ANSI/SMPTE 278M-1996

SMPTE STANDARD

for Television Digital Recording — 19-mm Type D-6 — Content of Helical Data and Time and Control Code Records

1 Scope

1.1 This standard specifies the content of the data blocks which form the helical records as specified in ANSI/SMPTE 277M on 19-mm tape in cassettes as specified in SMPTE 226M. Part of this standard is the specification of the time and control code record, which forms the longitudinal index track, as specified in ANSI/SMPTE 277M.

1.2 Digital video and audio data derived from various image standards are recorded with a data rate of approximately 1 Gbit/s. All image standards recorded by this format employ the identical track pattern, inner and outer block structure, and modulation code.

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 S4.40-1992, Digital Audio Engineering — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data (AES-3)

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

ANSI/SMPTE 277M-1996, Television Digital Recording — 19-mm Type D-6 — Helical Data, Longitudinal Index, Cue and Control Records

3 Helical record content

3.1 Recorded data

Eight tracks form a cluster. Each cluster is divided into 3 sectors as shown in figure 1. The A and C sectors contain audio data, and the B sectors contain the video data.

Each segment starts with the B sector, followed by the C sector of the same cluster, and ends with the A sector of the next recorded cluster as shown in figure 2. The segment counting cycle starts with cluster 0 which is identified by the program reference point (see ANSI/SMPTE 277M).

One data field as defined in ANSI/SMPTE 277M is the minimum edit distance for video and audio. The data field is formed by a group of segments. The number of segments per data field is a parameter depending on the recorded video standard as defined in table 1. For a video standard with 30 frames/s, the arrangement for video and audio data within one data field is shown in figure 3.

Video data are distributed over the 8 tracks of a cluster as shown in table 2. The audio data are recorded twice and placed at the beginning and at the end of each track. Before recording, all data are submitted to a modulation code.

3.2 Track structure

All recorded blocks along a slant track have the same size regardless of content. The basic structure of a track is shown in figure 4.

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American National Standard

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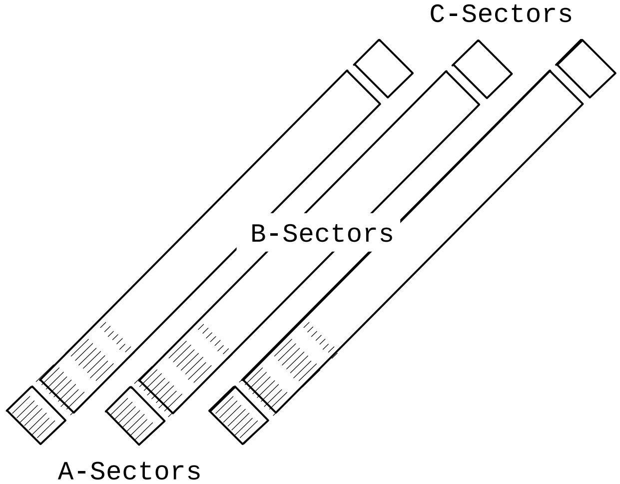

Figure 1 – Sector arrangement for all video standards

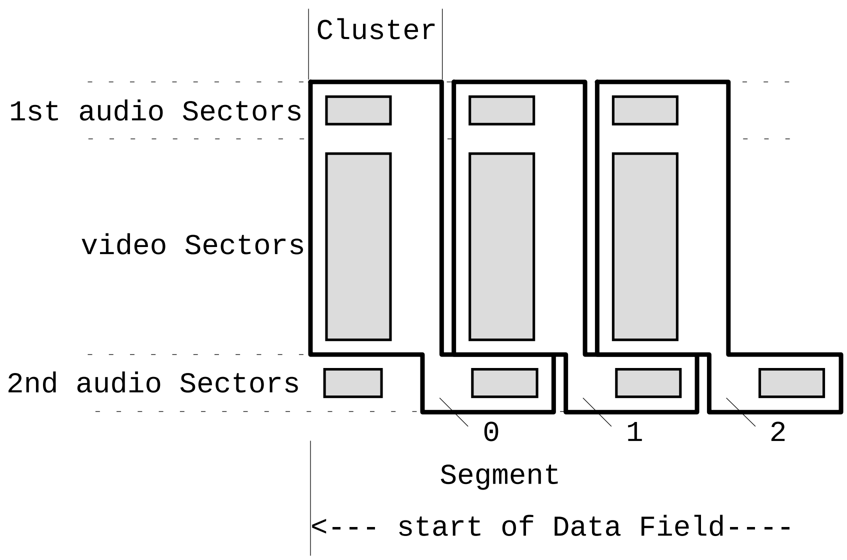

Figure 2 – Segment numbering

Table 1 – Number of segments per data field as parameter of the video standard

No. of active samples/line	No. of active lines/frame	Frames/s	Data fields/frame	Segments/data field SDF
1920	1035	30[1)]	2	5
1920	1080	30[1)]	2	5
1920	1152	25	2	6
1920	1080	24	2	6
1280	720	60	1	5

[1)] All figures in the table related to 30 frames/s are valid as well for a possible recording based on 29.97 frames/s, if not otherwise specified.

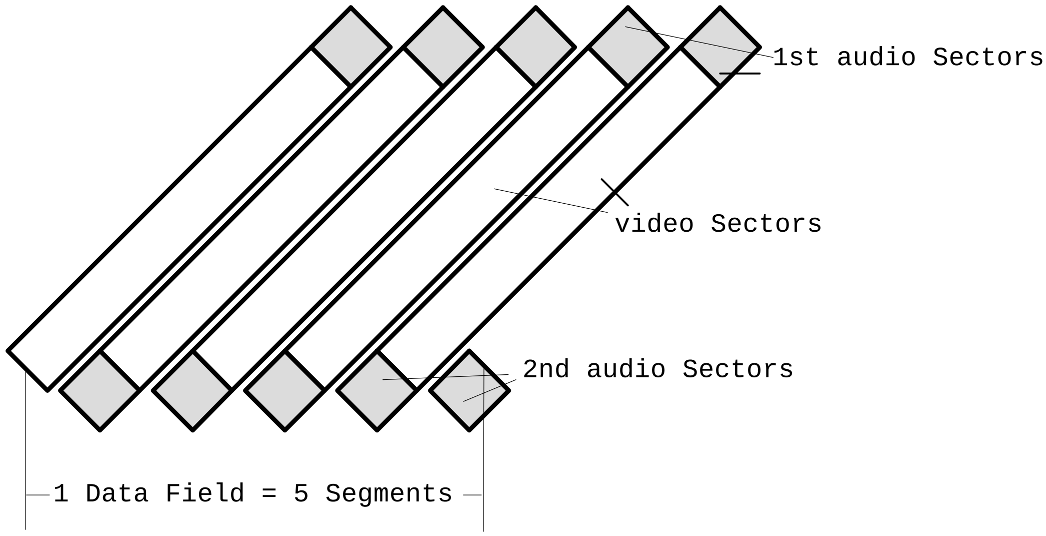

Figure 3 – Location of video and audio for television standards based on 30 frames/s

Table 2 – Distribution of video data within a cluster (numbering of tracks as shown in ANSI/SMPTE 277M)

Track 0	Luminance
Track 1	Chrominance
Track 2	Luminance
Track 3	Chrominance
Track 4	Luminance
Track 5	Chrominance
Track 6	Luminance
Track 7	Chrominance

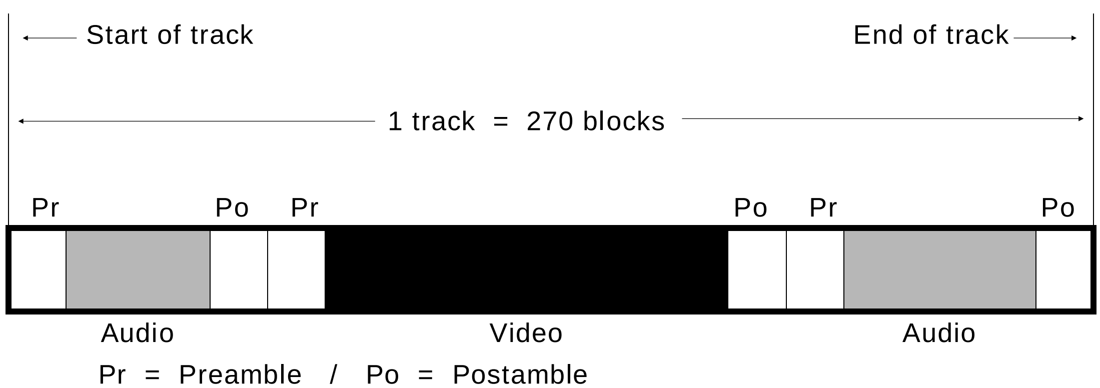

Figure 4 – Track structure

The first and second records of audio are identified by the identification bytes ID 1 and ID 2 (see SMPTE 277M). The numbering of ID 1 along the track and the associated state of bit 0 of byte ID 2 is shown in figure 5. The definition for the remaining seven bits of identification byte ID 2 is given in table 3.

3.3 Synchronization pattern (SYNC)

Each block starts with a synchronization pattern. The SYNC is not subject to channel modulation and is 24 bits on tape. This is equivalent to the length of two data bytes before 8–12 channel modulation (see figure 6). Their task is to synchronize the channel decoder as well as to control word and block synchronization. There are two synchronization patterns. The selection depends on the last modulation bit (numbered '-1' in figure 6).

3.4 Inner error correction

The error correction system is based on a Reed-Solomon product code formed by inner and outer codes. The outer error correction is described in 4.4 and 5.4.

The inner code blocks contain the RData bytes and the preceding block identification (ID), both protected by 16 check bytes (see figure 7).

3.4.1 Check bytes

Parameters:

– field generator polynomial: $x^8 + x^4 + x^3 + x^2 + 1$

– code generator polynomial: $(x+1)\ (x+a)\ (x+a^2)\ (x+a^3)\ (x+a^4)\ (x+a^5)\ (x+a^6)\ (x+a^7)\ (x+a^8)\ (x+a^9)\ (x+a^{10})\ (x+a^{11})\ (x+a^{12})\ (x+a^{13})\ (x+a^{14})\ (x+a^{15})$, where $a = 02_h$ in GF(256)

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

See annex A for examples of check byte patterns.

3.5 Randomization sequences

The randomization of data bytes is based on a randomization table as described in clause 7 of SMPTE 277M. Eight randomizing sequences are used. These sequences are created by using eight different (row/column) addresses for the start of the sequence within that randomization table. The start address will be determined by bits 0, 1, and 2 of the identification byte ID1 (see table 4).

4 Video and data processing

4.1 Processing structure

The block diagrams of the record and playback data processing are shown in figures 8 and 9.

4.2 Intertrack shuffling

The pixels of each video line are distributed equally over all 8 tracks of a cluster. A distribution cycle repeats every eight luminance pixels and eight chrominance pixels. The sequence of tracks within a cycle is varied from line to line and is dependent on the data field number. An example of a distribution cycle is given in figure 10.

4.2.1 Program for track distribution

```
For DFIELD = 0 to 3
  For RLINE = 0 to MAXRLINE
    For PIXEL = 0 to MAXPIXEL
    Track = 2 * ( ( P0 + (PIXEL MOD 4) ) MOD 4)
            + CHROMA
    Next PIXEL
  Next RLINE
Next DFIELD
```

4.2.2 Input parameters

CHROMA: = 0 for Y signal, = 1 for Cr/Cb signal

RLINE: Number of recorded line ($0 \le$ RLINE $\le$ MAXRLINE)

PIXEL: Sample number within a line ($0 \le$ PIXEL $\le$ MAXPIXEL)

DFIELD: Number of data field ($0 \le$ DFIELD ≤ 3)

The relationship of recorded lines (RLINE) to video lines at the video interface is given in table 5.

4.2.3 Auxiliary parameters

The cyclic counting of the data fields is synchronized by the two data field pulse doublet of the control track as described in 9.2.8 of SMPTE 277M. The television standard dependent parameters MAXRLINE and MAXPIXEL are given in table 6. The auxiliary parameter P0 is given in table 7.

Block number		ID 1	bit 0 of ID 2
270	Postamble	85h	1
269		84h	1
268		83h	1
267	Audio	82h	1
266		81h	1
265		80h	1
264	Preamble	7Fh	1
263	Postamble	FEh	0
262		FDh	0
261		FCh	0
260		FBh	0
.		.	.
.	Video	.	.
11		02h	0
10		01h	0
9		00h	0
8	Preamble	FFh	0
7	Postamble	05h	1
6		04h	1
5		03h	1
4	Audio	02h	1
3		01h	1
2		00h	1
1	Preamble	FFh	1

Figure 5 – IDs within one track

Table 3 – Definition of bits 1 to 7 of identification byte ID 2

No. of active lines/frame	Frames/s	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
1035	30/29.97	1/0	1	1	0	0	0	0
1080	30/29.97	1/0	1	1	1	0	0	0
1152	25	1	0	0	1	0	0	0
1080	24	0	0	1	1	1	0	0
720	60	1	1	0	0	1	0	0

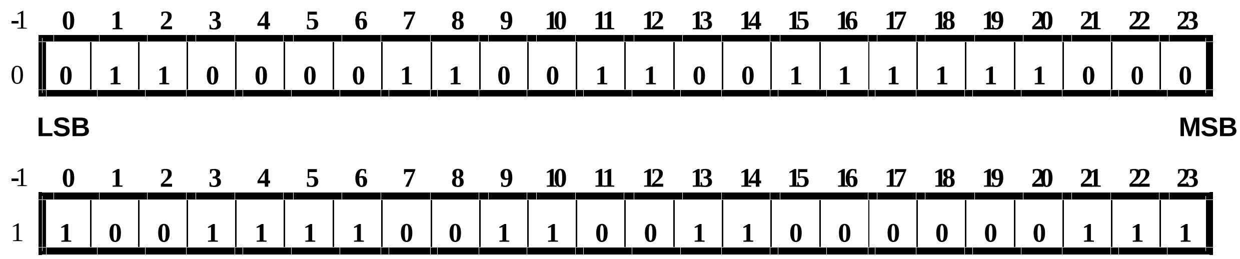

Figure 6 – Synchronization pattern

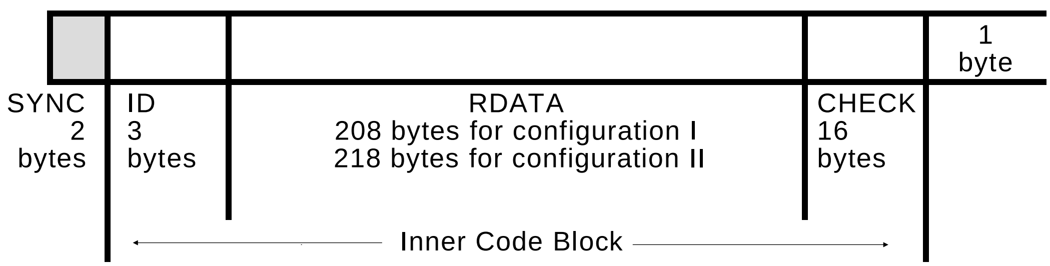

Figure 7 – Structure of the inner code block before channel modification

Table 4 – Relationship between randomizing sequences and ID1 (for row/column see clause 6 of ANSI/SMPTE 277M)

ID1 bit 0	ID1 bit 1	ID1 bit 2	Start address (row/column
0	0	0	00/0
1	0	0	D0/0
0	1	0	A0/1
1	1	0	70/2
0	0	1	40/3
1	0	1	10/4
0	1	1	E0/4
1	1	1	B0/5

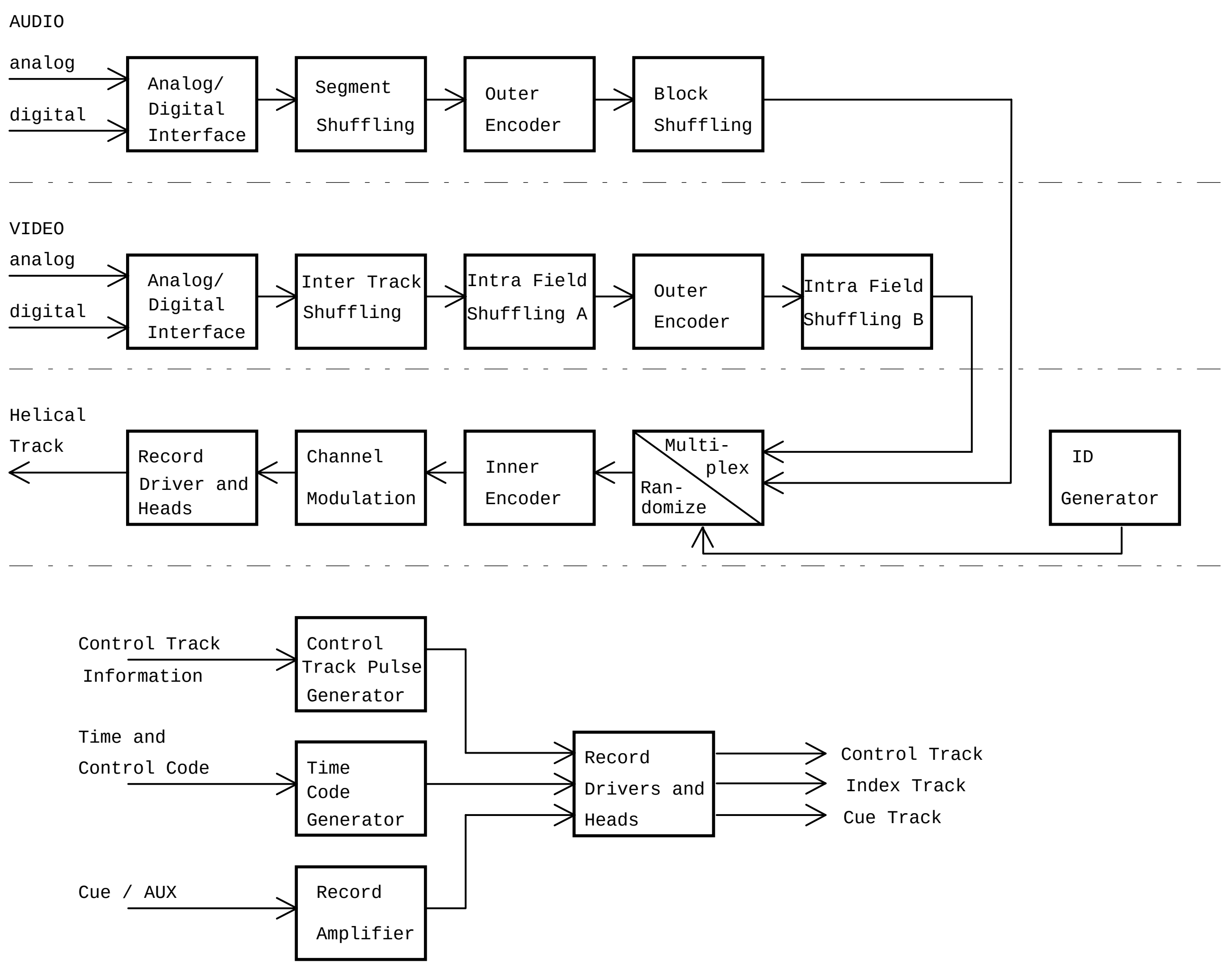

Figure 8 – Record signal processing

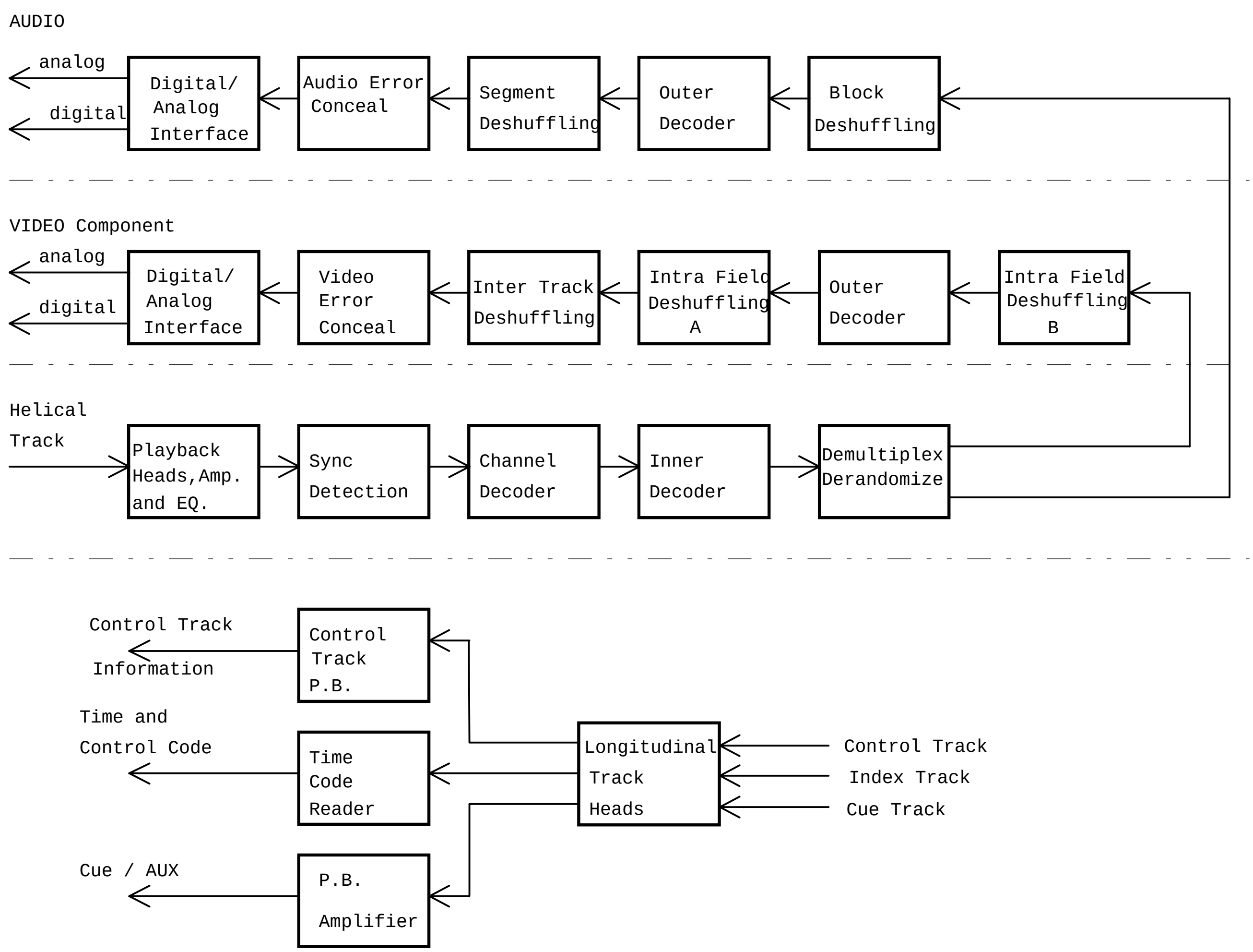

Figure 9 – Playback signal processing

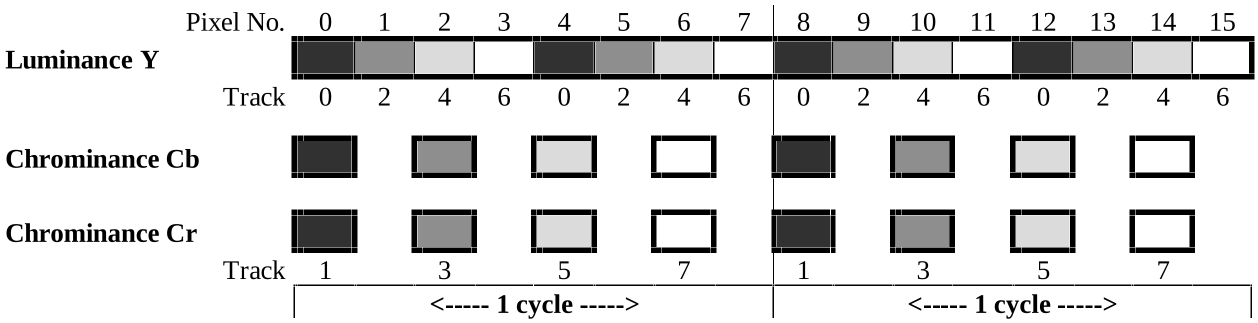

Figure 10 – Intertrack shuffling for RLINE 0 and DFIELD 0

Table 5 – Relationship of recorded lines (RLINE) to video lines

Even-numbered DFIELDs					
No. of active lines/frame	Frames/s	First video line recorded (equivalent RLINE)	Last video line recorded	User lines recorded	Manufacturer RLINEs 1)
1035	30/29.97	38 (0)	557	38–40	—
1080	30/29.97	18 (2)	560	18–20	0, 1
1152	25	42 (21)	620	42–44	0-20, 600-623
1080 (p) 2)	24	37 (2)	581	37–41	0, 1, 547–653
720 (p) 2)	60	22 (2)	744	22–24	0, 1, 725–779
Odd-numbered DFIELDs					
1035	30/29.97	601 (0)	1120	601, 602	—
1080	30/29.97	582 (3)	1123	582, 583	0, 1, 2
1152	25	668 (22)	1245	668, 669	0–21, 600–623
1080 (p) 2)	24	582 (5)	1121	—	0, 1, 2, 3, 4, 545–653
720 (p) 2)	60	22 (2)	744	22–24	0, 1, 725–779

1) Manufacturer lines are internal to the recorder only.
2) p = progressive.

Table 6 – Television standard dependent parameters

No. of active lines/frame	Frames/s	MAXRLINE	MAXPIXEL Y	MAXPIXEL C_r, C_b
1035	30/29.97	519	1919	959
1080	30/29.97	544	1919	959
1152	25	623	1919	959
1080	24	653	1919	959
720	60	779	1279	639

4.2.4 Output parameter

TRACK: Track number (0 < = TRACK < = 7)

4.3 Intrafield shuffling

Data shuffling is performed over one data field. The shuffling sequence is created by writing to a shuffling memory array (see figure 11) in a shuffling sequence and reading the array in a different shuffling sequence. The size of the array corresponds to 1/8 of the amount of data within one data field. There is an array for each track number. After writing to the array, the outer error protection encoding is performed.

4.3.1 Writing sequence for the shuffling array

Program for writing sequence:

```
For RLINE = 0 to MAXRLINE
   For PIXEL = 0 to MAXPIXEL
      ROW = ( P1 * P3 + P2 * RLINE ) MOD 240
      DGROUP = RLINE MOD SDF
      COLUMN = 2*INTEGER ( RLINE/SDF ) + P4
   Next PIXEL
Next RLINE
```

4.3.1.1 Input parameters

RLINE: Number of recorded line (0 ≤ RLINE ≤ MAXRLINE)

PIXEL: Sample number within a line (0 ≤ PIXEL ≤ MAXPIXEL)

SDF: Number of segments per data field (see table 1)

4.3.1.2 Auxiliary parameters

P1 = 67

P2 = 85

P3 = INTEGER (PIXEL/4) MOD 240

P4 = { INTEGER (PIXEL/960) for Y component of video
{0 for C_b component of video
{1 for C_r component of video

4.3.1.3 Output (array) definitions

ROW: Byte number within an outer block
(0 ≤ ROW ≤ 239 datas)
(240 ≤ ROW ≤ 253 outer check bytes)

DGROUP: Data group number in the shuffling array (0 ≤ DGROUP ≤ SDF – 1)

COLUMN: Location of a pixel within a data group (0 ≤ COLUMN ≤ COLMAX). Parameter COLMAX is given in table 8.

The data group contains all data bytes which will form the data content of a block on tape. The location of the data group on tape is defined by the read sequence for the shuffling array (see table 8).

4.3.2 Reading sequence for the shuffling array

Program for reading the shuffling array:

```
BEGIN
   For P8 = 0 TO P6-1
      SEGM = INTEGER ( ( (P8 – P9 + P6) MOD P6) / 240)
      BLOCK = SDF * INTEGER ( P10/SDF ) +
                 ((P10 + P7*SEGM + P7) MOD SDF) + 23
   Next P8
   For P8 = P6 TO P5
      SEGM   = INTEGER ( ( P8 – P6) / 14 )
      BLOCK  = ( P8 – P6 ) MOD 14 + 9
   Next P8
END
```

4.3.2.1 Input parameters

RLINE: Number of recorded line (0 ≤ RLINE ≤ MAXRLINE)

ROW: Byte number within an outer block (0 ≤ ROW ≤ 253)

DFIELD: Data field number (0 ≤ DFIELD ≤ 3)

TRACK: Track number (0 ≤ TRACK ≤ 7)

DGROUP: Data group number in the array (0 ≤ DGROUP ≤ SDF-1)

COLUMN: Location of a pixel within a data group (0 ≤ COLUMN ≤ COLMAX)

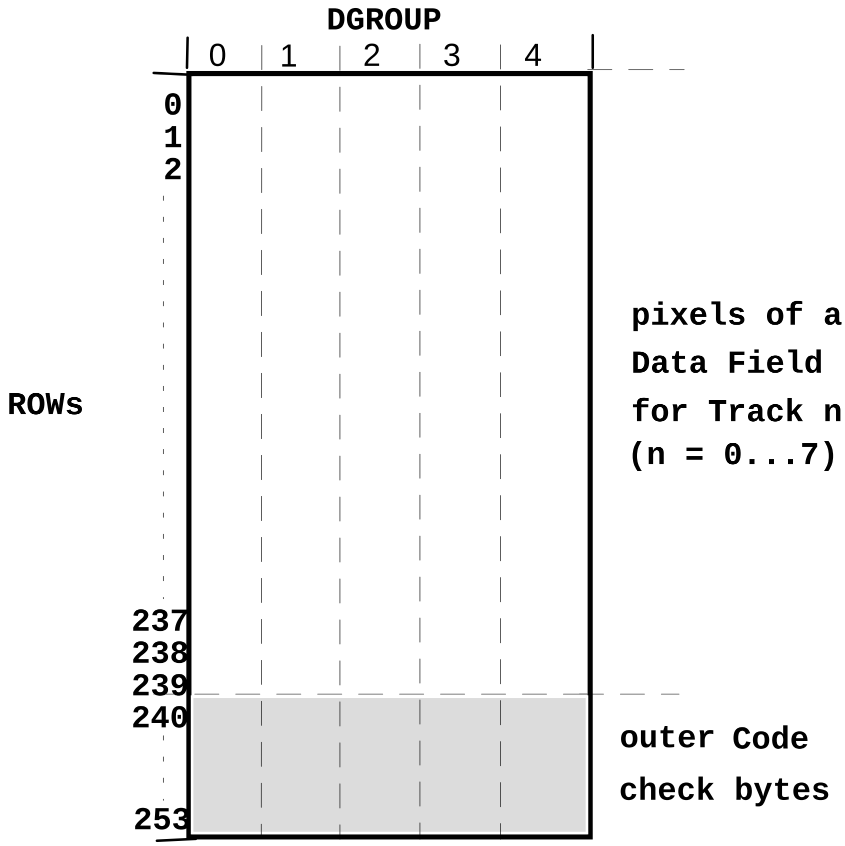

Figure 11 – Shuffling array for standards with 30 frames/s

Table 7 – Auxiliary parameter P0 as function of DFIELD and RLINE

DFIELD mod 2	RLINE mod 4	P0
0	0	0
0	1	2
0	2	3
0	3	1
1	0	3
1	1	1
1	2	0
1	3	2

Table 8 – Parameter COLMAX

Standard	1035/30 1035/29.97	1080/30 1080/29.97	1152/25	1080/24	720/60
COLMAX	207	217	207	217	207

4.3.2.2 Auxiliary parameters

The auxiliary parameters shall be in accord with table 9.

P8 = SDF*ROW + DGROUP
P9 = 300*INTEGER (TRACK/2) + 60*DFIELD
P10 = (P8 – P9 + P6) MOD 240

4.3.2.4 Output parameters

SEGM: Segment number of block ($0 \leq SEGM \leq SDF-1$)

BLOCK: Number of a block within a track ($9 \leq BLOCK \leq 262$)

The number BLOCK defines the location of the data group within the track. The number SEGM defines the number of the segment to which the data group belongs.

4.4 Outer error correction

The error correction system is based on a Reed-Solomon product code formed by inner and outer codes. The inner error correction is described in 3.4.

The outer error correction calculates 14 check bytes for the 240 data bytes shown in the columns of figure 11. The check bytes are appended to the end of the data bytes at the bottom of the shuffling array.

4.4.1 Parameters

– Field generator polynomial: $x^8 + x^4 + x^3 + x^2 + 1$

– Code generator polynomial: $(x+1)\ (x+a)\ (x+a^2)\ (x+a^3)\ (x+a^4)\ (x+a^5)\ (x+a^6)\ (x+a^7)\ (x+a^8)\ (x+a^9)\ (x+a^{10})\ (x+a^{11})\ (x+a^{12})\ (x+a^{13})$, where a = 02 (hex) in GF(256)

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

See annex A for examples of check byte patterns.

5 Audio processing

5.1 Introduction

The number of audio channels is determined by the recorded HDTV standard as defined in table 10.

Table 9 – Television standard dependent auxiliary parameters

Standard	1035/30 1035/29.97	1080/30 1080/29.97	1152/25	1080/24	720/60
P5	1269	1269	1523	1523	1269
P6	1200	1200	1440	1440	1200
P7	1	1	4	4	1

Table 10 – Number of audio channels and samples as a function of the television standard

Active lines/frame	Frames/s	No. of audio channels	No. of audio samples/channel/data field
1035	30/29.97	10	800
1035	30/29.97	10	800/801
1080	30	10	800
1080	29.97	10	800/801
1152	25	12	960
1080	24	12	1000
720	60	10	800

Channels are processed in 5 or 6 pairs. Channels 1/2, 3/4, 5/6, 7/8, 9/10, and 11/12 form pairs that are independently and identically processed.

Audio words of the channel pairs are written into an array having the size of an audio sector. Control words are multiplexed with the audio words in the product block to provide housekeeping in the interface and in processing. After the addition of error protection data in the vertical (column) direction, the audio data are shuffled by using a different read sequence. Error protection in the horizontal (row) direction is common with the video data.

5.2 Source coding

Audio record data are formed independently from the audio and ancillary data at the input interface for each of the 10 audio channels for 30-Hz standards or 12 audio channels for 24-Hz and 25-Hz standards. The AES/EBU inputs meet the requirements of ANSI S4.40.

These data include audio samples, channel status data (C), user data (U), and validity bits (V).

5.2.1 Source data are defined as follows:

a) Audio sample: Sampling frequency 48 kHz, synchronous with video
Word length: 24 bits
Coding: Twos complement linear PCM

b) Channel status data

Bit rate: One bit per audio sample
Block length: 192 bits, 24 bytes
Coding: See ANSI S4.40

Channel status bytes 0 and 1 are used to derive internal control words as described in 5.3.5.3.

c) User data

Bit rate: One bit associated with each audio word

d) Validity bit

Bit rate: One bit associated with each audio word
Coding: 0 = sample valid; 1 = sample defective

5.2.2 Every 24-bit audio word recorded is composed of three 8-bit words:

Word a: Bit 0...3 – Content depends on selected length mode as described in 5.3.5.5 (see figures 15–17).

Bit 4...7 – Audio data bit 0..3 of audio sample

Word b: Audio data bit 4..11 of audio sample

Word c: Audio data bit 12..19 of audio sample

5.3 Source processing

5.3.1 Introduction

Audio data are processed in data fields. For 30-Hz television standards, each data field contains 10 sectors with audio (see figure 3) or 12 sectors (see figure 12) for 24-Hz or 25-Hz standards. The data for a channel pair are identical for the first and second audio sector, but differ in the block shuffling.

The number of audio samples per data field per channel is dependent on the television standard, and defined in table 10. In addition, a number of control bytes are added to the data.

5.3.2 Relative video-to-audio timing

Audio input samples time coincident with the beginning of the first line of the video frame at the video input will be recorded at the beginning of the first audio data fields in each video frame. The tolerance is ± 20 audio samples. At this location, the audio word numbering starts with WORD 0.

5.3.3 Shuffling array

An audio sector (two audio channels) is processed as an audio array with 40 by 208 bytes for configuration I, and 40 by 218 bytes for configuration II.

Each recorded audio word has a length of 24 bits. It contains a 24-bit audio sample or a 20-bit audio sample plus 4-bit ancillary data as described in 5.3.5.5. The distribution of the audio words within one audio sector, including control words and outer error protection data, is shown in table 11 for configuration I and table 12 for configuration II. Data bytes not related to audio words or control bytes are set to 00_h.

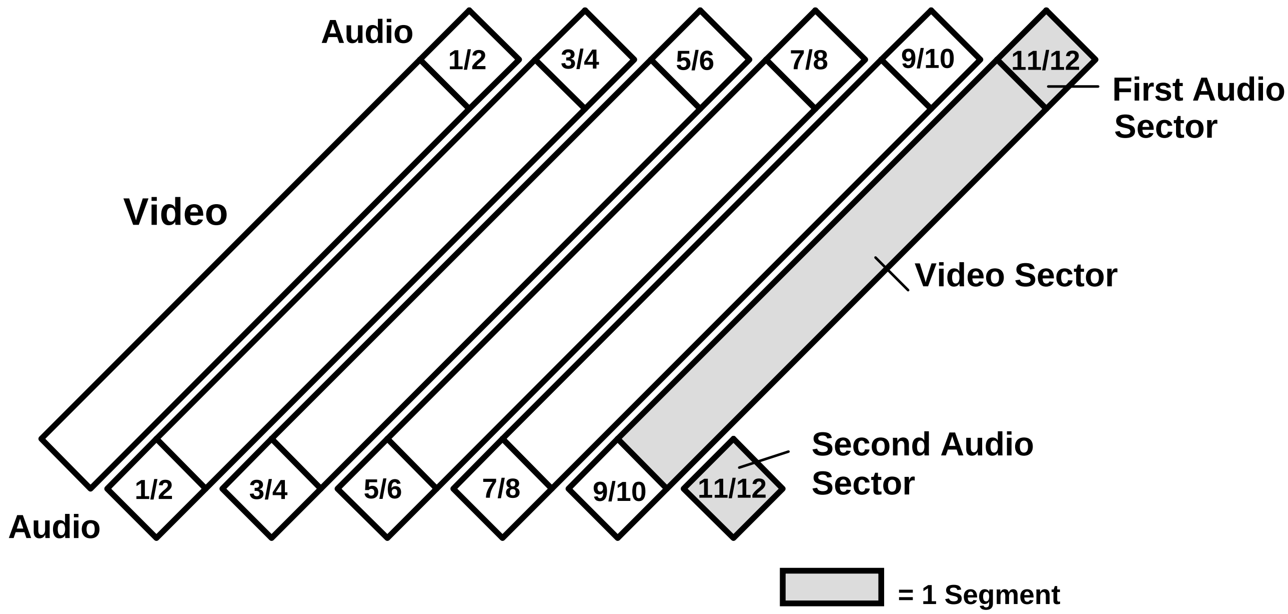

Figure 12 – Distribution of audio channels within a data field with 6 segments (24-Hz and 25-Hz video standards)

5.3.4 Block shuffling

The block shuffling for the first audio sector is described in table 13, and for the second audio sector in table 14 .

5.3.5 Control bytes

Control bytes are generated from incoming data or internally, providing information necessary for data processing and the output interface. The position of all control words within a data field is shown in tables 11 and 12.

5.3.5.1 ELAP

Indicates that an audio edit has occurred at the data field boundaries and defines the type of edit. The possible types of edit are described in figure 13. Editing is performed on channel pairs.

5.3.5.2 STAND

Contains information about the number of data fields per second.

5.3.5.3 CHPR1 and CHPR2

Contains 4 bits of channel status byte 0 and 4 bits of channel status byte 1 as defined in figure 14. CHPR1 is related to audio channel 1 and CHPR2 to audio channel 2.

5.3.5.4 TIME 0/1/2/3/4/5

These control bytes contain time information in the format in table 17.

All types of time information are defined by a two-digit number. Each digit is a BCD coded 4-bit word. Bits 0..3 of the TIME control bytes are used for the lower digit and bits 4..7 are used for the higher digit.

Table 11 – Audio array for configuration I (Block length = 229 bytes)

COLUMN	0	1	2	3	172	173	204	205	206	207
AROW 0	Word a/0/1	Word b/0/1	Word c/0/1	Word a/14/1	Word b/798/1	Word c/798/1	Word a/952/1	Word b/952/1	Word c/952/1	ELAP
AROW 1	Word a/0/2	Word b/0/2	Word c/0/2	Word a/14/2	Word b/798/2	Word c/798/2	Word a/952/2	Word b/952/2	Word c/952/2	ELAP
AROW 2	Word a/1/1	Word b/1/1	Word c/1/1	Word a/15/1	Word b/799/1	Word c/799/1	Word a/953/1	Word b/953/1	Word c/953/1	ELAP
AROW 3	Word a/1/2	Word b/1/2	Word c/1/2	Word a/15/2	Word b/799/2	Word c/799/2	Word a/953/2	Word b/953/2	Word c/953/2	ELAP
AROW 4	Word a/2/1	Word b/2/1	Word c/2/1	Word a/16/1	Word b/800/1	Word c/800/1	Word a/954/1	Word b/954/1	Word c/954/1	STAND
AROW 5	Word a/2/2	Word b/2/2	Word c/2/2	Word a/16/2	Word b/800/2	Word c/800/2	Word a/954/2	Word b/954/2	Word c/954/2	STAND
AROW 6	Word a/3/1	Word b/3/1	Word c/3/1	Word a/17/1	Word b/801/1	Word c/801/1	Word a/955/1	Word b/955/1	Word c/955/1	STAND
AROW 7	Word a/3/2	Word b/3/2	Word c/3/2	Word a/17/2	Word b/801/2	Word c/801/2	Word a/955/2	Word b/955/2	Word c/955/2	STAND
AROW 8	Word a/4/1	Word b/4/1	Word c/4/1	Word a/18/1	Word b/802/1	Word c/802/1	Word a/956/1	Word b/956/1	Word c/956/1	CHPR/1
AROW 9	Word a/4/2	Word b/4/2	Word c/4/2	Word a/18/2	Word b/802/2	Word c/802/2	Word a/956/2	Word b/956/2	Word c/956/2	CHPR/2
AROW 10	Word a/5/1	Word b/5/1	Word c/5/1	Word a/19/1	Word b/803/1	Word c/803/1	Word a/957/1	Word b/957/1	Word c/957/1	TIME 0
AROW 11	Word a/5/2	Word b/5/2	Word c/5/2	Word a/19/2	Word b/803/2	Word c/803/2	Word a/957/2	Word b/957/2	Word c/957/2	TIME 1
AROW 12	Word a/6/1	Word b/6/1	Word c/6/1	Word a/20/1	Word b/804/1	Word c/804/1	Word a/958/1	Word b/958/1	Word c/958/1	TIME 2
AROW 13	Word a/6/2	Word b/6/2	Word c/6/2	Word a/20/2	Word b/804/2	Word c/804/2	Word a/958/2	Word b/958/2	Word c/958/2	TIME 3
AROW 14	Word a/7/1	Word b/7/1	Word c/7/1	Word a/21/1	Word b/805/1	Word c/805/1	Word a/959/1	Word b/959/1	Word c/959/1	TIME 4
AROW 15	Word a/7/2	Word b/7/2	Word c/7/2	Word a/21/2	Word b/805/2	Word c/805/2	Word a/959/2	Word b/959/2	Word c/959/2	TIME 5
AROW 16	Word a/8/1	Word b/8/1	Word c/8/1	Word a/22/1	Word b/806/1	Word c/806/1	ASUB0	ETI12	ETI0	AMODE
AROW 17	Word a/8/2	Word b/8/2	Word c/8/2	Word a/22/2	Word b/806/2	Word c/806/2	ASUB1	ETI13	ETI1	ERRFLG
AROW 18	Word a/9/1	Word b/9/1	Word c/9/1	Word a/23/1	Word b/807/1	Word c/807/1	ASUB2	ETI14	ETI2	WCNT
AROW 19	Word a/9/2	Word b/9/2	Word c/9/2	Word a/23/2	Word b/807/2	Word c/807/2	ASUB3	ETI15	ETI3	WCNT
AROW 20	Word a/10/1	Word b/10/1	Word c/10/1	Word a/24/1	Word b/808/1	Word c/808/1	00	ETI16	ETI4	WCNT
AROW 21	Word a/10/2	Word b/10/2	Word c/10/2	Word a/24/2	Word b/808/2	Word c/808/2	00	ETI17	ETI5	WCNT
AROW 22	Word a/11/1	Word b/11/1	Word c/11/1	Word a/25/1	Word b/809/1	Word c/809/1	00	RTI0	ETI6	00
AROW 23	Word a/11/2	Word b/11/2	Word c/11/2	Word a/25/2	Word b/809/2	Word c/809/2	00	RTI1	ETI7	00
AROW 24	Word a/12/1	Word b/12/1	Word c/12/1	Word a/26/1	Word b/810/1	Word c/810/1	00	ASTC0	ETI8	00
AROW 25	Word a/12/2	Word b/12/2	Word c/12/2	Word a/26/2	Word b/810/2	Word c/810/2	00	ASTC1	ETI9	00
AROW 26	Word a/13/1	Word b/13/1	Word c/13/1	Word a/27/1	Word b/811/1	Word c/811/1	00	ASTC2	ETI10	00
AROW 27	Word a/13/2	Word b/13/2	Word c/13/2	Word a/27/2	Word b/811/2	Word c/811/2	00	ASTC3	ETI11	00
AROW 28	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0
AROW 29	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1
AROW 30	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2
AROW 31	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3
AROW 32	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4
AROW 33	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5
AROW 34	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6
AROW 35	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7
AROW 36	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8
AROW 37	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9
AROW 38	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10
AROW 39	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11

NOTE – Word x/yyy/z – > x: (a = bit 0–7, b = bit 8–15, c = bit 16–23) / yyy = sample number / z = channel number.

Table 12 – Audio array for configuration II (Block length = 239 bytes)

COLUMN	0	1	204	205	206	207	213	214	215	216	217
AROW 0	Word a/0/1	Word b/0/1	Word a/952/1	Word b/952/1	Word c/952/1	Word a/966/1	Word a/994/1	Word b/994/1	Word c/994/1	ELAP	00
AROW 1	Word a/0/2	Word b/0/2	Word a/952/2	Word b/952/2	Word c/952/2	Word a/966/2	Word a/994/2	Word b/994/2	Word c/994/2	ELAP	00
AROW 2	Word a/1/1	Word b/1/1	Word a/953/1	Word b/953/1	Word c/953/1	Word a/967/1	Word a/995/1	Word b/995/1	Word c/995/1	ELAP	00
AROW 3	Word a/1/2	Word b/1/2	Word a/953/2	Word b/953/2	Word c/953/2	Word a/967/2	Word a/995/2	Word b/995/2	Word c/995/2	ELAP	00
AROW 4	Word a/2/1	Word b/2/1	Word a/954/1	Word b/954/1	Word c/954/1	Word a/968/1	Word a/996/1	Word b/996/1	Word c/996/1	STAND	00
AROW 5	Word a/2/2	Word b/2/2	Word a/954/2	Word b/954/2	Word c/954/2	Word a/968/2	Word a/996/2	Word b/996/2	Word c/996/2	STAND	00
AROW 6	Word a/3/1	Word b/3/1	Word a/955/1	Word b/955/1	Word c/955/1	Word a/969/1	Word a/997/1	Word b/997/1	Word c/997/1	STAND	00
AROW 7	Word a/3/2	Word b/3/2	Word a/955/2	Word b/955/2	Word c/955/2	Word a/969/2	Word a/997/2	Word b/997/2	Word c/997/2	STAND	00
AROW 8	Word a/4/1	Word b/4/1	Word a/956/1	Word b/956/1	Word c/956/1	Word a/970/1	Word a/998/1	Word b/998/1	Word c/998/1	CHPR/1	00
AROW 9	Word a/4/2	Word b/4/2	Word a/956/2	Word b/956/2	Word c/956/2	Word a/970/2	Word a/998/2	Word b/998/2	Word c/998/2	CHPR/2	00
AROW 10	Word a/5/1	Word b/5/1	Word a/957/1	Word b/957/1	Word c/957/1	Word a/971/1	Word a/999/1	Word b/999/1	Word c/999/1	TIME 0	00
AROW 11	Word a/5/2	Word b/5/2	Word a/957/2	Word b/957/2	Word c/957/2	Word a/971/2	Word a/999/2	Word b/999/2	Word c/999/2	TIME 1	00
AROW 12	Word a/6/1	Word b/6/1	Word a/958/1	Word b/958/1	Word c/958/1	Word a/972/1	00	00	00	TIME 2	00
AROW 13	Word a/6/2	Word b/6/2	Word a/958/2	Word b/958/2	Word c/958/2	Word a/972/2	00	00	00	TIME 3	00
AROW 14	Word a/7/1	Word b/7/1	Word a/959/1	Word b/959/1	Word c/959/1	Word a/973/1	00	00	00	TIME 4	00
AROW 15	Word a/7/2	Word b/7/2	Word a/959/2	Word b/959/2	Word c/959/2	Word a/973/2	00	00	00	TIME 5	00
AROW 16	Word a/8/1	Word b/8/1	Word a/960/1	Word b/960/1	Word c/960/1	Word a/974/1	ASUB0	ETI12	ETI0	AMODE	00
AROW 17	Word a/8/2	Word b/8/2	Word a/960/2	Word b/960/2	Word c/960/2	Word a/974/2	ASUB1	ETI13	ETI1	ERRFLG	00
AROW 18	Word a/9/1	Word b/9/1	Word a/961/1	Word b/961/1	Word c/961/1	Word a/975/1	ASUB2	ETI14	ETI2	WCNT	00
AROW 19	Word a/9/2	Word b/9/2	Word a/961/2	Word b/961/2	Word c/961/2	Word a/975/2	ASUB3	ETI15	ETI3	WCNT	00
AROW 20	Word a/10/1	Word b/10/1	Word a/962/1	Word b/962/1	Word c/962/1	Word a/976/1	00	ETI16	ETI4	WCNT	00
AROW 21	Word a/10/2	Word b/10/2	Word a/962/2	Word b/962/2	Word c/962/2	Word a/976/2	00	ETI17	ETI5	WCNT	00
AROW 22	Word a/11/1	Word b/11/1	Word a/963/1	Word b/963/1	Word c/963/1	Word a/977/1	00	RTI0	ETI6	00	00
AROW 23	Word a/11/2	Word b/11/2	Word a/963/2	Word b/963/2	Word c/963/2	Word a/977/2	00	RTI1	ETI7	00	00
AROW 24	Word a/12/1	Word b/12/1	Word a/964/1	Word b/964/1	Word c/964/1	Word a/978/1	00	ASTC0	ETI8	00	00
AROW 25	Word a/12/2	Word b/12/2	Word a/964/2	Word b/964/2	Word c/964/2	Word a/978/2	00	ASTC1	ETI9	00	00
AROW 26	Word a/13/1	Word b/13/1	Word a/965/1	Word b/965/1	Word c/965/1	Word a/979/1	00	ASTC2	ETI10	00	00
AROW 27	Word a/13/2	Word b/13/2	Word a/965/2	Word b/965/2	Word c/965/2	Word a/979/2	00	ASTC3	ETI11	00	00
AROW 28	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0	PV0
AROW 29	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1	PV1
AROW 30	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2	PV2
AROW 31	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3	PV3
AROW 32	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4	PV4
AROW 33	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5	PV5
AROW 34	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6	PV6
AROW 35	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7	PV7
AROW 36	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8	PV8
AROW 37	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9	PV9
AROW 38	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10	PV10
AROW 39	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11	PV11

NOTE – Word x/yyy/z – > x: (a = bit 0–7, b = bit 8–15, c = bit 16–23) / yyy = sample number / z = channel number.

Table 13 – Block shuffling for first audio sector

ARow No.	Track No.	Block No.
0	5	266
1	4	266
2	7	266
3	6	266
4	1	266
5	0	266
6	3	266
7	2	266
8	5	267
9	4	267
10	7	267
11	6	267
12	1	267
13	0	267
14	3	267
15	2	267
16	5	268
17	4	268
18	7	268
19	6	268

ARow No.	Track No.	Block No.
20	1	268
21	0	268
22	3	268
23	2	268
24	5	269
25	4	269
26	7	269
27	6	269
28	1	269
29	0	269
30	3	269
31	2	269
32	5	265
33	4	265
34	7	265
35	6	265
36	1	265
37	0	265
38	3	265
39	2	265

Table 14 – Block shuffling for second audio sector

ARow No.	Track No.	Block No.
0	0	3
1	1	3
2	2	3
3	3	3
4	4	3
5	5	3
6	6	3
7	7	3
8	0	4
9	1	4
10	2	4
11	3	4
12	4	4
13	5	4
14	6	4
15	7	4
16	0	5
17	1	5
18	2	5
19	3	5

ARow No.	Track No.	Block No.
20	4	5
21	5	5
22	6	5
23	7	5
24	0	6
25	1	6
26	2	6
27	3	6
28	4	6
29	5	6
30	6	6
31	7	6
32	0	2
33	1	2
34	2	2
35	3	2
36	4	2
37	5	2
38	6	2
39	7	2

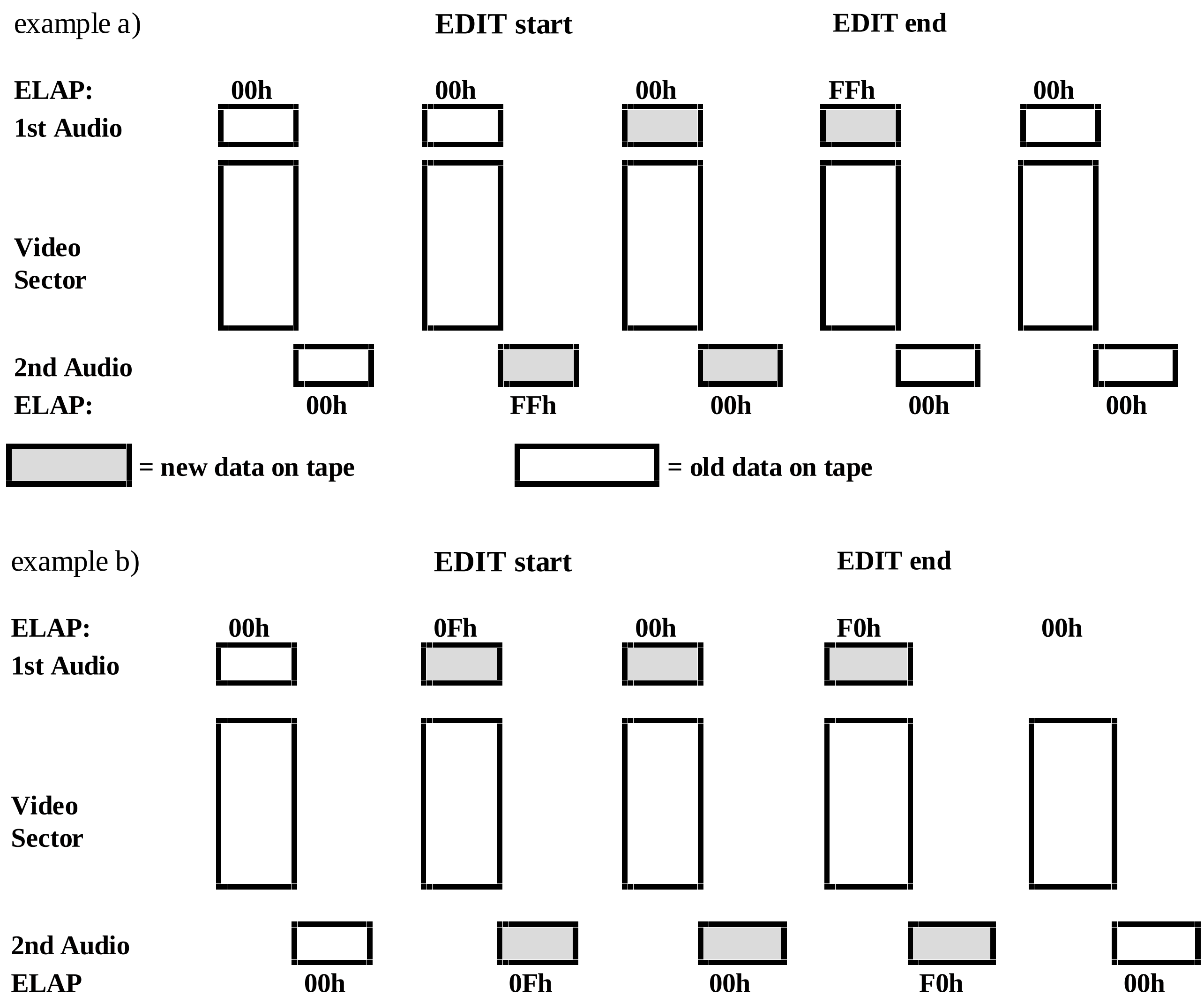

Figure 13 – Two examples (showing one segment only) of an audio insert edit

Table 15 – Definition of ELAP

	ELAP							
	LSB							MSB
Type of edit	0	1	2	3	4	5	6	7
None	0	0	0	0	0	0	0	0
Start or end: 1st or 2nd audio sector new	1	1	1	1	1	1	1	1
Start: 1st and 2nd audio sector new	1	1	1	1	0	0	0	0
End: 1st and 2nd audio sector new	0	0	0	0	1	1	1	1
Not defined	Other combinations							

Table 16 – Control byte STAND

	LSB							MSB
Data fields/s	0	1	2	3	4	5	6	7
48	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	1	0
59.94	0	0	0	0	0	0	0	1
60	0	0	0	0	0	0	1	1

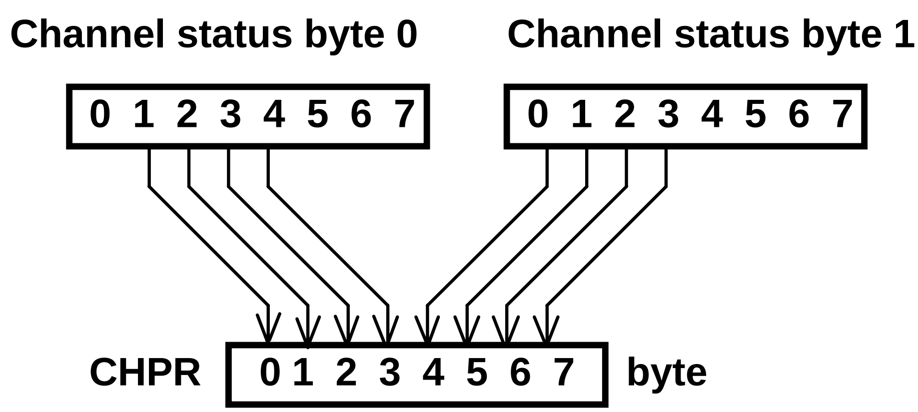

Figure 14 – Generating the CHPR byte from channel status bytes

Table 17 – Time information

Control byte	TIME 5	TIME 4	TIME 3	TIME 2	TIME 1	TIME 0
Type	year	month	day	hour	minute	second
2 digits	YY	MM	DD	hh	mm	ss
Maximum value	99	12	31	23	59	59

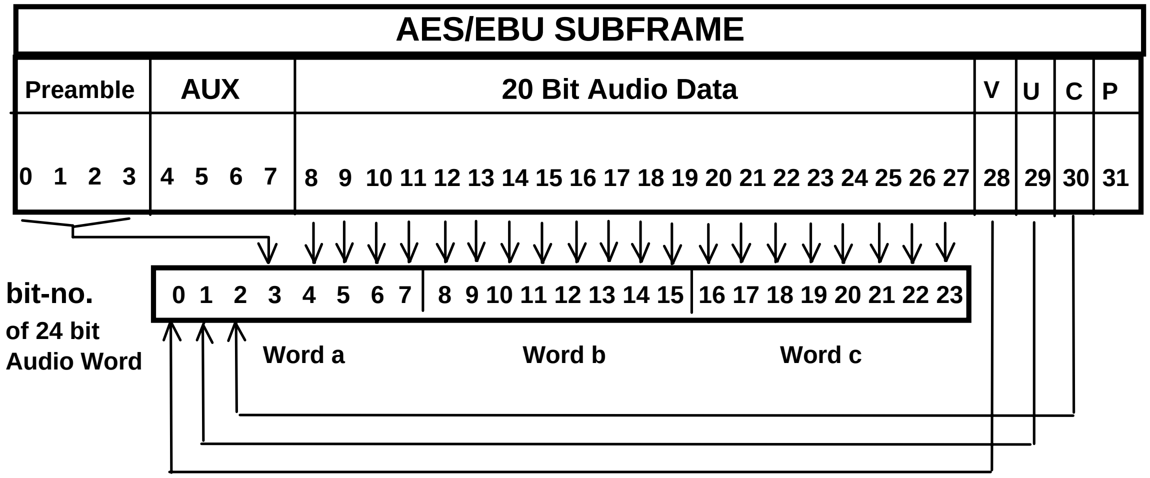

Figure 15 – 24-bit distribution for length mode 0

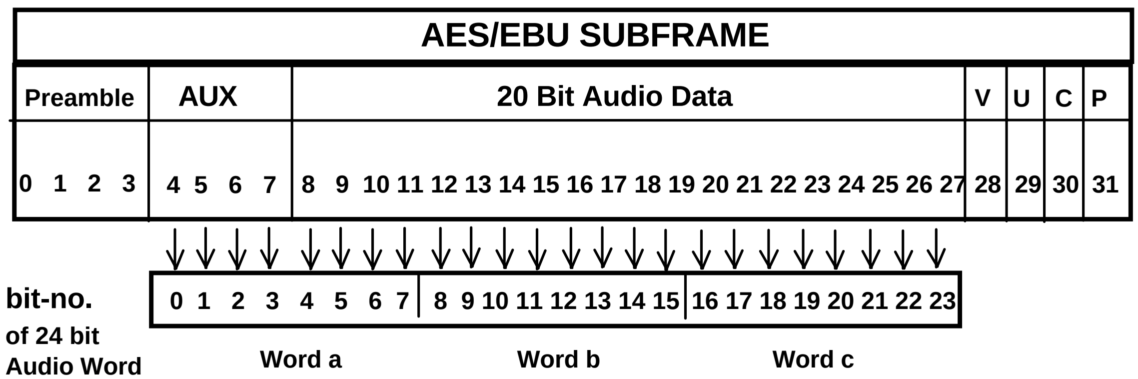

Figure 16 – 24-bit distribtiion for length mode 1

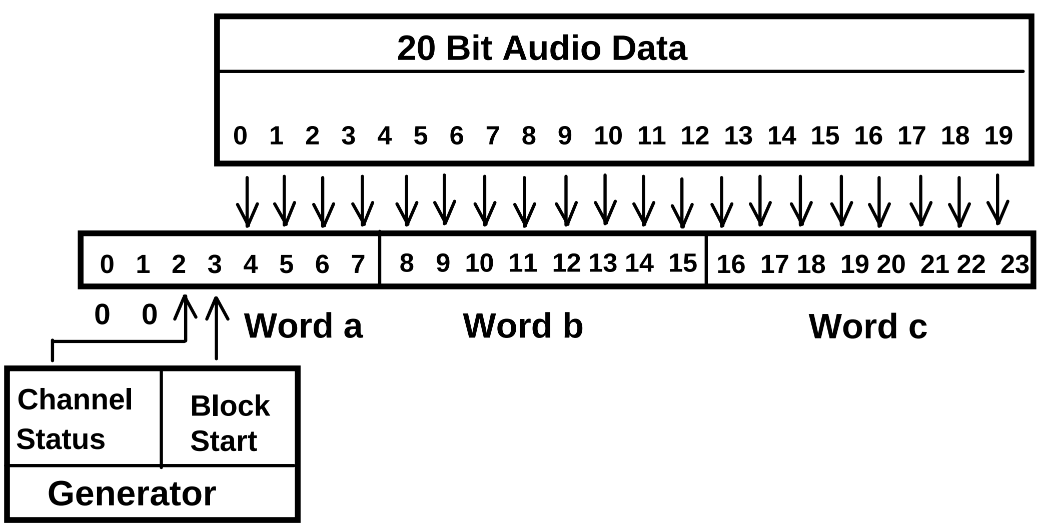

Figure 17 – 24-bit distribution for length mode 2

5.3.5.5 AMODE

This word specifies the source of an audio channel pair and defines the 24-bit audio word usage for a channel pair.

All bits of the control word AMODE, with the exception of bit 6, are defined in table 18. Bit 6 specifies the use of 24-bit audio words for a non-audio application. This bit follows bit 1 of the channel status byte 0. It is defined as follows:

Bit 6 = '0' : Normal audio mode
Bit 6 = '1' : Nonaudio mode

Table 18 – AMODE coding

Type	Bit 0	1	2	3	4	5	6	7
Length mode 0	0	0	0	0	0	0	X	1
Length mode 1	1	1	1	1	0	0	X	1
Length mode 2	0	0	0	0	0	0	X	0

For a nonaudio application, concealment must be disabled and ELAP set to first and second audio sector new (see table 15).

Length mode 0: The 24-bit audio word contains 20 bits of sampled audio data, 1 validity bit (V), 1 user bit (U), 1 channel status bit (C), and 1 block start bit.

Word a: Bit 0: Bit 28 of AES/EBU subframe
Bit 1: Bit 29 of AES/EBU subframe
Bit 2: Bit 30 of AES/EBU subframe
Bit 3: Block start bit, set to "1" if the biphase coded preamble equals "11101000" or "00010111" (see ANSI S4.40 clause 2.4)
Bits 4...7: Bit 8...11 of AES/EBU subframe

Word b: Bits 12..19 of AES/EBU subframe
Word c: Bits 20..27 of AES/EBU subframe

Length mode 1: The 24-bit word contains 24 bits of sampled data from the AES/EBU interface.

Word a: Bits 4...11 of AES/EBU subframe
Word b: Bits 12..19 of AES/EBU subframe
Word c: Bits 20..27 of AES/EBU subframe

The V, U, C, and block start bits are not recorded.

Length mode 2: If a non-AES/EBU interface is used, 20 bits of data are assigned to audio. The channel status bit and the block start bit shall be generated as defined in ANSI S4.40; bit 0 and bit 1 are set to "0."

Word a: Bit 0: is set to "0"
Bit 1: is sent to "0"
Bit 2: Channel status bit internally generated
Bit 3: Block start bit set to "1" indicates the start of the 192-bit channel status sequence
Bits 4...7: Bits 0...3 of audio sample

Word b: Bits 4..11 of audio sample
Word c: Bits 12..19 of audio sample

5.3.5.6 ERRFLG

The control byte ERRFLG shall indicate the type of editing and occurrence of erroneous data at the AES/EBU interface.

Bit 0, Bit 1: Type of editing

0, 0 = Normal record
0, 1 = Assemble
1, 0 = Insert
1, 1 = Not defined

Bit 2: AES/EBU input erroneous (if AES/EBU input selected)

0 = No error
1 = CRC-, parity-errors

Bit 3: Synchronization error

0 = No error
1 = No synchronization between video and audio

Bit 4: Hardware error (audio only)

0 = No error
1 = Hardware error detected during record

Bit 5: Software error (audio only)

0 = No error
1 = Software error detected during record

Bit 6, Bit 7: 0, 0

5.3.5.7 WCNT

The control byte WCNT provides an audio word count within a data field. It is used only for standards with 59.94 data fields per second and specifies the number of usable audio samples in the current audio data field.

WCNT:

00000000 (bin) = 800 audio samples/channel/data field

11111111 (bin) = 801 audio samples/channel/data field

The WCNT sequence for 10 successive data fields shall be: 801, 801, 800, 801, 801, 801, 801, 800, 801, 801.

The start of the WCNT sequence is related to the sequence start pulse on the control track as described in 9.2.7 of ANSI/SMPTE 277M.

5.3.5.8 ETI

ETI bytes shall provide equipment type information to identify the recording DTTR. Scanner, tape deck, and processor serial numbers will be written on tape. A serial number has a maximum of 8 digits, S0 to S7. Pairs of two digits are mapped to one control byte as shown in table 19. ISO characters may be used for the identification of manufacturer and type of recorder.

5.3.5.9 RTI0, RTI1

The number of operating hours of the headwheel shall be written in 16-bit hexadecimal format, the low byte shall be RTI0 and the high byte shall be RTI1.

5.3.5.10 ASTC0/1/2/3, ASUB0/1/2/3

Time code and binary group data are extracted from the LTC data. The ordering of the extracted bits is rearranged to form two different types of control bytes, the ASTC (audio sector time code) and the ASUB (audio sector user bit), as shown in table 20. ASTC and ASUB change every two data fields. Within that period, ASTC and ASUB are written into all audio sectors.

Table 19 – Equipment type information

Description		Control byte	Code
Scanner	S1, S0	ETI0	BCD
Scanner	S3, S2	ETI1	BCD
Scanner	S5, S4	ETI2	BCD
Scanner	S7, S6	ETI3	BCD
Tape deck	S1, S0	ETI4	BCD
Tape deck	S3, S2	ETI5	BCD
Tape deck	S5, S4	ETI6	BCD
Tape deck	S7, S6	ETI7	BCD
Processor	S1, S0	ETI8	BCD
Processor	S3, S2	ETI9	BCD
Processor	S5, S4	ETI10	BCD
Processor	S7, S6	ETI11	BCD
Four ISO 646 characters for manufacturer identification		ETI12	ISO 646
		ETI13	ISO 646
		ETI14	ISO 646
		ETI15	ISO 646
Two ISO 646 characters for DTTR type identification		ETI16	ISO 646
		ETI17	ISO 646

Table 20 – ASTC and ASUB coding

Longitudinal Timecode Bit	Unit	Description	Bit	
Bit 0	1		Bit 0	
Bit 1	2	Frame	Bit 1	
Bit 2	4	Units	Bit 2	
Bit 3	8		Bit 3	
Bit 8	10	Frame	Bit 4	ASTC0
Bit 9	20	tens	Bit 5	
Bit 10		Drop frame flag	Bit 6	
Bit 11		Color frame flag	Bit 7	
Bit 16	1		Bit 0	
Bit 17	2	Seconds	Bit 1	
Bit 18	4	Units	Bit 2	
Bit 19	8		Bit 3	
Bit 24	10		Bit 4	ASTC1
Bit 25	20	Seconds	Bit 5	
Bit 26	40	tens	Bit 6	
Bit 27		Biphase mark correction bit	Bit 7	
Bit 32	1		Bit 0	
Bit 33	2	Minutes	Bit 1	
Bit 34	4	Units	Bit 2	
Bit 35	8		Bit 3	
Bit 40	10		Bit 4	ASTC2
Bit 41	20	Minutes	Bit 5	
Bit 42	40	tens	Bit 6	
Bit 43		Binary group flag bit	Bit 7	
Bit 48	1		Bit 0	
Bit 49	2	Hours	Bit 1	
Bit 50	4	Units	Bit 2	
Bit 51	8		Bit 3	
Bit 56	10	Hours	Bit 4	ASTC3
Bit 57	20	tens	Bit 5	
Bit 58		Unassigned adress bit	Bit 6	
Bit 59		Binary group flag bit	Bit 7	
Bit 4	Bit0		Bit 0	
Bit 5	Bit1	1st	Bit 1	
Bit 6	Bit2	Binary Group	Bit 2	
Bit 7	Bit3		Bit 3	
Bit 12	Bit0		Bit 4	ASUB0
Bit 13	Bit1	2nd	Bit 5	
Bit 14	Bit2	Binary Group	Bit 6	
Bit 15	Bit3		Bit 7	
Bit 20	Bit0		Bit 0	
Bit 21	Bit1	3d	Bit 1	
Bit 22	Bit2	Binary Group	Bit 2	
Bit 23	Bit3		Bit 3	
Bit 28	Bit0		Bit 4	ASUB1
Bit 29	Bit1	4th	Bit 5	
Bit 30	Bit2	Binary Group	Bit 6	
Bit 31	Bit3		Bit 7	
Bit 36	Bit0		Bit 0	
Bit 37	Bit1	5th	Bit 1	
Bit 38	Bit2	Binary Group	Bit 2	
Bit 39	Bit3		Bit 3	
Bit 44	Bit0		Bit 4	ASUB2
Bit 45	Bit1	6th	Bit 5	
Bit 46	Bit2	Binary Group	Bit 6	
Bit 47	Bit3		Bit 7	
Bit 52	Bit0		Bit 0	
Bit 53	Bit1	7th	Bit 1	
Bit 54	Bit2	Binary Group	Bit 2	
Bit 55	Bit3		Bit 3	
Bit 60	Bit0		Bit 4	ASUB3
Bit 61	Bit1	8th	Bit 5	
Bit 62	Bit2	Binary Group	Bit 6	
Bit 63	Bit3		Bit 7	

5.4 Outer error correction

AROWs 28 to 39 of an audio shuffling array contain the error correction data (see tables 11 and 12).

Type: Reed-Solomon

Galois field: GF(256)

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

Code generator polynomial: $G(x) = (x+1)(x+a)(x+a^2)(x+a^3)(x+a^4)(x+a^5)(x+a^6)(x+a^7)(x+a^8)(x+a^9)(x+a^{10})(x+a^{11})$ here 'a' is given by 02_h in GF(256)

Check characters: PV11, PV10, PV9, PV8, PV7, PV6, PV5, PV4, PV3, PV2, PV1, PV0

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

Examples of check byte patterns for the outer error correction of the audio signal are given in annex A.

6 Time and control code record

6.1 Recorded format

The signal recorded on this track shall be in accordance with the specifications of ANSI/SMPTE 12M.

6.2 Record location

The signal shall be recorded on the longitudinal index track as specified in ANSI/SMPTE 277M.

6.3 Relative timing

An external time and control code that meets the specifications described in ANSI/SMPTE 12M or a time code that was internally generated within the recorder shall be timed for recording as follows:

The relationship between the start of address of the time code and the program reference point is defined by dimension P2 of figures 10 and 11, and table 3 of ANSI/SMPTE 277M.

Annex A (informative)
Check byte patterns

Figures A.1–A.4 show examples of check byte patterns.

Table A.1 – Examples of check byte patterns for the inner error correction, if the number of RData bytes per sync block equals 208 (configuration I)

	Byte position	Pattern 1	Pattern 2	Pattern 3
ID bytes	0	00	00	CC
	1	00	01	CC
	2	00	02	CC
RData bytes D (x)	0	00	03	CC
	1	00	04	CC
	2	00	05	CC
	3	00	06	CC
	4	00	07	CC
	5	00	08	CC
	6	00	09	CC
	....	.....	.....	.....
	205	00	D0	CC
	206	00	D1	CC
	207	01	D2	CC
Check bytes	0	3B	C4	00
	1	0D	8C	6E
	2	68	B0	D3
	3	BD	25	12
	4	44	EF	36
	5	D1	1D	45
	6	1E	1F	60
	7	08	96	59
	8	A3	F6	28
	9	41	6A	39
	10	29	3E	7E
	11	E5	43	83
	12	62	53	A9
	13	32	DA	27
	14	24	20	9D
	15	3B	3D	D6

NOTE – Table entries in patterns 1, 2, and 3 are in hexadecimal notation.

Table A.2 – Examples of check byte patterns for the inner error correction, if the number of RData bytes per sync block equals 218 (configuration II)

	Byte position	Pattern 1	Pattern 2	Pattern 3
ID bytes	0	00	00	CC
	1	00	01	CC
	2	00	02	CC
RData bytes D (x)	0	00	03	CC
	1	00	04	CC
	2	00	05	CC
	3	00	06	CC
	4	00	07	CC
	5	00	08	CC
	6	00	09	CC
	....	.....	.....	.....
	215	00	DA	CC
	216	00	DB	CC
	217	01	DC	CC
Check bytes	0	3B	E6	59
	1	0D	25	1A
	2	68	C1	C6
	3	BD	30	4B
	4	44	D3	DD
	5	D1	FB	AE
	6	1E	9D	57
	7	08	54	45
	8	A3	38	A7
	9	41	89	B2
	10	29	47	37
	11	E5	BC	0A
	12	62	9B	76
	13	32	5C	83
	14	24	C2	54
	15	3B	40	EA

NOTE – Table entries in patterns 1, 2, and 3 are in hexadecimal notation.

Table A.3 – Examples of check byte patterns for the outer error correction of the video signal

	Byte position	Pattern 1	Pattern 2	Pattern 3
Data bytes D (x)	0	00	00	CC
	1	00	01	CC
	2	00	02	CC
	3	00	03	CC
	4	00	04	CC
	5	00	05	CC
	6	00	06	CC
	....	.....	.....	.....
	237	00	ED	CC
	238	00	EE	CC
	239	01	EF	CC
Check bytes	240	0E	19	A9
	241	36	10	C0
	242	72	E4	4A
	243	46	27	BA
	244	AE	F8	C0
	245	97	84	2B
	246	2B	83	AB
	247	9E	2B	D1
	248	C3	86	FD
	249	7F	3C	2C
	250	A6	D8	F2
	251	D2	66	B8
	252	EA	28	99
	253	A3	32	0A

NOTE – Table entries in patterns 1, 2, and 3 are in hexadecimal notation.

Table A.4 – Examples of check byte patterns for the outer error correction of the audio signal

	Byte position	Pattern 1	Pattern 2	Pattern 3
Data bytes D (x)	0	00	00	CC
	1	00	01	CC
	2	00	02	CC
	3	00	03	CC
	4	00	04	CC
	5	00	05	CC
	6	00	06	CC
	....	.....	.....	.....
	25	00	19	CC
	26	00	1A	CC
	27	01	1B	CC
Check bytes	28	44	F5	85
	29	77	30	54
	30	43	C3	7D
	31	76	3A	53
	32	DC	48	F2
	33	1F	F6	6F
	34	07	FE	DB
	35	54	ED	2C
	36	5C	07	8D
	37	7F	3C	3B
	38	D5	CF	98
	39	61	65	BB

NOTE – Table entries in patterns 1, 2, and 3 are in hexadecimal notation.

Annex B (informative)
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