ANSI/SMPTE 262M-1995

SMPTE STANDARD

for Television, Audio and Film -- Binary Groups of Time and Control Codes — Storage and Transmission of Data

1 Scope

This standard specifies a directory index to classify various types of data to be recorded into the binary groups (user bits) of the SMPTE time and control code. The directory index, located in two binary groups of the time and control code frame, fully specifies the type of data stored in the remaining binary groups of that frame.

This standard also specifies the group assignments of timing, application, and control data types to subsets of the directory index. It applies to both linear and vertical interval time code applications. Specifications of application dialects will be developed in related documents.

2 Normative references

The following documents 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 documents indicated below.

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

SMPTE RP 169-1995, Television, Audio and Film Time and Control Code — Auxiliary Time Address Data in Binary Groups — Dialect Specification of Directory Index Locations

ISO/IEC 646:1991, Information Technology — ISO 7-Bit Coded Character Set for Information Interchange

ISO/IEC 2022:1994, Information Technology — Character Code Structure and Extension Techniques

3 Data structure

3.1 Frame format (see figure 1)

3.1.1 Binary group labels

The binary group containing the lowest frame address bit numbers is referred to as binary group 1 (BG 1), and the binary group containing the highest bit numbers is referred to as binary group 8 (BG 8). Within a binary group, the lowest bit number contains the least significant bit of data.

3.1.2 Binary byte labels

The data content of the binary groups may be specified as 8-bit character sets, in which case the characters should be inserted in accordance with ANSI/SMPTE 12M. Thus, binary groups 1 and 2 form binary byte 1, binary groups 3 and 4 form binary byte 2, binary groups 5 and 6 form binary byte 3, and binary groups 7 and 8 form binary byte 4. Within a binary byte, the lower numbered binary group contains the four least significant bits of data.

3.1.3 Directory index

Binary groups 7 and 8 shall be used as a directory index for page-line user bit applications. Binary group 8 shall specify a directory page totalling 16 pages, and binary group 7 shall specify a directory line totalling 16 lines per page.

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American National Standard

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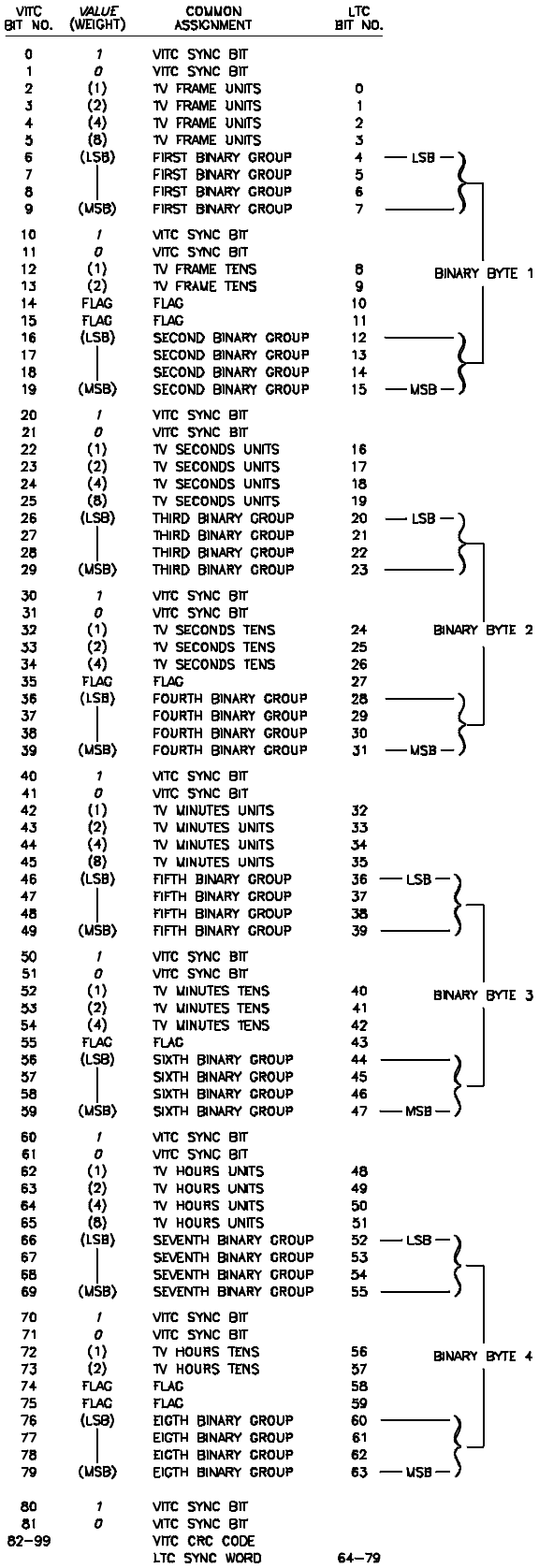

VITC BIT NO.	*VALUE* (WEIGHT)	COMMON ASSIGNMENT	LTC BIT NO.	
0	*1*	VITC SYNC BIT		
1	*0*	VITC SYNC BIT		
2	(1)	TV FRAME UNITS	0	
3	(2)	TV FRAME UNITS	1	
4	(4)	TV FRAME UNITS	2	
5	(8)	TV FRAME UNITS	3	
6	(LSB)	FIRST BINARY GROUP	4	— LSB —
7	|	FIRST BINARY GROUP	5	
8	|	FIRST BINARY GROUP	6	
9	(MSB)	FIRST BINARY GROUP	7	
10	*1*	VITC SYNC BIT		
11	*0*	VITC SYNC BIT		
12	(1)	TV FRAME TENS	8	BINARY BYTE 1
13	(2)	TV FRAME TENS	9	
14	FLAG	FLAG	10	
15	FLAG	FLAG	11	
16	(LSB)	SECOND BINARY GROUP	12	
17	|	SECOND BINARY GROUP	13	
18	|	SECOND BINARY GROUP	14	
19	(MSB)	SECOND BINARY GROUP	15	— MSB —
20	*1*	VITC SYNC BIT		
21	*0*	VITC SYNC BIT		
22	(1)	TV SECONDS UNITS	16	
23	(2)	TV SECONDS UNITS	17	
24	(4)	TV SECONDS UNITS	18	
25	(8)	TV SECONDS UNITS	19	
26	(LSB)	THIRD BINARY GROUP	20	— LSB —
27	|	THIRD BINARY GROUP	21	
28	|	THIRD BINARY GROUP	22	
29	(MSB)	THIRD BINARY GROUP	23	
30	*1*	VITC SYNC BIT		
31	*0*	VITC SYNC BIT		
32	(1)	TV SECONDS TENS	24	BINARY BYTE 2
33	(2)	TV SECONDS TENS	25	
34	(4)	TV SECONDS TENS	26	
35	FLAG	FLAG	27	
36	(LSB)	FOURTH BINARY GROUP	28	
37	|	FOURTH BINARY GROUP	29	
38	|	FOURTH BINARY GROUP	30	
39	(MSB)	FOURTH BINARY GROUP	31	— MSB —
40	*1*	VITC SYNC BIT		
41	*0*	VITC SYNC BIT		
42	(1)	TV MINUTES UNITS	32	
43	(2)	TV MINUTES UNITS	33	
44	(4)	TV MINUTES UNITS	34	
45	(8)	TV MINUTES UNITS	35	
46	(LSB)	FIFTH BINARY GROUP	36	— LSB —
47	|	FIFTH BINARY GROUP	37	
48	|	FIFTH BINARY GROUP	38	
49	(MSB)	FIFTH BINARY GROUP	39	
50	*1*	VITC SYNC BIT		
51	*0*	VITC SYNC BIT		
52	(1)	TV MINUTES TENS	40	BINARY BYTE 3
53	(2)	TV MINUTES TENS	41	
54	(4)	TV MINUTES TENS	42	
55	FLAG	FLAG	43	
56	(LSB)	SIXTH BINARY GROUP	44	
57	|	SIXTH BINARY GROUP	45	
58	|	SIXTH BINARY GROUP	46	
59	(MSB)	SIXTH BINARY GROUP	47	— MSB —
60	*1*	VITC SYNC BIT		
61	*0*	VITC SYNC BIT		
62	(1)	TV HOURS UNITS	48	
63	(2)	TV HOURS UNITS	49	
64	(4)	TV HOURS UNITS	50	
65	(8)	TV HOURS UNITS	51	
66	(LSB)	SEVENTH BINARY GROUP	52	— LSB —
67	|	SEVENTH BINARY GROUP	53	
68	|	SEVENTH BINARY GROUP	54	
69	(MSB)	SEVENTH BINARY GROUP	55	
70	*1*	VITC SYNC BIT		
71	*0*	VITC SYNC BIT		
72	(1)	TV HOURS TENS	56	BINARY BYTE 4
73	(2)	TV HOURS TENS	57	
74	FLAG	FLAG	58	
75	FLAG	FLAG	59	
76	(LSB)	EIGTH BINARY GROUP	60	
77	|	EIGTH BINARY GROUP	61	
78	|	EIGTH BINARY GROUP	62	
79	(MSB)	EIGTH BINARY GROUP	63	— MSB —
80	*1*	VITC SYNC BIT		
81	*0*	VITC SYNC BIT		
82–99		VITC CRC CODE		
		LTC SYNC WORD	64–79	

Figure 1 – Frame format (vertical interval and linear track)

3.2 Directory index format (see figure 2)

3.2.1 Time or media address data

All address data contained on pages 0, 1, and 2 relate to program timing and should be processed accordingly. Two types of address dialects can be stored in these pages: auxiliary time address and media address.

Auxiliary time address data can be stored at directory index lines 0 through 9 of pages 0 and 1, and lines 0 through 3 of page 2, which correspond to auxiliary time address hours 00 through 23. This dialect, as specified in SMPTE RP 169, provides a second time address with the same order and format as the primary time address data.

Media address data other than time address can be stored in directory index lines 10 through 15 of pages 0 and 1 and lines 4 through 15 of page 2.

3.2.2 Control data

One page (page 15) containing 16 lines is assigned to control data which consists of instructions requiring real-time command and execution. A frame carrying control data shall include an 8-bit checksum and have highest priority for encoding (see 3.4.5).

3.2.3 Applications data

Twelve pages, for a total of 192 lines, are reserved for user application subsets. A particular application dialect may specify a group of page-line subsets.

3.3 Use of binary groups

3.3.1 Binary group flag bits

When the data structure conforms to this format, the binary group flag bits shall be set in accordance with ANSI/SMPTE 12M for page-line applications.

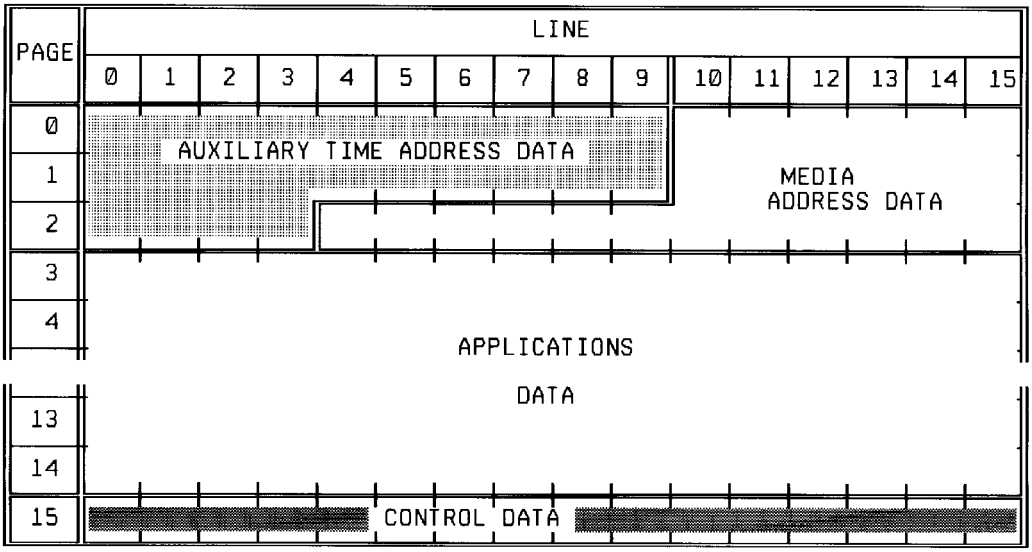

Figure 2 – Page-line directory

Table 1 – Binary group flag values for page-line encoding

		24- and 30-fps systems		25-fps systems	
Binary group flag	Bit value	LTC bit	VITC bit	LTC bit	VITC bit
BGF2	1	59	75	43	55
BGF1	0	58	74	58	74
BGF0	1	43	55	27	35

3.3.2 Subset applications

Each frame of time and control code may contain only one type of data, identified by the value of the directory index. The choice of data types and their repetition frequency is left to the discretion of the user.

3.3.3 Error detection

Error detection may be provided for as an 8-bit checksum. This consists of the twos complement of the least significant byte (modulo 256) of the sum of the specified binary bytes.

3.4 Message formats

3.4.1 Control codes (see figure 3)

This format consists of 2-byte instructions conveying real-time commands in binary bytes 2 and 3. Binary byte 1 carries an 8-bit checksum of binary bytes 2, 3, and 4.

3.4.2 Single-frame messages (see figure 3)

This format consists of a 3-byte message transmitted within binary bytes 1, 2, and 3. Certain applications dialects may specify binary byte 1 as an 8-bit checksum of binary bytes 2, 3, and 4.

3.4.3 Message strings (see figure 4)

A string of formatted data can be encoded as a message string comprising three types of frames: prefix frame(s), message frame(s), and suffix frame(s), each of which is assigned a unique directory index. The maximum message length shall be constrained to 256 frames.

The prefix and suffix frames shall be structured as follows: Binary byte 1 carries an 8-bit checksum of binary bytes 2, 3, and 4. Binary bytes 2 and 3 provide message specifier information, such as message ID, destination address, and message length. Multiple prefix and suffix frames may be specified for a message string, as required by the application dialect. Each prefix and suffix frame shall be identified as such by a unique directory index allocation.

The message frame shall be structured as follows: Each message frame carries message data in binary bytes 1, 2, and 3, while binary byte 4 carries the directory index, indicating a message frame.

When transmitting a message conforming to ISO/IEC 646 and ISO/IEC 2022, unused bytes of the message frame preceding the first suffix frame shall be null filled. Use of the parity bit provided with this data type allows error detection on the message data.

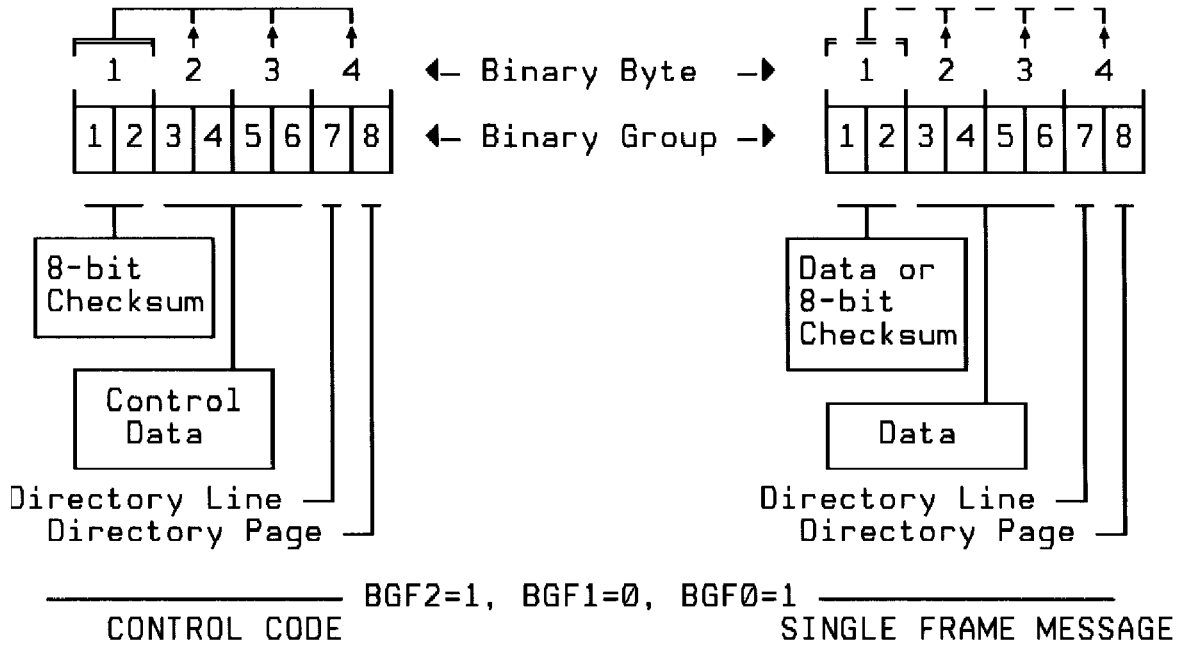

Figure 3 – Control code and single-frame message formats

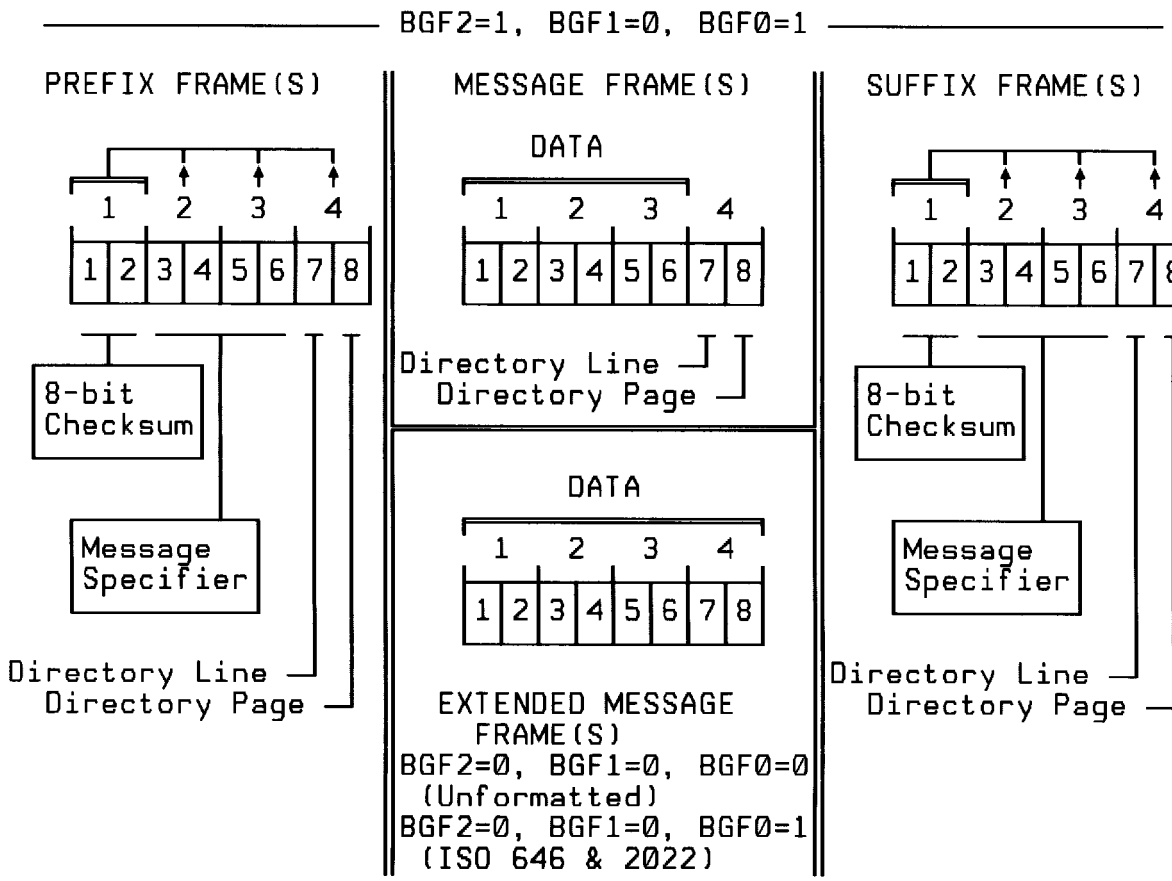

Figure 4 – Message and extended message formats

3.4.4 Extended message strings (see figure 4)

A string of unformatted data conforming to ISO/IEC 646 and ISO/IEC 2022 can be combined with the message prefix and suffix frames, as defined in 3.4.3, to provide an extended message string format. The data type carried in the extended message frames is signalled by the binary group flag bits, in accordance with ANSI/SMPTE 12M.

3.4.5 Message encoding priority

In the absence of other applications guidelines, and in the event that multiple sources of directory index data request encoding to the binary groups of the same time address location, the higher page numbered directory index application shall take priority. Similarly, priority shall be given to higher line numbered applications for time-coincident directory index data of the same page number. Applications dialects should specify source priority coding for situations where time-coincident data of the same page and line number may occur.