SMPTE STANDARD

D-Cinema Distribution Master Common Audio Channels and Soundfield Groups

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Approved
February 26, 2013

Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in Part XIII of its Operations Manual.

SMPTE ST 428-12 was prepared by Technology Committee 21DC.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this Engineering Document.

It is useful to unambiguously identify the nature of D-Cinema audio essence. This information can be used, for instance, to inform users of the content of a D-Cinema Package, automatically route audio essence to proper server outputs based on the local auditorium configuration and configure audio processing.

It is useful to enable Audio Channels to be combined into logical Soundfield Groups. This allows D-Cinema audio essence to be described at a high-level, e.g. 5.1 soundfield configuration, while allowing processing of individual Audio Channels, e.g. routing of the Left Audio Channel to the proper server output.

1 Scope

This standard defines Universal Labels, names and symbols for common D-Cinema Audio Channels and Soundfield Groups for the purpose of labeling D-Cinema audio essence.

This standard also provides informative guidance on the location and characteristics of common D-Cinema loudspeakers, and on the naming of D-Cinema Audio Channels and Soundfield Groups.

This standard neither specifies the suitability of Audio Channels and Soundfield Groups for a particular sound track, nor specifies the loudspeakers to be present in an auditorium.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; followed by formal languages; then figures; and then any other language forms.

3 Normative Reference

The following standard contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was 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 standards indicated below.

SMPTE ST 400:2012, SMPTE Labels Structure

4 Glossary

4.1
Audio Channel
Distinct collection of sequenced audio samples that are intended for delivery to a single loudspeaker, loudspeaker array or other reproduction device.

4.2
Loudspeaker
Electro Mechanical transducer which converts an audio signal into sound.

4.3
Soundfield
Acoustical space created by simultaneously reproducing one or more Audio Channels.

4.4
Soundfield Configuration
Defined arrangement or configuration of loudspeakers that convey the intended Soundfield.

4.5
Soundfield Group
Collection of one or more Audio Channels meant to be played out simultaneously through a given Soundfield Configuration.

5 Parameters

This standard associates the following parameters with D-Cinema Audio Channels and Soundfield Groups.

5.1 UL

The UL parameter is a [SMPTE ST 400] Universal Label (UL) unique to the associated Audio Channel or Soundfield Group.

5.2 Description

The Description parameter describes the associated Audio Channel or Soundfield Group.

5.3 Name

The Name parameter is the human-readable string commonly used to refer to the Audio Channel or Soundfield Group. It is unique within this document.

5.4 Symbol

The Symbol parameter is a short ASCII string that identifies the Audio Channel or Soundfield Group. See Annex D for guidelines.

A Symbol shall consist of a minimum of 1 and a maximum of 6 ASCII characters in the set {0x30..0x39, 0x41..0x5A, 0x61..0x7A}. Mixed-case is used for readability.

A Symbol shall be unique within this document, including future revisions. As specified in the clause above, each Symbol is a unique combination of mixed-case alphanumeric character. Once a Symbol has been defined, no other Symbol shall be defined with the same sequence of alphanumeric character but different case. For example, no "RsS" Symbol can be defined if the Symbol "Rss" already exists.

Implementations shall encode the Symbol exactly as specified in this specification; i.e., using the exact sequence of mixed-case alphanumeric characters.

Implementations should use case-sensitive comparisons when decoding Symbols, but may use case-insensitive comparisons.

6 Audio Channels

Table 1 lists common D-Cinema Audio Channels.

Many Audio Channels are meant to drive loudspeakers defined in Annex B, and are denoted as such. The symbol of these Audio Channels is identical to the abbreviation of the associated loudspeaker.

Table 1 – Audio Channels

Audio Channel UL Byte 12 (see Table 2)	Name	Symbol	Description
01h	Left	L	Intended to drive the Left loudspeaker (see Annex B).
02h	Right	R	Intended to drive the Right loudspeaker (see Annex B).
03h	Center	C	Intended to drive the Center loudspeaker (see Annex B).
04h	LFE	LFE	Intended to drive the Screen Low Frequency Effects loudspeaker (see Annex B).
05h	Left Surround	Ls	Intended to drive the Left Surround (see Annex B).
06h	Right Surround	Rs	Intended to drive the Right Surround (see Annex B).
07h	Left Side Surround	Lss	Intended to drive the Left Side Surround (see Annex B).
08h	Right Side Surround	Rss	Intended to drive the Right Side Surround (see Annex B).
09h	Left Rear Surround	Lrs	Intended to drive the Left Rear Surround loudspeaker(s) (see Annex B).
0Ah	Right Rear Surround	Rrs	Intended to drive the Right Rear Surround loudspeaker(s) (see Annex B).
0Bh	Left Center	Lc	Intended to drive the Left Center loudspeaker (see Annex B).
0Ch	Right Center	Rc	Intended to drive the Right Center loudspeaker (see Annex B).
0Dh	Center Surround	Cs	Intended to drive the Center Surround loudspeaker (see Annex B).
0Eh	Hearing Impaired	HI	A dedicated Audio Channel optimizing dialog intelligibility for the hearing impaired. This may carry a special dialog centric mix, i.e. a mix in which the dialog is predominate and dynamic range compression may be employed.
0Fh	Visually Impaired-Narrative	VIN	A dedicated narration channel describing the main picture events for the visually impaired.

Note: Multiple Hearing Impaired and Visually Impaired-Narrative channels can be made available simultaneously to theatre systems; e.g., to accommodate multiple languages. In such an event, additional information, covered in other documents, is associated with each of these channels to distinguish them.

Table 2 specifies the structure of the Audio Channel UL.

Table 2 – Audio Channel UL Structure

Byte No.	Description	Value (hex)	Meaning
1	Object Identifier	06h	
2	Label side	0Eh	
3	Designator	2Bh	ISO, ORG
4	Designator	34h	SMPTE
5	Registry Category Designator	04h	Labels
6	Registry Designator	01h	Labels Registry
7	Structure Designator	01h	Labels Structure
8	Version Number	0Dh	Registry Version at the point of registration of this label
9	Item Designator	03h	Interpretive
10	Essence Kind	02h	Sound Essence
11	Essence Facet	01h	Audio Channel
12	Audio Channel Designator	xxh	See Table 1
13-16	Reserved	00h	

7 Soundfield Groups

Table 3 lists common D-Cinema Soundfield Groups. Each Soundfield Group consists of a collection of one or more Audio Channels meant to be played out simultaneously through a given Soundfield Configuration. Annex B depicts these Soundfield Configurations.

Table 3 – Soundfield Groups

Soundfield Group UL Byte12 (see Table 4)	Name	Symbol	Audio Channels	Notes
01h	5.1	51	L, C, R, Ls, Rs, LFE	Ls and Rs generally extend to the rear wall in this configuration.
02h	7.1DS	71	L, C, R, Lss, Rss, Lrs, Rrs, LFE	
03h	7.1SDS	SDS	L, Lc, C, Rc, R, Ls, Rs, LFE	Ls and Rs generally extend to the rear wall in this configuration.
04h	6.1	61	L, R, C, Lss, Rss, Cs, LFE	
05h	1.0 Monaural	M	C	Single channel mono designed to be played from the center screen speaker.

Table 4 specifies the structure of the Soundfield Group UL.

Table 4 – Soundfield Group UL Structure

Byte No.	Description	Value (hex)	Meaning
1	Object Identifier	06h	
2	Label side	0Eh	
3	Designator	2Bh	ISO, ORG
4	Designator	34h	SMPTE
5	Registry Category Designator	04h	Labels
6	Registry Designator	01h	Labels Registry
7	Structure Designator	01h	Labels Structure
8	Version Number	0Dh	Registry Version at the point of registration of this label
9	Item Designator	03h	Interpretive
10	Essence Kind	02h	Sound Essence
11	Essence Facet	02h	Soundfield Group
12	Soundfield Group Designator	xxh	See Table 3.
13-16	Reserved	00h	

Annex A Bibliography (Informative)

SMPTE RP 173-2002, Loudspeaker Placements for Audio Monitoring in High-Definition Electronic Production

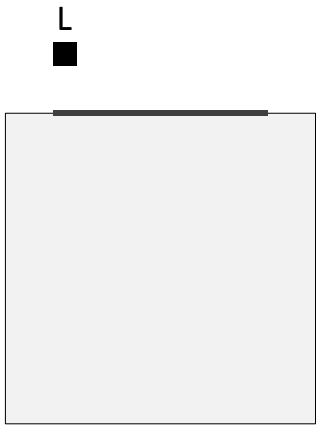
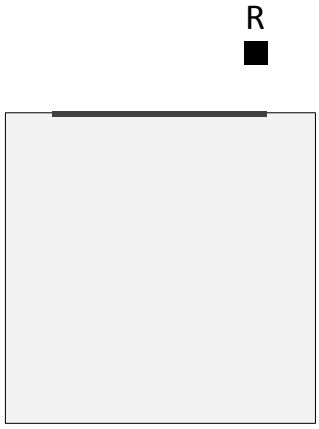
IETF RFC 2234 (November 1997), Augmented BNF for Syntax Specifications: ABNF

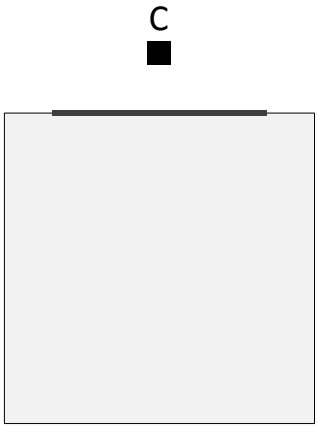
ITU-R BR.1384 (12/98), Parameters for International Exchange of Multi-Channel Sound Recordings with or without Accompanying Picture

Annex B Common D-Cinema Loudspeakers (Informative)

The following defines common D-Cinema loudspeakers, including their name, symbol (in parentheses) and a description of their typical location. Each loudspeaker definition is accompanied by a diagram illustrating location – the shaded square denotes the boundaries of the auditorium with the screen as a heavy line at the top.

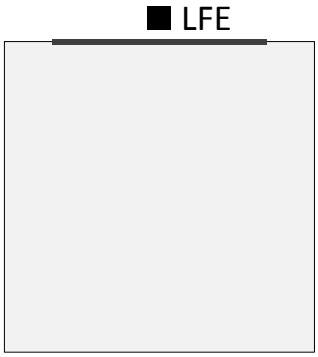
Table B.1 – Common D-Cinema Loudspeakers

	**Left (L)** Typically positioned behind the screen to the far left edge, horizontally, of the screen center as viewed from the seating area.
	**Right (R)** Typically positioned behind the screen to the far right edge, horizontally, of the screen center as viewed from the seating area.



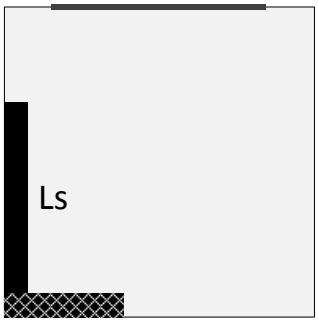
Center (C)

This loudspeaker position is typically behind the screen corresponding to the horizontal center of the screen as viewed from the seating area. Also the intended speaker position for mono reproduction.



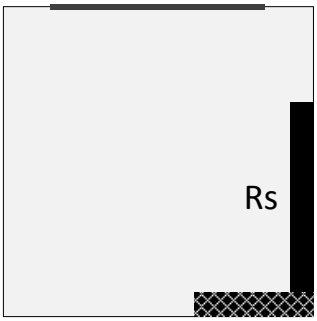
Screen Low Frequency Effects (LFE)

Screen low frequency effects subwoofer loudspeaker(s). This is typically one or more band-limited low frequency only loudspeakers at the screen end of the room.



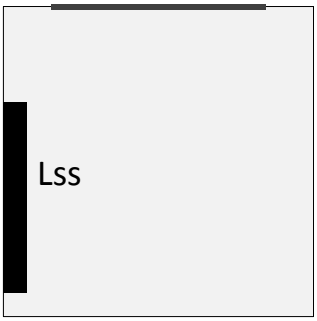
Left Surround (Ls)

An array of loudspeakers positioned along the left side of the room above the audience, starting approximately 1/3 of the distance from the screen to the rear wall and the left side of the rear wall. As depicted by the crosshatch area, the array does not extend to the rear wall in all auditoriums.



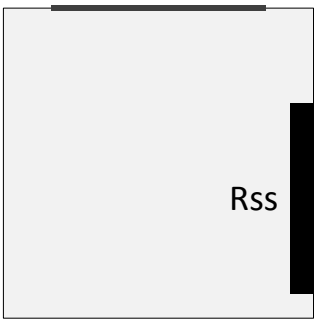
Right Surround (Rs)

An array of loudspeakers positioned along the right side of the room above the audience, starting approximately 1/3 of the distance from the screen to the rear wall and the right side of the rear wall. As depicted by the crosshatch area, the array does not extend to the rear wall in all auditoriums.



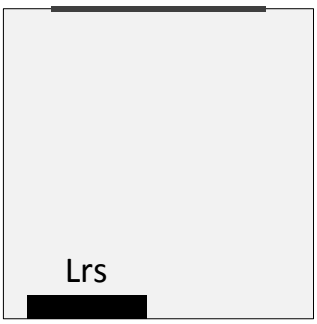
Left Side Surround (Lss)

Typically an array of loudspeakers positioned along the left side of the room above the audience, starting approximately 1/3 of the distance from the screen to the rear wall.



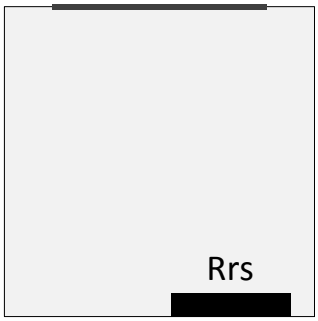
Right Side Surround (Rss)

Typically an array of loudspeakers positioned along the right side of the room above the audience, starting approximately 1/3 of the distance from the screen to the rear wall.



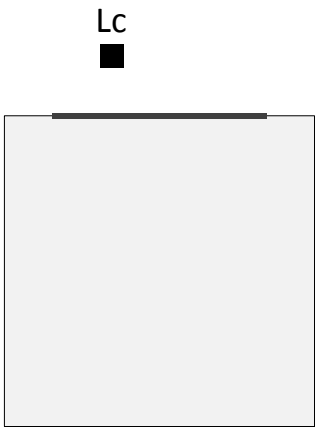
Left Rear Surround (Lrs)

One or more loudspeakers typically on the rear wall of the room above the audience to the left horizontally.



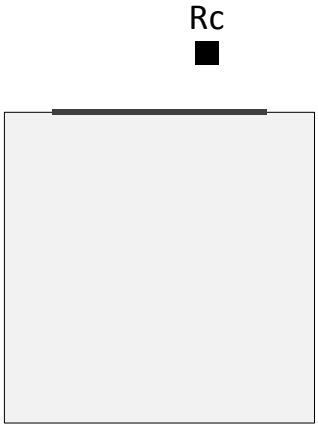
Right Rear Surround (Rrs)

One or more loudspeakers typically on the rear wall of the room above the audience to the right horizontally.



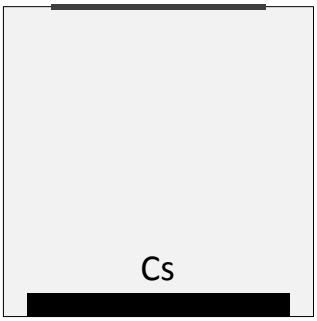
Left Center (Lc)

Mid left to center screen loudspeaker. This loudspeaker position is typically between the Center screen speaker and the Left screen speaker. The elevation is the same as the Left, Center and Right screen speakers.



Right Center (Rc)

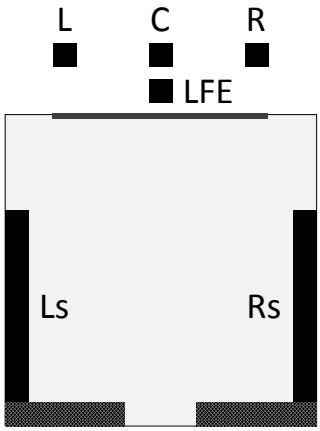
Mid right to center screen loudspeaker. This loudspeaker position is typically between the Center screen speaker and the Right screen speaker. The elevation is the same as the Left, Center and Right screen speakers.



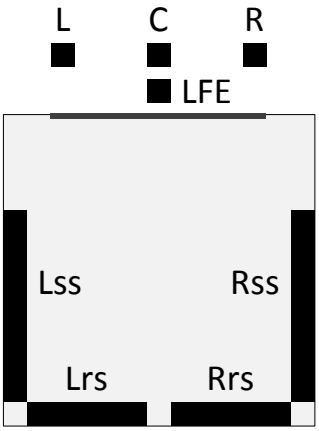
Center Surround (Cs)

One or more loudspeakers placed to create a center rear surround image. The Cs can be a single speaker in the center of the rear wall of the theater, or an array of speakers on the rear wall of the theater.

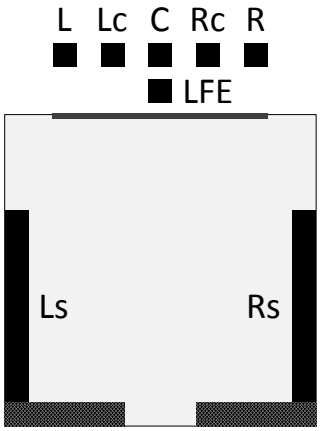
Annex C Soundfield Configuration Diagrams (Informative)



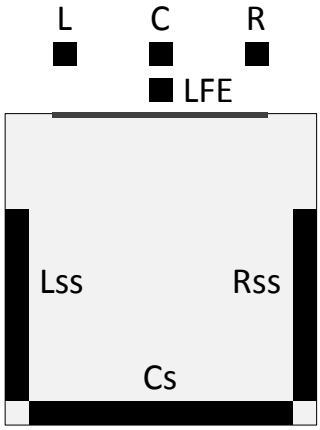
5.1



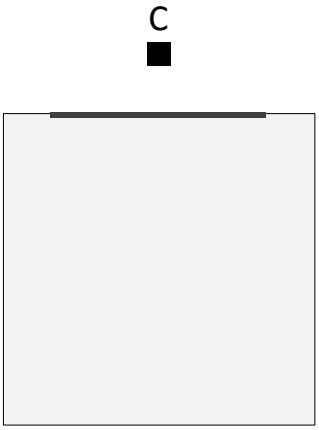
7.1DS



7.1SDS



6.1



1.0
Monaural

Annex D Guidelines for Naming D-Cinema Audio Channels and Soundfield Groups
(Informative)

It is recommended that specifications defining Audio Channels and Soundfield Groups for use in D-Cinema:

(i) Define Audio Channel names with the same general structure as used in Table 1 and follow the pattern ["Left" | "Center" | "Right"] [SP ("Side" | "Rear" | "Vertical" | "Wide")] [SP ("Surround" | "Point")] [SP "Height"] expressed using the ABNF syntax specified in RFC 2234. It is recommended that the associated Symbol be an abbreviation of the Name and follow the provisions of Section 5.4. For example, assuming the Name of an Audio Channel intended to drive the left wide loudspeaker could be "Left Wide", its corresponding Symbol could be "Lw".

(ii) Define Soundfield Group names with the same general structure as used in Table 3 and follow the pattern NCHAN ["." NLFE] [UNIQUE] expressed using the ABNF syntax specified in RFC 2234. NCHAN = 1*DIGIT is the number of full bandwidth Audio Channels, NLFE = 1*DIGIT is the number of band-limited, low-frequency effects Audio Channels and UNIQUE = 1*(A-Z) is a string unique to the Soundfield Group. It is recommended that the corresponding Symbol be a mnemonic representation of the Name and follow the provisions of Section 5.4. For example. the Name of a Soundfield Group consisting of 9 full-bandwidth Audio Channels and one low-frequency effects channel could be "9.1" and its corresponding Symbol "91".