

The SMPTE Operations Manual for Standards states:

At any time, a Technology Committee may revise, amend, or otherwise initiate a new Project on a Stable document.

A Stable document is “In Force”, and not deprecated or withdrawn.

* * * * *

SMPTE “Stable” documents were previously described as “Archived” and the attached document may be marked as “Archived”. The status of a SMPTE document described as “Archived” is exactly as described above for a “Stable” document.

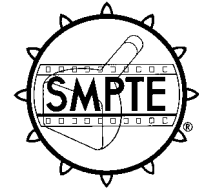
Stable documents may not adhere to the latest style and format of SMPTE documents, or to current usage of normative language. Suitable care should be taken in interpretation.

SMPTE STANDARD

ANSI/SMPTE 230M-1996

Revision of
ANSI/SMPTE 230M-1991

for Television Analog Recording — 1/2-in Type L — Electrical Parameters, Control Code and Tracking Control



Page 1 of 13 pages

1 Scope

1.1 This standard specifies the electrical parameters of video, audio, time and control code, and tracking-control signals for 1/2-in type L helical-scan video tape recorders operating with video signals having a typical scanning structure of 525 lines, 59.94 fields per second, and 2:1 interlace. This standard specifies two recording modes: Mode 1 uses oxide-particle tape, and mode 2 uses metal-particle tape and permits audio frequency modulation (AFM) signals to be recorded.

1.2 Where nominal values are given without tolerances, interchange performance will be limited by implementation accuracy.

2 Normative references

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

ANSI/IEEE 152-1992, Audio Program Level Measurement

ANSI/SMPTE 12M-1995, Television, Audio and Film — Time and Control Code

ANSI/SMPTE 238M-1992, Television Analog Recording — 1/2-in Type L — Tapes and Cassettes

IEC 268-12 (1987), Part 12: Application of Connectors for Broadcast and Similar Use

ITU-R BT.470-4, Television Systems

3 Video recording

This component video recording system is intended to operate compatibly in an NTSC environment. To achieve this, the levels and ratios used in the format are derived from the monochrome or composite input signal as defined in 3.4.

The video recording system shall provide separate signal paths for the luminance and color-difference signals. These component signals shall be recorded on two separate tracks designated respectively as the Y track for the luminance signal and the C track for the color-difference signals. The R-Y and B-Y color-difference signals shall be recorded in the form of a compressed time-division multiplexed signal on the C track. When operating in mode 2, two AFM signals may be recorded in addition to the compressed color-difference signals.

3.1 Mode selection

3.1.1 Two modes of operation are defined for the following tape types:

- Oxide-particle tape: Mode 1
- Metal-particle tape: Mode 2

3.1.2 Sensing of tape type shall be automatic by means of a sensing hole in the cassette as described in ANSI/SMPTE 238M.

CAUTION NOTICE: This Standard may be revised or withdrawn at any time. The procedures of the Standard Developer require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of publication. Purchasers of standards may receive current information on all standards by calling or writing the Standard Developer.

Printed in USA.

3.2 Luminance channel

3.2.1 Signal Processing

A signal processing system, as specified in this standard, shall contain the following elements in the order of the signal flow.

3.2.1.1 A means for modifying the sync portion of the luminance signal.

3.2.1.2 A means for insertion of a vertical interval subcarrier is required in mode 2 when the signal to be recorded has been decoded from a composite source as defined in ITU-R BT.470-4. The vertical interval subcarrier (VISC) is optional in mode 1.

3.2.1.3 A video nonlinear preemphasis process.

3.2.1.4 A video preemphasis network.

3.2.1.5 A means for clipping the video signal after preemphasis.

3.2.1.6 A linear frequency modulator having constant deviation with respect to the amplitude of the modulating frequencies.

3.2.1.7 An amplifier to provide current drive to the Y channel record heads.

3.2.2 Modification of sync portion

Means shall be used to modify the pulse width and amplitude of the sync portion as shown in figure 1.

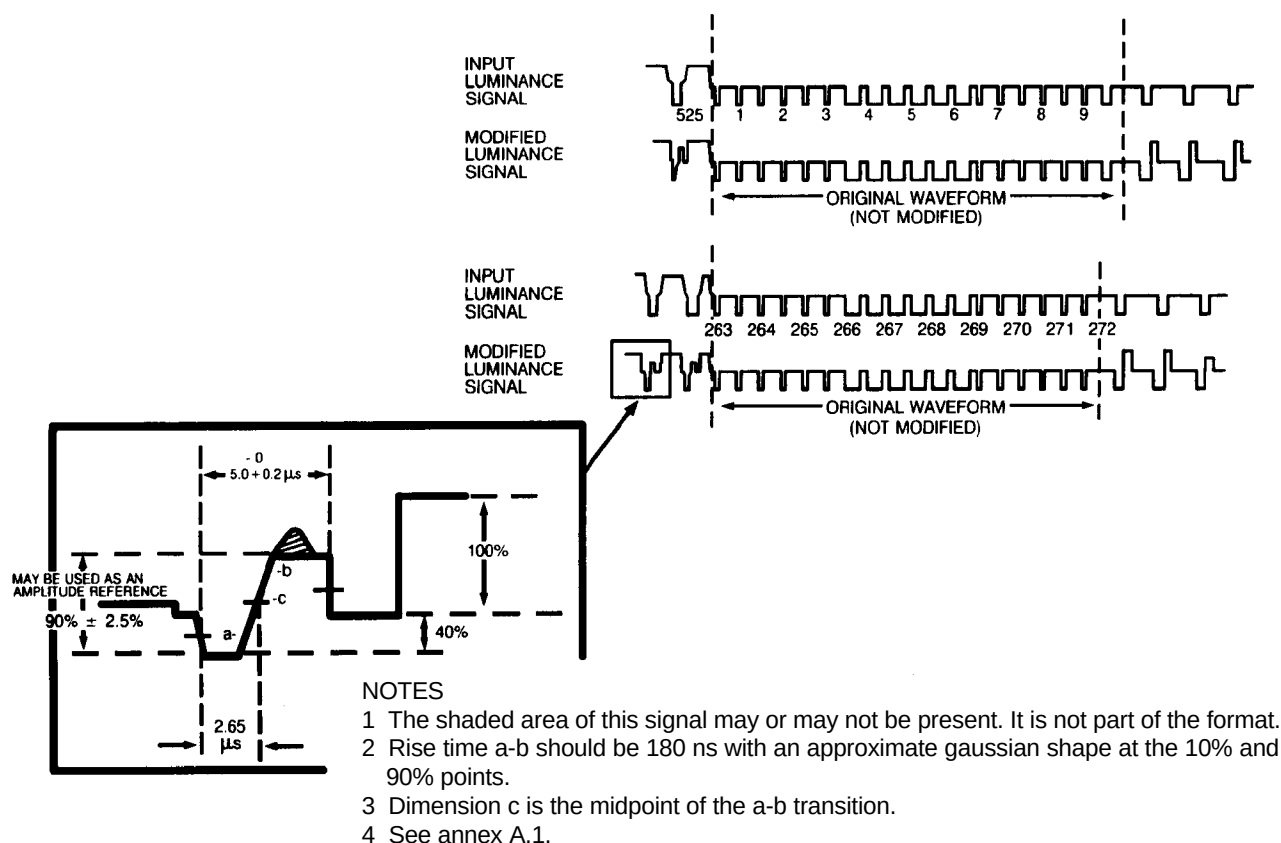


**Figure 1 -- Waveform of the modified luminance sync
(vertical sync and equalizing pulse portion remains unmodified)**

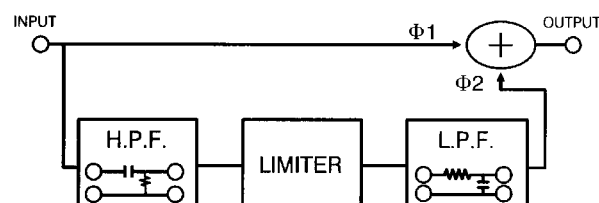
3.2.3 Luminance nonlinear preemphasis

The luminance signal shall receive nonlinear preemphasis (see figure 2). The characteristics shall be as shown in table 1.

Table 1 – Video nonlinear preemphasis characteristics

MHz	Input (dB)					
	-30	-20	-15	-10	-5	0
0.2	0.4	0.4	0.4	0.4	0.3	0.2
0.5	1.9	1.7	1.7	1.4	0.8	0.4
1.0	4.6	4.0	3.5	2.4	1.3	0.7
1.5	6.7	5.6	4.6	3.0	1.6	0.9
2.0	8.0	6.6	4.9	3.3	1.8	1.1
3.0	9.5	7.5	5.3	3.6	2.2	1.3
4.0	9.9	7.6	5.3	3.6	2.2	1.4
5.0	9.9	7.3	5.1	3.3	2.0	1.2

Values are in decibels.



NOTE – The phase of the side chain (Φ_2) shall be equal to the phase of the input signal (Φ_1) at 3.58 MHz prior to the mixing.

Figure 2 – Block diagram of video nonlinear preemphasis

3.2.4 Luminance preemphasis

Preemphasis is defined by the frequency and phase characteristics of the network shown in figure 3 when fed from a zero impedance source and feeding an infinite impedance load.

3.2.5 Amplitude clipping

For an input signal where blanking is at 0% and peak white at 100%, any positive or negative amplitude excursion exceeding the levels shown in table 2 shall be clipped.

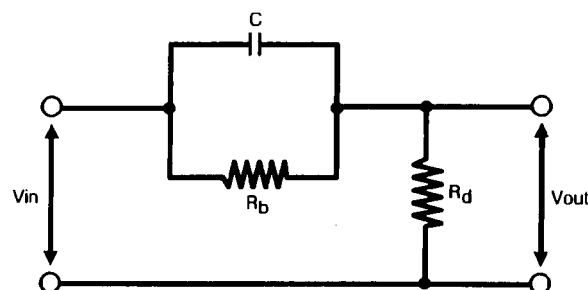


Figure 3 – Preemphasis network

Table 2 – Luminance amplitude clipping characteristics

	Mode 1	Mode 2
Positive excursion limit	+310% nom +315% max	+324% nom +329% max
Negative excursion limit	-125% nom -130% max	-214% nom -219% max

3.2.6 Recorded carrier frequency

Carrier frequencies corresponding to reference video levels shall be as shown in table 3 when recording a flat-field signal.

Table 3 – Carrier frequencies corresponding to reference video levels

	Mode 1	Mode 2
100% white	6.4 MHz nom	7.7 MHz nom
50% level	5.7 MHz nom	7.0 MHz nom
Blanking	4.97 ± 0.05 MHz	6.27 ± 0.05 MHz
Sync tip	4.4 MHz nom	5.7 MHz nom
Deviation (blanking to peak white)	1.43 ± 0.05 MHz	1.43 ± 0.05 MHz

3.2.7 Y track record head current

3.2.7.1 The amplitude of the record current for the Y track shall be such that the maximum level of remanent flux on the tape is produced when recording a Y signal with 50% amplitude flat field.

3.2.7.2 The amplitude of the Y track record current shall decrease with increasing frequency in the range 2 MHz to 10 MHz, according to a straight line contained within limit lines as shown in figure 4.

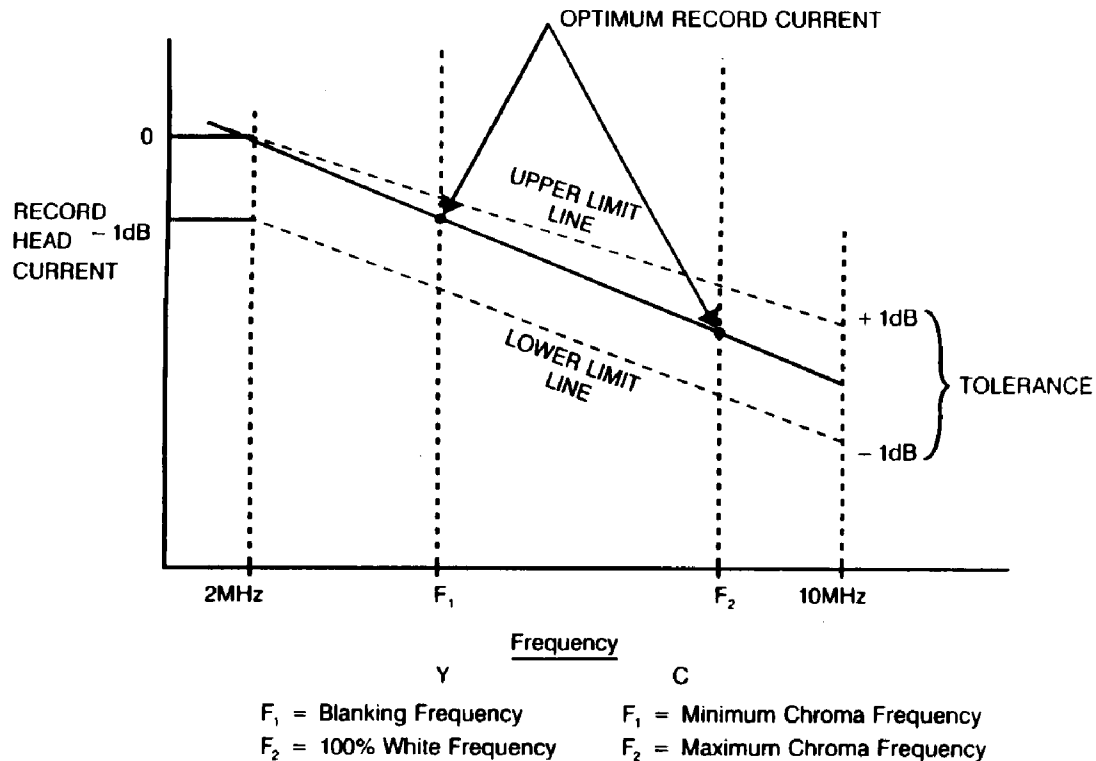


Figure 4 – Record equalization

3.3 C channel

3.3.1 Signal processing

A signal processing system, as specified by this standard, shall contain the following elements in the order of the signal flow:

3.3.1.1 A means of compressing the time scale of the R-Y and B-Y signals over a period of one horizontal line such that they may be time multiplexed into one horizontal line.

3.3.1.2 A means of adding a horizontal timing pulse.

3.3.1.3 A video nonlinear preemphasis process.

3.3.1.4 A video preemphasis network.

3.3.1.5 A means for clipping the video signal after preemphasis.

3.3.1.6 A linear frequency modulator having constant deviation with respect to the amplitude of the modulating frequencies.

3.3.1.7 A high-pass filter to reduce the low frequency component amplitude of the FM chrominance signal.

3.3.1.8 A means of combining the frequency modulated audio signal and the frequency modulated chrominance signal in mode 2 when the AFM signals are present.

3.3.1.9 An amplifier to provide amplitude current drive to the C channel record heads

3.3.2 Time compression and multiplexing

3.3.2.1 The R-Y and B-Y signals shall each be compressed into a half-time scale as shown in figure 5.

3.3.2.2 The compressed R-Y and B-Y signals shall be multiplexed alternately and delayed by one horizontal line with respect to the luminance signal as shown in figure 6.