SMPTE RECOMMENDED PRACTICE

RP 164-1992

Location of Vertical Interval Time Code

1 Scope

The purpose of this practice is to define the preferred location of the vertical interval time code (VITC) at equipment interfaces, and its location on recorded media.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the edition indicated was 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 standard indicated below.

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

3 Position of VITC

3.1 VITC should appear on one line in each field.

3.2 The preferred line shall be 14 (277).

3.3 If it is necessary to preserve compatibility with older equipment, VITC should appear on two nonconsecutive lines in each field.

3.3.1 In the above case, the preferred lines are 14 and 16 (277 and 279) except:

- lines 12 and 14 (275 and 277) in type C recorders with sync head;

- lines 16 and 18 (279 and 281) in type C recorders without sync head.

3.4 On component equipment, the VITC shall appear on the luminance channel.

Approved August 1, 1992

PROPOSED SMPTE STANDARD

SMPTE 32M

Revision, redesignation and consolidation of ANSI V98.32M-1983, ANSI V98.33M-1983, SMPTE RP 112-1983, SMPTE RP 142-1986, and SMPTE RP 148-1987

for Video Recording —

1/2-in Type H — Cassette, Tape and Records

Table of contents

1 Scope

This standard specifies the characteristics and parameters for type H, helical-scan, 1/2-in video tape recorders operating with video signals as defined by CCIR Recommendation 624-3, and having a typical scanning structure of 525 lines, 59.94 fields per second, and 2:1 interface.

This standard also specifies the double record time mode (long play, LP) and the triple record time mode (extended play, EP), and optional frequency modulation (FM) audio recording.

This standard further specifies the dimensions of the video tape and compact video cassette for use in a type H, helical-scan, 1/2-in video tape recording cassette system with the aid of a cassette adaptor.

Finally, this standard specifies the characteristics and parameters for high-performance type H, helical-scan, 1/2-in video tape recorders operating with video signals as defined by CCIR Recommendation 624-3, and having a typical scanning structure of 525 lines, 59.94 fields per second and 2:1 interlace.

2 Normative reference

CCIR Recommendation 624-3 (MOD F), Characteristics of Television Systems

3 Basic type H parameters and characteristics

3.1 General specifications

3.1.1 Measurement conditions

The dimensions shall be measured with no transverse or longitudinal tension applied to the tape.

3.1.2 Measurement environment

The temperature shall be 20°C ± 1°C, with a relative humidity of (50 ± 2)%.

3.1.3 Tape speed

The tape speed shall be 33.35 mm/second ± 0.5%.

3.1.4 Video writing speed

The nominal video writing speed shall be 5.80 m/second.

3.1.5 Video head drum diameter

The video head drum diameter shall be 62.00 mm ± 0.01 mm.

3.2 Video tape and video cassette

3.2.1 Tape characteristics

3.2.1.1 Length and thickness dimensions

The length and thickness dimensions of the video tape shall be as given in table 1.

3.2.1.2 Tape width

The average tape width shall be 12.65 mm ± 0.01 mm. Width fluctuation shall not exceed 6 μm. The average tape width is the average of measured values of the width of the video tape, made at many points along a length of the video tape.

3.2.1.3 Tape type

The type of video tape to be used shall be high resolution video tape (for example, cobalt iron-oxide tape).

3.2.1.4 Coercivity

The coercivity shall be approximately 50×10^3 A/m.

3.2.2 Leader and trailer tape

3.2.2.1 Length

The length of the leader and trailer tape shall be as follows:

– T-160, T-120 and T-90	170 mm ± 20 mm;
– T-60 and T-30	150 mm ± 20 mm.

The length of the leader and trailer tape is defined to be the distance between the point where they attach to the reel hub and the point where they attach (splice) to the magnetic tape.

3.2.2.2 Thickness and width

The thickness of the leader and trailer tape shall be 40 μm + 5 μm – 25 μm. The width shall be 12.65 mm ± 0.03 mm.

3.2.2.3 Material

The material shall be polyester film or its equivalent with a light transmission greater than 50% (measured over the range of wavelengths 800 nm to 950 nm).

3.2.2.4 Attachment

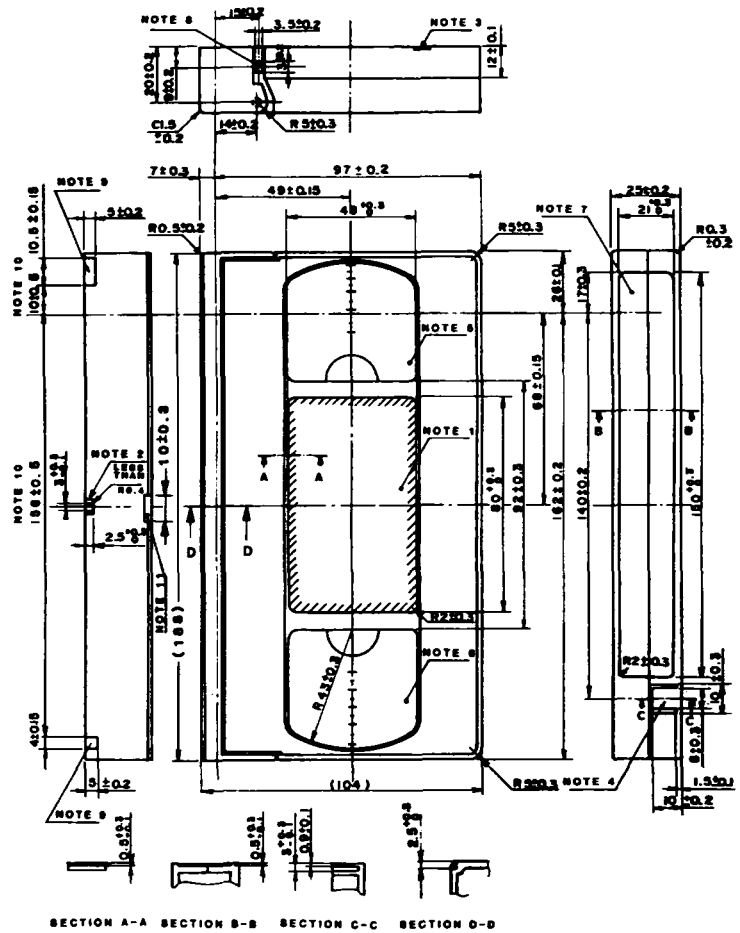
The attachment of the leader and the trailer to the video tape and to the reel hubs shall be capable of withstanding a pulling force of at least 30 N. The leader-to-video tape and trailer-to-video tape splicing gaps shall each be less than 0.07 mm.

3.2.3 Video cassette

Dimensions for the video cassette are shown in figures 1 to 5. The path of the video tape within the cassette is shown in figure 6.

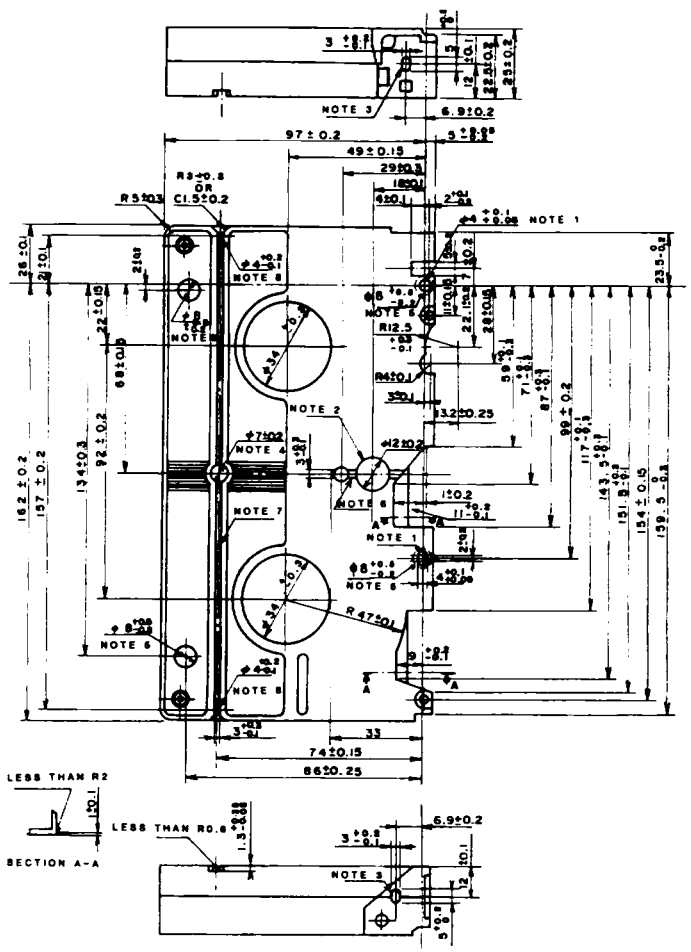
Table 1 – Video tape dimensions

Name	Tape length m	Playing time min	Reel hub diameter mm	Tape thickness μm
T-160	327^{+3}_{0}	160	26	15.6 ± 0.5
T-120	246^{+3}_{0}	120	26	19.0^{+1}_{-2}
T-90	185^{+3}_{0}	90	26	19.0^{+1}_{-2}
T-60	125^{+3}_{0}	60	62	19.0^{+1}_{-2}
T-30	64^{+3}_{0}	30	62 (or 70)	19.0^{+1}_{-2}



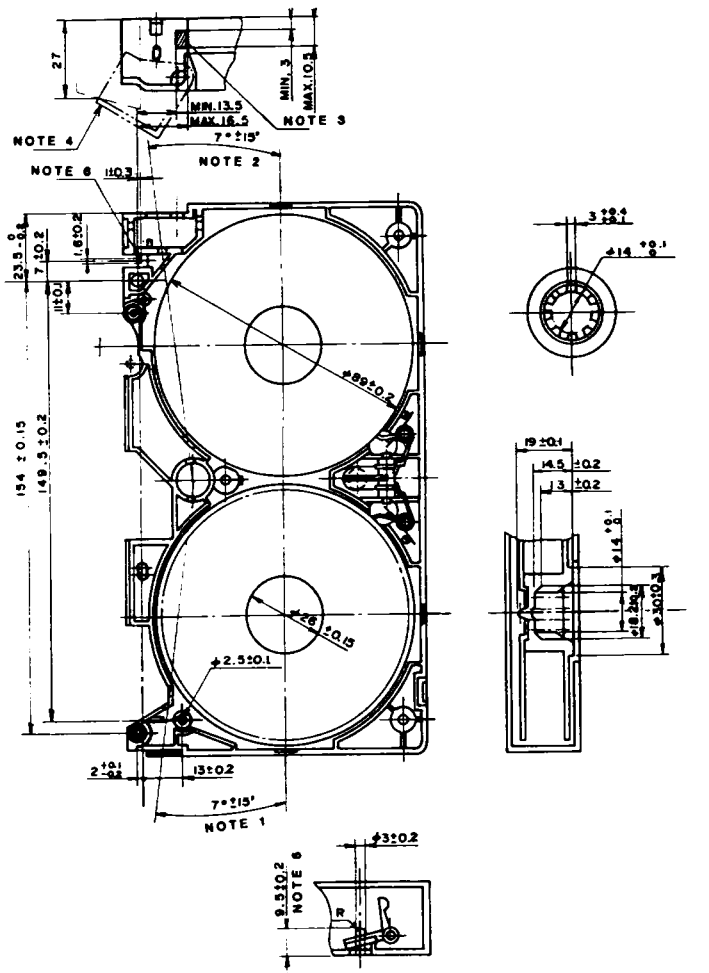
NOTES
1 Top label area.
2 Guide groove A to prevent improper insertion.
3 Guide groove B to prevent improper insertion.
4 Break-out lug to prevent accidental erasure.
5 Window for take-up reel.
6 Window for supply reel.
7 Side label area.
8 Unlocking pin for the front cover. The unlocking force is less than 0.15 N.
9 Groove for positioning of cassette.
10 Allowances include slight play of the front cover.
11 Recess to prevent improper insertion.

Figure 1 – Top and side view of video cassette



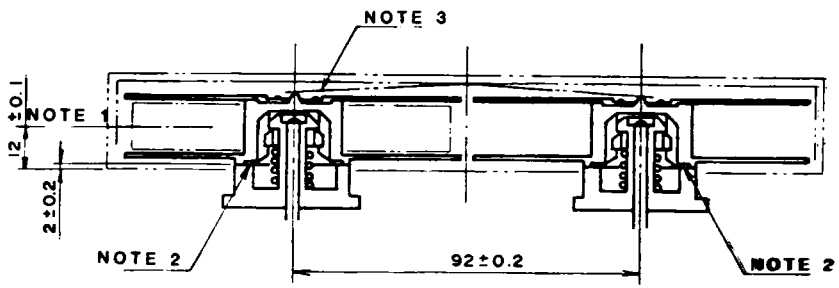
NOTES
1 Reference hole.
2 Hole for the sensor lamp.
3 Hole for the sensor light pass.
4 Unlocking hole for the reel brake. The unlocking force is less than 0.69 N.
5 Datum plane. The flatness of the four datum planes shall be less than 0.2 mm.
6 Guide groove A to prevent improper insertion.
7 Guide groove B to prevent improper insertion.
8 Auxiliary hole position.

Figure 2 – Bottom view of video cassette



NOTES
1 Sensor light angle of supply side.
2 Sensor light angle of take-up side.
3 Pushing position of the cover unlocking device of the recorder.
4 The cover opens more than 27 mm. The opening force is less than 1 N.
5 Position of the brake unlocking pin of the recorder.
6 Position of the lever in the recorder for opening the cassette cover.

Figure 3 – Inner structure and reels



NOTES
1 Center of tape.
2 Height of the reel base from the cassette datum plane. The cassette shall operate smoothly at a height of 2.0 mm + 0.8 mm – 0.5 mm.
3 Reel spring.

Figure 4 – Relationship between reels and spindles

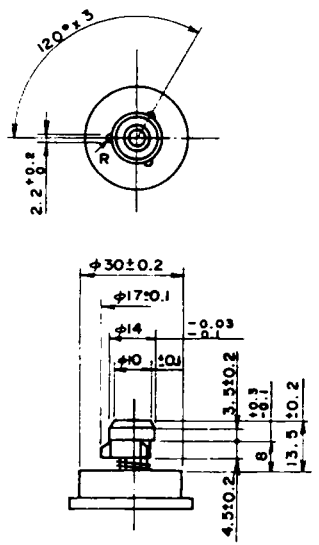


Figure 5 – Reel spindle

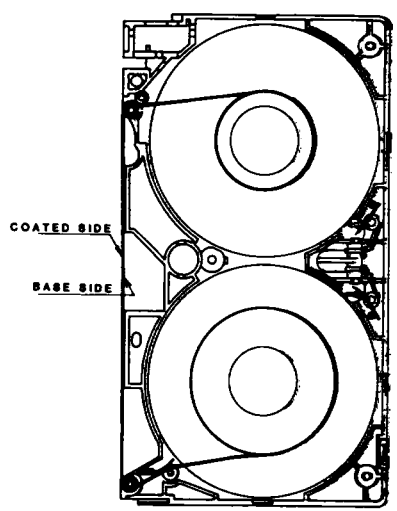


Figure 6 – Tape winding

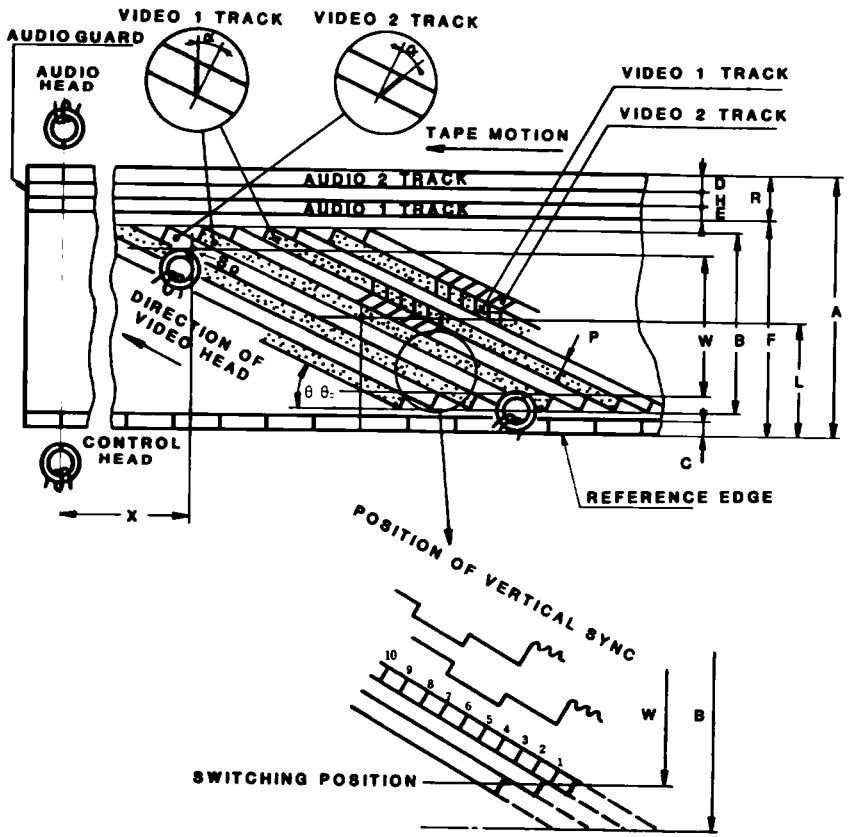


Figure 7 – Track configuration from magnetic coating side

Table 2 – Track configuration (refer to figure 7)

Dimensions	Description	SP mode mm
A	Tape width	12.65 ± 0.01
B	Video recording area width	10.6
C	Control track width	0.75 ± 0.10
D	Audio 2 track width (stereophonic)	0.35 ± 0.05
E	Audio 1 track width (stereophonic)	0.35 ± 0.05
F	Audio track reference line	11.65 ± 0.05
H	Audio-to-audio track guard band	0.3
L	Video track center from reference edge of tape	6.2
P	Video track pitch	0.058
R	Audio track width (monophonic)	1.0 ± 0.1
T	Video track width	0.058
W	Video recording effective area	10.07
X	Position of audio and control track head	79.244
α	Video head azimuth angle	+6° and –6°
θ	Video track angle	5° 58' 9.9"
θ_0	Video track angle (tape stationary)	5° 56' 7.4"
	Track shift error (from logical value)	0.014
	Track bend (peak-to-peak value)	0.014

NOTES
1 Values are nominal where there are no tolerances specified.
2 Dimension θ_0 represents the video track angle without linear motion of the video tape, such as might result from repetitive reading of a single track (one field) of the video record on the tape.

3.3 Video tape records; SP mode track configuration and dimensions

The track configuration and the transverse and longitudinal dimensions in the SP mode shall be as specified in figure 7 and table 2.

3.4 Audio and control track head position

The distance X on the tape pattern, from the end of the 180° scan of a video head to the audio and control track head position, shall be 79.244 mm, as shown in figure 7.

3.5 Audio record displacement

Program audio or other information which is time coincident with video information recorded at a point S_0 of the video 2 track shall be recorded on either audio track at a distance X downstream from that point (S_0). (See figure 7.) S_0 is the center of the video track at the switching position of the video heads.

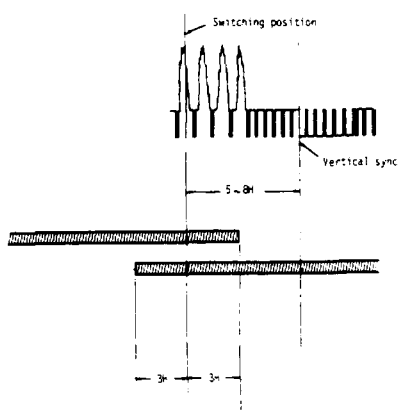


Figure 8 – Switching position and overlap of two video heads

3.6 Video head switching

The switching position between the two heads during playback shall lie between 5 and 8 horizontal lines ahead of the leading edge of the vertical sync signal, as shown in figure 8.

3.7 Tape tension

The tape tension for the record and playback modes, measured with a spring scale for a full supply reel, shall be normally from 0.30 N to 0.45 N at the entrance of the drum when the tape is pulled at the specified speed.

3.8 Relationship of video track and video field signal

Type H recording devices, whose applications require that each video signal field and video tape track be distinguished, shall record video field 1 on video tape track 1, and video field 2 on video tape track 2.

3.9 Video recording

The video recording system shall provide separate signal paths for the luminance and chrominance signals. The luminance signal shall be frequency modulated on a high-frequency rf carrier signal prior to recording. The chrominance signal shall be down-converted to a low frequency prior to recording. After this separate processing, the signals shall be combined and recorded together on a single video track.

3.9.1 Luminance channel

3.9.1.1 Signal processing

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

3.9.1.1.1 Separation filter

The luminance signal component of the composite video signal shall be separated from the chrominance component by a filter that attenuates the luminance signal by no less than 40 dB at the chrominance subcarrier frequency.

3.9.1.1.2 Preemphasis

The luminance video signal shall be preemphasized prior to frequency modulation. The preemphasis network characteristic shall be as shown in figure 9.

3.9.1.1.3 Clipping

The preemphasized luminance video signal shall be clipped prior to frequency modulation. The clipping levels are as shown below. The level from sync tip to peak white is defined to be 100%.

- White clipping level measured from tip of sync: 160% nominal, 155% minimum, 200% maximum;
- Dark clipping level measured from tip of sync: –40% nominal, –50% minimum, –30% maximum.

3.9.1.1.4 Modulation characteristics

The preemphasized and clipped luminance video signal shall be frequency modulated (FM) by a linear frequency modulator, having constant deviation with respect to the amplitude of the modulating frequencies, on an rf carrier corresponding to the reference luminance video levels below:

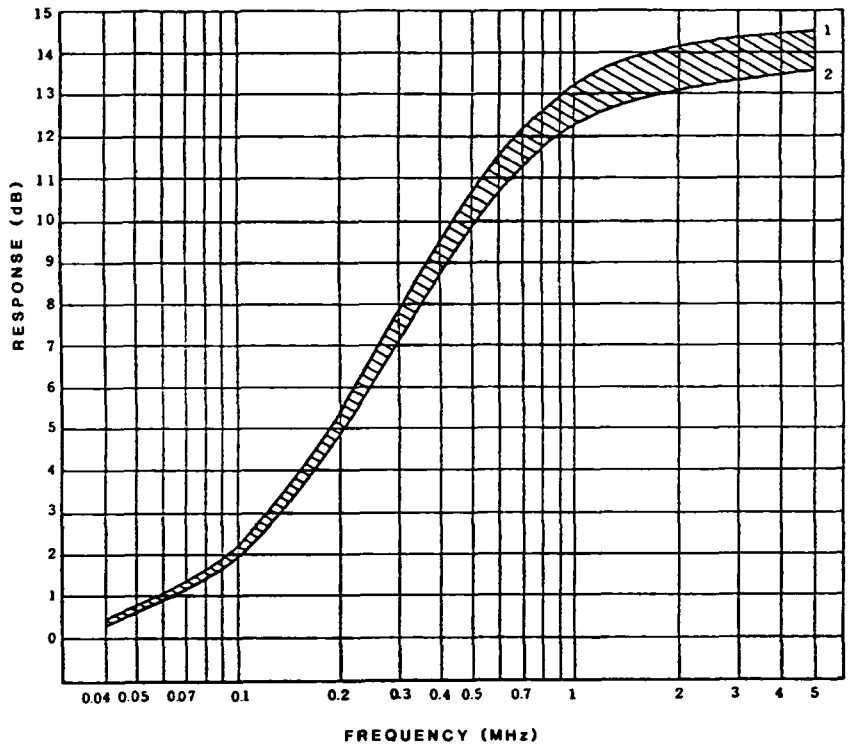
- Reference white level (100 IRE units) 4.4 MHz ± 0.1 MHz;
- Reference sync level (–40 IRE units) 3.4 MHz ± 0.1 MHz;
- Frequency deviation, ref white to ref sync (140 IRE units) 1.0 MHz ± 0.1 MHz.

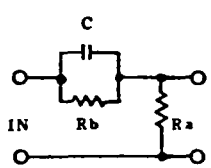
3.9.1.1.5 High-pass filter

The FM rf carrier, frequency modulated by the luminance video signal, shall be processed by a high-pass filter prior to recording. The high-pass filter network characteristic shall be as shown in figure 10.

3.9.1.1.6 Recording level

The record current shall be set to the optimum value over the entire bandwidth of the FM carrier. Optimum record current shall be that which returns the maximum output signal level during playback.

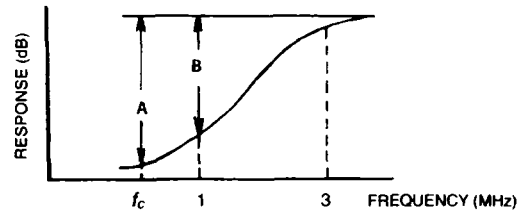




$T = C \times Rb = 1.3\ \mu sec \pm 0.05\ \mu sec$ $\left.\begin{array}{l} T = 1.35\ \mu sec \\ X = 4.3 \end{array}\right\} \ldots (1)$

$X = Rb/Ra = 4 \pm 0.3$ $\left.\begin{array}{l} T = 1.25\ \mu sec \\ X = 3.7 \end{array}\right\} \ldots (2)$

Figure 9 – Preemphasis characteristic of luminance signal



A = Greater than 17 dB.

B = Greater than 10 dB.

f_c = Converted chrominance carrier frequency (629.371 kHz).

Figure 10 – FM high-pass filter

3.9.2 Chrominance channel

3.9.2.1 Signal processing

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

3.9.2.1.1 Separation filter

The chrominance signal component of the composite video signal shall be separated from the luminance component by a band-pass filter. Characteristics of the band-pass filter shall be as follows:

- Center-frequency: 3.58 MHz;
- Response: –3 dB at 4.08 MHz; –3 dB at 3.08 MHz.

3.9.2.1.2 Recording level

The chrominance signal is recorded directly on the video tape as an amplitude modulated (AM) rf carrier. Record level shall be such that the amplitude of the played back chrominance signal is 7 dB to 10 dB below the saturation level of the recording chrominance signal.

3.9.2.1.3 Color burst amplitude doubler

The amplitude of the color burst part of the chrominance signal shall be increased by 6.0 dB ± 0.5 dB prior to recording.

3.9.2.1.4 Chrominance frequency conversion

The chrominance signal shall be (down) converted such that the new carrier frequency to be recorded equals the horizontal scanning rate, multiplied by 40 (629.371 kHz). (See figure 11.)

3.9.2.1.5 Chrominance carrier phase rotation

The chrominance carrier shall be shifted in phase at every horizontal sync pulse as follows:

- video track 1: Advance +90° from the carrier phase of the previous horizontal line period;

- video track 2: Retard –90° from the carrier phase of the previous horizontal line period.

Shift of phase shall be completed before color burst occurs in each horizontal blanking interval.

3.9.3 Recording signal

3.9.3.1 Luminance and chrominance combination

The FM luminance carrier and AM chrominance carrier shall be combined before recording.

3.9.3.2 Record amplifier

An amplifier shall be provided to supply recording signal current drive to the record heads.

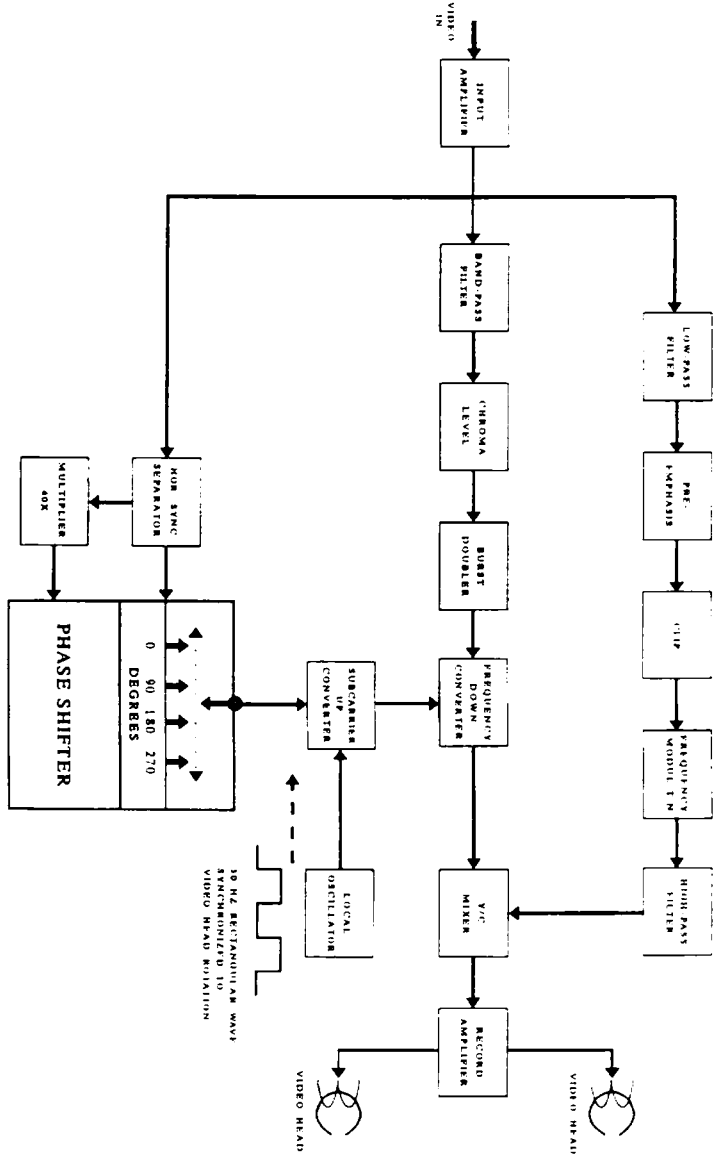
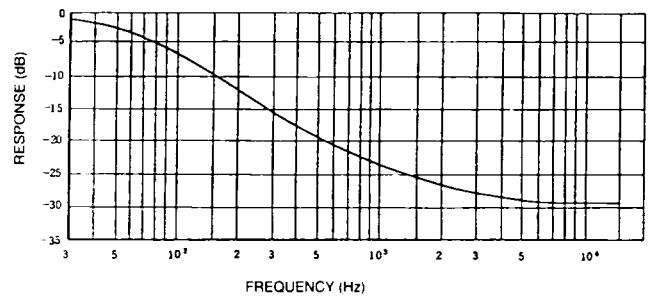


Figure 11 – Record process block diagram



Frequency (Hz)	Response (dB)
30	- 1.3
40	- 2.1
50	- 3.0
70	- 4.7
100	- 7.0
200	-12.2
300	-15.5
400	-17.7
500	-19.5
600	-20.8
700	-21.9
800	-22.7
1000	-24.1
1500	-26.0
2000	-26.9
3000	-27.7
4000	-28.0
5000	-28.2
7000	-28.3
10 000	-28.4
15 000	-28.4

Figure 12 – Reproducing deemphasis of audio signal

3.10 Longitudinal audio signal recording

Two longitudinal tape tracks shall be provided for the recording of audio signals. These shall be as specified in figure 7 and table 2.

3.10.1 Recording level

The recording reference audio level shall be 100 nWb/m.

3.10.2 Audio signal recording current characteristics

Recording current shall have a characteristic such that the reproduced output shall be of essentially flat frequency response after application of the deemphasis characteristic shown in figure 12. The time constants shall be 120 μs and 3180 μs.

3.10.3 Relative polarity

For stereo program material, the relative polarity of the audio signals at the inputs to a stereo television video tape recorder shall be such that any monophonic component of the program shall have the same polarity in the magnetic records of both channels.

3.10.4 Audio track allocation

For stereo audio associated with television program material, audio track 1 shall carry the discrete left (L) signal and audio track 2 shall carry the discrete right (R) signal. The terms left and right shall relate to the viewer's perspective.

3.11 Control signal

3.11.1 Recording signal

The positive-going edge of the recorded control pulse signal shall be in coincidence with the start of video 1 track scan as shown in figure 13.

3.11.2 Polarity

The control signal shall be recorded so that the rotating drum side of the control head poles shall be north polarized when the pulse signal is positive.

3.11.3 Recording current waveform

The rise time shall be less than 200 μsec.

4 LP and EP modes

4.1 Tape speed

The tape speed shall be 16.67 mm/s ± 0.5% in the LP mode and 11.12 mm/s ± 0.5% in the EP mode.

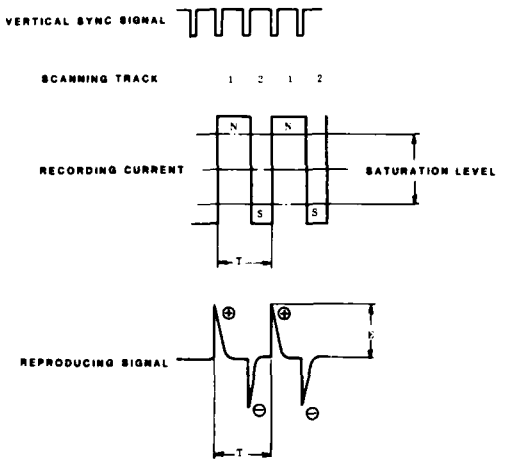


Figure 13 – Control signal waveform and polarity

Table 3 – Track configuration (refer to figure 7)

Dimensions	Description	LP mode mm	EP mode mm
A	Tape width	12.65 ± 0.01	12.65 ± 0.01
B	Video recording area width	10.6	10.6
C	Control track width	0.75 ± 0.10	0.75 ± 0.10
D	Audio 2 track width (stereophonic)	0.35 ± 0.05	0.35 ± 0.05
E	Audio 1 track width (stereophonic)	0.35 ± 0.05	0.35 ± 0.05
F	Audio track reference line	11.65 ± 0.05	11.65 ± 0.05
H	Audio-to-audio track guard band	0.3	0.3
L	Video track center from reference edge of tape	6.2	6.195
P	Video track pitch	0.029	0.019
R	Audio track width (monophonic)	1.0 ± 0.1	1.0 ± 0.1
T	Video track width	0.029	0.019
W	Video recording effective area	10.07	10.07
X	Position of audio and control track head	79.251	79.253
α	Video head azimuth angle	+6° and –6°	+6° and –6°
θ	Video track angle	5° 57′ 8.5″	5° 56′ 8.1″
θ_0	Video track angle (tape stationary)	5° 56′ 7.4″	5É 56′ 7.4″
	Track shift error (from logical value)	0.010	0.010
	Track bend (peak-to-peak value)	0.010 or less	0.010 or less

NOTES
1 Values are nominal where there are no tolerances specified.
2 Dimension θ_0 represents the video track angle without linear motion of the video tape, such as might result from repetitive reading of a single track (one field) of the video record on the tape.

Table 4 – Response characteristics of subpreemphasis for basic system

LP mode — Unit dB

Input level (dB) \ Frequency	50 kHz	200 kHz	500 kHz	1 MHz	2 MHz	3 MHz
0	0 ± 0.3	0 ± 0.4	0.1 ± 0.4	0.7 ± 0.4	1.2 ± 0.5	1.5 ± 0.6
–10	0 ± 0.3	0.1 ± 0.4	0.8 ± 0.4	2.2 ± 0.5	3.3 ± 0.7	4.0 ± 1.0
–14	0 ± 0.3	0.2 ± 0.4	2.0 ± 0.5	3.8 ± 0.8	5.3 ± 1.0	6.0 ± 1.2
–20	0 ± 0.3	0.4 ± 0.4	2.3 ± 0.5	5.0 ± 0.8	6.8 ± 1.0	7.5 ± 1.2

EP mode — Unit dB

Input level (dB) \ Frequency	50 kHz	200 kHz	500 kHz	1 MHz	2 MHz	3 MHz
0	0 ± 0.4	0.4 ± 1.5	1.0 ± 1.5	2.0 ± 1.5	2.0 ± 2.0	1.0 ± 2.0
–10	0 ± 0.4	1.2 ± 1.5	2.5 ± 1.5	4.5 ± 1.5	4.5 ± 2.0	3.0 ± 2.0
–14	0 ± 0.4	1.7 ± 1.5	4.5 ± 1.5	5.5 ± 1.5	5.5 ± 2.0	3.5 ± 2.0
–20	0 ± 0.4	3.0 ± 1.5	6.0 ± 1.5	7.0 ± 1.5	6.5 ± 2.0	4.5 ± 2.0

NOTE – The subpreemphasis response characteristic shall be defined by comparing the peak-to-peak amplitude of a sine wave signal at the input with the peak-to-peak amplitude of the sine wave signal at the output. The reference response shall be 0 dB at a frequency of 10 kHz. For a signal at the input that is a 100% peak white video signal, the amplitude of the signal, from sync tip to peak white, shall be defined as 0 dB. Subpreemphasis response shall be determined by comparing a sine wave in the active video part of the signal, at the input, with the wave form in the active video part of the signal at the output. Sync may be included in the measurement.

4.2 Track configuration

The transverse and longitudinal dimensions shall be as specified in figure 7 and table 3.

4.3 Recording characteristics

4.3.1 Video signal

4.3.1.1 FM recording of luminance component

4.3.1.1.1 Subpreemphasis and main preemphasis

For the LP and EP modes, the luminance signal shall be subpreemphasized and main preemphasized. The characteristics of the subpreemphasis shall be as shown in table 4. The characteristics of the main preemphasis shall be as given in 3.9.

4.3.1.2 FM carrier interleave

The FM carrier frequency to be recorded using the channel 1 video head shall be $\frac{1}{2}$ f_H higher than that using the channel 2 video head (f_H = 15.734 kHz).

4.3.1.3 The color burst amplitude shall not be doubled in the LP mode.

4.3.2 Longitudinal audio recording

4.3.2.1 Audio signal recording current characteristics

Recording current shall have a characteristic such that the reproduced output shall be of essentially flat frequency response after application of a deemphasis characteristic. The time constants for the LP and EP modes shall be t_1 = 170 μs and t_2 = 3180 μs.

4.3.3 Other characteristics and parameters

For characteristics and parameters not given above, the specifications of clause 3 shall apply.

5 FM audio recording characteristics

5.1 Recording method

A system of audio recording is specified that uses frequency modulation (FM) methods. The FM audio signal shall be recorded into the depth of the magnetic layer of the video tape. It shall be recorded at a specified number of TV fields earlier in time than the associated video signal and in the video track area. Separate FM audio heads shall be mounted on the scanning drum for this purpose. The video signal shall be subsequently recorded on the surface of the same area of the video tape. This system is known as depth multiplex recording. The FM audio and video head gaps shall be of different azimuth angles to minimize crosstalk between their respective recordings.

5.2 Track pattern

FM audio tracks are related to the video tracks as shown in figure 14 and dimensions shall be in accordance with table 5.

5.3 Recording time difference

The FM audio heads shall be arranged so that the FM audio signal is recorded within the time-difference limits specified in table 5. The FM audio signal shall be recorded prior to the video signal which is recorded at the same location on the tape.

5.4 FM audio azimuth angle

The azimuth angles of adjacent FM audio tracks shall be +30° 30′ and −30° 30′, respectively. The relationship of the directions of the azimuth angles of coincident video and FM audio tracks shall be as specified in table 5.

5.5 Recording characteristics

Two channels of audio shall be recorded. Each channel shall use an FM subcarrier of a different frequency. The recording signal spectrum is shown in figure 15. The block diagram of this system is shown in figure 16.

5.6 Noise reduction

An audio noise-reduction system shall be used. The noise-reduction encoder shall be as shown in figure 17 and shall have the following characteristics:

- Detection method: Peak detection;
- Compression ratio: 2:1 logarithmic compression;
- Attack time: 3 to 10 ms (see figure 18);
- Recovery time: 70 ms ± 14 ms.

5.7 Preemphasis

The preemphasis time constants shall be as follows: t_1 = 56 μs ± 11μs, t_2 = 20 μs ± 4 μs (see figure 19).

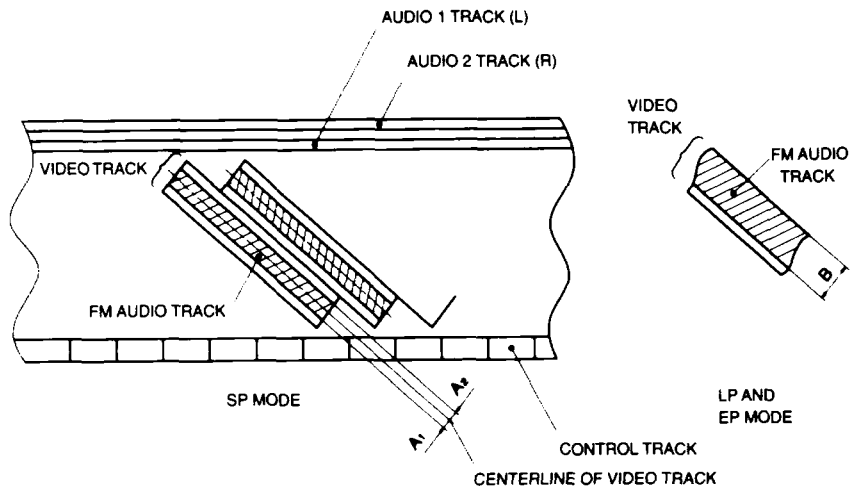


Figure 14 – FM audio track location

Table 5 – Audio track dimensions

Item	SP mode	LP mode	EP mode
FM audio track width A_1, A_2, and B (unit:mm)	Min. value of A_1, A_2: 0.010 Max.value of A_1, A_2: 0.029	Min. value of B: 0.012	Min. value of B: 0.016
Recording time sequence	Audio recorded 0 to 2 fields earlier than the associated video recording	Audio recorded 1/3 to 2-1/3 fields earlier than the associated video recording	Audio recorded 1-1/3 to 3-1/3 fields earlier than the associated video recording
Azimuth angle direction: audio head vs video head	Opposite direction	Opposite direction	Same direction

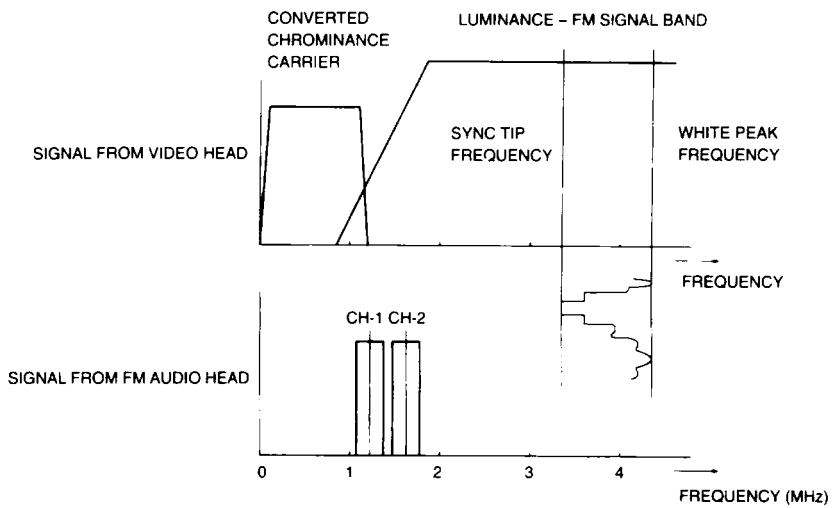


Figure 15 – Signal spectrum: FM audio, AM chrominance video and FM luminance video

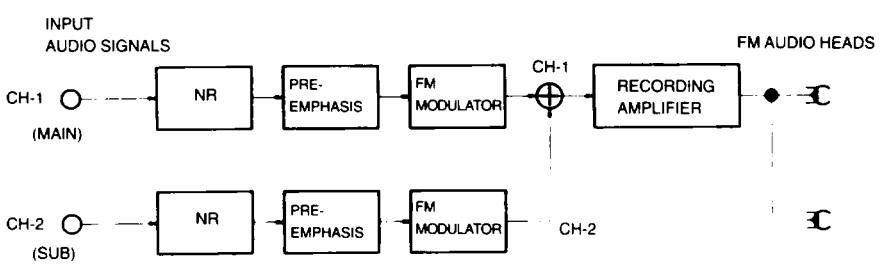


Figure 16 – Block diagram of FM audio recording system

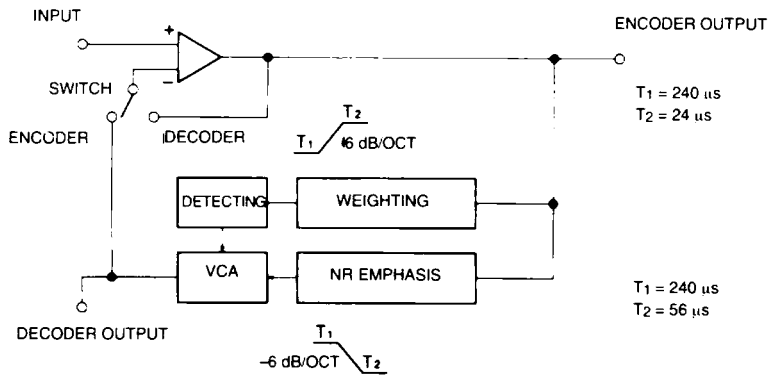


Figure 17 – Block diagram of noise-reduction system

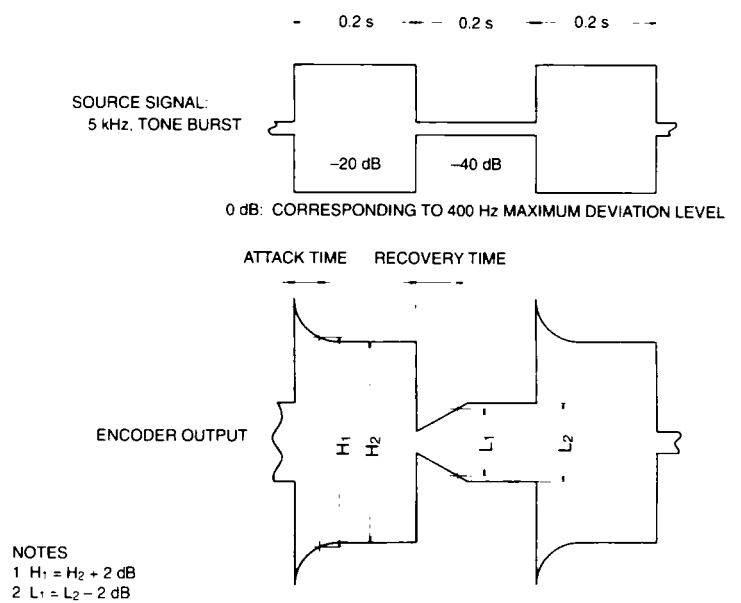


Figure 18 – Encoder transient measurement method

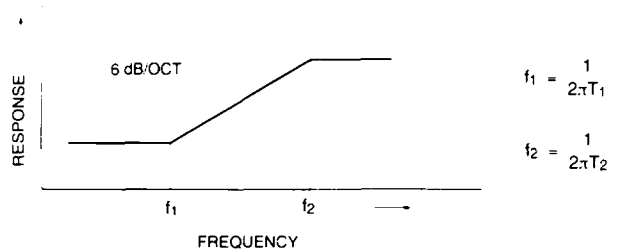


Figure 19 – Preemphasis

5.8 Center carrier frequencies

Center carrier frequencies shall be as follows:

- Channel 1: 1.3 MHz ± 10 kHz
- Channel 2: 1.7 MHz ± 10 kHz

5.9 Frequency deviation

Frequency deviation shall be as follows:

- Maximum frequency deviation: ± 150 kHz;
- Reference frequency deviation: ± 50 kHz at 400 Hz;
- Reference level: The input audio signal level at the reference frequency deviation.

5.10 Polarity

The modulation polarity of the channel 1 and channel 2 audio signals shall be the same. For simultaneous positive- (or negative-) going audio signals, present at the channel 1 and 2 inputs, the polarity of frequency modulation deviation shall be the same for the channel 1 and channel 2 FM modulators.

5.11 Recording level

The FM audio rf signals shall be recorded such that their playback rf levels are approximately equal and maximum.

5.12 Channel application

For stereo audio associated with television program material, audio channel 1 shall carry the discrete left (L) signal and audio channel 2 shall carry the discrete right (R) signal. The terms left and right shall relate to the viewer's perspective.

When the FM audio channels are used for other than stereo recordings, the channel use shall be as follows:

	Monophonic recording	Main and sub recording
Channel 1	Monophonic signal	Main signal
Channel 2	Monophonic signal	Subsignal

6 Compact video tape and cassette

6.1 Compact video tape

6.1.1 Longitudinal dimensions

Longitudinal dimensions of the compact video tape shall be as follows:

Name	Tape length (m)	Playing time (min)
TC-20	$43.7\ ^{+2}_{0}$	20
TC-10	$24\ ^{+2}_{0}$	10

6.1.2 Width

The average tape width shall be 12.65 mm ± 0.01 mm. Width fluctuation shall not exceed 6 μm. The average tape width is the average of measured values of the width of the video tape made at many points along a length of the video tape.

6.1.3 Thickness

The tape thickness shall be 19 μm + 1 μm – 2 μm.

6.2 Leader and trailer tape

6.2.1 Length

The length of the leader and trailer tape shall be as follows:

- Leader tape: 80 mm ± 5 mm;
- Trailer tape: 110 mm ± 5 mm.

6.2.2 Thickness and width

The thickness shall be 20 μm + 2 μm – 6 μm and the width shall be 12.65 mm ± 0.03 mm.

6.2.3 Material

The material shall be polyester film or its equivalent with a light transmission greater than 70% (measured over the range of wavelengths 800 nm to 950 nm).

6.2.4 Attachment

The attachment of the leader and trailer to the video tape and the reel hub shall be capable of withstanding a pulling force of at least 30 N. The splicing gap between the leader and trailer and the video tape shall be less than 0.07 mm.

6.3 Compact video cassette

Dimensions for the compact video cassette and tape winding shall be as specified in figures 20 to 25 and figure 30, respectively. The cassette dimensions include two types of front cover with and without a front cover locking structure.

6.3.1 Front cover

6.3.1.1 Front cover with locking structure (see figure 26)

With this type of cassette, a spring force is always present to keep the front cover closed. The forces (F_1 and F_2) in note 1 to figure 26, necessary to open the front cover with the lock released, shall be as follows:

- $0.1\ N \leq F_1 \leq 0.25\ N$;
- $0.05\ N \leq F_2 \leq 0.2\ N$.

Even when the front cover is locked, it shall be forcibly released with a force (F_3) of less than 0.8 N at the unlocking position indicated in note 3 to figure 26. The unlocking pin shall be pushed to the unlocking position indicated in note 4 with a force (F_4) of less than 0.8 N. The unlocking pin shall be pushed to the surface of the cassette side wall with a force (F_5) of less than 3 N.

6.3.1.2 Front cover without locking structure (see figure 27)

In this design, the cover shall have two stable positions — completely closed or completely open. When the front cover is within an angle of 20° open or closed, as indicated in note 1 to figure 27, the cover shall automatically become fully open or fully closed. The forces (F_1 and F_2) in figure 27 necessary to open and close the front cover shall be as follows:

$0.05\ N \leq F_1 \leq 0.2\ N$;
$0.05\ N \leq F_2 \leq 0.2\ N$.

6.3.2 Reel dimensions

The dimensions of the reel shall be in accordance with figures 28 and 29. The tape shall be pulled out with the following forces as shown in note 3 to figure 28 and note 2 to figure 29 with the brake engaged:

- Supply reel: $0.4\ N \leq F \leq 1.5\ N$;
- Take-up reel: $0.05\ N \leq F \leq 3\ N$.

6.3.3 E-values

E-values L_1 and L_2 as shown in note 1 and note 2 to figure 30 shall be more than 0.7 mm, respectively.

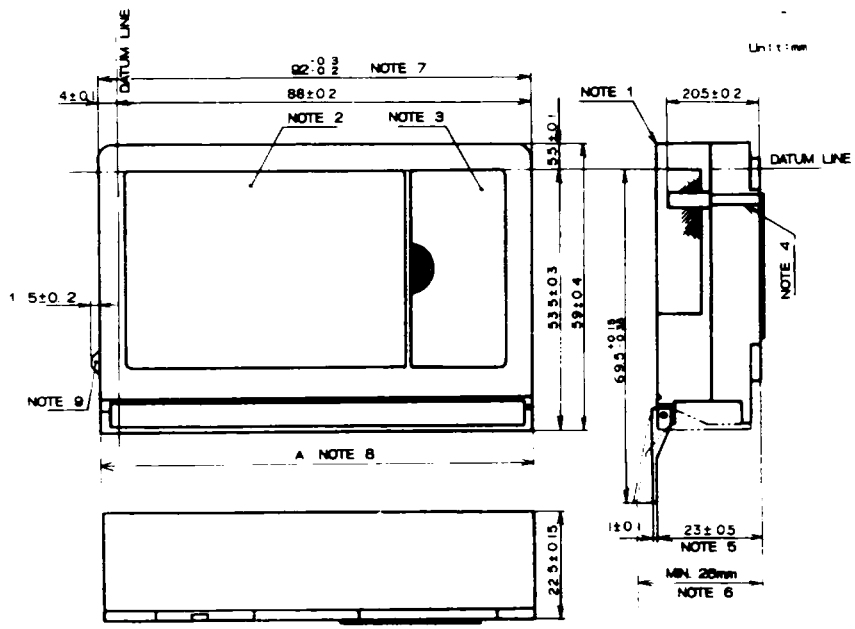
6.3.4 Guide rollers

Guide rollers shall be provided as shown in figure 30. The perpendicularity of all rollers shall be less than 0° 27′ with respect to the video cassette reference plane (see figure 31).

6.3.5 Cassette reels

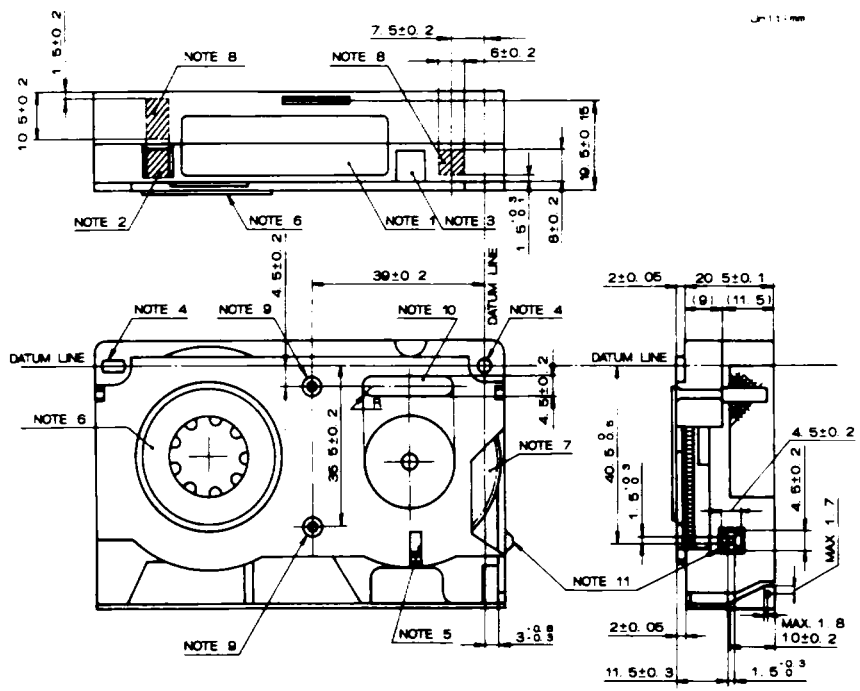
The reels in the cassette as shown in note 4 to figure 32 shall be pushed down with the following forces by a reel spring:

- Supply reel: 1.6 N ± 0.4 N;
- Take-up reel: 0.7 N + 0.3 N – 0.2 N.



NOTES
1 All ridges on the cassette body shall be less than R 0.5 mm or C 0.5 mm.
2 Top label area.
3 Window for supply reel.
4 Guide groove. When a gauge, having dimensions of the groove on the lower case, is inserted into the groove from the bottom, the gauge shall not contact the walls of the corresponding groove in the upper case.
5 Distance when the front cover is at normal opening position.
6 Maximum value when the front cover is fully opened.
7 The front cover without a locking structure is 92.0 mm ± 0.3 mm.
8 The length A of the front cover shall be smaller than the cassette length, up to 0.6 mm max.
9 See figure 21, note 11, for a description of the front cover unlocking device.

Figure 20 – Complete compact video cassette case (1)



NOTES
1 Side label area.
2 Erasure prevention tab area. The depth of the recess shall be 2.5 mm.
3 Groove corresponding to the unlocking pin for reel brake shown in figure 2, note 4.
4 Datum holes.
5 Groove to prevent misinsertion, corresponding to the guide groove shown in figure 2, note 6.
6 Supply reel.
7 Take-up reel.
8 Auxiliary hole positions. The depth of the recess shall be 2.5 mm.
9 Screw locations for securing upper and lower cases.
10 Area for identification. This identification shall not protrude from the bottom surface.
11 Front cover unlocking device only for the type of front cover with a locking structure.

Figure 21 – Complete compact video cassette case (2)

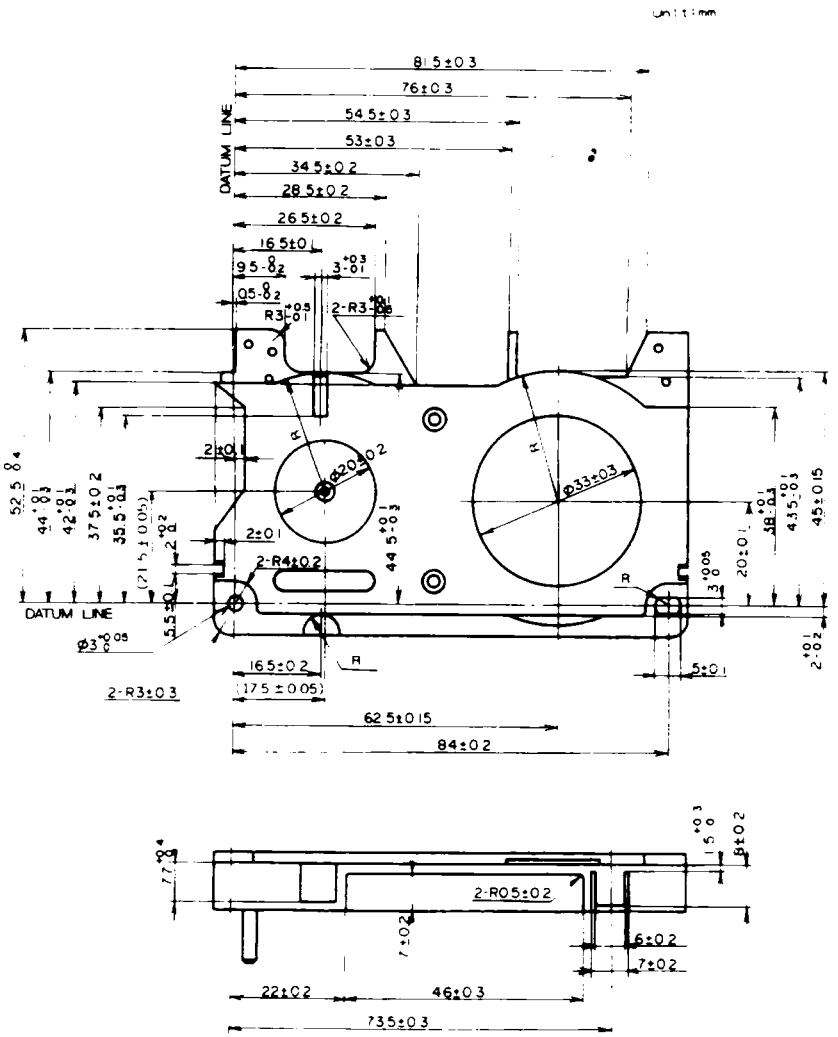
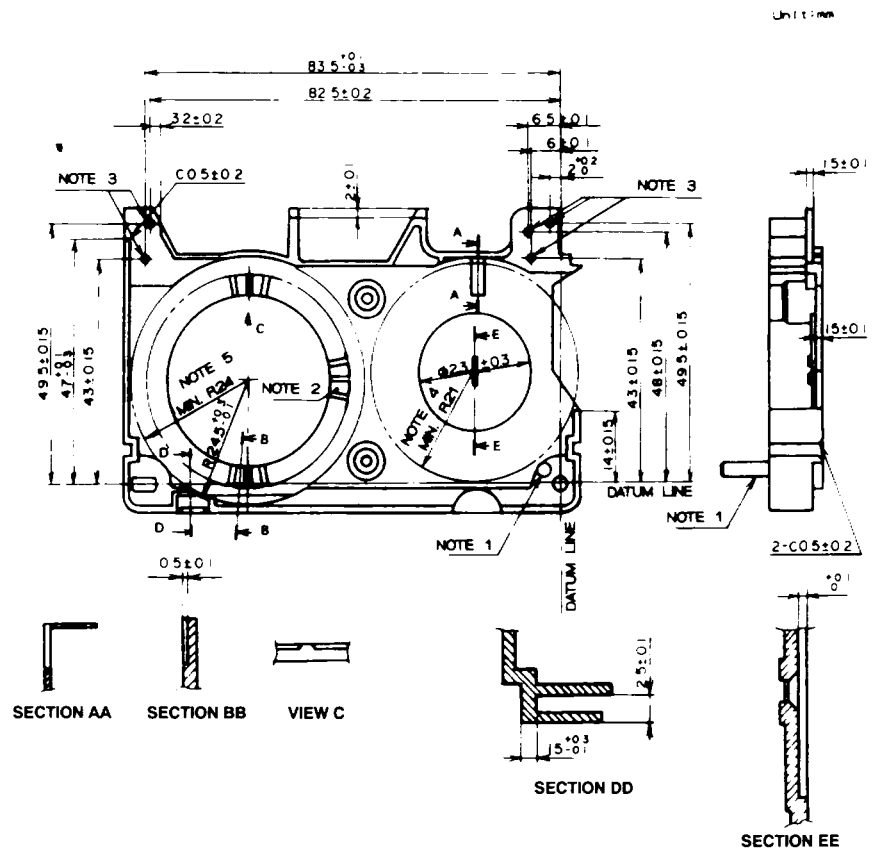
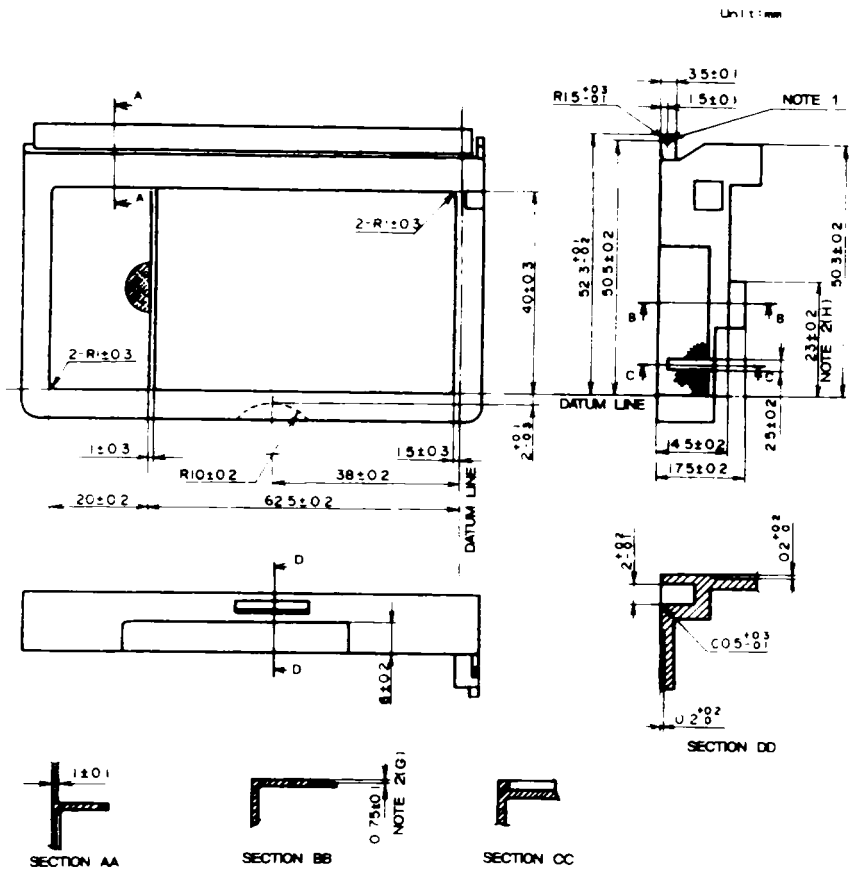


Figure 22 – Lower compact video cassette half (1)



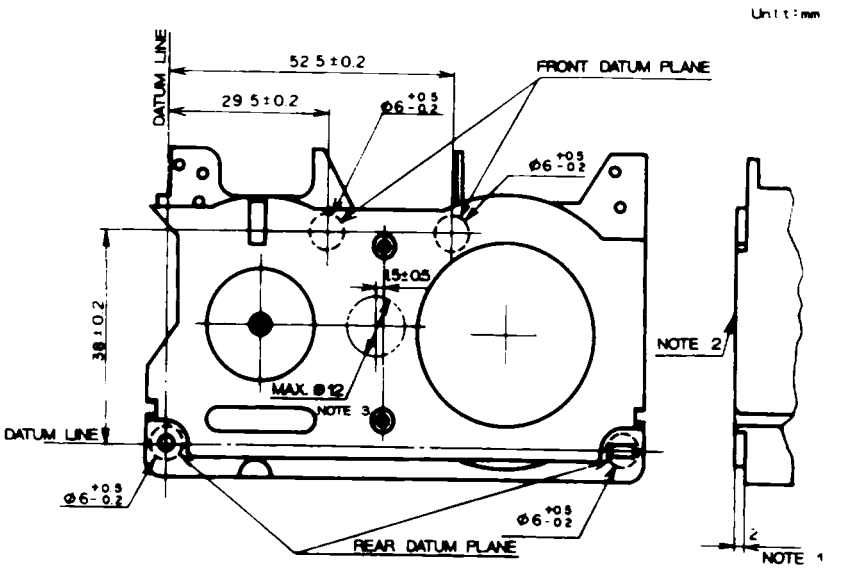
NOTES
1 Take-up reel brake mounting boss.
2 Supply reel brake.
3 Center of tape guide rollers.
4 Radius R21 shows the limit of reel rotation. No obstruction is permitted within this radius while the reel is turning.
5 Radius R24 shows the limit of reel rotation. No obstruction is permitted within this radius while the reel is turning.

Figure 23 – Lower compact video cassette half (2)



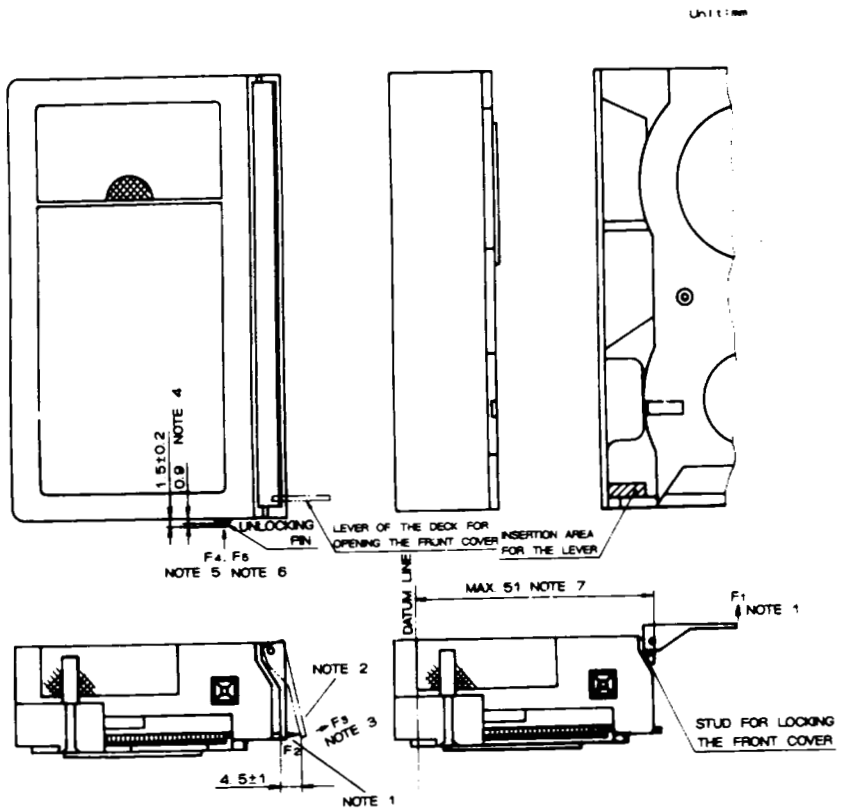
NOTES
1 Front cover turning axis.
2 This step dimension G may be 0 mm when dimension H is 20.0 mm ± 0.2 mm.

Figure 24 – Upper compact video cassette half



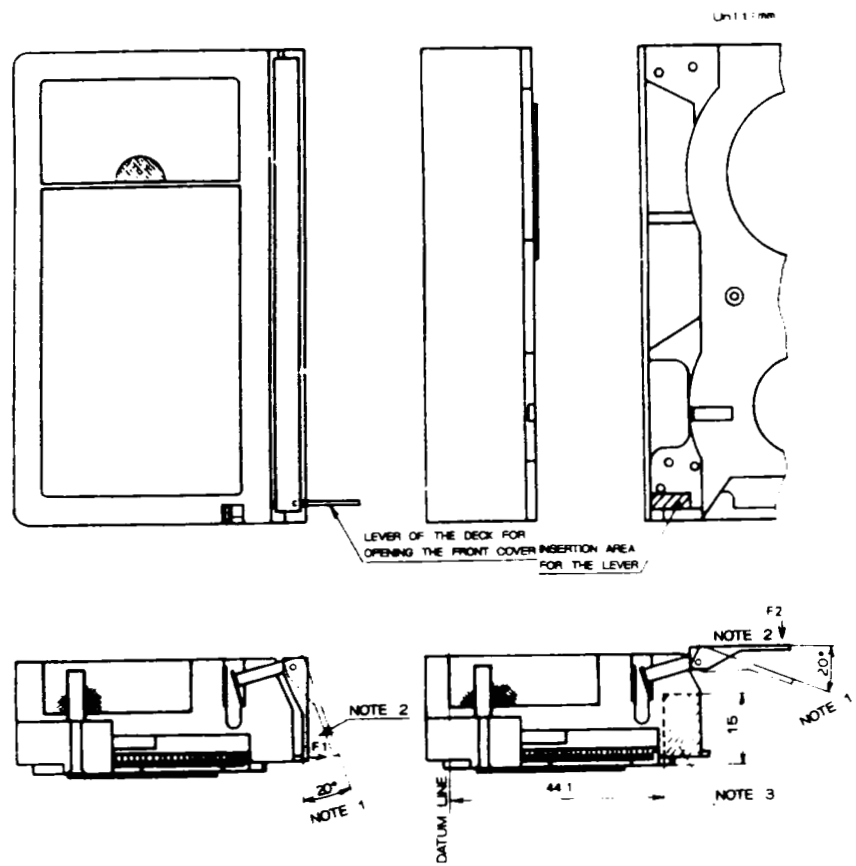
NOTES
1 The cassette reference plane is an imaginary plane which includes the two points 2 mm over the two rear datum planes and one of the two front datum planes.
2 The cassette bottom surface shall be between +0.1 mm (convex) and –0.2 mm (concave) referred to the reference plane.
3 A molding gate, if necessary on this surface, shall be positioned within this area.

Figure 25 – Compact video cassette reference plane



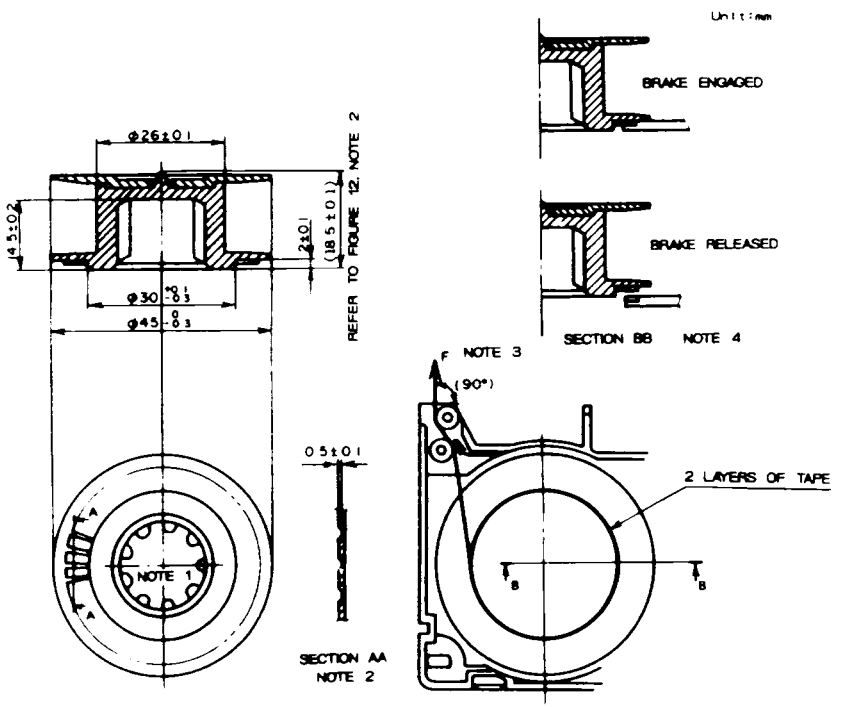
NOTES
1 F_1, F_2: Force necessary to open the front cover at each position without a lock.
2 Locking and unlocking position of the front cover.
3 F_3: Force necessary to open with the front cover locked.
4 Locking and unlocking position of the unlocking pin.
5 F_4: Force necessary to push to the unlocking position.
6 F_5: Force necessary to push to the surface of the cassette wall.
7 End position of the stud for locking the front cover.

Figure 26 – Compact video cassette front cover with locking structure



NOTES
1 Front cover shall open (right) or close (left) by itself within these angles.
2 F_1, F_2: Force necessary to open and close.
3 This figure indicates the allowed insertion range for the front cover releasing lever of the deck.

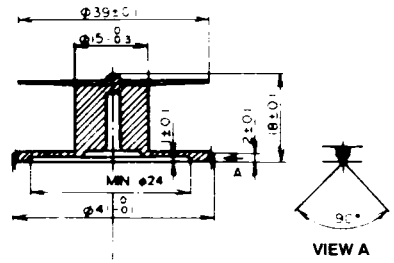
Figure 27 – Compact video cassette front cover without locking structure



NOTES
1 The dimensions of the reel socket shall conform to the specifications in figure 3.
2 The structure of the reel brake is not restricted to this figure, provided that the brake force is provided by friction.
3 With the brake engaged, the tape shall be pulled out as shown above with brake force F.
4 The brake shall be fully released at the raised position of the supply reel within the cassette. For the releasing position, refer to figure 32, note 2.

Figure 28 – Compact video cassette supply reel and reel brake

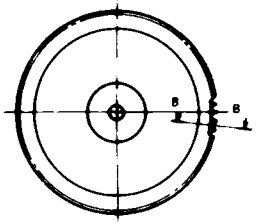
Unit : mm

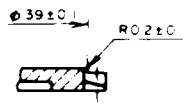


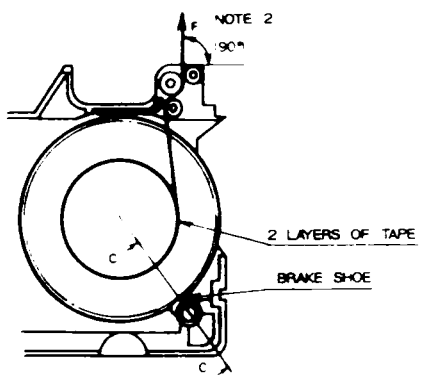
GEAR SPECIFICATIONS

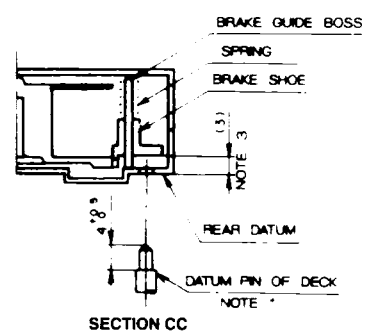
TOOTH FORM	FULL DEPTH TEETH*
MODULE	0.5
PRESSURE ANGLE	20°
NUMBER OF TEETH	80
PITCH CIRCLE	φ40

*REFER TO VIEW A



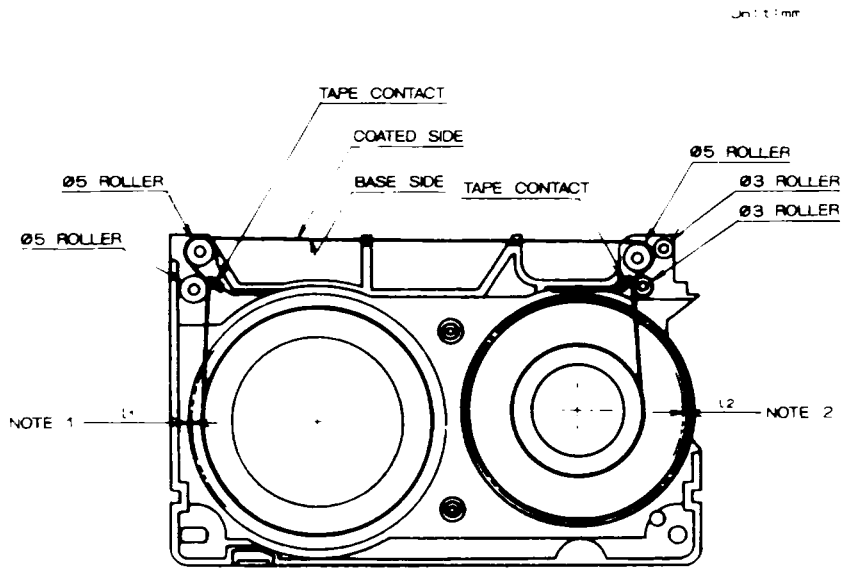






NOTES
1 The brake shall be released when the brake shoe is pushed up by the pin. At the released position when the brake shoe is pushed up, the spring force shall be less than 0.3 N.
2 With the brake engaged, the tape shall be pulled out as shown above with brake force F.
3 The dimensions are shown with the brake engaged.

Figure 29 – Compact video cassette take-up reel and reel brake



NOTES
1 E-value L_1 of the supply reel.
2 E-value L_2 of the take-up reel.

Figure 30 – Compact video cassette tape winding and guide rollers

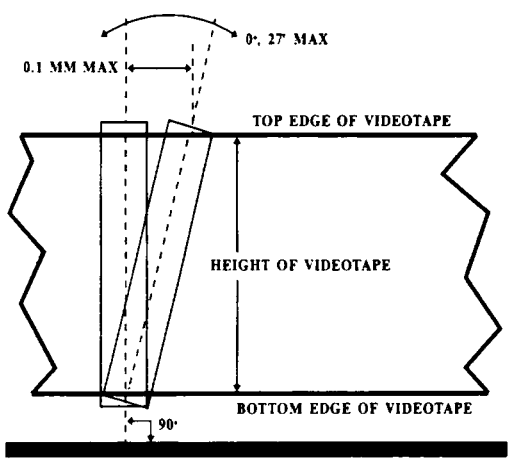
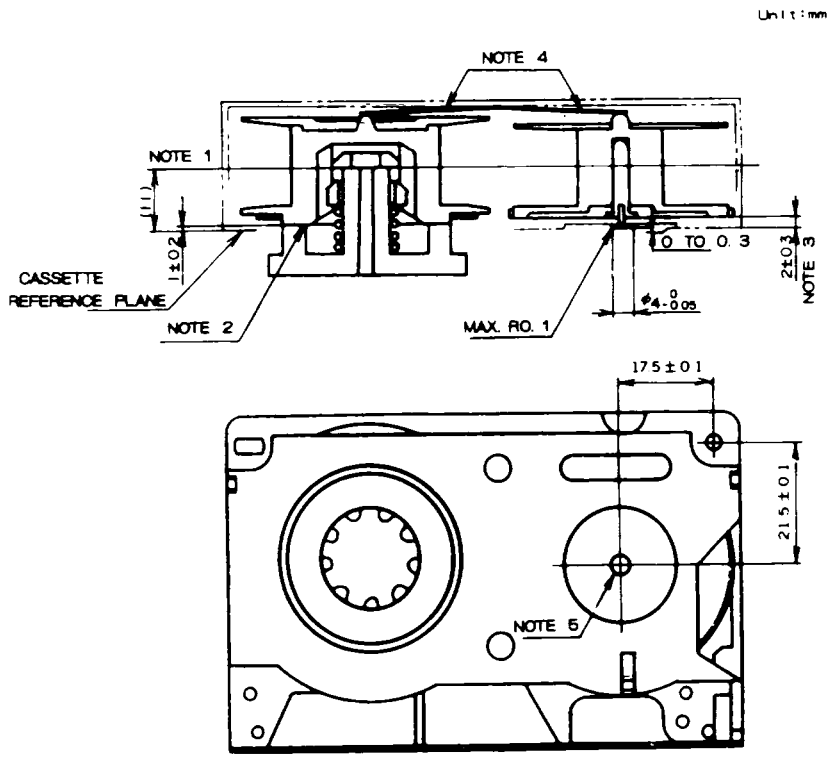


Figure 31 – Perpendicularity



NOTES
1 Center of the tape.
2 Bottom plane of the supply reel. The supply reel shall be rotatable without contacting the cassette case at the height range of 1.0 mm + 0.8 mm – 0.5 mm from the cassette reference plane.
3 Flange wobble of the take-up reel is included.
4 The reels in the cassette shall be pushed down.
5 Positioning screw.

Figure 32 – Relative positions of reels with respect to compact video cassette case

6.3.6 Screw head

The center of the positioning screw head shall be placed within 0.05 mm of the axis of rotation of the take-up reel (see figure 32).

6.4 Other specifications

The window and the upper flange of the supply reel shall be clear to indicate the remaining tape.

7 High-performance type H cassette, records and system

7.1 Modes of operation

Only the SP and EP modes of operation shall be functional in the high-performance type H system. The LP mode shall not be used.

7.2 Video tape records

The track configuration and the transverse and longitudinal dimensions shall be as specified in figure 7 and table 2 or table 3, as applicable to the operating mode.

7.3 Video tape

7.3.1 Nomenclature

The following type names shall be used in order to indicate tape conformance to the high-performance type H system:

- ST-XXX, where XXX indicates tape length in minutes for standard size video cassettes;

- ST-CXX, where XX indicates tape length in minutes for compact size video cassettes.

The indication of tape length in minutes shall conform to that described in table 1 and 6.1.1 for the SP and EP operating modes only.

7.3.2 Tape type

The type of video tape used shall be high-resolution video tape (for example, cobalt iron-oxide tape).

7.3.3 Coercivity

The coercivity shall be approximately 70×10^3 A/m.

7.4 Video cassette

7.4.1 Cassette identification

Video cassettes and compact video cassettes for the high-performance type H system shall have an identification hole (ID hole) as defined in figures 33 and 34. All other mechanical parameters shall conform to those described in 3.2 and 6.1.

7.5 Recording characteristics

7.5.1 Video signal

7.5.1.1 FM recording of luminance component

7.5.1.1.1 Modulation characteristics

FM carrier frequencies corresponding to reference video levels shall be as shown in table 6. The FM carrier shall be interleaved in the EP mode. In this mode, the FM carrier frequency recorded by the channel 1 video head shall be $f_H/2$ higher than that of the channel 2 video head (f_H = 15.734 kHz).

7.5.1.1.2 Recording level

The recording current shall have the optimum value at all frequencies within the entire FM carrier range defined in table 6.

NOTE - Optimum record current is the recording current value which is necessary to obtain the maximum output signal level during playback.

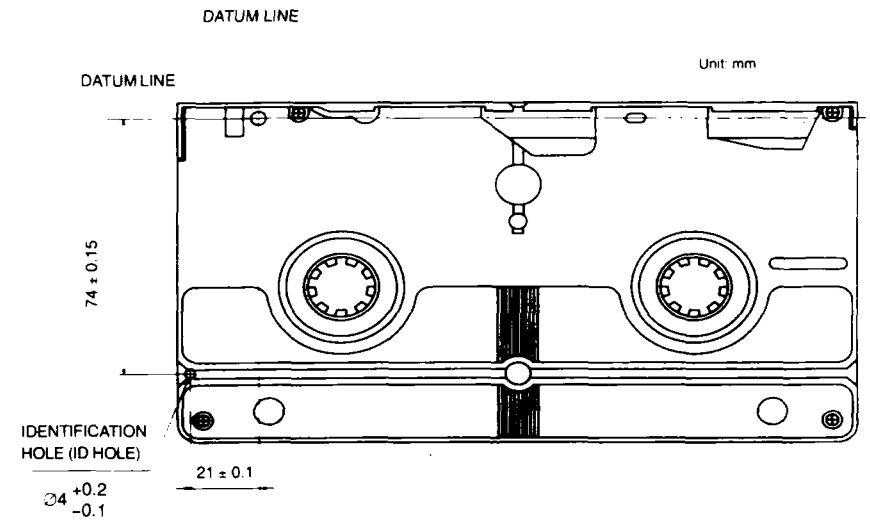
7.5.1.1.3 Subpreemphasis and main preemphasis

The luminance signal shall be subpreemphasized and main preemphasized. The characteristics of the subpreemphasis shall be as shown in table 7. The characteristics of the main preemphasis shall be as specified in 3.9.

7.5.1.1.4 Clipping levels

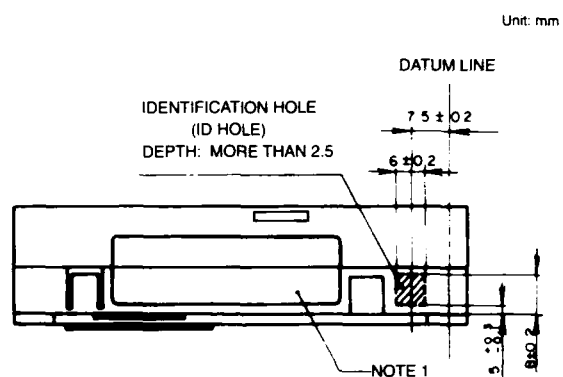
The preemphasized luminance video signal shall be clipped prior to frequency modulation. The clipping levels shall be as shown below. The level from sync tip to peak white is defined to be 100%.

- White clipping level measured from tip of sync: 210% nominal, 189% minimum, 231% maximum;
- Dark clipping level measured from tip of sync: –70% nominal, –77% minimum, –63% maximum.



NOTE – Depth shall be more than 3.8 mm (from datum plane).

Figure 33 – Identification hole (ID hole) of cassette



NOTE – Side label area.

Figure 34 – Identification hole (ID hole) of compact cassette

Table 6 – FM carrier frequencies

Reference white level	7.0 MHz ± 0.1 MHz
Reference sync level	5.4 MHz ± 0.1 MHz
Frequency deviation, white to sync	1.6 MHz ± 0.1 MHz

Table 7 – Response characteristics of subpreemphasis for high-performance system

SP mode — Unit dB

Frequency / Input level (dB)	200 kHz	500 kHz	1 MHz	2 MHz	3 MHz	5 MHz
0	−1.73 ± 0.30	−1.60 ± 0.30	−1.04 ± 0.30	−0.37 ± 0.50	−0.07 ± 0.50	−0.06 ± 0.50
−10	−1.30 ± 0.30	−0.73 ± 0.50	0.69 ± 0.50	1.75 ± 0.50	2.10 ± 0.50	2.02 ± 0.50
−20	−0.65 ± 0.50	1.09 ± 0.50	2.86 ± 0.50	4.16 ± 0.50	4.60 ± 0.50	4.43 ± 0.60
−30	−0.49 ± 0.50	2.35 ± 0.50	5.30 ± 0.60	7.14 ± 0.60	7.64 ± 0.70	7.34 ± 0.70

EP mode — Unit dB

Frequency / Input level (dB)	200 kHz	500 kHz	1 MHz	2 MHz	3 MHz	5 MHz
0	−1.86 ± 0.30	−0.76 ± 0.30	0.81 ± 0.30	1.60 ± 0.50	1.72 ± 0.50	1.54 ± 0.50
−10	−1.46 ± 0.30	0.11 ± 0.50	2.50 ± 0.50	3.73 ± 0.50	3.89 ± 0.50	3.59 ± 0.50
−20	−0.82 ± 0.50	1.93 ± 0.50	4.70 ± 0.50	6.14 ± 0.50	6.36 ± 0.50	5.97 ± 0.60
−30	−0.63 ± 0.50	3.21 ± 0.50	7.14 ± 0.60	9.15 ± 0.60	9.43 ± 0.70	8.89 ± 0.70

NOTE – The subpreemphasis response characteristic shall be defined by comparing the peak-to-peak amplitude of a sine wave signal at the input with the peak-to-peak amplitude of the sine wave signal at the output. The reference response shall be 0 dB at a frequency of 10 kHz. For a signal at the input that is a 100% peak white video signal, the amplitude of the signal, from sync tip to peak white, shall be defined as 0 dB. Subpreemphasis response shall be determined by comparing a sine wave in the active video part of the signal, at the input, with the wave form in the active video part of the signal at the output. Sync may be included in the measurement.

7.5.1.2 525-line/60-field chrominance signal recording

The specifications of 3.9 shall apply to all items except those stated below.

7.5.1.2.1 Level of luminance video component remaining in down-converted chrominance subcarrier signal

The amplitude of a luminance video component that remains as part of the chrominance signal after it is down-converted prior to recording shall be attenuated more than 20 dB in the vicinity of 1.2 MHz with reference to the down-converted chrominance subcarrier frequency.

7.5.1.2.2 Recording level

The chrominance signal shall be recorded with the luminance FM signal acting as bias. The chrominance signal recording level shall be set so that the playback level of the spurious components measured at a frequency $f_y - 2f_c$ is attenuated between 20 dB and 25 dB with reference to the level of the output signal at a frequency f_y:

– f_y: Center carrier frequency of luminance signal (6.5 MHz);

– f_c: Converted chrominance subcarrier frequency.

7.5.1.3 Audio signal and control signal records

Audio signal and control signal records shall conform to 3.9.

Annex A (informative)
High-quality mode technology

A.1 Compatibility

This annex summarizes the technology that may be applied to effect a high-quality mode of operation. This results in improved picture quality for type H format video recordings. The application of high-quality mode processing does not affect compatibility between high-quality mode recordings and those recorded without application of high-quality mode processing. None, all, or any of the high-quality mode techniques may or may not be applied without affecting type H compatibility (see table A.1).

A.1.1 Use of high-quality mode identification

High-quality mode technologies are as follows:

1 Greater white clip amplitude;
2 Luminance video signal vertical processing;
3 Chrominance video signal vertical processing;
4 Detail enhancement

These are described in the remainder of this annex.

A type H VTR may be identified as applying high-quality mode technology if item 1 is combined with at least one other item (2, 3, or 4) listed above.

Alternatively, a type H VTR may be identified as applying high-quality mode technology if items 2 and 3 above are applied in the playback circuit chain only.

A.2 Improving picture quality using vertical emphasis in the LP and EP modes

To maintain compatibility, the following describes the allowable range of parameters when attempting to improve LP and EP mode picture quality.

A.2.1 The vertical preemphasis for the luminance signal shall be as shown in figure A.1

A.2.2 The vertical preemphasis for the chrominance signal shall be as shown in figure A.2.

A.2.3 The white clipping level shall be a maximum of 200% measured from the sync tip.

CAUTION – FM carrier frequency shall be as given in 3.9.1.1.4:
- White peak: 4.4 MHz ± 0.1 MHz;
- Sync tip: 3.4 MHz ± 0.1 MHz.

A.3 Improving picture quality using detail enhancer

When reproducing small amplitude video signals, their output pictures are apt to become weak. Therefore, if their signals are enhanced moderately in recording the original signal, it is possible to improve the picture quality of detail components. This technology may be applied to the SP, LP, and EP modes as shown in figure A.3.

A.4 Specified values

The specified values shall be as follows:
- Emphasis ratio: less than 8 dB;
- Amount of emphasis: less than 10 IRE units;
- Operating frequency: more than 1 MHz (frequency at one-half of maximum emphasis ratio, measured at –40 dB or less input level).

A.5 Recording circuit

An example of the recording circuit is shown in figure A.4.

A.6 Example of response characteristics

An example of maximum emphasis (8 dB) is shown in figure A.5.

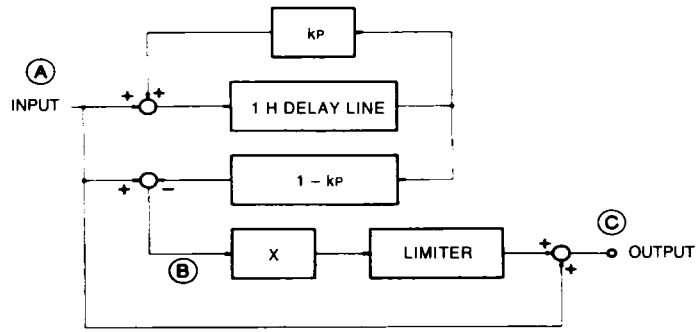
NOTE - Measure input/output ratios at the following input levels using sine wave:
0 dB, –10 dB, –20 dB, –30 dB, –40 dB, –50 dB

Peak-to-peak of 0 dB sine wave shall be the voltage from sync tip to 100% peak white.

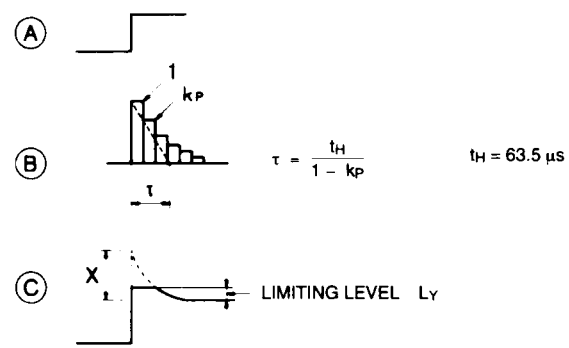
Table A.1 – Recording application of high-quality mode technology

		SP mode	LP and EP modes
1	Greater white clip level (200% maximum)	Applied	Applied
2	Luminance video signal vertical processing X = 0.65 max; L = 5% max	Not applied	Applied: k_P = 0.5 max
3	Chrominance video signal vertical processing X = 1 max; L = 15% max	Not applied	Applied: k_P = 0.35 max
4	Detail enhancer emphasis ratio: Less than 8 dB Amount of emphasis: Less than 10 IRE units Operating frequency: Greater than 1 MHz	Applied	Applied

(1) Basic circuit



(2) Waveforms at A, B and C.

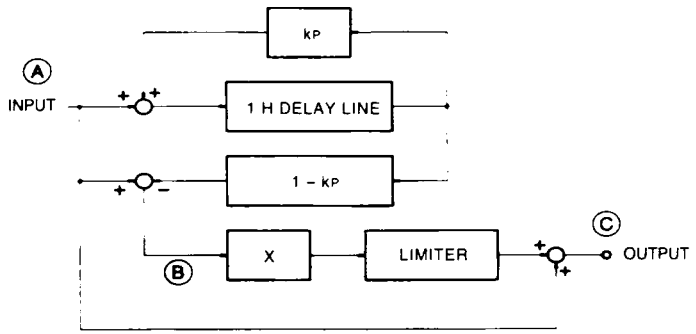


(3) Values:
Feedback factor, k_P = less than 0.5 (time constant t = 2.0 t_H)
Amount of emphasis, X = less than 0.65
Limiting level, L_Y = less than 5 IRE units

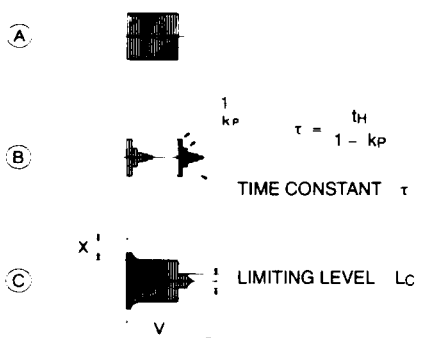
NOTE – Vertical emphasis shall not be applied during the equalizing pulse and vertical sync pulse intervals.

Figure A.1 – Luminance signal vertical preemphasis

(1) Basic circuit



(2) Waveforms at A , B and C .



(3) Values:

Feedback factor, k_P = less than 0.35 (time constant $\tau = 1.5\ t_H$)
Amount of emphasis, X = less than 1.0
Limiting level, L_C = less than 15% (with reference to 100% for the peak-to- peak amplitude of the red signal in the 75% color bar signal)

NOTE – Vertical emphasis shall not be applied during the equalizing pulse and vertical sync pulse intervals.

Figure A.2 – Chrominance signal vertical preemphasis

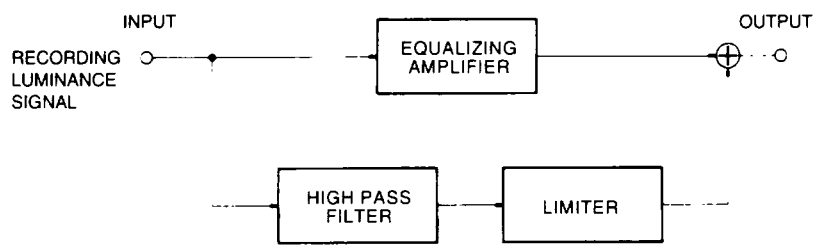


Figure A.3 – Block diagram

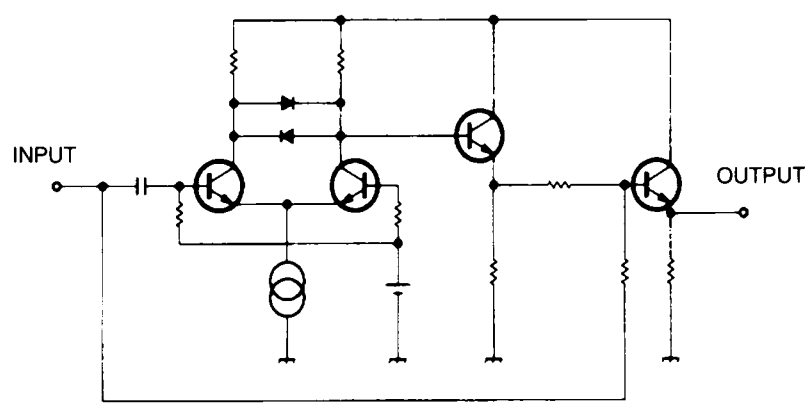
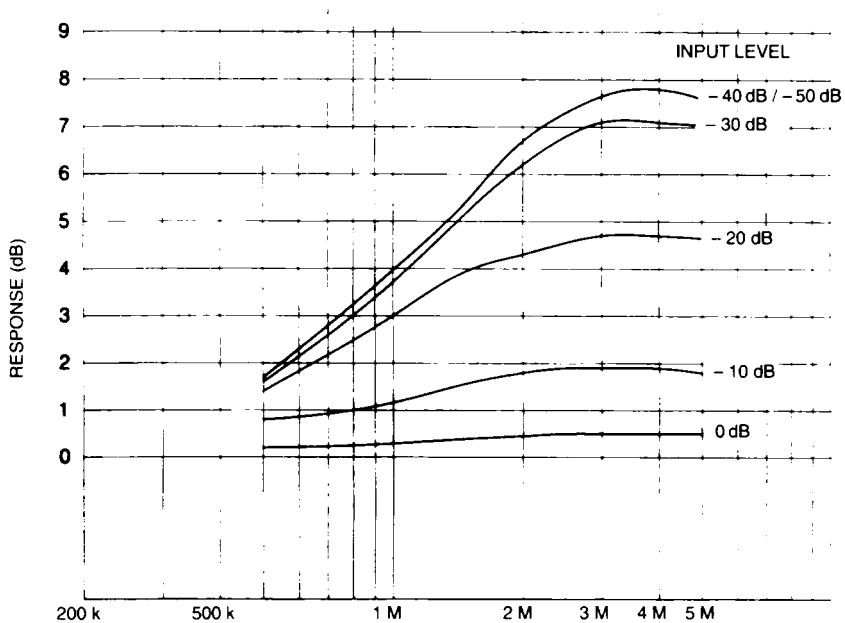


Figure A.4 – Example of recording circuit



EMPHASIS RATIO	8 dB
AMOUNT OF EMPHASIS	10 IRE
OPERATING FREQUENCY	4 dB / 1 MHz

Figure A.5 – Response characteristics of detail enhancer

Annex B (informative)
Compact video cassette adaptor

A compact video cassette adaptor allows use of a compact video cassette in video recording equipment designed for the standard video cassette specified in 3.2.

One design for such a device, using the adaptor as an example, is illustrated in figures B.1 and B.2. Figure B.1 shows the external appearance of the adaptor while figure B.2 shows the internal construction. In use, a compact video cassette is placed in the adaptor and the top lid is closed. The adaptor is then inserted into a standard video cassette machine. When the top lid is closed, the tape guide arm of the adaptor extracts tape from the compact video cassette and pulls it to a position that permits the normal loading mechanism in the VCR to complete the tape-loading cycle.

At the conclusion of use, the tape is rewound using the normal VCR rewind function and the adaptor is removed from the VCR.

To remove the compact video cassette from the adaptor, the operation knob (figure B.1) is pressed in the direction of the arrow. The adaptor mechanism then fully winds the tape into the compact video cassette and the adaptor lid opens to permit removal of the cassette.

Figure B.2 shows that the supply reel of a cassette placed in the adaptor is directly driven by the VCR supply reel drive.

The cassette take-up reel is indirectly driven from the VCR take-up drive through use of an intermediate gear.

Figure B.2 also illustrates two safety features of this adaptor design. A lever is shown on the end of the adaptor. It detects an improper adaptor position and thus protects the system from damage that might result if the adaptor were not fully inserted into the VCR. In addition, the adaptor has on its edge a linked tab that prevents accidental erasure of a compact video cassette.

Recording on a cassette contained in the adaptor is not possible if the tab of the compact video cassette has been removed.

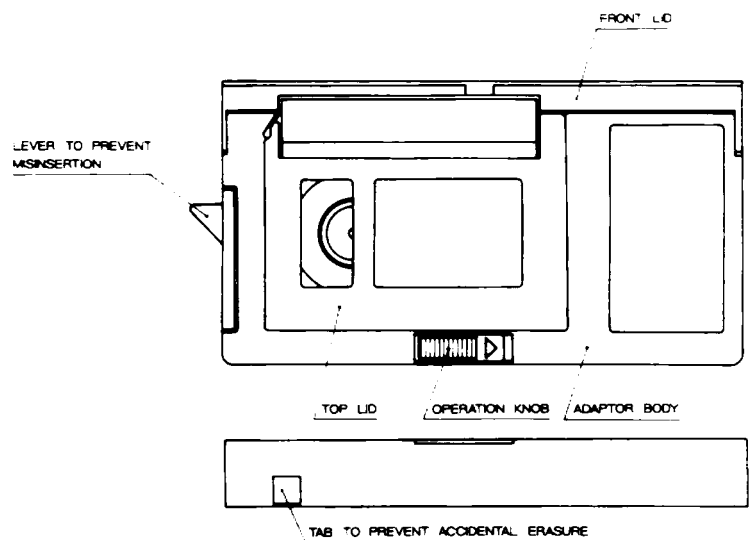


Figure B.1 – Example of the compact video cassette adaptor

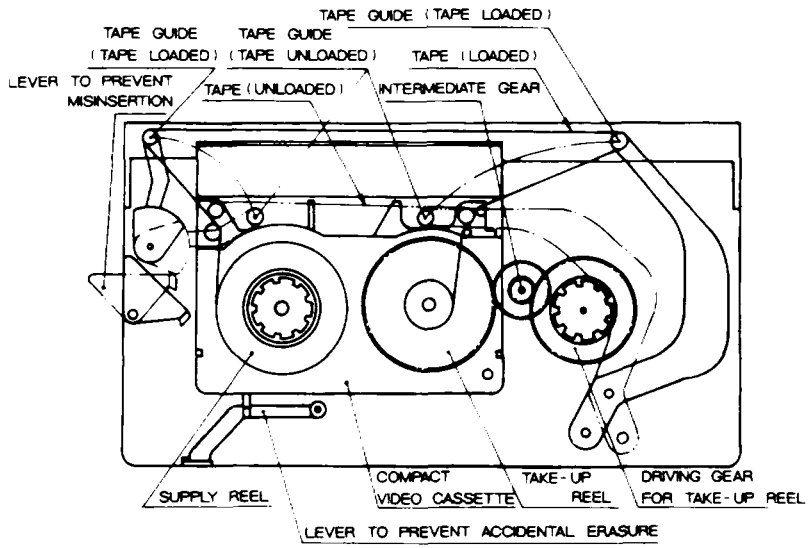


Figure B.2 – Main parts and movement of the compact video cassette adaptor

PROPOSED SMPTE RECOMMENDED PRACTICE

RP 154

Reference Signals for the Synchronization of 525-Line Video Equipment

Introduction

Composite or component video equipment frequently requires an external reference signal for synchronization. Color black is the commonly used external reference signal for NTSC equipment. This practice specifies the use of a color black signal meeting or bettering the tolerances defined herein as a reference signal for all forms of composite or component, digital or analog equipment using the 525-line system.

1 Scope

This practice defines a synchronization signal to be used as an external timing reference for video equipment using a 525-line, 59.94-Hz field rate, 2:1 interlace standard.

2 Normative reference

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.

SMPTE 170M, Television — Studio Applications — Composite Analog NTSC Signal

IEC 169-8 (1978), R.F. Coaxial Connectors with Inner Diameter of Outer Conductor 6.5 mm (0.256 in) with Bayonet Lock — Characteristic Impedance 50 Ohms (Type BNC), and Appendix A (1990)

3 Timing reference

3.1 Output reference

Where a separate reference is required for the output function, the equipment shall derive its timing reference for the output function from a signal as defined in clause 6.

3.2 Input reference

For equipment that stores video with variable delay (i.e., video recorders, synchronizers, timebase correctors) or that monitors video, the equipment may derive its timing reference for the input function from the input video or from a reference signal as defined in clause 6.

4 Connector

BNC connectors shall be in accordance with IEC 169-8.

5 Impedance

The reference signal shall operate in a 75-ohm environment.

6 Reference signal

The reference signal is defined as follows:

6.1 Signal characteristics

The signal waveform shall conform to the specifications for system NTSC as defined in SMPTE 170M, except as noted herein.

6.2 Picture signal level

The signal level throughout the active picture period shall correspond to blanking or black level (0 IRE or 7.5 IRE ± 2.5 IRE, respectively (see note 1).

6.3 Signal amplitude

The amplitude of the synchronizing pulses shall be 286 mV + 100 mV – 50 mV. The peak-to-peak amplitude of the subcarrier burst shall be nominally equal in amplitude to that of the synchronizing pulse.

6.4 Rise and fall time of horizontal-synchronizing pulses

The rise and fall time of the horizontal-synchronizing pulses shall be 140 ns ± 20 ns, measured between the 10% and 90% amplitude levels.

6.5 Jitter

The timing of individual leading edges of horizontal-synchronizing pulses shall be within ± 2.5 ns of the timing of leading edges, as averaged over at least one field (see note 2).

7 Digital representation

Where equipment will be operated primarily in a digital environment, a serial or parallel representation of a color black or other color video signal may be used as an additional or alternate reference. The digital signal need not conform to 6.2, as APL does not affect sync detection in a digital signal. Reference signals shall conform to appropriate SMPTE standards or recommended practices for digital interface of television signals. Where a composite digital signal is used, a 10-bit representation is recommended.

NOTES

1 Reference signals of higher constant APL are specifically not recommended because they may cause performance degradation related to APL variations between the vertical interval and other parts of the signal. Furthermore, reference signals with changing APL, such as moving video or switched test signals, are also specifically not recommended because they may cause disturbances to the video signal being processed by the equipment for which they are the reference.

2 In order to achieve the level of performance specified, it may be necessary to provide a synchronizing pulse generator to serve the local area. In the presence of hum and noise, it may also be necessary to take steps in the system design to prevent the reduction of the level of performance from that required.