improved film supports for negative films that had been produced since his first article. In the September 1955 *Journal*, with J. F. Carroll, he published data on the effect of nitrogen oxide gases on processed acetate films. In the March 1960 issue Dr. Calhoun and P. Z. Adelstein discussed the factors which affect dimensional changes in cellulose estar base motion-picture films, pointing out that film dimensions are standardized at the time of cutting and perforating and subsequently vary with conditions of age in a fairly well-defined manner.

In addition to these important papers, Dr. Calhoun has published articles on physical properties and dimensional stability of safety aerographic film (*Photogrammetric Eng.*, June 1947), air conditioning and storage (*Heating and Ventilating*, October 1949; *Phot. Sci. & Tech. Sect. B. PSA Jour.*, Octo-

ber 1952; *Jour. Biological Photographic Assn.*, August 1953). With D. A. Leister, he discussed the effect of gelatin layers on the dimensional stability of photographic film (*Phot. Sci. & Eng.* 3; No. 1, Jan.-Feb. 1959). A short article in the British publication *Perspective* in 1960 discussed the technology of new film bases. With L. E. Keller and R. F. Newell, Jr., Dr. Calhoun described a method of studying possible distortions in aerial film (*Photogrammetric Eng.*, September 1960). Physical properties of estar polyester base aerial films for topographic mapping were described jointly with P. Z. Adelstein and J. T. Parker (*Photogrammetric Eng.*, June 1961). In *The American Archivist* for July 1967, he published information on the preservation of motion-picture film. From this brief review of his published papers it can be seen that he has made available a considerable amount of useful data on the physical properties of photographic films.

Besides being a member of the SMPTE, Dr. Calhoun is a member of the American Chemical Society and the Society of Photographic Scientists and Engineers.

In April, 1938, he married Jean Fettes of Calgary, Alberta, Canada. They have three children. Dr. Calhoun was active for 13 years in Boy Scout work and was a member of the Board of Elders of Summerville Presbyterian Church from 1969-1971. —

Glenn E. Matthews

## standards and recommended practices

### Draft American National Standards

Two Draft American National Standards, which are editorial revisions of previous issues, are published here for a trial period and public review: C98.8, Specifications for an Audio Level and Multifrequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s (381 mm/s), and C98.11, Specifications for an Audio Level and Multifrequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 7.5 in/s (190.5 mm/s).

Comments should be addressed to Alex E. Alden, *Staff Engineer*, at Society Headquarters prior to 1 November 1975. The proposals have been submitted to American National Standards Committee C98. All comments received through *Journal* publication will be reviewed before conclusion of action by that committee.

### Proposed SMPTE Recommended Practices

Two Proposed SMPTE Recommended Practices are published here for a trial period and public review: RP 43, Video Test Tape for Quadruplex Video Frequency Magnetic Tape Recorders Operating at 15 in/s and Practice HB of SMPTE Recommended Practice RP 6, and RP 44, Video Test Tape for Quadruplex Video Frequency Magnetic Tape Recorders Operating at 7.5 in/s and Practice HB of SMPTE Recommended Practice RP 6.

It should be pointed out that the specifications have been modified to state that the axis of the multibursts shall be at 55 IRE units instead of 50 and that the peak-to-peak amplitude of the bursts shall be 90 IRE units instead of 100. In addition, the window signal has been changed to a modulated 12-1/2T pulse

instead of a 20T pulse. An audio record has also been added to the two tracks — a 1-kHz signal at 110 nanowebers on Audio Record No. 1 and at 260 nanowebers on Audio Record No. 2.

Comments on the proposals should be addressed to Alex E. Alden, *Staff Engineer*, at Society Headquarters prior to 1 November 1975. If no adverse criticism is received by that date, the Proposed SMPTE Recommended Practices will be submitted to the Board of Governors for final approval.

### Approved International Standards

The International Organization for Standardization (ISO) approved International Standard ISO 3042-1975, Cinematography — Labelling of Containers for Unexposed Motion-Picture Films and Magnetic Films — Minimum Information Specifications. Although the USA does not have a comparable national standard, the section on raw stock winding is in accordance with PH22.75.

Copies of all International Standards are sold through the American National Standards Institute, 1430 Broadway, New York, NY 10018.

ISO is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. The International Standard published here was developed by Technical Committee 36 on Cinematography. The work of this committee is administered by the Engineering Department of the SMPTE which functions as the secretariat in ANSI's name. The report of the last meeting of the committee was published in the February 1974 *Journal of the SMPTE*. — Alex E. Alden, *Staff Engineer*

# Specifications for an Audio Level and Multifrequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s (381 mm/s)

C98.8

Revision of  
C98.8-1973

Page 1 of 4 pages

## 1. Scope

This standard specifies an audio frequency test tape to be used for adjusting the sensitivity and the frequency response of the program audio reproducing system and adjusting the sensitivity of Audio Record No. 2 (cue track) of quadruplex video magnetic tape recorders operating at a tape speed of 15 in/s (381 mm/s), in accordance with American National Standard Frequency Response and Operating Level of Recorders and Reproducers for Audio Record One for 2-inch Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s, C98.3-1973.

## 2. General Specifications

**2.1** Dimensions of Records. The dimensions of pertinent records constituting this test tape shall conform to American National Standard Dimensions of Video, Audio and Tracking Control Records on 2-inch Video Magnetic Tape Quadruplex Recorded at 15 and 7.5 in/s, C98.6-1973.

**2.2** Tape Speed. The nominal linear speed of this test tape shall be 15 in/s (381 mm/s) in accordance with American National Standard Speed of 2-inch Tape for Quadruplex Video Magnetic Tape Recording, C98.4-1970.

**2.3** Stock. The test sections shall be recorded on transversely-oriented television magnetic recording tape, the dimensions of which are specified in American National Standard Dimensions of 2-inch Video Magnetic Tape, C98.1-1963 (R1969).

**2.4** Video Signal. No video signal of any kind shall be recorded.

**2.5** Tracking Control Signal. A tracking control signal, conforming to that specified in SMPTE Recommended Practice on Specifications of Tracking Control Record for 2-inch Quadruplex Video Magnetic Tape Recordings, RP 16-1970, as applicable, shall be recorded throughout the tape.

**2.6** Test sections shall be recorded on Audio Record No. 1.

**2.7** A 1000 Hz  $\pm$  2 percent tone shall be recorded throughout the length of the tape on Audio Record No. 2 at a shortcircuit tape flux level of  $260 \pm 10$  nanowebers per meter of track width.

**2.8** Voice announcement at the beginning of this tape shall provide identification as to the applicable American National Standard, the test tape manufacturer, the recorded level of the reference frequency and the signal on Audio Record No. 2. Each test section and segment shall be preceded by voice announcements identifying the content. Voice announcements shall be recorded on Audio Record No. 1 only at a level approximately 5 dB below operating level. (See 3.1 below.)

**2.9** Weighted Peak Flutter. The weighted peak flutter of this test tape shall not exceed 0.2 percent.

## 3. Test Sections

**3.1** SMPTE Quadruplex Audio Operating Level Test. Recorded on Audio Record No. 1, this section is used to calibrate the sensitivity of an audio reproducing system.

**3.1.1** Frequency. The frequency of the recording shall be 1000 Hz  $\pm$  2 percent when the tape is reproduced at exactly 15 in/s (381 mm/s).

**3.1.2** Tape Flux Per Meter Width. The SMPTE Quadruplex Audio Operating Level Test recording has an rms shortcircuit tape flux per meter track width of  $110 \pm 3$  nanowebers per meter of track width. (110 nWb/m corresponds to 110 pWb/mm, and 11 mWb/mm.)

**3.1.3** Flux Level Variation. The flux level variation during the length of the tone shall fall within an envelope whose total width is 0.5 dB.

**3.1.4** Distortion. The total harmonic distortion of this section, when reproduced, shall not exceed 2 percent.

**3.1.5** Duration. The minimum duration of this section shall be one minute.

**3.2** Frequency Response Test. Recorded on Audio Record No. 1, this section is to be used to calibrate the frequency response of the audio reproducing system of a video magnetic tape recorder.

**3.2.1** Frequencies. The following test segment frequencies (in hertz) shall be recorded in the order given.

1000 (reference) / 63 / 125 / 250 / 500 / 1000 / 2000 / 4000 / 8000 / 10 000 / 12 500 / 16 000 / 1000 (reference)

The frequency of each recording shall be  $\pm$  2 percent of its specified value when the tape is reproduced at exactly 15 in/s (381 mm/s).

**3.2.2** Tape Flux Level vs Frequency. The shortcircuit tape flux level versus frequency shall be as given by the following equation:

$$L_s(f) \text{ re } 110 \text{ nWb/m} = 0.2 + 10 \log_{10} \left\{ \frac{1 + (f/f_0)^2}{1 + (f/f_1)^2} \right\} \text{ [dB]}$$

where  $f$  is the frequency at which the response is being computed;  $f_0$  is the low-frequency transition frequency, 80 Hz; and  $f_1$  is the high-frequency

frequency transition frequency, 4500 Hz. A graph of this equation is shown in the figure. A table of values of the tape flux and flux level is also given.

**3.2.3** Flux Level Variation. The tape flux level at each frequency shall be within  $\pm$  0.5 dB of the value specified in Sec. 3.2.2. The tolerance of  $\pm$  0.5 dB may be extended to  $\pm$  2 dB provided that a calibration chart is supplied with the test tape by the manufacturer. The calibration figures furnished with the test tape shall represent the levels to be added algebraically to the reproducer output level when the particular test tape is reproduced. With the addition of these factors, the output level of the reproducer will be that which would have resulted if the test tape flux vs frequency had been exactly as specified in Sec. 3.2.2.

**3.2.4** Duration. The duration of frequency response test segments shall be approximately ten seconds.

**3.3** Azimuth. The tape flux shall be parallel to the reference edge of the tape with an azimuth alignment error not to exceed  $\pm$  0.9 milliradians ( $\pm$  3 minutes of angle).

## 4. Calibration

**4.1** Calibration of Tape Flux. The shortcircuit 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, S4.6-1973.

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

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

**4.2 Flux Level Variation Measurements.** All flux level variations shall be measured with a meter or graphic level recorder which has a full-wave rectified average measurement law and the dynamics of the standard volume indicator (vu meter), as specified in American National Standard Volume Measurements of Electrical Speech

and Program Waves, C16.5-1954 (R1961).  
**4.3 Weighted Peak Flutter Measurement.** Weighted peak flutter shall be measured in accordance with American National Standard Method of Measurement for Weighted Peak Flutter of Sound Recording and Reproducing Equipment, S4.3-1972.

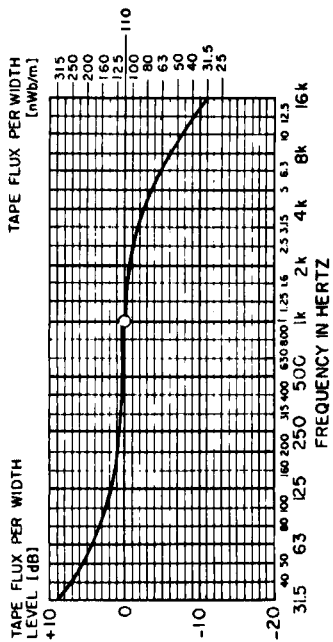
**Appendix**

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

**A1.** A guide to proper usage and an explanation of the calibration techniques should be supplied with each test tape.

many Audio Reference Level Recorders for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s, C98.7-1969, and the flux/frequency response given in Sec. 3.2.2. is the same as that standardized in American National Standard Electrical Characteristics of Audio Record One for 2-in Quadruplex Video Magnetic Tape Recording at 15 and 7.5 in/s, C98.3-1970.

**A2.** Although stated in a different way, the flux specified in Sec. 3.1.2 is the same as previously standardized in American National Standard Specifications for a Pri-



Flux and Flux Level vs Frequency on Audio Record No. 1

Frequency Hz	Flux Per Width nWb/m	Relative Level dB
63	181	+4.3
80	159	+3.2
100	144	+2.3
125	133	+1.7
160	126	+1.2
200	121	+0.8
250	118	+0.6
315	116	+0.4
400	114	+0.3
500	113	+0.2
630	112	+0.2
800	111	+0.1
1000	110	+0.0
1250	108	-0.1
1600	106	-0.3
2000	103	-0.6
2500	98.2	-1.0
3150	92.0	-1.6
4000	84.2	-2.3
5000	75.1	-3.3
6300	65.2	-4.5
8000	55.4	-6.0
10000	46.1	-7.6
12500	37.8	-9.3
16000	30.7	-11.1

Flux and flux level versus frequency calculated at "preferred frequencies" using the equation given in Sec. 3.2.2.

# Specifications for an Audio Level and Multifrequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 7.5 in/s (190.5 mm/s)

C98.11  
Revision of  
C98.11-1974

## 1. Scope

This standard specifies an audio frequency test tape to be used for adjusting the sensitivity and the frequency response of the program audio reproducing system and adjusting the sensitivity of Audio Record No. 2 (cue-track) of quadruplex video magnetic tape recorders operating at a tape speed of 7.5 in/s (190.5 mm/s), in accordance with American National Standard Frequency Response and Operating Level of Recorders and Reproducers for Audio Record One for 2-inch Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s, C98.3-1973.

## 2. General Specifications

**2.1** Dimensions of Records. The dimensions of pertinent records constituting this test tape shall conform to American National Standard Dimensions of Video, Audio and Tracking Control Records on 2-inch Video Magnetic Tape Quadruplex Recorded at 15 and 7.5 in/s, C98.6-1973.

**2.2** Tape Speed. The nominal linear speed of this test tape shall be 7.5 in/s (190.5 mm/s) in accordance with American National Standard Speed of 2-inch Tape for Quadruplex Video Magnetic Tape Recording, C98.4-1970.

**2.3** Stock. The test sections shall be recorded on transversely-oriented television magnetic recording tape, the dimensions of which are specified in American National Standard Dimensions of 2-inch Video Magnetic Tape, C98.1-1963 (R1969).

**2.4** Video Signal. No video signal of any kind shall be recorded.

**2.5** Tracking Control Signal. A tracking control signal, conforming to that specified in SMPTE Recommended Practice on Specifications of Tracking Control Record for 2-inch Quadruplex Video Magnetic Tape Recordings, RP 16-1970, as applicable, shall be recorded throughout the tape.

**2.6** Test sections shall be recorded on Audio Record No. 1.

**2.7** A 1000 Hz  $\pm$  2 percent tone shall be recorded throughout the length of the tape on Audio Record No. 2 at a shortcircuit tape flux level of  $260 \pm 10$  nanowebers per meter of track width.

**2.8** Voice announcement at the beginning of this tape shall provide identification as to the applicable American National Standard, the test tape manufacturer, the recorded level of the reference frequency and the signal on Audio Record No. 2. Each test section and segment shall be preceded by voice announcements identifying the content. Voice announcements shall be recorded on Audio Record No. 1 only at a level approximately 5 dB below operating level. (See 3.1 below.)

**2.9** Weighted Peak Flutter. The weighted peak flutter of this test tape shall not exceed 0.2 percent.

## 3. Test Sections

**3.1** SMPTE Quadruplex Audio Operating Level Test. Recorded on Audio Record No. 1, this section is used to calibrate the sensitivity of an audio reproducing system.

**3.1.1** Frequency. The frequency of the recording shall be 1000 Hz  $\pm$  2 percent when the tape is reproduced at exactly 7.5 in/s (190.5 mm/s).

**3.1.2** Tape Flux Per Meter Width. The SMPTE Quadruplex Audio Operating Level Test recording has an rms shortcircuit tape flux per meter track width of  $110 \pm 3$  nanowebers per meter of track width, (110 nWb/m corresponds to 110 pWb/mm, and 11 mAx/mm).

**3.1.3** Flux Level Variation. The flux level variation during the length of the tone shall fall within an envelope whose total width is 0.5 dB.

**3.1.4** Distortion. The total harmonic distortion of this section, when reproduced, shall not exceed 2 percent.

**3.1.5** Duration. The minimum duration of this section shall be one minute.

**3.2** Frequency Response Test. Recorded on Audio Record No. 1, this section is to be used to calibrate the frequency response of the audio reproducing system of a video magnetic tape recorder.

**3.2.1** Frequencies. The following test segment frequencies (in hertz) shall be recorded in the order given.

1000 (reference) / 63 / 125 / 250 / 500 / 1000 / 2000 / 4000 / 8000 / 10 000 / 12 500 / 16 000 / 1000 (reference)

The frequency of each recording shall be  $\pm$  2 percent of its specified value when the tape is reproduced at exactly 7.5 in/s (190.5 mm/s).

**3.2.2** Tape Flux Level vs Frequency. The shortcircuit tape flux level versus frequency shall be as given by the following equation:

$$L_{\phi}(f) \text{ re } 110 \text{ nWb/m} = -9.8 + 10 \log_{10} \left\{ \frac{1 + (f/f_0)^2}{1 + (f/f_1)^2} \right\} \text{ [dB]}$$

where  $f$  is the frequency at which the response is being computed;  $f_0$  is the low-frequency transition frequency, 80 Hz; and  $f_1$  is the high-frequency transition frequency, 4500 Hz. A graph

of this equation is shown in the figure. A table of values of the tape flux and flux level is also given.

**3.2.3** Flux Level Variation. The tape flux level at each frequency, up to and including 10 kHz, shall be within  $\pm$  0.5 dB of the value specified in Sec. 3.2.2. Above 10 kHz, the tolerance shall be increased to  $\pm$  1.0 dB. The tolerances may be extended to  $\pm$  2 dB provided that a calibration chart is supplied with the test tape by the manufacturer. The calibration figures furnished with the test tape shall represent the levels to be added algebraically to the reproducer output level when the particular test tape is reproduced. With the addition of these factors, the output level of the reproducer will be that which would have resulted if the test tape flux vs frequency had been exactly as specified in Sec. 3.2.2.

**3.2.4** Duration. The duration of frequency response test segments shall be approximately ten seconds.

**3.3** Azimuth. The tape flux shall be parallel to the reference edge of the tape with an azimuth alignment error not to exceed  $\pm$  0.9 milliradians ( $\pm$  3 minutes of angle).

## 4. Calibration

**4.1** Calibration of Tape Flux. The shortcircuit 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, S4.6-1973.

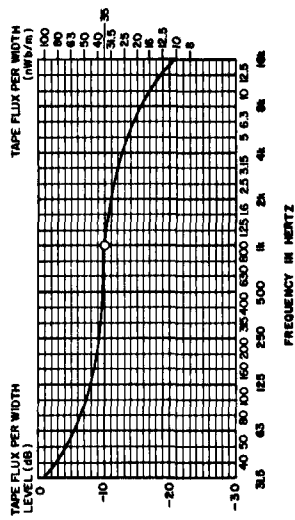
J. G. McKnight, "Flux and flux-frequency response measurements and standardization in magnetic recording," J. SMPTE, 78: 457-472, June 1969.

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

**4.2 Flux Level Variation Measurements.** All flux level variations shall be measured with a meter or graphic level recorder which has a full-wave rectified average measurement law and the dynamics of the standard volume indicator (vumeter), as specified in American National Standard Volume Measurements of Electrical Speech

and Program Waves, C16.5-1954 (R1961).

**4.3 Weighted Peak Flutter Measurement.** Weighted peak flutter shall be measured in accordance with American National Standard Method for Measurement of Weighted Peak Flutter of Sound Recording and Reproducing Equipment, S4.3-1972.



Flux and Flux Level vs Frequency on Audio Record No. 1

Frequency Hz	Flux Per Width nWb/m	Relative Level dB
63	57.2	-5.7
80	50.2	-6.8
100	45.5	-7.7
125	42.0	-8.3
160	39.8	-8.8
200	38.2	-9.2
250	37.3	-9.4
315	36.7	-9.6
400	36.0	-9.7
500	35.7	-9.8
630	35.4	-9.8
800	35.1	-9.9
1000	34.8	-10.0
1250	34.1	-10.1
1600	33.5	-10.3
2000	32.6	-10.6
2500	31.0	-11.0
3150	29.1	-11.6
4000	26.6	-12.3
5000	23.7	-13.3
6300	20.6	-14.5
8000	17.5	-16.0
10000	14.6	-17.6
12500	11.9	-19.3
16000	9.7	-21.1

Flux and flux level versus frequency calculated at "preferred frequencies" using the equation given in Sec. 3.2.2.

**Appendix**

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

**A1.** A guide to proper usage and an explanation of the calibration techniques should be supplied with each test tape.

**A2.** Although stated in a different way, the flux specified in Sec. 3.1.2 is the same as previously standardized in American National Standard Specifications for a Pri-

mary Audio Reference Level Recording for Quadruplex Video Magnetic Tape Recorders Operating at 7.5 in/s, C98.10-1969, and the flux/frequency response given in Sec. 3.2.2 is the same as that standardized in American National Standard Electrical Characteristics of Audio Record One for 2-in Quadruplex Video Magnetic Tape Recording at 15 and 7.5 in/s, C98.3-1970.

**SMPT E RECOMMENDED PRACTICE**

*Video Test Tape for Quadruplex Video Frequency Magnetic Tape Recorders Operating at 15 in/s and Practice HB of SMPTE Recommended Practice RP 6*

**RP 43**  
Revision of  
RP 43-1971

2.11 The position of the tape neutral plane shall be in accordance with SMPTE Recommended Practice RP 36-1971. Specifications for Positioning Tape Neutral Plane and Adjacent Tape Guides for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s and 7.5 in/s.

**3. Test Section**

3.1 Video Test Signals. Five types of test signals, as specified in 3.1.1 through 3.1.5, shall be recorded on the tape.

3.1.1 Color Bars. An encoded color-bar signal conforming to FCC Rules and Regulations Part 73, Subpart E, April 1972.

3.1.2 Multiburst. A white pulse followed by a series of six sine wave bursts. The white pulse width and the width of each burst shall be  $\frac{1}{2}$  the width of the scan line between the end of H blanking and the start of H blanking. The white bar amplitude shall be at  $100 \pm 1$  IRE units. The axis of the bursts shall be at  $55 \pm 1$  IRE units, and the peak-to-peak amplitude of the bursts shall be  $90 \pm 1$  IRE units. The frequencies of the bursts in time sequence shall be 300 KHz, 1.5 MHz, 2.0 MHz, 3.0 MHz, 3.6 MHz, and 4.2 MHz. Harmonic distortion of the sine wave burst signals shall be less than 1 percent.

3.1.3 Ramp. A continuous ramp (or staircase signal consisting of 10 equal-height steps) extending from 0 to 100 IRE units, and repeating at a rate. Color subcarrier having a peak-to-peak amplitude of  $20 \pm 2$  IRE units shall be combined additively with the ramp (or staircase signal).

3.1.4 Window and Pulses. A window signal, a modulated  $12\frac{1}{2}$  I (1.56  $\mu$ sec) pulse, and a 2T (0.25  $\mu$ sec) sine-squared pulse. All signals shall extend from  $7\frac{1}{2} \pm 2\frac{1}{2}$  IRE units to  $100 \pm 1$  IRE units. The three signals shall occur on alternate lines with the window signal on one line, and the 2T and  $12\frac{1}{2}$  I pulses on the next line, with the alternation continuing throughout the field. The leading and trailing edges of the window shall correspond in shape and rise time to the leading and trailing edges of the 2T pulse, respectively. The timings of the pulses and window shall be measured at their half-amplitude points, and shall be as specified below:

- (i) Leading edge of window: 0.3H after trailing edge of preceding horizontal sync pulse.
  - (ii) Width of window: 0.4H.
  - (iii) Leading edge of  $12\frac{1}{2}$  I pulse: 0.4H after trailing edge of preceding horizontal sync pulse.
  - (iv) Leading edge of 2T pulse: 0.2H after leading edge of  $12\frac{1}{2}$  I pulse.
  - (v) Tolerances: All dimensions given in (i) through (iv) shall be held within  $\pm 0.03H$ .
- 3.1.5 Black. A signal consisting of sync, burst and  $7\frac{1}{2} \pm 2\frac{1}{2}$  IRE units of setup.

3.2 Sequence of Video Signals. The video signals shall be recorded in the sequence indicated as follows:

2.5 Voice announcements at the beginning of this tape shall reference this recommended practice. Voice announcements shall be recorded at a level approximately 7 dB below reference level, as defined in Section 3.1.2 of American National Standard and Specifications for an Audio Level and Multi-Frequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s, C398.4-1973. Announcement shall be recorded on Audio Record No. 1 only. A video identification signal may be included during the voice announcement section. If no video identification signal is used, sync, sync and set-up, or test signal shall be recorded on the video channel during the voice announcement.

2.6 Recorded carrier frequencies shall conform to those specified by Practice HB of SMPTE Recommended Practice RP 6; recording pre-emphasis shall be the complement of the de-emphasis characteristic specified by Practice HB of SMPTE Recommended Practice RP 6.

2.7 Tape vacuum guide radius and position shall conform to SMPTE Recommended Practice RP 11-1968. Tape Vacuum Guide Radius and Position for 2-in Quadruplex Video Magnetic Tape Recording.

2.8 Audio Record No. 1 shall be in accordance with American National Standard Frequency Response and Operating Level of Recorders and Reproducers for Audio Record One for 2-in Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s, C398.3-1973.

2.9 Video synchronizing waveforms and signal amplitudes shall conform to the rules and regulations of the Federal Communications Commission for color transmissions. Color subcarrier synchronization. The timing of the synchronizing waveforms shall be uninterrupted during the transition from the identification signals specified in Section 2.5 to the video test signals specified in Section 3.1 and 3.2, and shall be uninterrupted during the transitions between video test signals specified in Section 3.2.

2.10 Geometric distortion on the test tape caused by lack of exact 90° angular separation (quadrature error) of the transducers on the video head wheel making the recording shall not exceed 0.03 micro-seconds peak to peak.

1. Scope
  - (a) Positioning of the vacuum guide.
  - (b) Indication of video frequency response characteristics of the reproducing system.
  - (c) Adjustment of gain of the video reproducing system.
  - (d) Comparison of carrier frequencies of the video recording system.
  - (e) Verification of level and phase of the control track recording system.
  - (f) Adjustment of the gain of the program audio reproducing system.

**2. General Specifications**

2.1 Dimensions of Records. The dimensions of pertinent records making up this test tape shall conform to American National Standard Dimensions of Video, Audio and Tracking Control Records on 2-in Video Magnetic Tape, Quadruplex Recorded at 15 and 7.5 in/s, C398.6-1973.

2.2 Tape Speed. The nominal linear speed of this test tape shall be 15 in/s in accordance with American National Standard Speed of 2-in Tape for Quadruplex Video Magnetic Tape Recording, C398.4-1970.

2.3 Tape Stock. The test sections shall be recorded on transversely-oriented television magnetic recording tape optimized for use with Practice HB of SMPTE Recommended Practice RP 6. The dimensions of the tape stock shall be as specified in American National Standard Dimensions of 2-in Video Magnetic Tape, C398.1-1963 (R1969).

2.4 Tracking Control Signal. A tracking control signal, conforming to that in SMPTE Recommended Practice RP 16-1970. Specifications of Tracking Control Record for 2-in Quadruplex Video Magnetic Tape Recordings, shall be recorded throughout the tape.

Nominal Time from Start of Test Signal	Signal	Duration	Begin	End
0:00	Black	0:20	0:00	0:20
0:30	Multiburst	0:30	0:30	0:50
0:25	Ramp	0:25	0:50	1:15
1:15	Window and Pulses	0:25	1:15	1:40
0:30	Color Bars	0:30	1:40	2:10
0:10	Black	0:10	2:10	2:20
1:30	Multiburst	1:30	2:20	3:50
0:10	Black	0:10	3:50	4:00
2:20	Ramp	2:20	4:00	6:20
0:10	Black	0:10	6:20	6:30
1:20	Window and Pulses	1:20	6:30	7:50
0:10	Black	0:10	7:50	8:00
2:20	Color Bars	2:20	8:00	10:20
0:10	Black	0:10	10:20	10:30

The tolerance on all durations shall be  $\pm 2$  seconds, with the exception of the black signals, which shall have a tolerance of  $\pm 4$  seconds, —0 seconds.

**3.3 Audio Test Signals**

3.3.1 Audio Record No. 1. A 1 kHz  $\pm 5$  percent tone shall be recorded at a shortcircuit tape flux level of  $110 \pm 5$  nanowebers per meter of track width throughout the test section on Audio Record No. 1, except as interrupted for the announcements defined in Section 3.4.

3.3.2 Audio Record No. 2. A 1 kHz  $\pm 5$  percent tone shall be recorded throughout the length of the tape at a shortcircuit tape flux level of  $260 \pm 10$  nanowebers per meter of track width on Audio Record No. 2 (cue track).

3.4 Voice Announcements. Each time the type of signal recorded on the tape is changed, an appropriate voice announcement identifying the new signal shall be made. Instructional or precautionary information may be included in such announcements. No identifying announcements shall be required during the black signal portions of the tape. All voice announcements shall be made under the same conditions as stated in Section 2.5, except that the video test signal shall not be interrupted.

**4. Calibration**

4.1 Calibration of audio level on all test tapes for field use shall be accomplished by comparison on a calibrated reproducer with a test tape made in accordance with ANSI C398.8-1973.

4.2 Audio Level Measurements. All level measurements shall be made by means of a vu meter, as specified in American National Standard Volume Measurements of Electrical Speech and Program Waves, C16.5-1954 (R1961).

4.3 Video Level Measurements. All video measurements of luminance levels shall be made in accordance with IEEE Std 293-1958 (R1972). Television: Measurement of Luminance Signal Levels.

Note: The frequency response of a recovered video signal is a function of such variables as recording current and type of tape stock used; therefore, the optimum reproducing-equalization setting for this tape will not necessarily be the optimum reproducing-equalization setting for all other recordings.

**SMPTÉ RECOMMENDED PRACTICE**

*Video Test Tape for Quadruplex Video Frequency Magnetic Tape Recorders Operating at 7.5 in/s and Practice HB of SMPTE Recommended Practice RP 6*

**RP 44**  
Revision of  
RP 44-1971

Signal	Duration	Nominal Time from Start of Test Signals	
		Begin	End
Black	0:20	0:00	0:20
Multiburst	0:30	0:20	0:50
Ramp	0:25	0:50	1:15
Window and Pulses	0:25	1:15	1:40
Color Bars	0:30	1:40	2:10
Black	0:10	2:10	2:20
Multiburst	1:30	2:20	3:50
Black	0:10	3:50	4:00
Ramp	2:20	4:00	6:20
Black	0:10	6:20	6:30
Window and Pulses	1:20	6:30	7:50
Black	0:10	7:50	8:00
Color Bars	2:20	8:00	10:20
Black	0:10	10:20	10:30

2.11 The position of the tape neutral plane shall be in accordance with SMPTE Recommended Practice RP 36-1971. Specifications for Positioning Tape Neutral Plane and Adjacent Tape Guides for Quadruplex Video Magnetic Tape Recorders Operating at 15 in/s and 7.5 in/s.

**3. Test Section**

3.1 Video Test Signals. Five types of test signals, as specified in 3.1.1 through 3.1.5, shall be recorded on the tape.

3.1.1 Color Bars. An encoded color-bar signal conforming to FCC Rules and Regulations Part 73, Subpart E, April 1972.

3.1.2 Multiburst. A white pulse followed by a series of six sine wave bursts. The white pulse width and the width of each burst shall be  $\frac{1}{2}$  the width of the scan line between the end of H blanking and the start of H blanking. The white bar amplitude shall be at  $100 \pm 1$  IRE units. The axis of the bursts shall be at  $55 \pm 1$  IRE units, and the peak-to-peak amplitude of the bursts shall be  $90 \pm 1$  IRE units. The frequencies of the bursts in time sequence shall be 500 kHz, 1.5 MHz, 2.0 MHz, 3.0 MHz, 3.6 MHz and 4.2 MHz. Harmonic distortion of the sine wave burst signals shall be less than 1 percent.

3.1.3 Ramp. A continuous ramp (or staircase) signal consisting of 10 equal-height steps) extending from 0 to 100 IRE units, and repeating at a line rate. Color subcarrier having a peak-to-peak amplitude of  $20 \pm 2$  IRE units shall be combined additively with the ramp (or staircase signal).

3.1.4 Window and Pulses. A window signal, a modulated  $12\frac{1}{2}$ T (1.56  $\mu$ sec) pulse, and a 2T (0.25  $\mu$ sec) sine-squared pulse. All signals shall extend from  $7\frac{1}{2} \pm 2\frac{1}{4}$  IRE units to  $100 \pm 1$  IRE units. The three signals shall occur on alternate lines with the window signal on one line, and the 2T and  $12\frac{1}{2}$ T pulses on the next line, with the alternation continuing throughout the field. The leading and trailing edges of the window shall correspond in shape and rise time to the leading and trailing edges of the 2T pulse, respectively. The timings of the pulses and window shall be measured at their half-amplitude points, and shall be as specified below:

- (i) Leading edge of window: 0.3H after trailing edge of preceding horizontal sync pulse.
- (ii) Width of window: 0.4H.
- (iii) Leading edge of  $12\frac{1}{2}$ T pulse: 0.4H after trailing edge of preceding horizontal sync pulse.
- (iv) Leading edge of 2T pulse: 0.2H after leading edge of  $12\frac{1}{2}$ T pulse.
- (v) Tolerances: All dimensions given in (i) through (iv) shall be held within  $\pm 0.03$ H.

3.1.5 Black. A signal consisting of sync, burst and  $7\frac{1}{2} \pm 2\frac{1}{4}$  IRE units of set-up.

3.2 Sequence of Video Signals. The video signals shall be recorded in the sequence indicated as follows:

2.5 Voice announcements at the beginning of this tape shall reference this recommended practice. Voice announcements shall be recorded at a level approximately 5 dB below reference level, as defined in Section 3.1.2 of American National Standard Specifications for an Audio Level and Multi-frequency Test Tape for Quadruplex Video Magnetic Tape Recorders Operating at 7.5 in/s, C98.11-1971. Announcement shall be recorded on Audio Record No. 1 only. A video identification signal may be included during the voice announcement section. If no video identification signal is used, sync, sync and setup, or test signal shall be recorded on the video channel during the voice announcement.

2.6 Recorded carrier frequencies shall conform to those specified by Practice HB of SMPTE Recommended Practice RP 6; recording pre-emphasis shall be the complement of the de-emphasis characteristic specified by Practice HB of SMPTE Recommended Practice RP 6.

2.7 Tape vacuum guide radius and position shall conform to SMPTE Recommended Practice RP 11-1968, Tape Vacuum Guide Radius and Position for 2-in Quadruplex Video Magnetic Tape Recording.

2.8 Audio Record No. 1 shall be in accordance with American National Standard Frequency Response and Operating Level of Revolvers and Reproducers for Audio Record One for 2-in Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s, C98.3-1973.

2.9 Video synchronizing waveforms and signal amplitudes shall conform to the rules and regulations of the Federal Communications Commission for color transmissions. Color subcarrier synchronizing burst shall be included throughout the recording. The timing of the synchronizing waveforms shall be uninterrupted during the transition from the identification signals specified in Section 2.5 to the video test signals specified in Section 3.1 and 3.2, and shall be uninterrupted during the transitions between video test signals specified in Section 3.2.

2.10 Geometric distortion on the test tape caused by lack of exact 90° angular separation (quadrature error) of the transducers on the video head wheel making the recording shall not exceed 0.03 microseconds peak to peak.

1. Scope
  - (a) This recommended practice specifies a video frequency test tape to be used with quadruplex television video tape recorders operating at 7.5 in/s (19.05 cm/s) and Practice HB of SMPTE Recommended Practice RP 6, Reference Carrier Frequencies and De-Emphasis Characteristics for 2-in Quadruplex Video Magnetic Tape Recording. It is to be used for:
    - (a) Positioning of the vacuum guide.
    - (b) Indication of video frequency response characteristics of the reproducing system.
    - (c) Adjustment of gain of the video reproducing system.
    - (d) Comparison of carrier frequencies of the video recording system.
    - (e) Verification of level and phase of the control track recording system.
    - (f) Adjustment of the gain of the program audio reproducing system.

2. General Specifications

2.1 Dimensions of Records. The dimensions of pertinent records making up this test tape shall conform to American National Standard Dimensions of Video, Audio and Tracking Control Records on 2-in Video Magnetic Tape Quadruplex Recorded at 15 and 7.5 in/s, C98.6-1973.

2.2 Tape Speed. The nominal linear speed of this test tape shall be 7.5 in/s in accordance with American National Standards Speed of 2-in Tape for Quadruplex Video Magnetic Tape Recording, C98.4-1970.

2.3 Tape Stock. The test sections shall be recorded on transversely-oriented television magnetic recording tape optimized for use with Practice HB of SMPTE Recommended Practice RP 6. The dimensions of the tape stock shall be as specified in American National Standard Dimensions of 2-in Video Magnetic Tape, C98.1-1963 (R1969).

2.4 Tracking Control Signal. A tracking control signal, conforming to that in SMPTE Recommended Practice RP 16-1970, Specifications of Tracking Control Record for 2-in Quadruplex Video Magnetic Tape Recordings, shall be recorded throughout the tape.

The tolerance on all durations shall be  $\pm 2$  seconds, with the exception of the black signals, which shall have a tolerance of  $\pm 4$  seconds, —0 seconds.

3.3 Audio Test Signals

3.3.1 Audio Record No. 1. A 1 kHz  $\pm 5$  percent tone shall be recorded at a shortcircuit tape flux level of  $110 \pm 5$  nanowebers per meter of track width throughout the test section on Audio Record No. 1, except as interrupted for the announcements defined in Section 3.4.

3.3.2 Audio Record No. 2. A 1 kHz  $\pm 5$  percent tone shall be recorded throughout the length of the tape at a shortcircuit tape flux level of  $260 \pm 10$  nanowebers per meter of track width on Audio Record No. 2 (cue track).

3.4 Voice Announcements. Each time the type of signal recorded on the tape is changed, an appropriate voice announcement identifying the new signal shall be made. Instructional or precautionary information may be included in such announcements. No identifying announcements shall be required during the black signal portions of the tape. All voice announcements shall be made under the same conditions as stated in Section 2.5, except that the video test signal shall not be interrupted.

**4. Calibration**

4.1 Calibration of audio level on all test tapes for field use shall be accomplished by comparison on a calibrated reproducer with a test tape made in accordance with ANSI C98.11-1974.

4.2 Audio Level Measurements. All level measurements shall be made by means of a vu meter, as specified in American National Standard Volume Measurements of Electrical Speech and Program Waves, C16.5-1957 (R1961).

4.3 Video Level Measurements. All video measurements of luminance levels shall be made in accordance with IEEE Std 205-1958 (R1972), Television: Measurement of Luminance Signal Levels.

Note: The frequency response of a recovered video signal is a function of such variables as recording current and type of tape stock used; therefore, the optimum reproducing-equalization setting for this tape will not necessarily be the optimum reproducing-equalization setting for all other recordings.

## Cinematography — Labeling of containers for unexposed motion-picture films and magnetic films — Minimum information specifications

### 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the information to be used for identifying the contents of containers for unexposed motion-picture films and magnetic films.

### 2 REFERENCES

- ISO 69, *Cinematography — 16 mm motion-picture raw stock film — Cutting and perforating dimensions.*  
 ISO 486, *Cinematography — 16 mm motion-picture film perforated 8 mm Type R — Cutting and perforating dimensions.*  
 ISO 491, *Cinematography — 35 mm motion-picture film — Cutting and perforating dimensions.*  
 ISO 1039, *Cinematography — Cores for motion-picture and magnetic film rolls — Dimensions.*  
 ISO 1700, *Cinematography — 8 mm Type S motion-picture raw stock film — Cutting and perforating dimensions.*  
 ISO 2986, *Cinematography — Motion-picture film 16 mm perforated 8 mm Type S (1-3) and (1-4) — Cutting and perforating dimensions.<sup>1)</sup>*  
 ISO 3022, *Cinematography — 35 mm motion-picture film perforated 16 mm — Cutting and perforating dimensions.*  
 ISO 3023, *Cinematography — 65 mm and 70 mm motion-picture film — Cutting and perforating dimensions.*  
 ISO 3774, *Cinematography — 35 mm motion-picture film perforated 8 mm Type S (1-3-5-7-0) — Cutting and perforating dimensions.<sup>1)</sup>*

### 3 LABEL INFORMATION

- 3.1 The container, carton or its label shall include the following information about the contents:
- 3.1.1 Name and type of film in words, and if desirable the codified designation.
- 3.1.2 Film exposure index for camera films only, and, if necessary, the type of chromatic sensitivity.

<sup>1)</sup> At present at the stage of draft.

## 4 PERFORATION CHARACTERISTICS

### 4.1 Methods of identification

Several perforation shapes and pitches and several perforation row formats presently exist in the motion-picture field. The preferred methods of identifying these different characteristics and their designations are listed in the table in 4.2.1.

### 4.2 Shape and designations of the perforation

4.2.1 For 35 mm films common perforation shapes are identified as follows:

Preferred perforation designation*	Other perforation designations (not preferred)
P	KS
DH	—
N	BH
SC	CSS
AC	CSA, CS

\* The dimensions of these perforations are specified in ISO 491.

4.2.2 Perforations used for 16 mm single and multiple rows have not been given a code letter designation. The perforation shape and dimensions are found in ISO 69.

4.2.3 No perforation shape identification is necessary for 17.5 mm, 65 mm and 70 mm film having 35 mm "p" type perforations.

4.2.4 Films perforated 8 mm Type S are specified in ISO 1700, and are designated with an "S".

4.2.5 Films perforated 8 mm Type R are specified in ISO 486 and are designated with an "R".

### 4.3 Information about pitch

Pitch is specified in nominal millimetres or to the ten-thousandth of an inch. The inch specification shall be in parentheses and follow the millimetre designation when used in combination. Parentheses are not necessary when the inch specification is in a separate location.

### 4.4 Rows of perforations

The number and location of the perforation row are specified from the reference edge as follows:

4.4.1 For films which have an end-use width narrower than the parent width and intermediate films whose subsequent print has an end-use width narrower than the parent width, the rows of the perforations in the parent width film shall be listed in arabic numerals followed by the letter R; for example, 1R, 2R, 3R.

The arrangement of rows of perforations shall be specified by numerals separated by a dash to indicate how the rows of perforations are placed on the film.

The perforation rows shall be numbered starting at the reference edge. The reference edge is that edge of the strip nearest to the row of perforations which is retained on one of the slit prints (i.e. not discarded in any subsequent slitting). The row(s) of perforations which is discarded will always be given the number 0. Negative or intermediate films which are not slit may contain the 0-numbered row of perforations if that perforation row corresponds to the discard row of perforations on the subsequent print stock. (See annex B for examples of how to apply this perforation row indication system.)

4.4.2 Film not normally slit or used for small formats and containing two rows of perforations symmetrically located does not require information about the position of the rows of perforations.

4.4.3 No perforation row identification is required for films which are 8 mm and 17.5 mm wide and which contain one row of perforations, or for other films for which an ambiguity does not exist.

## 5 WINDING DESIGNATION

5.1 For the designation of the emulsion orientation for sensitized films, or, in the case of magnetic coated films, the side containing the magnetic coating, the following symbols shall be used:

"E" for winding emulsion inside;

"EO" for winding emulsion outside.

5.2 For films with non-symmetrical rows of perforations, two types of winding are possible for the same position of the emulsion. They are specified as winding "A" or winding "B". The definition of "A" and "B" is based on the definition of a reference edge of the film.

5.2.1 When a roll of motion-picture film with non-symmetrical rows of perforations wound on a core or spool is held so that the outside end of the film leaves the roll at the top and toward the right, it is designated as

— Winding "A" when the reference edge of the film is toward the observer;

— Winding "B" when the reference edge is away from the observer.

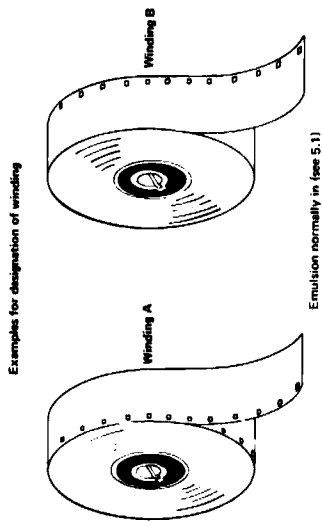
5.2.2 For convenience, the emulsion orientation symbols and winding symbols may be combined, i.e. EIA, EIB, EOA, EOB.

5.2.3 For 16 mm films with one row of perforations on spools for daylight loading cameras, winding EIB is to be preferred.

ANNEX A

OPTIONAL INFORMATION FOR CONTAINERS AND/OR LABELS

The following information may also be included on the container and/or its label :  
warranty, origin of the film, picture symbols indicating the use of the film; information on edge-printing and additional manufacturing identification, i.e. expiration date or information about the attachment of the film to the core.



ANNEX B

PERFORATION ROW IDENTIFICATION

The following examples illustrate the method for identifying film formats and perforation row location. A parent width 16 mm used for 8 mm production will be designated 16/8R and could have the following possible combinations of perforation row locations.

16/8R - 2R (1-3)

16/8R - 2R (1-4)

For a film designated 35/8S, the following combinations could exist :

35/8S - 5R (1-3-5-7-0)

35/8S - 2R (1-0)

