

# Standards and Recommended Practices

## **Proposed Withdrawal of American National Standard and SMPTE Recommended Practice**

On the recommendation of the Committee on Television Recording and Reproduction Technology, the Standards Committee has approved withdrawal of an American National Standard, ANSI/SMPTE 23M-1986, Video Recording — 1/2-in Type F Helical-Scan — Records; and an SMPTE Recommended Practice, RP 88-1986, Reference Carrier Frequencies and Pre-emphasis Characteristic for 1/2-in Type F Helical-Scan Video Tape Recording. Withdrawal was initiated because the documents are out of date and the International Electrotechnical Commission provides current documentation. Comments should be addressed to Sherwin H. Becker at Society Headquarters prior to October 1, 1991. All comments from *Journal* publication will be reviewed prior to further processing of the withdrawal action.

## **Approved SMPTE Recommended Practices**

Four SMPTE Recommended Practices were approved by the Society: RP 60-1991, Labels for Cartridge Spools for 2-in Quadruplex Video Magnetic Tape; RP 101-1991, Requirements for Recording American National Standard Time and Control Code on Quadruplex Video Tape Recorders; RP 87-1991, Reference Carrier Frequencies, Preemphasis Characteristic and Audio and Control Signals for 3/4-in Type E Helical-Scan Video Tape Cassette Recording; and RP 102-1991, Frequency Response and Operating Level of Recorders and Reproducers for Audio 2 Record for 2-in Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s. The practices are available from Society Headquarters for \$5.00 each.

— *Sherwin H. Becker, Director of Engineering*

## **SMPTE Standards Subscription Service**

The Society provides a Standards Subscription Service to assist firms, libraries, and individuals in establishing and maintaining a complete and current file of approved American National Standards, SMPTE Recommended Practices, and SMPTE Engineering Guidelines in the motion-picture, television, and video magnetic recording fields. Through this service, the Society makes automatic distribution to standards subscribers of all new and revised standards, recommended practices, and guidelines that are approved during the calendar year in these fields.

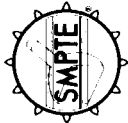
For further information, write to: Standards Subscription Service, Engineering Dept., Society of Motion Picture and Television Engineers, 595 West Hartsdale Ave., White Plains, NY 10607.



## SMPTE RECOMMENDED PRACTICE

RP 101-1991  
Revision of RP 101-1986

# Requirements for Recording American National Standard Time and Control Code on Quadruplex Video Tape Recorders



Page 1 of 2 pages

### 1 Scope

This practice specifies the record level and conditions for recording the time and control code, as specified in ANSI/SMPTE 12M-1986, on quadruplex video tape recorders which use 2-in tape at 7.5 in/s or 15 in/s recording tape speed.

### 2 Normative references

The following documents contain provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the documents indicated below.

ANSI/SMPTE 6-1988, Video Recording — Video, Audio and Tracking-Control Records — 2-in Quadruplex Tape

ANSI/SMPTE 12M-1986, Television — Time and Control Code — Video and Audio Tape for 525-Line 60-Field Systems

SMPTE RP 102-1991, Frequency Response and Operating Level of Recorders and Reproducers for Audio Record for 2-in Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s

IEEE Std 152-1953 (R1971), Volume Measurements of Electrical Speech and Program Waves

## Annex A (informative) Additional data

### A.1 Flux level measurements

Means for measuring the short-circuit flux level on magnetic recordings usually are not available to users of audio and video tape recorders. The value recommended in this document may be established by use of reference tapes supplied by the manufacturer of the tape recording equipment. These tapes contain a sine-wave reference level recording on each audio track whose rms short-circuit flux level is as specified for the format being used. The recorder is adjusted to record the same level that exists on the reference tape when its volume indicator reads 0 vu. If the recording level of the code is then adjusted so that the volume indicator reads +2 vu, the recorded code will have the required peak-to-peak flux level specified in 5.3. Measurements should be made with a standard volume indicator (vumeter), as specified in IEEE Std 152-1953. Although the ballistics of the meter are of little importance with respect to the code, the use of a full-wave rectifier and the approximate average reading characteristic of the volume indicator are essential to the accuracy of the procedure.

### A.2 Dub recordings

#### A.2.1 Preferred method

The preferred method of producing time and control code dubs is by inserting a slaved time code generator in the

video and time code signal paths between reproducer and recorder which ensures compliance with ANSI/SMPTE 12M-1986. When using this method, the user bit information, if any, will be delayed by two frames due to the length of a complete code group and the mechanical tolerance of audio head gap location specified in each format.

#### A.2.2 Other methods

Other acceptable methods of producing time and control code dubs are:

**A.2.2.1** Reclock and reshape the time code waveform to meet 3.3 of ANSI/SMPTE 12M-1986. The resulting waveform will not comply with 3.2.2 of ANSI/SMPTE 12M-1986, thereby allowing buildup of video-to-address timing errors on multiple generation dubs.

**A.2.2.2** Reshape the time code waveform to meet 3.3.1 and 3.3.2 of ANSI/SMPTE 12M-1986. Video-to-address timing errors and waveform transition jitter will build up on multiple generation dubs.

**A.2.2.3** Provide no special time code signal processing. The usefulness of dubs will be limited.

## Page 2 of 2 pages

### 3 Recorder requirements

The code shall not require any special or unusual adjustments to the recording channel of the audio 2 (cue) track. High-frequency bias, normally on this channel during recording, shall be used.

### 4 Code position

**4.1** The code shall be recorded on the audio 2 (cue) track, the location of which is specified in ANSI/SMPTE 6-1988.

**4.2** The start of the address shall be as specified in ANSI/SMPTE 12M-1986.

**4.3** The position of the address start point along the tape is determined by the position of the audio 2 head as specified in ANSI/SMPTE 6-1988.

### 5 Recorded signal

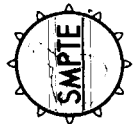
**5.1** The waveform of the code at the input of the recorder shall be as specified in ANSI/SMPTE 12M-1986.

**5.2** The response of the record channel shall be as specified in 4.1 of SMPTE RP 102-1991.

**5.3** The recording level shall be such as to produce a peak-to-peak short-circuit flux level on the tape of at least 600 nWb/m of track width. (See annex A.1.)

# SMPTE RECOMMENDED PRACTICE

## Reference Carrier Frequencies, Pre-emphasis Characteristic and Audio and Control Signals for 3/4-in Type E Helical-Scan Video Tape Cassette Recording



### 1 Scope

This practice specifies the reference frequencies for deviation of the frequency modulated carrier and associated video preemphasis characteristic for 3/4-in type E helical-scan video tape cassette recording of 525-line monochrome and NTSC color television signals at a tape speed of 95.3 mm/s (3.752 in/s). In addition, the characteristics of the audio and control signals are specified.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

- EIA RS-170, Electrical Performance Standards — Monochrome Television Studio Facilities
- EIA Industrial Electronics Tentative Standard No. 1, Color Television Studio Picture Line Amplifier Output Drawing

### 3 Video Signal

- 3.1 Luminance carrier frequencies
  - 3.1.1 Reference white level: 5.4 MHz ± 0.1 MHz
  - 3.1.2 Reference sync level: 3.8 MHz ± 0.2 MHz
  - 3.1.3 Reference white to sync level deviation: 1.6 MHz ± 0.1 MHz

### 3.2 Recording current characteristics

3.2.1 FM luminance carrier recording current shall be adjusted to produce maximum playback level. A high-pass filter having the characteristic shown in figure 1 shall be inserted into the FM signal path.

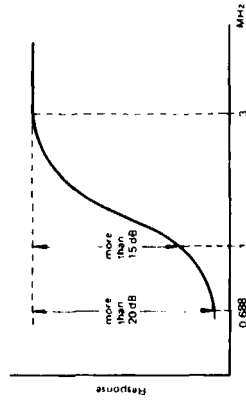


Figure 1 — FM high-pass filter

3.2.2 The down-converted chrominance signal of the AM chrominance carrier recording shall be 688.374 kHz ± 0.200 kHz. The recording current shall be that at which the playback signal level is 10 dB to 14 dB below the peak luminance level of color bars at 75% color saturation.

### 3.3 Luminance signal preemphasis characteristics

- 3.3.1 The preemphasis is shown in figure 3 and defined as the impedance response to the four-terminal network in figure 2.
- 3.3.2 Preemphasis is introduced to the video signal prior to the modulator.

### 4 Audio signal

#### 4.1 Recording characteristics

4.1.1 High-frequency time constant of 50 μs

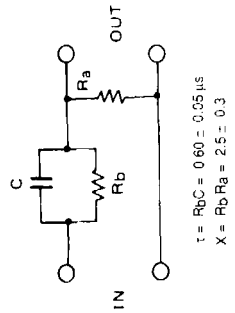


Figure 2 — Preemphasis network

4.1.2 Low-frequency time constant of 3180 μs

#### 4.2 Bias current

With a sine-wave recording signal of 1 kHz, the bias current shall be increased from the value producing maximum reproduced signal output to a level which results in the signal output dropping 0.5 dB.

#### 4.3 Reproducer operating level

The reproducing volume indicator (vu meter) shall deflect to the scale reference level (0 dB) when playing back a tape recorded with a 1000 Hz sine-wave short-circuit tape flux per unit track width of 100 nWb/m.

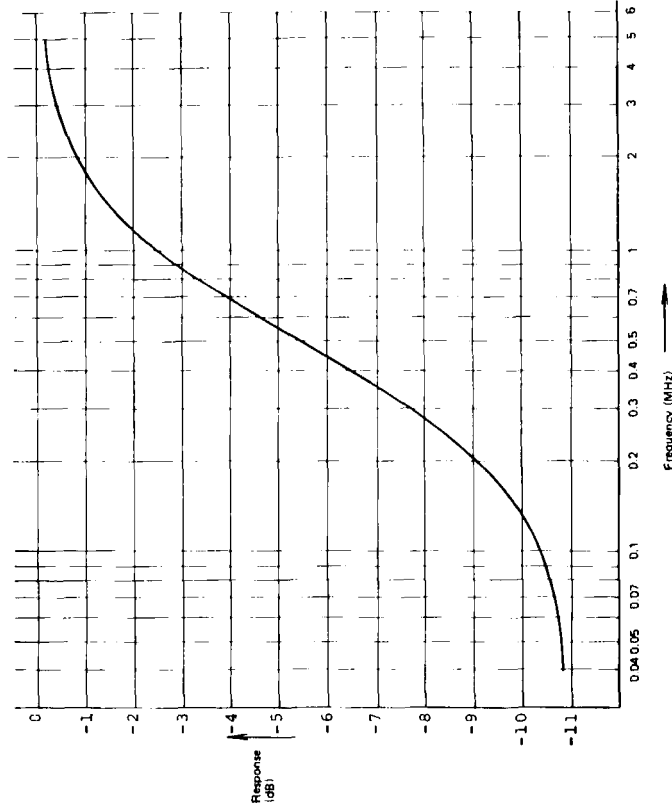


Figure 3 — Video preemphasis characteristic response for figure 2

**5 Control signal**

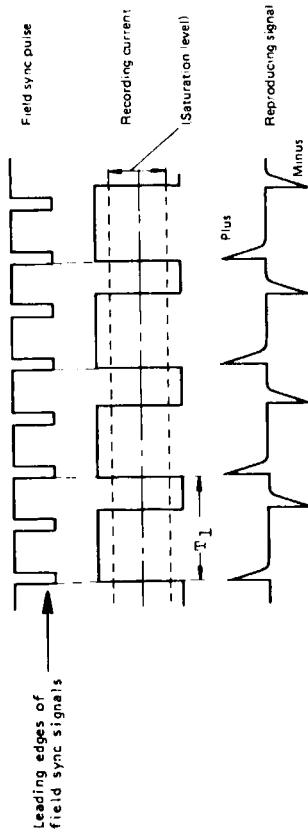
**5.1 Polarity**

A positive-going pulse shall be obtained at the plus terminal of the control-track head on playback where there is a change from south to north in the polarity of the magnetic tape. A south to north polarity change

shall identify field 1 of the NTSC signal as defined by EIA RS-170 and EIA Industrial Electronics Tentative Standard No. 1. The reference pulse shall be the positive-going pulse as shown in figure 4.

**5.2 Recording current waveform**

The rise time shall be less than 200 μs.

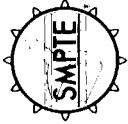


T<sub>1</sub> = 33.57 ms  
Polarity = Plus, north; minus, south

**Figure 4 – Control signals waveform and polarity**

**Annex A (informative)  
Bibliography**

ANSI/SMPTE 21M-1986, Video Recording — 3.4-in. Type E Helical Scan — Records



**SMPTE RECOMMENDED PRACTICE**  
**Frequency Response and Operating Level of Recorders and Reproducers for Audio 2 Record for 2-in Quadruplex Video Magnetic Tape Operating at 15 and 7.5 in/s**

be adjusted and monitored with a standard volume indicator (vu meter), as specified in IEEE Std 152-1953.

**3.2 Recorder operating level**

When a quadruplex video tape audio 2 record is recorded from a sinusoidal voltage having a frequency of 1000 Hz, such that the rms short circuit tape flux per unit track width on the record is 260 nWb·m ± 7 nWb·m of track width, the recording volume indicator shall be adjusted to deflect to its reference level (0 vu) scale mark.

**3.3 Reproducer operating level**

When a tape audio 2 record having an rms sinusoidal flux per unit track width of 260 nWb·m and a frequency of 1000 Hz is reproduced, the reproducing volume indicator shall deflect to its reference level (0 vu) scale mark.

**4 Frequency response**

**4.1 Recorder flux/frequency response**

When a tape record is recorded from a constant voltage level applied to the input terminals of the recording system, the short circuit flux level on the record versus frequency, Lo(f), shall be as given by the following equation:

$$Lo(f) = -9.8 + 10 \log_{10} \left\{ \frac{1 + (F_L/f)^2}{1 + (f/F_H)^2} \right\} \text{ [dB]}$$

where f is the frequency at which the response is being computed; F<sub>L</sub> is the low-frequency transition frequency, 80 Hz; and F<sub>H</sub> is the high-frequency transition frequency, 4500 Hz. A graph of this equation is shown in figure 1.

**1 Scope**

This practice specifies the frequency response and operating level of recorders and reproducers for audio 2 record (cue) for 2-in quadruplex video magnetic tape recording at 15 in/s and 7.5 in/s (381 mm/s and 190.5 mm/s), as defined in ANSI/SMPTE 6-1988.

**2 Normative references**

The following standards contain provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

ANSI/SMPTE 6-1988, Video Recording — Video, Audio and Tracking-Control Records — 2-in Quadruplex Tape

ANSI/SMPTE 8-1989, Video Recording — Quadruplex Recorders Operating at 15 in/s — Audio Level and Multifrequency Test Tape

ANSI/SMPTE 11-1989, Video Recording — Quadruplex Recorders Operating at 7.5 in/s — Audio Level and Multifrequency Test Tape

IEEE Std 152-1953 (R1971), Volume Measurements of Electrical Speech and Program Waves

**3 Operating level**

**3.1 Recording and reproducing level indicator**

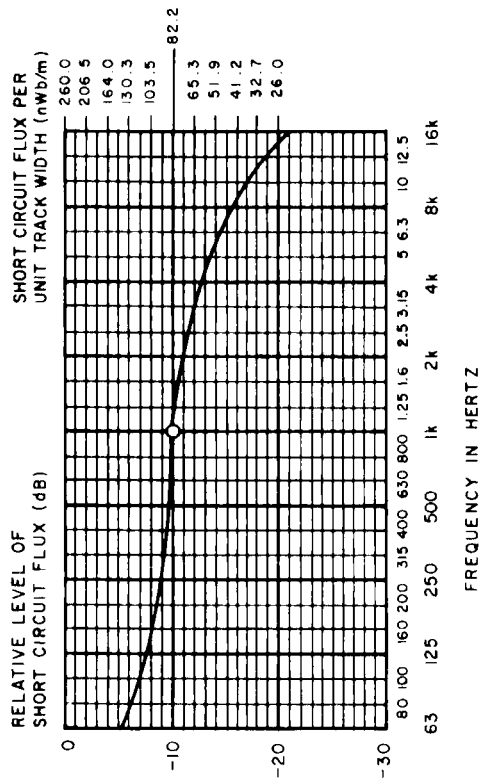
The audio and reproduce levels of the audio 2 record of the quadruplex video magnetic tape recorder shall

**Annex A (informative)  
Additional data**

**A.1** Although the absolute values of flux are different, the relative response-frequency values given in 4.1 are the same as those standardized in ANSI SMPTE 3-1986.

**A.2** Previous frequency-response standards for recorders and reproducers have been given in terms of a standard reproducing system having an ideal reproducing head followed by a standardized RC equalizing network whose time constant was given.

Because an adequate description of the ideal head and its interconnection to the following network is quite lengthy, it is simpler to specify the system responses in terms of the basic physical quantity for the recorded signal, the short circuit tape flux. The concepts are explained in detail by J. G. McKnight.



**Figure 1 – Short circuit tape flux per unit track width and relative level vs frequency for audio 2 record**

**4.2 Reproducer flux frequency response**

When a tape audio 2 record having a short circuit tape flux level versus frequency given in 4.1 is reproduced, the output voltage level of the reproducer versus frequency shall be constant.

**5 Field-method of calibrating recorders and reproducers (see annex A.3)**

**5.1** The practical calibration of a reproducer shall be performed by reproducing the audio level and multifrequency test tape defined in ANSI-SMPTE 8-1989 or ANSI SMPTE 11-1989. The practical calibration of a recorder shall then be performed by recording on a medium representative of that to be used and comparing the recording so made with the recording on the test tape.

**5.2** The flux-frequency response of a reproducer shall be calibrated by reproducing the frequency response test section of the specified test tape. The reproducing equalizer is adjusted so that output voltage level versus frequency of the reproducer is constant.

**5.3** The operating level of a reproducer shall be calibrated by reproducing the audio operating level test section of the specified test tape. The reproducing gain control is adjusted so that the volume indicator deflects to its reference level (0 vu) scale mark.

**5.4** The flux-frequency response of a recorder shall be calibrated by comparing the tape flux recorded by the recorder (with constant input voltage level) to the flux recorded on the frequency response test section of the specified test tape. The recording equalizer is adjusted so that the tape flux level versus frequency of a recorder (including the tape) is the same as that on the test tape.

**5.5** The operating level of a recorder shall be calibrated by comparing the tape flux recorded by the recorder when the recording volume indicator deflects to its reference level (0 vu) scale mark to the recording of the audio operating level test section of the specified test tape. The recording gain control is adjusted so that when the recording volume indicator deflects to its reference level (0 vu) scale mark, the recorded tape flux is the same as that on the test tape.

Rather than specifying flux-frequency response in terms of admittances of electrical networks, the equation and graph of the response function have been specifically given. The equation does, in fact, describe the response of the previously specified RC equalizing network with time constants of 2000  $\mu$ s and 35  $\mu$ s.

**A.3** It has been the practice of quadriplex video magnetic recorder reproducer manufacturers to insert a band elimination filter with maximum attenuation at 240 Hz in the reproducing channel for the audio 2 record. The purpose of this filter is to minimize interference from the adjacent tracking control record. It is necessary to disconnect this filter during response frequency measurements.

**Annex B (informative)  
Bibliography**

ANSI SMPTE 3-1986, Video Recording — Frequency Response and Operating Level of Recorders and Reproducers — Audio 2, Record on 2-in. Tape Operating at 1.5 and 7.5 in/s

McKnight, J. G., Flux and flux frequency measurements and standardization in magnetic recording. Journal of the SMP-E, 78(6), 457-472, June 1969