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SMPTE STANDARD

for Digital Video Recording — 1/2-in Type D-14 Component Format — 525/60 and 625/50



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1 Scope

This standard specifies the content, format, and recording method of the data blocks containing video, audio, and associated data which form the helical records on 12.65-mm (0.5-in) tape. In addition, this standard specifies the content, format, and recording method of the longitudinal record containing tracking information for the scanning head associated with the helical records, and also the longitudinal cue audio, and time and control code tracks.

One video channel and eight independent AES3 audio data channels¹⁾ are recorded in the digital format. Each of these AES3 data channels is designed to be capable of independent editing.

NOTE 1 – Throughout the text of this standard, the expression “AES3 audio data” shall be abbreviated to “audio data” and represents digitized audio and data in AES-3 format.

The video channel records and reproduces a component television signal in the 525-line system with a frame frequency of 29.97 Hz (hereafter referred to as the 525/60 system) and the 625-line system with a frame frequency of 25.00 Hz (hereafter referred to as the 625/50 system).

Figures 1 and 2 show block diagrams of typical recording and playback circuits.

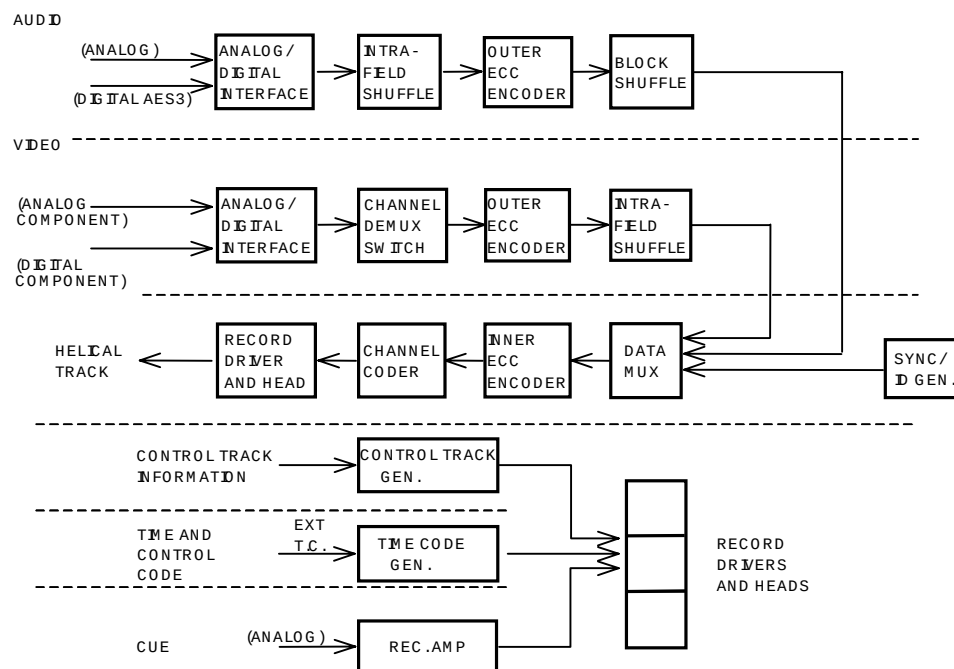


Figure 1 – Record block diagram

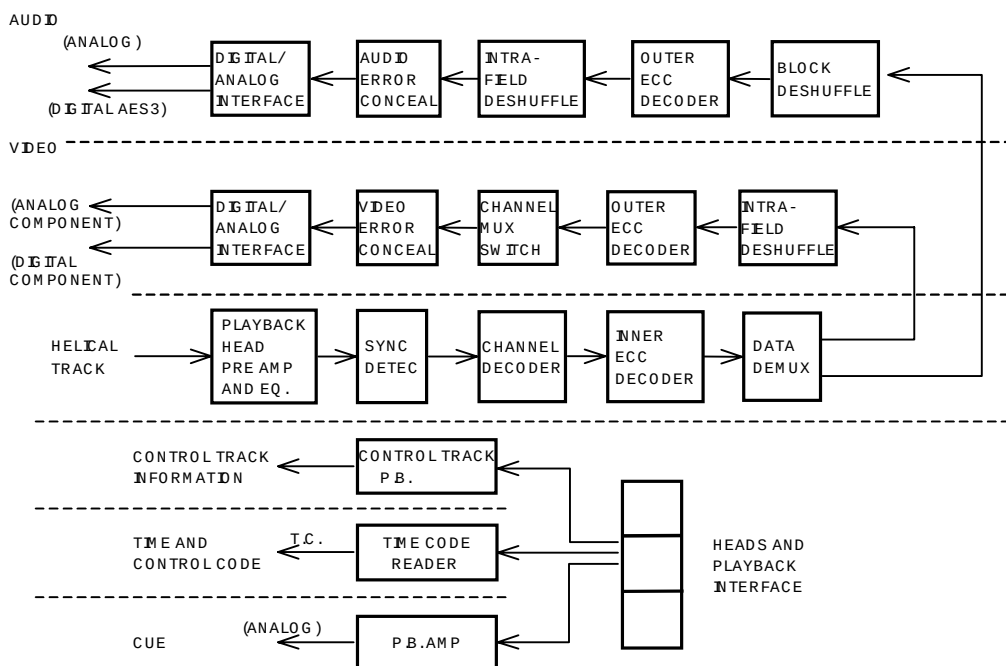


Figure 2 – Playback block diagram

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/SMPTE 125M-1995, Television — Component Video Signal 4:2:2 — Bit-Parallel Digital Interface

ANSI/SMPTE 259M-1997, Television — 10-Bit 4:2:2 Component and 4fsc Composite Digital Signals — Serial Digital Interface

ANSI/SMPTE 272M-1994, Television — Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space

SMPTE 12M-1999, Television, Audio and Film — Time and Control Code

SMPTE RP 155-1997, Audio Levels for Digital Audio Records on Digital Television Tape Recorders

AES3-1992 (R1997), Serial Transmission Format for two Channel Linearly Represented Digital Audio Data

3 Environment and test conditions

3.1 Environment

Tests and measurements made on the system to check the requirements of this standard shall be carried out under the following conditions:

- Temperature $20\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$
- Relative humidity $(50 \pm 2)\%$
- Barometric pressure from 86 kPa to 106 kPa
- Tape conditioning not less than 24 h
- Center tape tension $0.31\text{ N} \pm 0.05\text{ N}$ (see annex A)

4 Magnetic tape

4.1 Base

The base material shall be polyester or equivalent.

4.2 Width

The tape width shall be $12.650\text{ mm} \pm 0.008\text{ mm}$. The tape, covered with glass, shall be measured without tension at a minimum of five different positions along the tape using a calibrated comparator having an accuracy of 0.001 mm ($1\text{ }\mu\text{m}$). The tape width is defined as the average of the five readings.

4.3 Width fluctuation

Tape width fluctuation shall not exceed $5\text{ }\mu\text{m}$ peak to peak. Measurement of tape width fluctuation shall be taken over a tape length of 900 mm. The value of tape width fluctuation shall be evaluated by measuring the tape width at 10 points, each separated by a distance of 100 mm.

4.4 Tape thickness

Two types of tape thickness shall be permitted by this standard. The first tape thickness shall be 10.2 μm to 11.0 μm (referred to as 11 μm); the second tape thickness shall be 13.0 μm to 14.0 μm (referred to as 14 μm).

4.5 Transmissivity

Transmissivity shall be less than 5%, measured over the range of wavelengths 800 nm to 900 nm.

4.6 Offset yield strength

The offset yield strength shall be greater than 9 N for 11- μm tape and 10 N for 14- μm tape. The force to produce 0.2 % elongation of a 1000-mm test sample with a pull rate of a 10-mm per minute shall be used to confirm the offset yield strength. The line beginning at 0.2 % elongation parallel to the initial tangential slope is drawn and then read at the point of intersection of the line and the stress-strain curve.

4.7 Magnetic coating

The magnetic layer of the tape shall consist of a coating of metal particles or equivalent.

4.8 Coating coercivity

The coating coercivity shall be a class 1800 (144000 A/m) with an applied field of 400000 A/m (5000 Oe) as measured by a 50-Hz or 60-Hz B-H meter or vibrating sample magnetometer (VSM).

4.9 Particle orientation

The metal particles shall be longitudinally oriented.

5 Helical recordings

5.1 Tape speed

The tape speed shall be 167.228 mm/s (525/60 system) and 185.995 mm/s (625/50 system). The tolerance shall be $\pm 0.2\%$.

5.2 Record location and dimensions

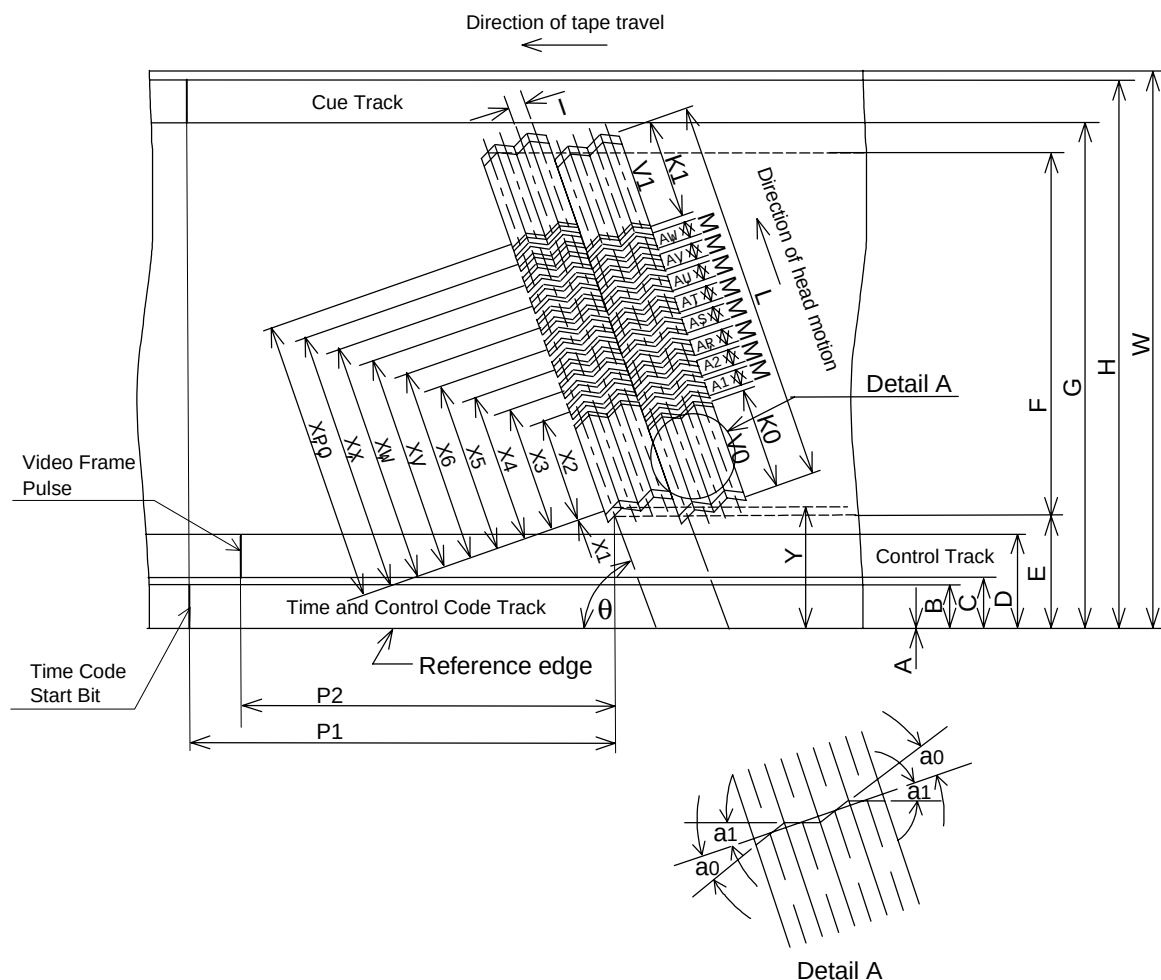
5.2.1 The format requires a full track width erasure for continuous recording and a flying erasure for insert editing.

5.2.2 Record location and dimensions for continuous recording shall be as specified in figures 3 and 4 and tables 1 (525/60 system) and 2 (625/50 system). In recording, sector locations on each helical track shall be contained within the tolerances specified in figure 3 and tables 1 (525/60 system) and 2 (625/50 system).

5.2.3 The reference edge of the tape for dimensions specified in this standard shall be the lower edge as shown in figure 3. The magnetic coating, with the direction of tape travel as shown in figure 3, is on the side facing the observer (measuring techniques are shown in annex B).

5.2.4 As indicated in figure 3, this standard anticipates a zero guard band between recorded tracks, and the record head width should be equivalent to the track pitch of 20 μm . The scanner head configuration should be chosen such that the recorded track widths are contained within the limits of 18 μm to 22 μm .

5.2.5 In insert editing, this standard provides a guard band of 2 μm (nominal) between the previously recorded track and the inserted track at editing points only. A typical track pattern for insert editing is shown in figure C.1 of annex C.



NOTES

- 1 A1 to A8 are audio data sectors.
- 2 V0 and V1 are video sectors.
- 3 Tape viewed from magnetic coating side.
- 4 Dimensions X1 to X10 are determined by the program reference point as defined in figure 4.

**Figure 3 – Location and dimensions* of recorded tracks
(See tables 1 and 2)**

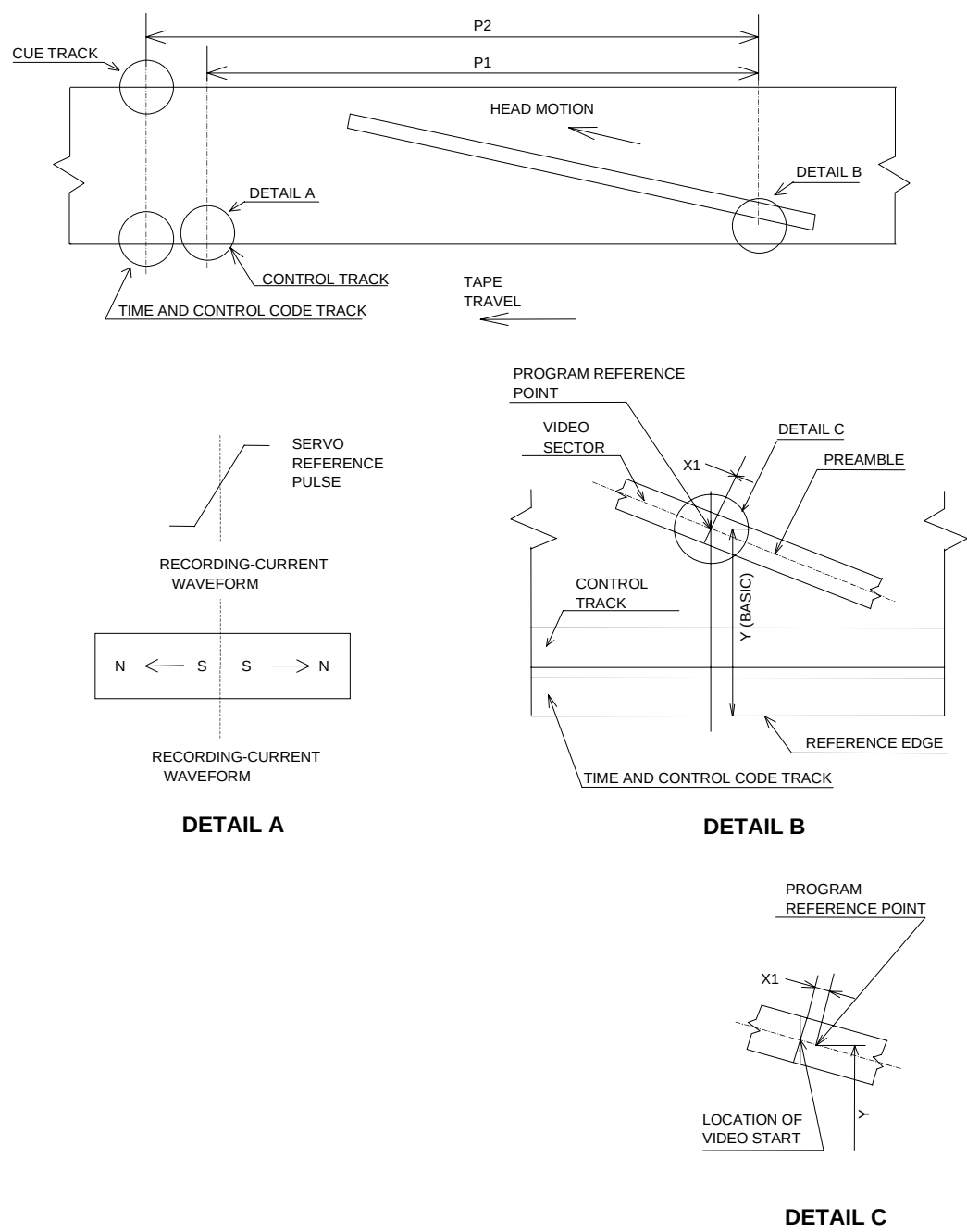


Figure 4 – Location of cue and time and control code track records

Table 1 – Record location and dimensions (525/60 system)

Dimensions		Nominal	Tolerance
A	Time and control code track lower edge	0	Basic
B	Time and control code track upper edge	0.450	± 0.050
C	Control track lower edge	0.900	± 0.050
D	Control track upper edge	1.300	± 0.050
E	Program area lower edge	1.629	Derived
F	Program area width	10.020	Derived
G	Cue audio track lower edge	11.950	± 0.050
H	Cue audio track upper edge	12.550	± 0.050
I	Helical track pitch	0.0200	Ref
K0	Video sector 0 length	51.624	Derived
K1	Video sector 1 length	51.562	Derived
L	Helical track total length	116.397	Derived
M	Audio data sector length	1.273	Derived
P1	Control track reference pulse to program reference point (see figure 4)	180.556	± 0.050
P2	Cue/time and control code signal, start of code word, to program reference point (see figure 4)	183.407	± 0.100
X1	Location of start of video sector V0	0	± 0.050
X2	Location of start of audio data sector A1	51.898	± 0.050
X3	Location of start of audio data sector A2	53.507	± 0.050
X4	Location of start of audio data sector A3	55.117	± 0.050
X5	Location of start of audio data sector A4	56.726	± 0.050
X6	Location of start of audio data sector A5	58.335	± 0.050
X7	Location of start of audio data sector A6	59.944	± 0.050
X8	Location of start of audio data sector A7	61.554	± 0.050
X9	Location of start of audio data sector A8	63.163	± 0.050
X10	Location of start of video sector V1	64.772	± 0.050
Y	Program reference point	1.639	Basic
θ	Track angle	4.9384 °	Basic
a0	Azimuth angle (track 0)	- 20.038 °	± 0.150 °
a1	Azimuth angle (track 1)	19.962 °	± 0.150 °
NOTES 1 Measurements shall be made under the conditions specified in 3.1. The measurements shall be corrected to account for actual tape speed (see figures B.1 and B.2). 2 All dimensions in millimeters.			

Table 2 – Record location and dimensions (625/50 system)

Dimensions		Nominal	Tolerance
A	Time and control code track lower edge	0	Basic
B	Time and control code track upper edge	0.450	± 0.050
C	Control track lower edge	0.900	± 0.050
D	Control track upper edge	1.300	± 0.050
E	Program area lower edge	1.745	Derived
F	Program area width	9.911	Derived
G	Cue audio track lower edge	11.950	± 0.050
H	Cue audio track upper edge	12.550	± 0.050
I	Helical track pitch	0.0200	Ref
K0	Video sector 0 length	52.104	Derived
K1	Video sector 1 length	52.034	Derived
L	Helical track total length	115.131	Derived
M	Audio data sector length	1.089	Derived
P1	Control track reference pulse to program reference point (see figure 4)	179.277	± 0.050
P2	Cue/time and control code signal, start of code word, to program reference point (see figure 4)	182.666	± 0.100
X1	Location of start of video sector V0	0	± 0.050
X2	Location of start of audio data sector A1	52.228	± 0.050
X3	Location of start of audio data sector A2	53.631	± 0.050
X4	Location of start of audio data sector A3	54.973	± 0.050
X5	Location of start of audio data sector A4	56.315	± 0.050
X6	Location of start of audio data sector A5	57.658	± 0.050
X7	Location of start of audio data sector A6	59.000	± 0.050
X8	Location of start of audio data sector A7	60.342	± 0.050
X9	Location of start of audio data sector A8	61.685	± 0.050
X10	Location of start of video sector V1	63.027	± 0.050
Y	Program reference point	1.756	Basic
θ	Track angle	4.9384 °	Basic
a0	Azimuth angle (track 0)	- 20.038 °	± 0.150 °
a1	Azimuth angle (track 1)	19.962 °	± 0.150 °
NOTES 1 Measurements shall be made under the conditions specified in 3.1. The measurements shall be corrected to account for actual tape speed (see figures B.1 and B.2). 2 All dimensions in millimeters.			

5.3 Helical track record tolerance zones

The lower edges of any eight consecutive tracks starting at the first track in each video frame shall be contained within the pattern of the eight tolerance zones established in figure 5. Each zone is defined by two parallel lines, which are inclined at an angle of 4.9384° (basic) with respect to the tape reference edge.

The centerlines of all zones shall be spaced apart 0.0200 mm (basic). The width of zones 1 to 3 and 5 to 8 shall be 0.006 mm (basic). The width of zone 4 shall be 0.004 mm (basic). These zones are established to contain track angle errors, track straightness errors, and vertical head offset tolerance (measuring technique is shown in annex B).

5.4 Relative positions of recorded information

5.4.1 Relative positions of longitudinal tracks

Audio data, Video, control track, time and control code, and cue track with information intended to be time coincident shall be positioned as shown in figures 3 and 4.

5.4.2 Program area reference point

The program area reference point is determined by the intersection of a line parallel to the reference edge of the tape at a distance Y from the reference edge and the centerline of the first track in each video field (segment 0, track 0). (See figures 3 and 4.)

The end of the preamble and start of the video sector shall be recorded at the program area reference point, and the tolerance is dimension X1. The locations are shown in figures 3 and 4; dimensions X1 and Y are in tables 1 and 2. The relationship between sectors and contents of each sector is specified in clause 6.

5.5 Gap azimuth

5.5.1 Cue track, control track, time code track

The azimuth angle of the cue, control track, and time and control code head gaps used to produce longitudinal track records shall be perpendicular to the track record.

5.5.2 Helical track

The azimuth of the head gaps used for the helical track shall be inclined at angles α_0 and α_1 as specified in tables 1 and 2, with respect to a line perpendicular to the helical track. The azimuth of the first track of every field (segment 0, track 0) shall be oriented in the counterclockwise direction with respect to a line perpendicular to the helical track direction when viewed from the side of the tape containing the magnetic record.

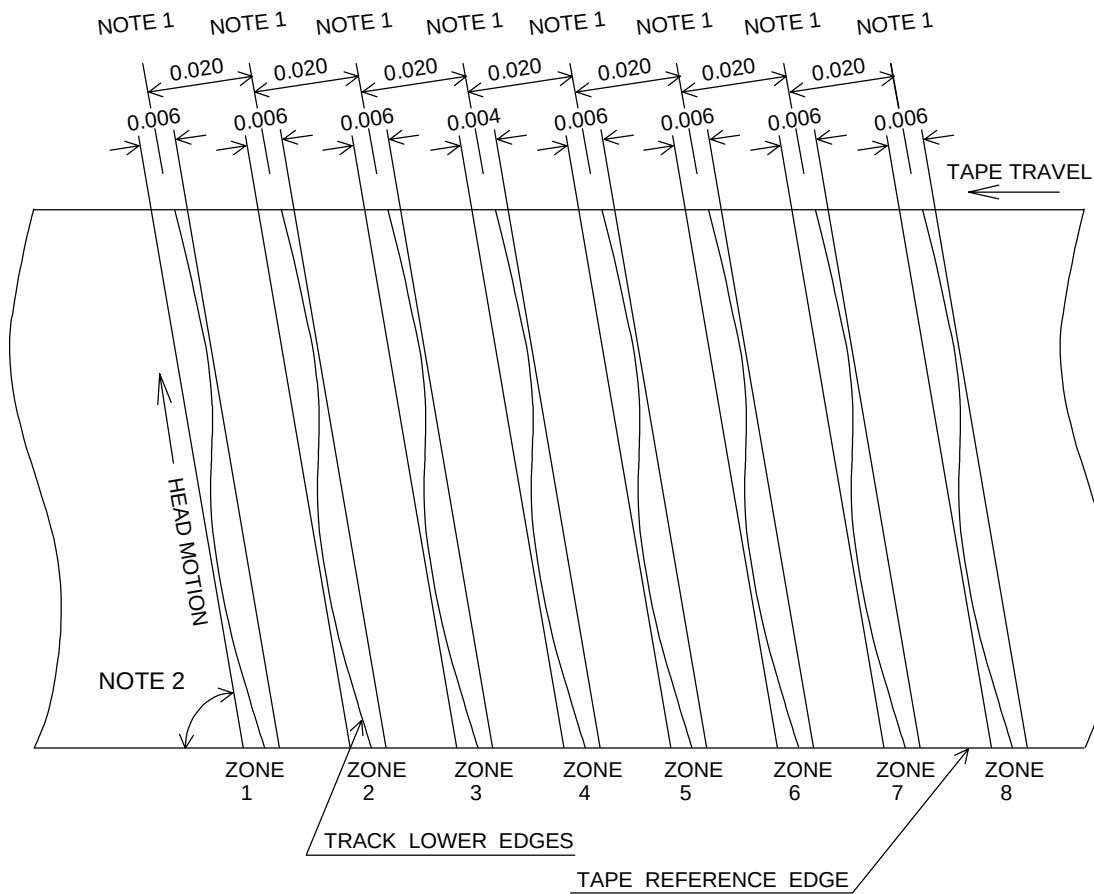
5.6 Transport and scanner (informative)

The effective drum diameter, tape tension, helix angle, and tape speed taken together determine the track angle. Different methods of design and/or variations in drum diameter and tape tension can produce equivalent recordings for interchange purposes.

One possible configuration of the transport uses a scanner with an effective diameter of 76.000 mm. Scanner rotation is in the same direction as tape motion during normal playback mode. Data are recorded by two groups of four heads mounted 180° apart. Figure 6 shows one possible mechanical configuration of the scanner, and table 3 shows the corresponding mechanical parameters. Figure 7 shows the relationship between the longitudinal heads and the scanner.

Other mechanical configurations are allowable provided the same footprint of recorded information is produced on tape.

Erase heads are illustrated in annex C.



NOTES

- 1 Tolerance zone centerlines.
- 2 4.9384° .
- 3 All dimensions in millimeters.

Figure 5 – Location and dimensions of tolerance zones of helical track record

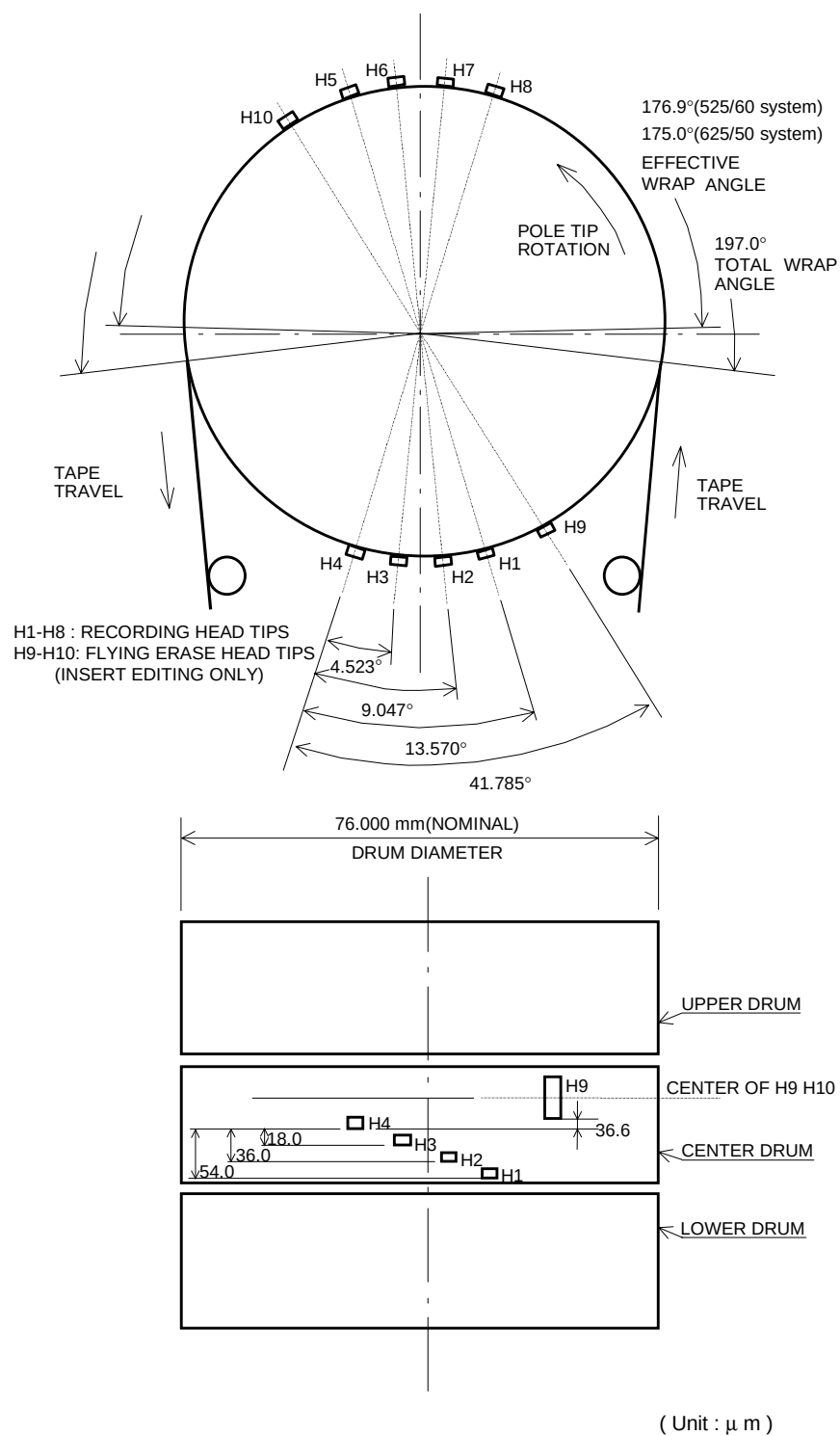
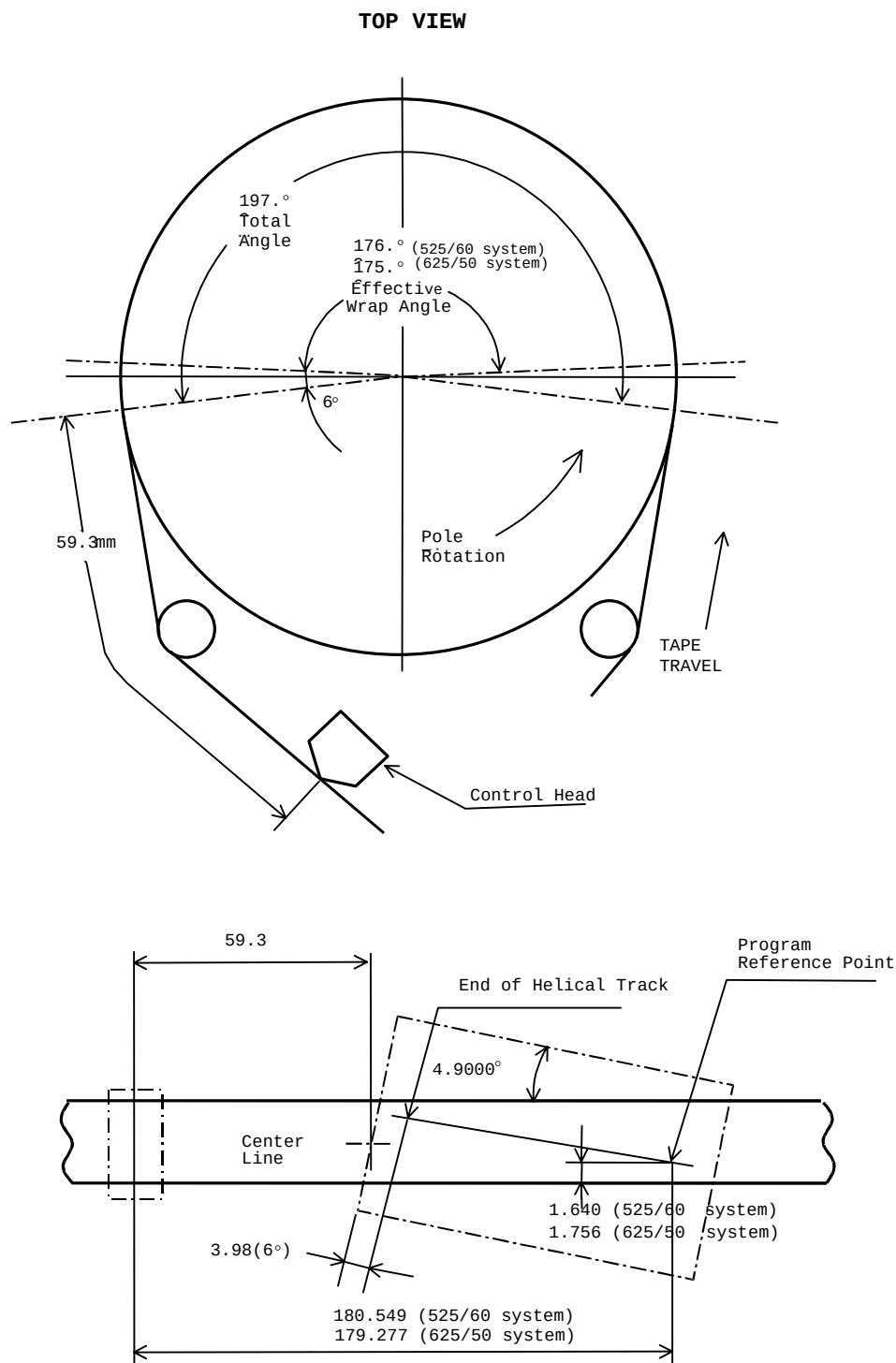


Figure 6 – A possible scanner configuration

Table 3 – Parameters for a possible scanner design

Parameters		525/60 system	625/50 system
Scanner rotation speed (rps)		90/1.001	100
Number of tracks per rotation		8	
Drum diameter (mm)		76.000	
Centre span tension (N)		0.31	
Helix angle (degrees)		4.9000	
Effective wrap angle (degrees)		176.9	175.0
Scanner circumferential speed (m/s)		21.5	23.9
H1,H5 overwrap head entrance (degrees)		14.1	16.0
H1,H5 overwrap head exit (degrees)		6	
Angular relationship (degrees)	H1 - H4: H2 - H4: H3 - H4: H5 - H8: H6 - H8: H7 - H8: H4 - H8:	13.570 9.047 4.523 13.570 9.047 4.523 180.000	
Vertical displacement (mm)	H1 - H4: H2 - H4: H3 - H4: H5 - H8: H6 - H8: H7 - H8:	0.054 0.036 0.018 0.054 0.036 0.018	
Maximum tip projection (μm) Note: Head projection from a drum surface		42.0	
Record head track width (μm) NOTE – Track edit points are excluded		20	



NOTE - Unwrapped, viewed magnetic coating side

Figure 7 – A possible longitudinal head location and tape wrap

6 Program track data

6.1 Introduction

Each television field is recorded on 12 tracks (525/60 system) or 16 tracks (625/50 system).

The helical tracks contain digital data from the video channel and eight audio data channels. Each track contains a video sector followed by eight audio data sectors corresponding to eight audio data channels and followed by a second video sector, recorded in that order. An edit gap between sectors accommodates timing errors during editing. Figure 8 shows the arrangement of video and audio data sectors on the tape.

6.2 Labeling convention

The least significant bit is written on the left and is the first recorded to tape. The lowest numbered byte is shown at the left/top and is the first encountered in the input data stream.

Byte values are expressed in hexadecimal notation unless otherwise noted. An h subscript indicates a hexadecimal value.

6.3 Sector details

Each sector (audio data or video) is divided into the following elements:

- Preamble containing clock run-up sequence, sync pattern, identification pattern and fill pattern;
- Sync blocks containing sync pattern and identification pattern, followed by a fixed length data block with error control;
- Postamble containing sync pattern and identification pattern.

6.3.1 Sync block

The sync block format is common to both audio data and video sectors. Each sync block contains a sync pattern (2 bytes) and an inner code block. Each inner block contains an identification pattern (2 bytes) and 85 (525/60 system) or 76 (625/50 system) data bytes of video, audio data, or outer check bytes followed by 8 inner check bytes.

The inner code block protects the two bytes of the identification pattern together with 85 data bytes (525/60 system) or 76 data bytes (625/50 system). Figures 9 (525/60 system) and 10 (625/50 system) show the sync block format.

6.3.2 Sync pattern

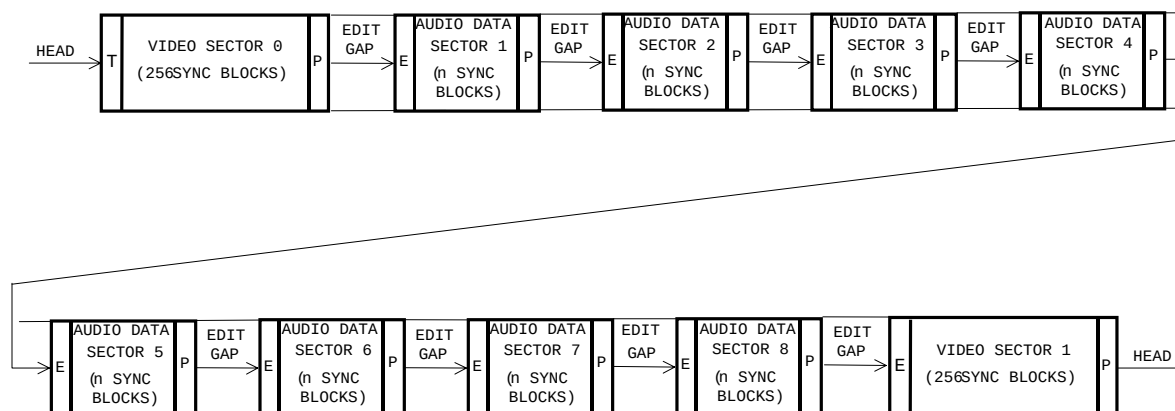
a) Length: 16 bits (2 bytes).

b) Pattern: 97F1 (in hexadecimal notation).

		LSB				MSB			
Byte 0	-	1	1	1	0	1	0	0	1
Byte 1	-	1	0	0	0	1	1	1	1

c) Protection: None.

d) Randomization: None.



NOTES

1 T = Track preamble (58 bytes).

2 E = In-track preamble (28 bytes).

3 P = Postamble (4 bytes).

4 Sync block: 97 bytes (525/60 system), 88 bytes (625/50 system).

5 Edit gap: 162 bytes nominal (525/60 system), 144 bytes nominal (625/50 system).

6 Sync blocks in audio sector n=6 (525/60 system), 5 (625/50 system).

Figure 8 – Sector arrangement on helical track

6.3.3 Identification pattern

As illustrated in figures 11 (525/60 system) and 12 (625/50 system), the first two bytes of each inner block are used for identification of sync block, segment (group of helical tracks scanned simultaneously), helical track number, television field, and sector (portion of a track). Bits 1 to 6 of the second byte (byte 3 of sync block) of the identification pattern identify the track. Bit 7 of the second byte (byte 3) identifies a sector on the helical track (see figures 13 and 14).

a) Length: 16 bits (2 bytes).

b) Arrangement: The sync block number (byte 2 and bit 0 of byte 3) follows a coded sequence along the track. Figures 15 and 16 show the sequence of the sync block numbers.

The sector ID (bits 1-7 of byte 3) identifies a particular sector.

The segment number is modulo 3 (525/60 system) or modulo 4 (625/50 system). For the 525/60 system, the field number for video sectors is modulo 4 ($VF_2 = 0$ in byte 3). The field number for audio data sectors is modulo 4 (for AF_0 and AF_1 in byte 3) and AF_2 (in byte 3) is used for the identification of the five field sequences. For the 625/50 system, the field number for video sectors is modulo 8 and the field number for audio data sectors is modulo 4 ($AF_2 = 0$).

c) Video field identification: The field address VF_0 , VF_1 , VF_2 (bits 4, 5, and 6 of byte 3) for video sync blocks shall identify the field sequence as shown below:

i) In the case of component recording, at the time of the start of each recording, the start of color frame sequence counter is indicated by the field address bits VF_0 , VF_1 , VF_2 these bits are set to zero. This point is coincident with field 1 of an arbitrary chosen frame for 525/60 or 625/50 component system.

ii) In the case of component signal derived from an optional composite signal input, the field address shall identify the four-field color sequences (525/60 system) or eight-field color sequences (625/50 system), as defined in ITU Report 624 and have the values of the field address set as shown below:

525/60 system:

Component signal input	Composite signal input	VF_0	VF_1	VF_2
Field 1	Color frame A, field I	0	0	0
Field 2	Color frame A, field II	1	0	0
Field 1	Color frame B, field III	0	1	0
Field 2	Color frame B, field IV	1	1	0

625/50 system:

Component signal input	Composite signal input	VF_0	VF_1	VF_2
Field 1	Color field I	0	0	0
Field 2	Color field II	1	0	0
Field 1	Color field III	0	1	0
Field 2	Color field IV	1	1	0
Field 1	Color field V	0	0	1
Field 2	Color field VI	1	0	1
Field 1	Color field VII	0	1	1
Field 2	Color field VIII	1	1	1

d) Audio data field identification: The field address AF_0 and AF_1 of the audio data sync block (bits 4 and 5 of byte 3) shall identify a four-field sequence as shown below. The sequence shall be identical for the 525/60 system and the 625/50 system. When audio data sectors are edited, the four-field sequence shall be maintained.

Field	AF_0	AF_1
m	0	0
m+1	1	0
m+2	0	1
m+3	1	1

For the 525/60 system, the field address AF_2 of the audio data sync block (bit 6 of byte 3) shall identify a five-field sequence for the number of audio data samples in the current field as shown below. When audio data sectors are edited, the five-field sequence shall be maintained (see 10.3.6 d). For the 625/50 system, the field address AF_2 of the audio data sync block (bit 6 of byte 3) shall be set always to 0.

525/60 system			625/50 system	
Field	AF_2	Number of audio data samples	AF_2	Number of audio data samples
n	0	801	0	960
n+1	0	801	0	960
n+2	0	801	0	960
n+3	0	801	0	960
n+4	1	800	0	960

e) Protection: The identification pattern is protected by an inner code block.

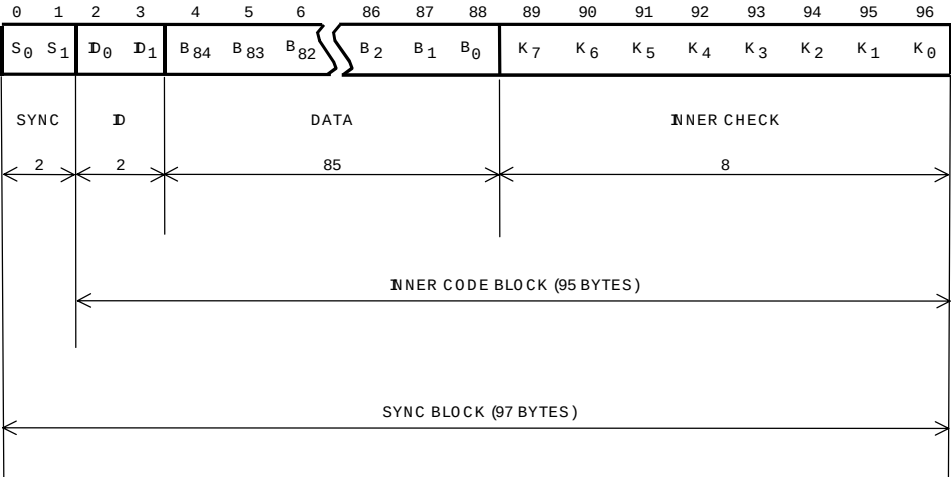


Figure 9 – Sync block format (525/60 system)

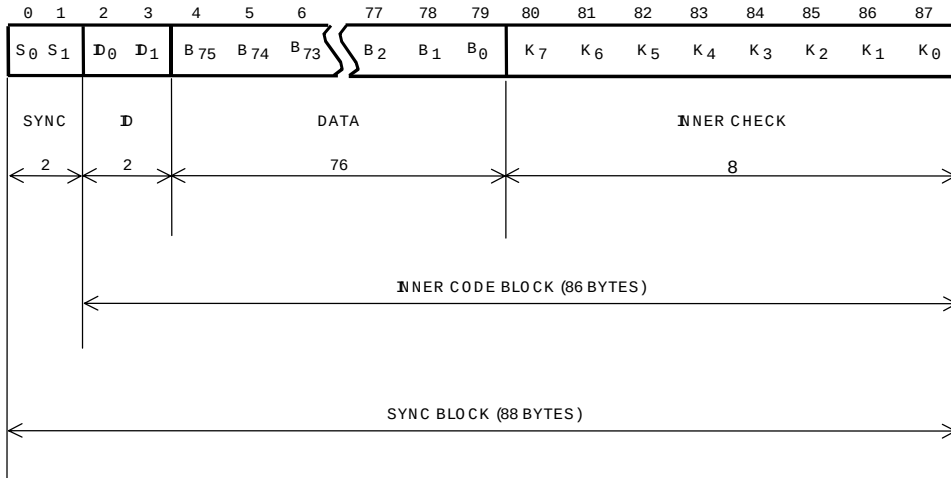
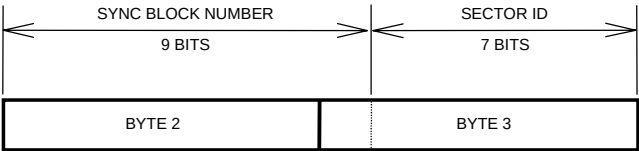
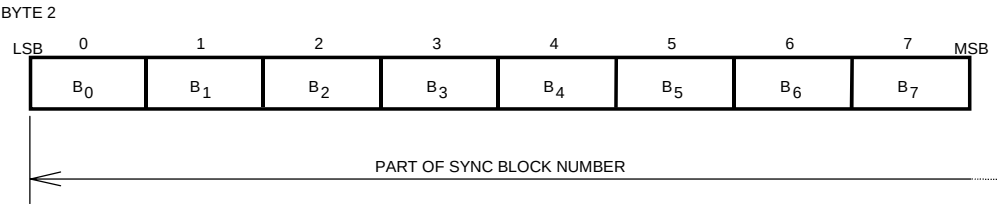


Figure 10 – Sync block format (625/50 system)

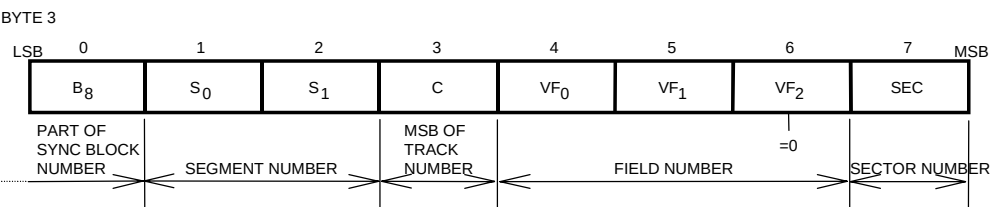
ARRANGEMENT



SYNC BLOCK NUMBER



SECTOR ID FOR VIDEO SYNC BLOCKS



SECTOR ID FOR AUDIO SYNC BLOCKS

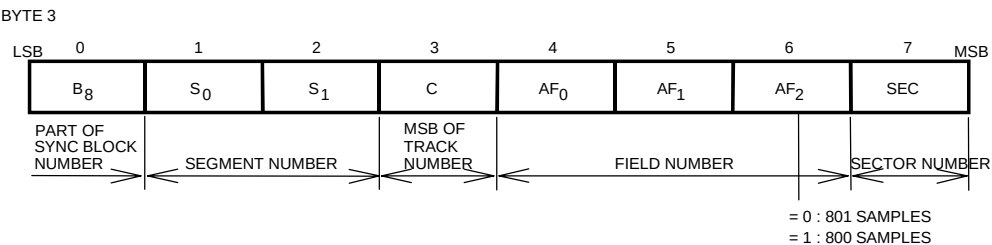
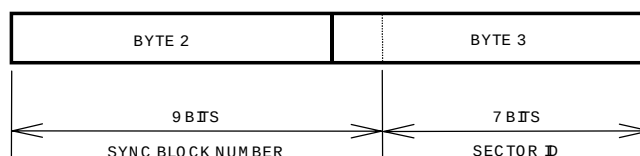
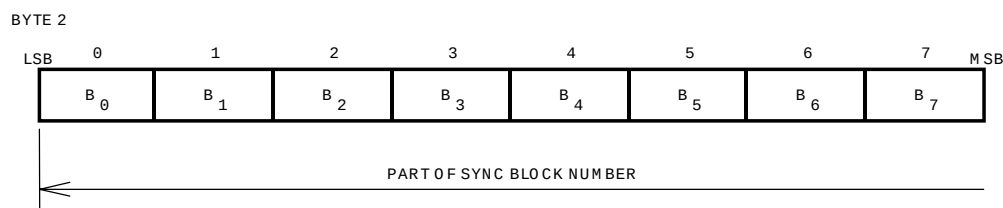


Figure 11 – Sync block identification format (525/60 system)

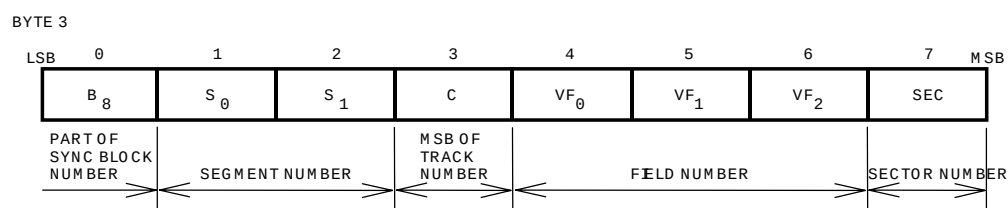
ARRANGEMENT



SYNC BLOCK NUMBER



SECTOR ID FOR VIDEO SYNC BLOCKS



SECTOR ID FOR AUDIO SYNC BLOCKS

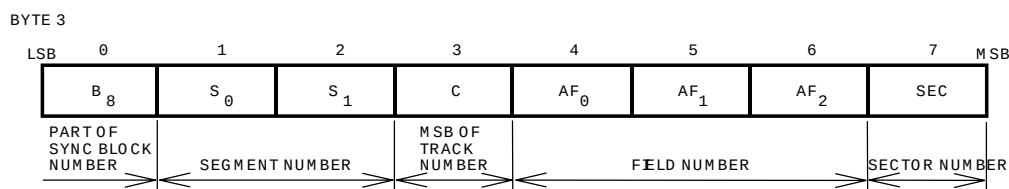
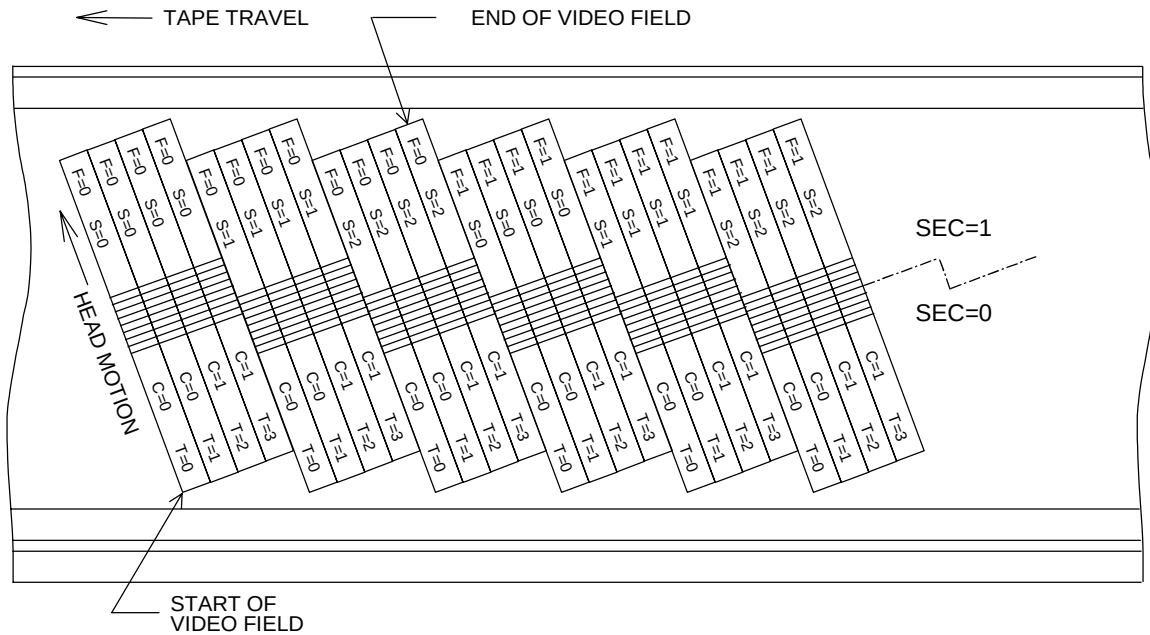


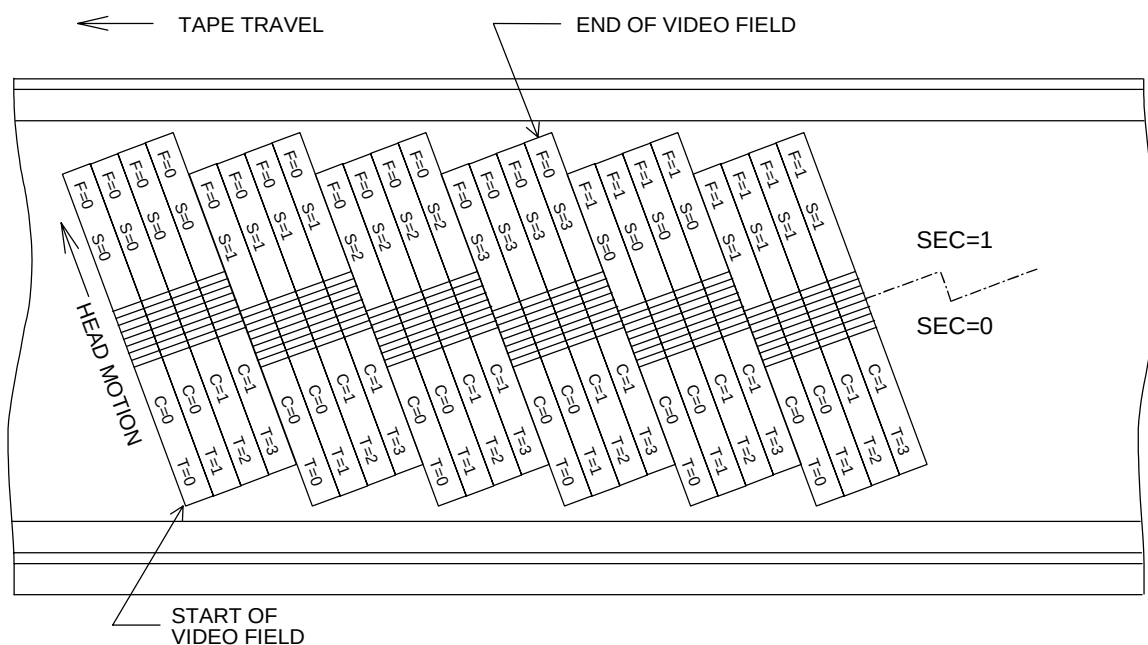
Figure 12 – Sync block identification format (625/50 system)



NOTES

- 1 F = field number (0, 1, 2, 3). (see Note in section 6.3.3.c)
- 2 S = segment number (0, 1, 2).
- 3 SEC = sector number; C = MSB of track number (0, 1).
- 4 T = track number (0, 1, 2, 3). LSB of track number is identified by the azimuth angle.
- 5 Audio data sectors are not shown.

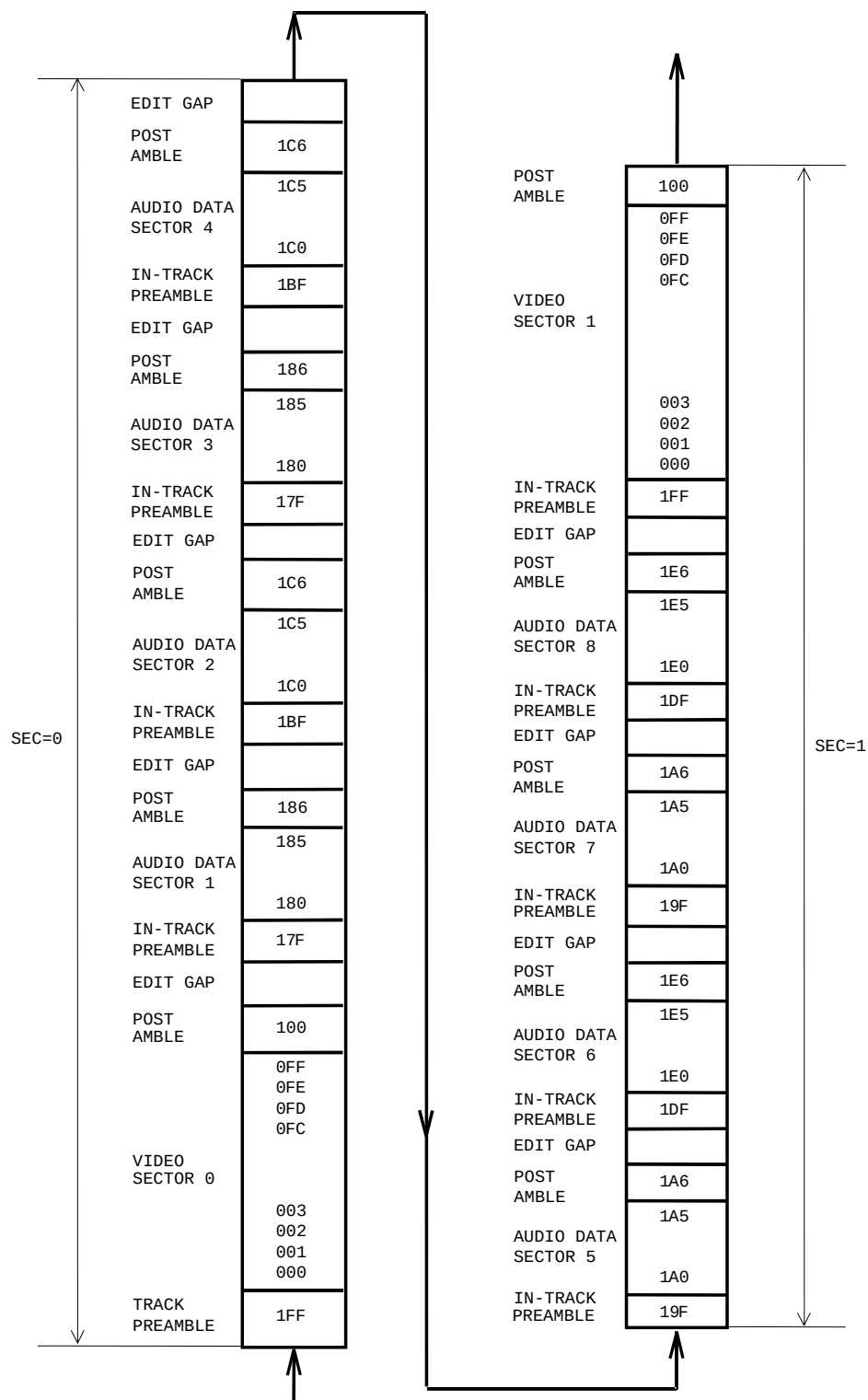
Figure 13 – Track, segment and field numbers (525/60 system)



NOTES

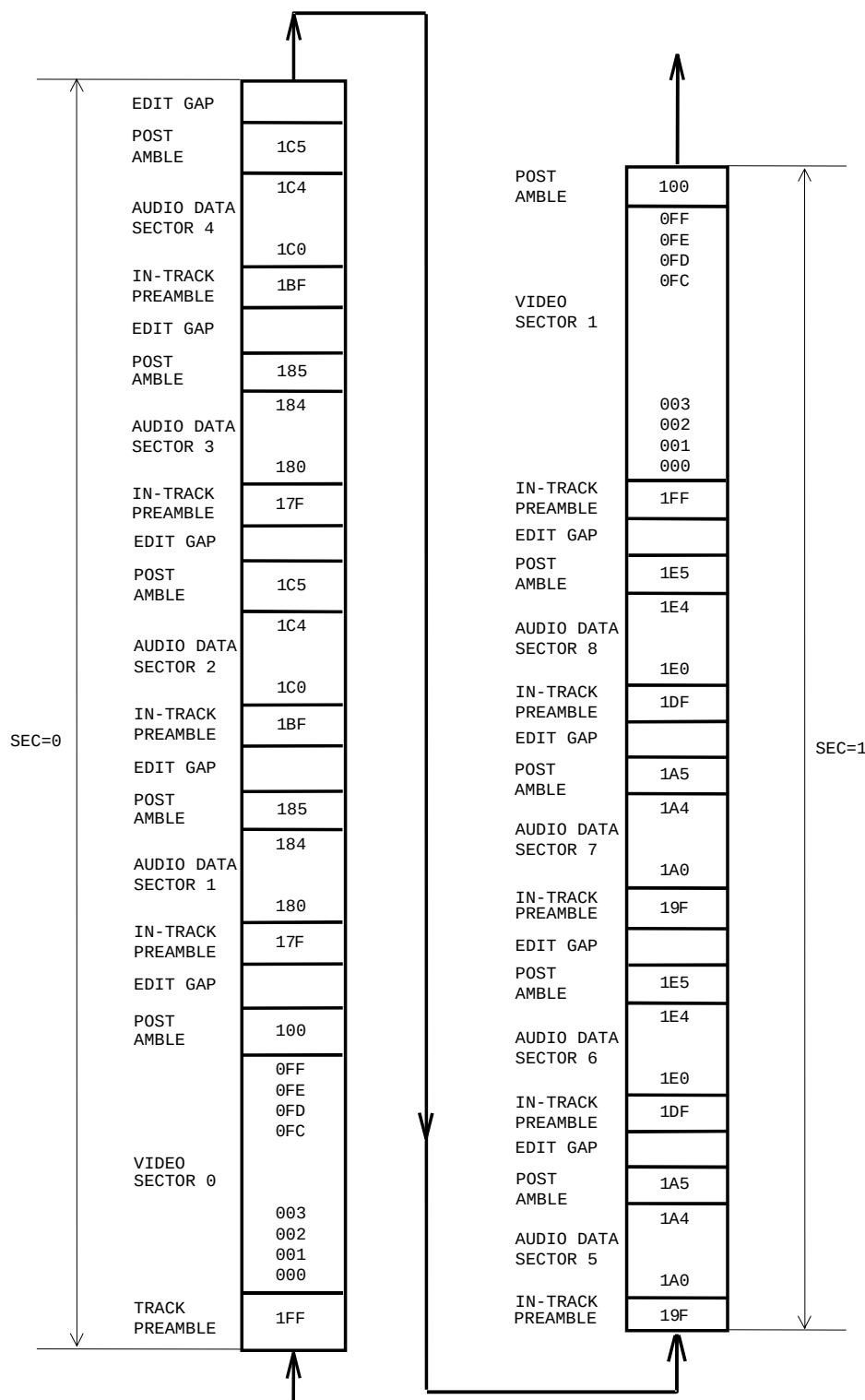
- 1 F = field number (0, 1, 2, 3 . . . 7). (see Note in section 6.3.3.c)
- 2 S = segment number (0, 1, 2, 3).
- 3 SEC = sector number; C = MSB of track number (0, 1).
- 4 T = track number (0, 1, 2, 3). LSB of track number is identified by the azimuth angle.
- 5 Audio data sectors are not shown.

Figure 14 – Track, segment and field numbers (625/50 system)



NOTE - Sync block number shows in hexadecimal notation.

Figure 15 – Sync block number (525/60 system)



NOTE - Sync block number shows in hexadecimal notation.

Figure 16 – Sync block number (625/50 system)

f) Randomization: The identification pattern is randomized before being channel coded. The randomizing is equivalent to performing the exclusive-OR operation between the serial data stream and the serial stream generated by the polynomial function

$$x^8 + x^4 + x^3 + x^2 + 1 \text{ (in GF(2))}$$

The first term is the most significant and the first to enter the division computation. The polynomial generator noted above is preset to 15_h (525/60) system or 0C_h (625/50 system) at the first byte of the identification pattern and continues to cycle until the end of the sync block.

6.3.4 Data field

This block is used for all video and audio data and the associated error correction data.

a) Length: 1 inner code block. For the 525/60 system, the inner code block contains 95 bytes consisting of two identification pattern bytes, 85 data bytes (outer ECC check bytes are considered data), plus 8 inner ECC check bytes. For the 625/50 system, the inner code block contains 86 bytes consisting of two identification pattern bytes, 76 data bytes (outer ECC check bytes are considered data), plus 8 inner ECC check bytes.

b) Arrangement: See figures 9 and 10.

c) Interleaving: None.

d) Protection: Inner ECC code.

Type: Reed-Solomon.

Galois Field: GF(256).

Field generator polynomial: $x^8 + x^4 + x^3 + x^2 + 1$,
where x^i are place keeping variables in GF(2), the binary field.

Order of use : Left-most term is most significant, "oldest" in time computationally, and first written to tape.

Code generator polynomial in GF(256) is:

$$G(x) = (x+1)(x+a)(x+a^2)(x+a^3)(x+a^4)(x+a^5)(x+a^6)(x+a^7),$$

where a is given by 02_h in GF(256).

Check characters : $K_7, K_6, K_5, K_4, K_3, K_2, K_1, K_0$ in $K_7x^7 + K_6x^6 + K_5x^5 + K_4x^4 + K_3x^3 + K_2x^2 + K_1x + K_0$ obtained as the remainder after dividing $x^8D(x)$ by $G(x)$, where

$$D(x) = ID_0x^{86} + ID_1x^{85} + B_{84}x^{84} + \dots + B_2x^2 + B_1x + B_0 \text{ (525/60 system);}$$

$$D(x) = ID_0x^{77} + ID_1x^{76} + B_{75}x^{75} + \dots + B_2x^2 + B_1x + B_0 \text{ (625/50 system).}$$

Polynomial of full code :

$$ID_0x^{94} + ID_1x^{93} + B_{84}x^{92} + B_{83}x^{91} + \dots + B_1x^9 + B_0x^8 + K_7x^7 + K_6x^6 + \dots + K_2x^2 + K_1x + K_0$$

(525/60 system);

$$ID_0x^{85} + ID_1x^{84} + B_{75}x^{83} + B_{72}x^{82} + \dots + B_1x^9 + B_0x^8 + K_7x^7 + K_6x^6 + \dots + K_2x^2 + K_1x + K_0$$

(625/50 system).

e) Randomization: All data and error correction check characters are randomized before being channel coded. The randomization is equivalent to randomization as defined in 6.3.3 e).

6.3.5 Sector preamble

All sectors are preceded by a preamble consisting of a clock run-up sequence, sync pattern (2 bytes), identification pattern (2 bytes), and fill pattern (4 bytes). The clock run-up sequence varies in length depending on the sector. The remaining elements of the preamble have the same format for all sectors. When a sector is edited, the appropriate preamble, including the run-up sequence, shall be recorded.

6.3.5.1 Track preamble (T)

The track preamble precedes the first sector of every track. The total length of track preamble is 58 bytes long and contains 50 bytes of run-up pattern "2C_h" which is followed by two bytes of sync pattern, two bytes of identification pattern, and four bytes of fill pattern "00_h".

LSB				MSB			
0	0	1	1	0	1	0	0

a) Arrangement: See figure 17 (a).

b) Total length: 58 bytes.

c) Run-up pattern: 2C_h.

d) Sync pattern: See 6.3.2.

e) Identification pattern: See 6.3.3.

f) Fill pattern: 00_h.

g) Protection: None.

h) Randomization: Only the identification pattern and fill pattern are randomized before being channel coded. The randomization is equivalent to randomization as defined in 6.3.3 e).

6.3.5.2 In-track preamble (E)

An in-track preamble precedes every sector except the first sector of a track. The total length is 28 bytes long and contains 20 bytes of run-up pattern "2C_h" followed by two bytes of sync pattern, two bytes of identification pattern, and four bytes of fill pattern "00_h".

a) Arrangement: See figure 17 (b).

b) Total length: 28 bytes.

c) Run-up pattern: 2C_h.

LSB				MSB			
0	0	1	1	0	1	0	0

d) Sync pattern: See 6.3.2.

e) Identification pattern: See 6.3.3.