

EBU Technical Recommendation R48-2005

Allocation of audio tracks on digital television recorders

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Most digital television tape recording formats can accommodate four high-quality digital audio tracks that are independently editable and erasable, and all are equally protected. Exceptions to this generalisation are the budget models within manufacturers' ranges that only provide two audio tracks, the D-10 digital television tape recording format that can accommodate up to eight¹ audio tracks and recently, certain HD VTRs that may accommodate more than eight² audio tracks.

To avoid operational confusion during the international exchange of programmes, the allocation of audio channels must be unequivocal.

The EBU recommends:

That for the international exchange of programmes, the audio channels within all digital recording formats are allocated as shown in **Table 1**.

This recommended allocation does not preclude further use of the unrecorded tracks for in-house applications of the receiving organization. In particular, tracks five to eight of the D-10 format set to eight-channel mode are freely available with the proviso that any in-house use should take into account that one pair of tracks may be required for the recording of Metadata in the future.

Table 1: Audio channel allocations in digital television recording formats with two, four or eight audio channels.

Table 1a: Recordings with complete programmes

Case	Programme type	No. of Tracks	Audio track Number				
			1	2	3	4	5, 6, 7, 8
1a	Mono programme	2	Complete mono mix	International sound (if any)			
1b	Mono programme	4	Complete mono mix	Mute (notes 1, 2)	International sound (if any)	Mute	
1c	Mono programme	8	Complete mono mix	Mute (notes 1, 2)	International sound (if any)	Mute	Mute
2a	Stereo programme	2	Complete mix, left	Complete mix, right			
2b	Stereo programme	4	Complete mix, left	Complete mix, right	International sound, left	International sound, right	
2c	Stereo programme	8	Complete mix, left	Complete mix, right	International sound, left	International sound, right	Mute
3a	Two complete stereo programmes	4	First programme complete mix, left	First programme complete mix, right	Second programme complete mix, left	Second programme complete mix, right	
3b	Two complete stereo programmes	8	First programme complete mix, left	First programme complete mix, right	Second programme complete mix, left	Second programme complete mix, right	Mute

¹ The D-10 (Sony IMX) format allows two audio operating modes – four-channel mode (24 bit/48 kHz) and eight-channel mode (16 bit/48 kHz). Pairs of tracks 1/2, 3/4 (5/6, 7/8) can be set to “audio” or “data” prior to commencing a recording and in this way non-audio data such as Metadata can be included. The exact operating mode set for recording should be marked on the cassette label and the VTR record card.

² The EBU is currently considering the issue of HD recording formats that may provide more than eight audio channels for the exchange of programme material on VTR cassettes. In the meantime the track allocation from track 1 to track 8 should be in accordance with that recommended herein.

Table 1b: Recordings with separate commentaries

Case	Programme type	No. of Tracks	Audio track Number				
			1	2	3	4	5, 6, 7, 8
4a	Mono	2	Commentary (if any)	International sound (if any)			
4b	Mono	4	Commentary	Mute (note 2)	International sound	Mute	
4c	Mono	8	Commentary	Mute (note 2)	International sound	Mute	Mute
5a	Stereo international sound	4	First commentary	Second commentary	International sound, left	International sound, right	
5b	Stereo international sound	8	First commentary	Second commentary	International sound, left	International sound, right	Mute
6a	Stereo	4	Commentary left	Commentary right	International sound, left	International sound, right	
6b	Stereo	8	Commentary left	Commentary right	International sound, left	International sound, right	Mute
7a	Non-mixed mono programme	4	Speech (commentary)	Music	Effects 1	Effects 2	
7b	Non-mixed mono programme	8	Speech (commentary)	Music	Effects 1	Effects 2	Mute

Table 1c: Recordings with second audio programme (SAP) / Audio Description

Case	Programme type	No. of Tracks	Audio track Number				
			1	2	3	4	5, 6, 7, 8
8a	Mono programme and SAP	2	Complete mono mix	SAP			
8b	Mono programme and SAP	4	Complete mono mix	SAP	International sound, left (if any)	International sound, right (if any)	
8c	Mono programme and SAP	8	Complete mono mix	SAP	International sound, left (if any)	International sound, right (if any)	Mute
9a	Stereo programme and SAP	4	Complete mix, left	Complete mix, right	SAP	Mute	
9b	Stereo programme and SAP	8	Complete mix, left	Complete mix, right	SAP	Mute	Mute

Note 1: See Note 1 to Case 1

Note 2: See Note 2 to Case 1

Table 1d: Recordings with multichannel (MCh.) sound (5.1)

Case	Programme type	No. of Tracks	Audio track Number							
			1	2	3	4	5	6	7	8
10a	MCh sound	2	Encoded MCh. sound data (note 6)							
11a	MCh. sound with stereo	4	Stereo left (note 3)	Stereo right (note 3)	Encoded MCh. sound data (note 6)					
11b	MCh. sound with stereo (Note 4)	8	Stereo left (note 3)	Stereo right (note 3)	MCh. Left	MCh. Right	MCh. Centre	MCh. LFE	MCh. Left Surround	MCh. Right Surround
11c	MCh. sound with stereo (Note 5)	8	MCh. Left	MCh. Right	MCh. Centre	MCh. LFE	MCh. Left Surround	MCh. Right Surround	Stereo left (note 3) Optional (note 7)	Stereo right (note 3) Optional (note 7)

Note 3: The stereo can be either a downmix from the multichannel sound or a separate stereo balance.

Note 4: Some organisations prefer that the audio track allocation of 2 track recordings is also used for multi-track recordings, so that the same replay equipment can be used to replay more than one format without the need to re-route the audio signals. In these circumstances, stereo sound can be recorded on tracks 1 and 2, with the multichannel sound on tracks 3 to 8. If such a recording is used for international exchange, this should be clearly shown on the labels and recording report.

Note 5: Some organisations prefer to match the audio track allocation for multi-track recordings, to that recommended for sound-only programmes, EBU Technical Recommendation R91-1998 [12]. In these circumstances, the multichannel sound can be recorded on tracks 1 to 6, with the stereo sound on tracks 7 and 8. If such a recording is used for international exchange, this should be clearly shown on the labels and recording report.

Note 6: Some forms of compression have different options for the audio coding (16 versus 20 bit coding). It is essential that this choice is noted on the labels and recording report.

Note 7: In some circumstances, neither a specific stereo mix nor an automated downmix will exist early on in the production process. Under these circumstances, tracks 7 and 8 would be unused.

Case 1: Single monophonic programme content

In this case a single monophonic sound accompanies the video content of programme. In such a case, the monophonic programme content represents the complete programme sound mix but, for the purpose of international exchange, it can be accompanied by the so-called "international sound" - the complete monophonic mix of music, effects, etc., lacking only the speech which can be added in the dubbing process in order to obtain a complete monophonic programme sound mix in a language different from the original one.

Note 1: The practice of some EBU Members is to record identical monophonic sound signals on tracks 1 and 2.

Note 2: Some organisations prefer that the audio track allocation of 2 track recordings is also used for 4 track recordings, so that the same replay equipment can be used to replay more than one format without the need to re-route the audio signals. In these circumstances, the international sound can be recorded on track 2 as well as, or instead of, on track 3. If such a recording is used for international exchange, this should be clearly shown on the labels and recording report.

Case 2: Single stereophonic programme content

This case is similar to case 1, i.e. a single complete stereophonic programme sound accompanies the video content of the programme. In this case, as in case 1, the stereophonic programme sound represents the complete programme sound mix and it can be accompanied by a complete stereophonic mix of music and all effects - a stereophonic international sound - which may be used by the receiving organisation for dubbing.

Case 3: Two complete stereophonic programme contents

In this case, the video content of the recorded television programme is accompanied by two somewhat different complete stereophonic programme mix sounds. The difference may be the language or any other component.

Note 1: In the case where two different stereophonic programme sounds are recorded with the same video programme content, the sending organisation should provide written information on the nature of each of the two sounds.

Case 4: Monophonic programme with separate commentary

When original news or documentary recordings with monophonic sound are exchanged, it is always expected to have the possibility to dub them in a different language. These recordings should therefore contain a complete international sound, i.e. the sound recorded on the spot with all ambience, original speech, etc. which can be mixed later, by the receiving organisation, with a new commentary in its own language.

Note 1: See Note 2 to Case 1

Case 5 and Case 6: Stereophonic programme with separate commentary

These cases are similar to case 4 but, since we are dealing here with stereophonic sound, all channels are used and the sound dubbing has to be done onto a copy of the original recording. On this recording again, the complete stereophonic mix can be recorded on channels 1 and 2, or the stereophonic commentary in the new language and the stereophonic international sound can be recorded on channels 1 & 2, and 3 & 4 respectively.

Case 7: Single monophonic programme content, non-mixed

In this case, the video content of the programme is accompanied by a non-mixed monophonic programme sound; i.e. the speech or commentary, the music and the effects are not mixed together. Such a configuration permits mixing at a later stage during the re-recording or dubbing of that particular tape. In general, such a case may appear when unfinished programmes, or programme segments, are exchanged (for example: one broadcasting organisation may collect inserts from different sources in order to assemble a complete programme).

Case 8: Monophonic programme and second audio programme (SAP) / Audio Description

In this case, a monophonic second audio programme (SAP) accompanies a complete monophonic programme.

Note 1: An audio-described programme is one with additional audible picture descriptions. In the dialogue breaks,

brief comments provide the purely visual elements of a scene to visually handicapped spectators. This technique of annotating picture content is known as Audio-Description. Usually, the additional descriptions are recorded on sound track 2 (Audio 2) of a transmission tape and are broadcast in the two channel audio mode (sound track 1 contains the complete monophonic mix).

Note 2: Stereophonic programme must be down-mixed to mono on sound track 1 before the Audio-Description can be recorded on sound track 2.

Case 9: Stereophonic programme and second audio programme (SAP) / Audio Description

In this case a complete stereophonic programme is accompanied by a monophonic second audio programme (SAP). Under the circumstances of use of SAP, the transmitted quality is of a lower quality than normal stereophonic programme sound.

Case 10: Single multichannel sound programme

In this case, the video content of the programme is accompanied by an encoded (compressed) multichannel sound mix, wherein the 5.1 (or more) channels of audio are compressed into a data stream compatible with a normal digital audio stereo data stream. This mode of working is very useful if the video recorder has only two audio tracks. If such a recording is used for international exchange, this should be clearly shown on the labels and recording report.

Case 11: Multichannel sound programme with accompanying stereo version of the same programme

In this case, the video content of the programme is accompanied by both a multichannel sound mix and a stereo version of the same programme. The stereo can be either a downmix derived from the multichannel mix or it can be a separate balance derived from the original sources. The multichannel sound can be an encoded format, similar to that used in Case 10, or it can be the non-compressed channels, left/right/centre/LFE/left-surround/right-surround.

If such a recording is used for international exchange, this should be clearly shown on the labels and recording report.

Longitudinal cue audio channel

In all the cases described above, the cue audio channel, if present, should preferably contain a complete monophonic programme mix or, if this is not practicable, the content of audio channel 1 (except from case 10a and case 11c).

Application

The allocations in Table 1 should be used on all digital recording formats, including:

- D-1 format [1][2]
- D-2 format [3]
- D-3 format [4]
- D-5 format [5]
- Digital Betacam [6]
- D-7 format (DVCPRO, 2-track allocations) [7]
- D-7 format (DVCPRO50, 4-track allocations) [7]
- Betacam SX
- D-9 format (digital S) [8]
- D-10 format (MPEG IMX, 4- or 8-track allocation) [9]

Allocations of audio channels for analogue television tape recording formats are given in EBU Rec. R38-1992 [10].

An equivalent ITU recommendation can be found in [11].

Bibliography

- [1] **EBU document Tech. 3252 (1986):** Standard for recording digital television signals on magnetic tape in cassettes
- [2] **IEC Publication 61016:** Helical-scan digital component videocassette recording system using 19 mm magnetic tape (format D-1)
- [3] **IEC Publication 61179:** Helical-scan digital composite video cassette recording system using 19-mm magnetic tape, format D-2 (NTSC, PAL, PAL-M)
- [4] **IEC Publication 61327:** Helical-scan digital composite video cassette recording system using 12,65 mm (0,5 in) magnetic tape - Format D-3
- [5] **IEC Publication 61835:** Helical-scan digital component video cassette recording system using 12,65 mm (0,5 in) magnetic tape - Format D-5
- [6] **IEC Publication IEC 61904:** Helical-scan digital component video cassette recording format using 12,65 mm magnetic tape and incorporated data compression (Format digital-L)
- [7] **IEC Publication 62071:** Helical-scan compressed digital video cassette recording system using 6,35 mm magnetic tape - Format D-7
- [8] **IEC Publication 62156:** Digital video recording with video compression 12,65 mm type D-9 component format 525/60 and 625/50 (digital S)
- [9] **IEC Publication IEC 62289 in preparation:** Helical-scan digital video cassette recording format using 12,65 mm magnetic tape and incorporating MPEG-2 compression - Format D-10
- [10] **EBU Technical Recommendation R38-1992:** Allocation of audio channels in analogue tape recording formats for international exchange of programmes
- [11] **ITU-R BR.779-2:** Operating practices for digital television recording.
- [12] **EBU Technical Recommendation R91-1998:** Track allocations and recording levels for the exchange of multichannel audio signals