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SMPTE RECOMMENDED PRACTICE

Logic Design for Decoding Digital Audio Control Words in D-1 Helical Data and Control Records



1 Scope

This practice describes a way of decoding the digital audio control words embedded in audio sectors of the D-1 recorded tape. By the method described, recordings made by different interpretations of the early proposed format for D-1 data and control records can be retrieved with the least level of conflict.

2 Normative references

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 227M, Television Digital Component Recording — 19-mm Type D-1 — Helical Data and Control Records

ANSI S4.40-1985, Digital Audio Engineering — Serial Transmission Format for Linearly Represented Digital Audio Data

EBU Tech 3252, Standard for Recording Digital Television Signals on Magnetic Tape in Cassettes

3 Definitions

3.1 audio control words: Three nibble (4 bits) bytes of words named CHAN, PREF, and LNGH recorded in audio sectors of the D-1 recorded

tape to control modes of digital audio. Each of the four channels has a set of those words.

3.2 CHAN bits: Defined in clause 5.4.1 of SMPTE 227M to specify the usage of the two input channels in an interface data stream.

3.3 PREF bits: Defined in clause 5.4.2 of SMPTE 227M to specify the usage of preemphasis in the audio coding.

3.4 LNGH bits: Defined in clause 5.4.3 of SMPTE 227M to specify the audio word length and the usage of the ancillary bits status, user, and validity.

3.5 BCNT bits: Defined in clause 5.5.1 of SMPTE 227M. Bit 0 (LSB) and bit 1 specify the number of useful data words in the current block. The format defined in SMPTE 227M is distinguished from the early proposed format by bit 2. The television standard is indicated by bit 3 (MSB).

3.6 V,U,C,R bits: V, U, and C bits are defined in clauses 4.3 validity bit, 4.4 user data bit, and 4.5 channel status bit of ANSI S4.40-1985. R bit is not used and is reserved for future use.

3.7 pseudo ID: In order to identify a particular type of coding and to correctly decode the recorded signal from those that are based on different implementations resulting from the early proposed format, implementation-specific bit sequences on CHAN, PREF, and LNGH are used as "pseudo identification" patterns. In practice, use of PREF only covers almost all cases.

4 Types of early implementation

Tables 1-3 show bit patterns of two implementations (A and B) for CHAN, PREF, and LNGH words resulting from early proposed formats. In each table, the second and left column shows the bit pattern when retrieved from the tape. The leftmost bit in the column is the first bit to be read from the recorded tape for that word.

5 Suggested logic system

Figure 1 shows a suggested logic for decoding audio control words. By this implementation, most of the early recordings can be automatically decoded.

Table 1 - PREF bits implementations (early proposed format)

Mode	Type of implementation			Command of pseudo ID *
	A	B		
0	0 0 0 0	Preemphasis off (default)		C
1	0 0 0 1	Preemphasis off = default	Preemphasis off	C
3	0 0 1 1	Unlocked (reserved)	CD type	B
7	0 1 1 1	Unlocked (reserved)	CCITT type	B
8	1 0 0 0	Preemphasis off	Unlocked (preemphasis off = default)	C
9	1 0 0 1	Unlocked (reserved)	Unlocked (preemphasis off)	C
11	1 0 1 1	Unlocked (reserved)	Unlocked (CD type)	B
12	1 1 0 0	CD type	Unlocked (reserved)	A
13	1 1 0 1	Unlocked (CD type)	Unlocked (reserved)	A
14	1 1 1 0	CCITT type	Unlocked (reserved)	A
15	1 1 1 1	Unlocked CCITT type		C

* A (B): Take "A" (or B) type of decoding for CHAN, PREF, and LNGH.
C: Cannot judge "A" or "B" by this control word.

NOTE - Modes 2, 4, 5, 6, and 10 are not used when bit 2 of BCNT = 0.

Table 2 - LNGH bits implementations (early proposed format)

Mode	Type of implementation			Command of pseudo ID *
	A	B		
0	0 0 0 0	16 + V + U + C + R		C
1	0 0 0 1	19 + C	Not used	A
2	0 0 1 0	18 + V + C	19 + C	C
3	0 0 1 1	19 + U	Not used	A
4	0 1 0 0	17 + V + U + C	18 + V + C	C
5	0 1 0 1	19 + V	Not used	A
6	0 1 1 0	18 + U + C	19 + U	C
7	0 1 1 1	20	Not used	A
8	1 0 0 0	Not used	17 + V + U + C	B
10	1 0 1 0	Not used	19 + V	B
12	1 1 0 0	Not used	18 + U + C	B
14	1 1 1 0	Not used	20	B

* A (B): Take "A" (or B) type of decoding for CHAN, PREF, and LNGH.
C: Cannot judge "A" or "B" by this control word.

NOTE - Modes 9, 11, 13, and 15 are not used when bit 2 of BCNT = 0.

Table 3 - CHAN bits implementations (early proposed format)

Mode	Type of implementation			Command of pseudo ID detector *
	A	B		
0	0 0 0 0	2 channel - default		C
1	0 0 0 1	2 channel	Undefined	A
2	0 0 1 0	Single channel	Stereophonic	C
3	0 0 1 1	Primary/secondary 2 channel	Undefined	A
4	0 1 0 0	Stereophonic	Single channel	C
8	1 0 0 0	Undefined	2 channel	B
12	1 1 0 0	Undefined	Primary/secondary 2 channel	B

* A (B): Take "A" (or B) type of decoding for CHAN, PREF, and LNGH.
C: Cannot judge "A" or "B" by this control word.

NOTE - Modes 5, 6, 7, 9, 10, 11, 13, 14, and 15 are not used when bit 2 of BCNT = 0.