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SMPTE ENGINEERING GUIDELINE

Audio Channel Assignments for Digital Television Tape Recorders with AES/EBU Digital Audio Inputs

1 Scope

1.1 This guideline specifies the allocation of input audio signals to digital audio channels on digital television tape recorders (DTTRs) when the inputs are connected through AES/EBU digital interfaces.

1.2 This guideline also specifies preferred assignments of programs to audio recording channels, on the basis of program type, for purposes of program exchange.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this guideline. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this guideline 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 (AES3)

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

ANSI/SMPTE 247M-1993, Television Digital Recording — 19-mm Type D-2 Composite Format — Helical Data and Control Records

EBU R48-1988, Allocation of Audio Channels in the D-1 Digital Television Tape-Recording Format

3 Definitions

3.1 AES/EBU data stream: A stream of data corresponding to the recommendations of ANSI S4.40 for the serial digital transmission of two channels of periodically sampled and linearly represented digital audio data. The following definitions are quoted from ANSI S4.40:

3.1.1 audio sample word: Amplitude of a digital audio sample. Representation is linear in 2's complement binary form. Positive numbers correspond to positive analog voltages at the input of the analog-to-digital converter (ADC). The number of bits per word can be specified from 16 to 24 in two coding ranges (less than or equal to 20 bits and less than or equal to 24 bits).

3.1.2 subframe: Fixed structure used to carry the information described in [sampling frequency, audio sample word, auxiliary sample bits, validity bit, channel status, user data, parity bit, and preambles].

3.1.3 frame: A sequence of two successive and associated subframes.

3.2 DTTR digital audio channel: The portion of the recorded data stream on a digital video recorder which contains sampled, quantized, and digitally represented audio information from a single audio channel. DTTRs may contain more than one of these channels, each of which is uniquely identified.

4 Default channel assignments for DTTRs with four AES/EBU digital inputs

4.1 This clause is applicable to DTTRs equipped with four input connectors and four output

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connectors conforming to ANSI S4.40. The data streams arriving at these inputs each contain two audio channels, labelled A and B. Each of the channels has a status word identifying the relationship between the A and B channels, as follows:

Status	Meaning
0	Mode not indicated, receiver defaults to two-channel mode
1	Two-channel mode
2	Single-channel mode (monophonic)
3	Primary/secondary mode (subframe A is primary)
4	Stereophonic mode (subframe A is left channel)
5-E	Undefined
F	Vector to byte 3 for future applications

4.2 The four digital audio recording channels in such a DTTR can only accept data from four of the eight incoming audio channels. As the DTTR is not transparent to all possible combinations of inputs, this guideline establishes a convention for the default relationship between audio channels on the input connectors and DTTR digital audio channels.

4.3 The assignment of input channels to DTTR channels in this convention is based upon the status word of the incoming data stream, and the input connector number as follows:

DTTR channel	Input channel carried	Conditions
1	1-A	Always
2	1-B	If input 1 status is 0,1,3,4
	2-A	If input 1 status is 2 or undefined
3	3-A	Always
4	3-B	If input 3 status is 0,1,3,4
	4-A	If input status is 2 or undefined

4.4 Output channels are data-filled, where possible, so as to be identical to the equivalent-numbered input.

4.5 Audio channels which arrive on an input connector, but which cannot be recorded due to the limited number of DTTR digital audio channels, are replaced with a null-filled channel at the identically-numbered output connector.

4.6 As a consequence of this convention, the DTTR is normally constrained to accept two-channel signals only if they appear on input connectors 1 and 3, and will not accept single-channel signals appearing on input connectors 2 and 4, respectively, when channel 1 or 3 is carrying a two-channel signal. Input channels 2-B and 4-B are never recorded.

4.7 The DTTR may, optionally, provide a means to reconfigure the input-to-DTTR and DTTR-to-output channel assignments.

5 Default channel assignments for DTTRs with two AES/EBU digital inputs

5.1 This clause is applicable to DTTRs equipped with two input connectors and two output connectors conforming to ANSI S4.40. In this case, the default allocation of incoming audio channels among the four DTTR digital audio channels is as follows:

DTTR channel	Input data carried
1	1-A
2	1-B
3	2-A
4	2-B

5.2 The DTTR may, optionally, provide a means to reconfigure the input-to-DTTR and DTTR-to-output channel assignments.

6 Channel allocations for program exchange

6.1 For the purpose of intercompany and international exchange of programs, it is advantageous to adhere to a consistent assignment of program types to specific audio channels. This simplifies the task of ensuring correct interface of program content to delivery channels at the playback location, and eases the requirements for labeling tapes.

6.2 Programs for exchange may include one or more of the following categories of audio

information recorded in the DTTR digital audio channels:

- Program (complete mix)
- International sound
- Commentary
- Music
- Effects
- SAP (second audio program)

6.3 Any of these, except SAP, may be monophonic or stereophonic.

6.4 The assignment of categories of audio information to DTTR digital audio channels is contained in table 1 and is recommended when the types of programs indicated are recorded for exchange purposes.

Table 1 – Assignment of categories of audio information to DTTR digital audio channels

DTTR channel	1 Monophonic program	2 Stereo-phonic program	3 Two complete stereo-phonic programs	4 Monophonic program with separate commentary	5 Stereo-phonic international sound with two separate commentaries	6 Stereo-phonic commentary and international sound	7 Non-mixed monophonic program	8 Stereo-phonic program and SAP
1	complete monophonic mix	complete mix, left	first program, complete mix, left	commentary	first commentary	commentary left	commentary	complete mix, left
2	blank	complete mix, right	first program, complete mix, right	blank	second commentary	commentary right	music	complete mix, right
3	international sound	international sound, left	second program, complete mix, left	international sound	international sound, left	international sound, left	effects 1	SAP
4	blank	international sound, right	second program, complete mix, right	blank	international sound, right	international sound, right	effects 2	blank