



Recommendation ITU-R BR.1384-2
(03/2011)

**Parameters for international exchange
of multi-channel sound recordings with
or without accompanying picture**

BR Series
**Recording for production, archival
and play-out; film for television**

Foreword

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Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R BR.1384-2^{*,**}**Parameters for international exchange of multi-channel sound recordings with or without accompanying picture^{***}**

(Question ITU-R 58/6)

(1998-2005-2011)

Scope

Recommendation ITU-R BR.1384 specifies the track assignment, recording characteristics and level alignment for multi-channel audio sound recordings.

The ITU Radiocommunication Assembly,

considering

- a) that one multi-channel stereophonic sound system has been defined in Recommendation ITU-R BS.775;
- b) that Recommendation ITU-R BS.775 – Multi-channel stereophonic sound system with and without accompanying picture, recommends the use of five reference recording signals for left (L), right (R), centre (C) channels for the front, and left surround (LS) and right surround (RS) channels for the side/rear, with an additional low frequency effects (LFE) channel;
- c) that Recommendation ITU-R BR.779 – Operating practices for digital television recording, contains specifications for the allocation of audio channels on 4-track digital television recording;
- d) that many regions exchange television programmes which include multi-channel sound;
- e) that a single set of technical parameters such as assignment of multi-channel audio signals to tracks, level conditions, etc. is needed in order to avoid operational problems,

recommends

1 that for the recording and exchange of multi-channel sound programme material with or without accompanying picture, the track assignment, recording characteristics and level alignment should be in accordance with Annex 1;

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44.

** This Recommendation should be brought to the attention of the International Electrotechnical Commission (IEC) Committee TC 100.

*** International programme exchange is defined as the transmission of television or sound programme material (or components thereof) among professional parties in different countries. It should be based on internationally agreed and widely employed technical standards or operating practices, except by prior bilateral agreement among the parties involved. If there are no such bilateral agreements, parties exchanging television or sound programme material are urged to follow the audio channel/signal to track assignments described in this Recommendation.

2 that the physical label on the recording media, shipping or storage container should indicate which mapping has been used on the recording media.

Annex 1

1 Signal definitions

The audio signals to be recorded for the multi-channel sound programme are designated according to Recommendation ITU-R BS.775:

3/2 format (preferred format for multi-channel sound, also usable for 2/2)

L	left channel/signal
C	centre channel/signal
R	right channel/signal
LS	left surround channel/signal (see Note 1)
RS	right surround channel/signal (see Note 1)
LFE	additional low frequency channel/signal (see Note 2)

3/1 format (see Note 3)

L	left channel/signal
C	centre channel/signal
R	right channel/signal
MS	monophonic surround channel/signal (see Note 4)

The mixed audio signals to be recorded are designated as follows:

2/0 format (two channel stereophony)

A	complete mix left total channel/signal
B	complete mix right total channel/signal
LTM&E	music and effects left total channel/signal
RTM&E	music and effects right total channel/signal

1/0 format (mono channel)

MM	complete mix mono channel/signal
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Additional signals to be recorded are designated as follows:

F	freely usable
NPCM	Non-PCM signal, defined in SMPTE 337-2008
SAP	secondary audio programme channel/signal

NOTE 1 – In film sound practice, the level calibration of stereo surround channels differs from that of the frontal channels by +3 dB. That is, the LS and RS channels in the cinema monitor system have an output level –3 dB with respect to that of the frontal channels and the level on a recording has the LS and RS channels at a level of 3 dB with respect to the frontal channels. The level of the LS and RS channels should be corrected when a transfer is done between the recording format employed in film sound to the recording format described in this Annex.

NOTE 2 – Inclusion of the LFE channel is optional. If the channel is included, its reproduction by the listener is also optional. Therefore this channel should not contain low frequency content which is essential to the programme content.

NOTE 3 – In circumstances where transmission capacity or other constraints apply, the monophonic surround channel (MS) is used. In the case of mono surround, the MS signal is fed to both LS and RS loudspeakers.

NOTE 4 – The monophonic surround channel (MS) is often referred to as the S channel.

2 Track assignment

The track assignment should be noted on the recording media and the shipping or storage container.

A basic 4 track sound recording format for recording a 3/1 multi-channel sound programme should have the following assignment of sound tracks (see Table 1)¹.

TABLE 1

Channel assignments for a 4-channel recording of 3/1 multi-channel sound

Track	Channel
1	L
2	R
3	C
4	MS

A basic 8 track sound recording format for recording a 3/2 multi-channel sound programme should have the following assignment of sound tracks (see Table 2). For media with six tracks, the assignments for tracks 1-6 shall be followed. Some media have more than eight tracks or a multiple of eight tracks. Media with more than eight tracks shall follow the assignment in Table 2 for the first group of eight tracks. When relevant (i.e. additional multichannel programmes are carried), it is recommended that other groupings of 8 tracks (i.e. tracks 9-16, or 17-24 on a 24-track media) also follow the channel assignments shown in Table 2.

TABLE 2

Channel assignments for an 8-channel recording^{*,}**

Track	Channel
1	L
2	R
3	C
4	LFE

¹ Note that the assignment in this Table is identical to that shown in Recommendation ITU-R BR.779, Annex 1, Table 2, case 10, “Four-channel uncompressed”. Table 2 in Recommendation ITU-R BR.779 also specifies that in the case of 2-channel stereophonic signals, they should be assigned to Track 1 (L) and Track 2 (R).

TABLE 2 (*end*)

Track	Channel
5	LS ⁽¹⁾
6	RS ⁽¹⁾
7	A
8	B

* Other channel assignment practices which apply to specific countries and in specific circumstances can be found in Appendix 2.

** Unused tracks should not carry any other signals. They should be left silent. This is to eliminate the possibility of operational error.

⁽¹⁾ In the case of programmes using the 3/1 multi-channel sound format, the MS (–3 dB) monophonic surround signal should be placed on both tracks 5 and 6. This allows a programme with a single surround channel to be treated as a programme with two surround channels. The MS (–3 dB) signal will be reproduced out of both the LS and RS loudspeakers, with a relative level of –3 dB with respect to the front channels. The combined power into the room will be the correct relative level of 0 dB.

3 Recording characteristics

3.1 Sampling frequency

In accordance with Recommendation ITU-R BS.646, the sampling frequency shall be 48 kHz.

3.2 Emphasis

The recording should be made without any emphasis.

4 Level calibration

With the exception of the LFE channel, all audio channels belonging to a common programme are recorded on the storage media at levels appropriate for reproduction over a set of loudspeaker channels which produce the same acoustic sound pressure level for a common stimulus. This means that the programme would play correctly over a reproduction system in which each of the individual speaker channels in the 3/2 configuration (L, C, R, LS, RS) has the same relative acoustic output when presented with equal level signals from the media.

The LFE channel is recorded with a level offset of –10 dB. This offset is compensated for in the reproduction system, where the LFE loudspeaker has an acoustic output (within its low frequency passband) of +10 dB with respect to the other channels, when fed by a signal whose level is equal to the level of the signals feeding each of the L, C, R, LS and RS channels (see § 6, Pink noise test signals).

5 Alignment level

The alignment level shall be noted on the tape label. A tone signal (e.g. 1 kHz sinusoid) at the alignment level should be recorded on all tracks at the beginning of the recording.

Note that different regions employ slightly different alignment levels.

In regions which follow EBU guidelines, and where the recording format is a digital format with a linear resolution of 16 bits or more, the level alignment rules given in EBU Technical Recommendation R64 – 1998 “Exchange of sound programmes as digital tape recordings” and EBU technical Recommendation R68 – 2000 “Alignment level in digital audio production equipment and in digital audio recorders” are used, considering the level definitions in Recommendation ITU-R BS.645:

- permitted maximum signal level –9 dB rel^{2,3};
- alignment signal level –18 dB rel².

In regions which follow SMPTE guidelines, and where the recording format is a digital format with a linear resolution of 16 bits or more, the level alignment rules given in SMPTE recommended practice RP155 – 2004 “Audio levels for digital audio records on digital television tape recorders” are used.

- alignment signal level –20 dB rel digital clipping.

6 **Pink noise test signals**

Pink noise test signals, if present, shall be at equal levels on all channels. Excepting the LFE channel, if each channel of pink noise is reproduced at the same acoustic sound pressure level at the central listening position, then the relative balance of the programme audio channels should be correctly reproduced.

In the case of the LFE channel, the pink noise test signal is intended to be reproduced at an acoustic sound pressure level (within the LFE channel <120 Hz passband) of +10 dB relative to any of the other individual channels. Note that due to the limited bandwidth of the LFE channel, if the acoustic level produced by the LFE pink noise is measured with a wideband sound pressure level meter, the reading will not measure +10 dB with respect to the other channels. The acoustic level of the LFE channel should measure +10 dB within its <120 Hz bandwidth when measured with a frequency selective meter.

² Relative to the digital clipping level, indicated with an IEC quasi-peak programme level meter.

³ In the future, a correctly loudness-normalized signal may contain quasi-PPM levels in excess of those permitted by Recommendation ITU-R BS.645.

Appendix 1 to Annex 1

A 12-track sound recording format for video recording of a 3/2 multi-channel sound programme should have the following assignment of sound tracks shown in Table 3, which follow the assignment in Table 2 for the first group of 8 tracks.

TABLE 3
Channel assignments for a 12-channel recording⁽¹⁾

Track	Mapping type 1 (channel)	Mapping type 2 (channel)
1	L	L
2	R	R
3	C	C
4	LFE	LFE
5	LS ⁽²⁾	LS ⁽²⁾
6	RS ⁽²⁾	RS ⁽²⁾
7	A	A
8	B	B
9	LTM&E	F
10	RTM&E	F
11	F	F
12	F	F

⁽¹⁾ Mapping types 1 and 2 are extensions of the 8 audio channel/signal to track mapping described by SMPTE 2035 (Audio Channel Assignments for Digital Television Recorders (DTRs)) Table 1, case 11d.

⁽²⁾ In the case of programmes using the 3/1 multi-channel sound format, the MS (−3 dB) monophonic surround signal should be placed on both tracks 5 and 6. This allows a programme with a single surround channel to be treated as a programme with two surround channels. The MS (−3 dB) signal will be reproduced out of both the LS and RS loudspeakers, with a relative level of −3 dB with respect to the front channels. The combined power into the room will be the correct relative level of 0 dB.

Appendix 2 to Annex 1

In some areas, slightly different track assignments are in use. Care should be taken to always examine the tape label to determine the exact assignment which is used. The following examples are known.

In the United States of America, the following channel assignment may sometimes be used when the recording does not carry a 2-channel stereo compatible signal.

TABLE 4
Channel assignments for an 8-channel recording

Track	Channel
1	L
2	R
3	C
4	LFE
5	LS ⁽¹⁾
6	RS ⁽¹⁾
7	F
8	F

⁽¹⁾ In the case of programmes using the 3/1 multi-channel sound format, the MS (–3 dB) monophonic surround signal should be placed on both tracks 5 and 6. This allows a programme with a single surround channel to be treated as a programme with two surround channels. The MS (–3 dB) signal will be reproduced out of both the LS and RS loudspeakers, with a relative level of –3 dB with respect to the front channels. The combined power into the room will be the correct relative level of 0 dB.

The channel assignments listed in Table 5 are also in common use for programme interchange in formats containing 12 audio tracks, in addition to the assignments listed in Table 3.

Care should be taken to always examine the tape label to determine the exact assignment which is used.

TABLE 5
Channel assignments for a 12-channel recording

Track number	Mapping type 12/1	Mapping type 12/2	Mapping type 12/3
1	A	Programme 1 A	
2	B	Programme 1 B	
3	LTM&E	Programme 2 A	
4	RTM&E	Programme 2 B	
5	L	Programme 1 L	Programme 1 NPCM
6	R	Programme 1 R	Programme 1 NPCM
7	C	Programme 1 C	Programme 2 NPCM
8	LFE	Programme 1 LFE	Programme 2 NPCM
9	LS	Programme 1 LS	Programme 1 MM
10	RS	Programme 1 RS	Programme 2 MM
11	F	F/Programme 2 SAP	F/Programme 2 SAP
12	F/SAP	F/Programme 1 SAP	F/Programme 1 SAP

The monophonic channel may optionally be replaced with a user defined audio signal.

