CTA Standard

Advanced Audio Extensions

CTA-861.2

(Formerly CEA-861.2)

August 2015

Consumer Technology Association™

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FOREWORD

This standard was developed by the Consumer Electronics Association's R4.8 DTV Interface Subcommittee.

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TABLES

Advanced Audio Extensions

1 Scope

This standard specifies High Channel Count Audio and Object Based Audio extensions to CEA-861-F [1] using an updated Audio InfoFrame and an additional EDID CEA data block.

The requirements of this standard are in addition to and complement CEA-861-F [1]. All devices compliant to CEA-861.2 shall also comply with CEA-861-F [1], except that this standard modifies Table 31 and deprecates and replaces Tables 29, 30 and 46 of CEA-861-F [1].

2 References

2.1 Normative References

The following standards contain provisions that, through reference in this text, constitute normative provisions of this standard. At the time of publication, the editions indicated were 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 editions of the standards listed here.

2.1.1 Normative Reference List

1. CEA-861-F, A DTV Profile for Uncompressed High Speed Digital Interfaces, May 2014
2. ISO/IEC 62574, Audio, video and multimedia systems - General channel assignment of multichannel audio
3. ISO/IEC 23008-3, Information technology -- High efficiency coding and media delivery in heterogeneous environments -- Part 3: 3D audio
4. ISO/IEC 60958 Digital audio interface
5. ETSI TS 103 190 V1.1.1 (2014-04) Digital Audio Compression (AC-4) Standard, Internet:
6. IEC 61937-13: Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 13: MPEG-H 3D Audio
7. IEC 61937-14: Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 14: Non-linear PCM bitstreams according to the AC-4 format
8. IEC 60958-3 Digital Audio Interface - Part 3: Consumer Applications, First Edition, 1999
9. VESA E-EDID™ Standard, VESA Enhanced Extended Display Identification Data Standard, Release A, Revision 1, February 9, 2000

2.1.2 Normative Reference Acquisition

ANSI/CEA Standards

- Global Engineering Documents, World Headquarters, 15 Inverness Way East, Englewood, CO USA 80112-5776; Phone 800-854-7179; Fax 303-397-2740; Internet: http://global.ihs.com;Email global@ihs.com

ISO/IEC Standards

- International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland. Telephone +41 22 919 02 11; Telefax +41 22 919 03 00; Web: www.iec.ch; Email: inmail@iec.ch

ETSI

- European Telecommunications Standards Institute, 650, route des Lucioles, 06921 Sophia-Antipolis Cedex, France ; Phone +33 (0)4 92 94 42 00 ; Fax +33 (0)4 93 65 47 16 ; Internet http://www.etsi.org

VESA Standards

- Contact Video Electronics Standards Association, 39899 Balentine Dr., Suite 125, Newark, CA 94560, USA; Phone 510-651-5122; Internet http://www.vesa.org

2.2 Informative References

The following documents contain information that is useful in understanding this standard. At the time of publication, the editions indicated were valid.

2.2.1 Informative Reference List

10. Rec. ITU-R BS.2051-0 (02/14) 'Advanced sound system for programme production'
11. HDMI, High-Definition Multimedia Interface Specification, Version 1.4b, October 11, 2011

2.2.2 Informative Document Acquisition

ITU Standards

- International Telecommunications Union, Place des Nations, CH-1211 Geneva 20, Switzerland; Phone +41 22 730 5111; Fax +41 22 733 7256; Internet http://www.itu.int/publications/default.aspx; Email itumail@itu.int

HDMI

- HDMI Licensing, LLC, 1140 E. Arques Avenue, Suite 100, Sunnyvale, CA 94085 ; Internet http://www.hdmi.org

2.3 Definitions

For the purposes of CEA-861.2 the following definitions apply.

Object Based Audio (OBA) - In Object Based Audio, each sound is expressed as an Object with a 3D position in space rather than a discrete number of channels or loudspeakers.

High Channel Count Audio (HCCA) – Channel based audio that can be presented in speaker configurations greater than 7.1. For this document, HCCA is limited to 32 channels.

Channel, **Speaker –** There is a direct relation between a **Channel** and a **Speaker**. Audio feeding into a **Speaker** is sent via a **Channel**.

2.4 Compliance Notation

As used in this document, "shall" denotes mandatory provisions of the standard. "Should" denotes a provision that is recommended but not mandatory. "May" denotes a feature whose presence does not preclude compliance and implementation of which is optional. "Optional" denotes items that may or may not be present in a compliant device.

2.5 Hexadecimal Notation

The characters 0x preceding numbers or letters A through F designate the following values as hexadecimal notation. All other numerical values are to be assumed decimal.

2.6 Bit Naming Conventions

The names of the individual bits of multi-bit data values are composed using a value's mnemonic followed by a bit number. The significance of each bit is indicated by the bit number according to little-endian convention (i.e. bit number 0 is the least significant).

Future bits begin with the mnemonic 'F' followed by a bit number, where bit numbers indicate location - not significance. Future bits shall be set to zero and ignored.

2.7 Symbols and Abbreviations

CEA	Consumer Electronics Association

FFP Fractional Fixed Point
HCCA High Channel Count Audio
ISO International Organization for Standardization
LPCM Linear pulse-code modulation
MSB Most Significant Byte
OBA Object Based Audio
PLP Primary Listening Position
RCD Room Configuration Descriptor
SPM Speaker Presence Mask

3 Room configuration

This section extends CEA-861-F [1] to include systems based on Speaker Location Names, and those based on a spatial coordinate system than can be fully utilized in rendering Object Based Audio.

3.1 Speaker Location Names

Table 1, shown below, modifies Table 30 in section 6.6.2 of CEA-861-F [1] so that the Speaker Location Names and descriptions are consistent with those in ISO/IEC 62574 [2].

Note that speaker location names are informatively associated to geometrical speaker positions as per Rec. ITU-R BS.2051-0 [10].

Label	Position Description	Code
FL	Front Left	0x00
FR	Front Right	0x01
FC	Front Center	0x02
LFE1	Low Frequency Effects 1	0x03
BL	Back Left	0x04
BR	Back Right	0x05
FLc	Front Left of Center	0x06
FRc	Front Right of Center	0x07
BC	Back Center	0x08
LFE2	Low Frequency Effects 2	0x09
SiL	Side Left	0x0A
SiR	Side Right	0x0B
TpFL	Top Front Left	0x0C
TpFR	Top Front Right	0x0D
TpFC	Top Front Center	0x0E
TpC	Top Center	0x0F
TpBL	Top Back Left	0x10
TpBR	Top Back Right	0x11
TpSiL	Top Side Left	0x12
TpSiR	Top Side Right	0x13
TpBC	Top Back Center	0x14
BtFC	Bottom Front Center	0x15
BtFL	Bottom Front Left	0x16
BtFR	Bottom Front Right	0x17
FLw	Front Left Wide	0x18
FRw	Front Right Wide	0x19
LS	Left Surround	0x1A
RS	Right Surround	0x1B
	reserved	0x1C

Label	Position Description	Code
	reserved	0x1D
TpLS	Top Left Surround	0x1E
TpRS	Top Right Surround	0x1F

Table 1 Speaker Location Names (Table 30)

3.2 Room Coordinate System

The CEA Room Coordinate System will describe the spatial location of components in a viewing and/or listening environment, such as the speakers and the display. These coordinates can then be translated to suit the needs of the various OBA rendering algorithms used to create a customized listening experience.

The origin of the Room Coordinate System is defined to be the most optimal seated listening position in the room. This is denoted as the Primary Listening Position (PLP).

The Room Coordinate System shall be based on a rectangular box that contains all of the components of interest centered on the PLP.

Xmax, Ymax and Zmax shall define the extremities of this box expressed as unsigned integer. values in decimeters 1(dm). Note that this will describe rooms as large as 51 meters on each axis.

The X axis is positive to the right of the PLP, from the perspective of the listener.

The Y-axis is positive from the PLP going forward toward the Display.

The Z-axis is positive from the PLP going Up.

The coordinate values along each axis shall be normalized by the maximum absolute excursion on that axis.

The procedure for characterizing a room shall be as follows:

The point of measurement for the display position shall be the center of the viewing area on the display surface.

The point of measurement for each speaker is at the acoustic center on the inward facing surface for direct speakers, and the acoustic center of the reflected or virtual sound field for reflected and virtualized speakers.

The transmission of display width described in Table 74 of CEA-861-F [1] is not sufficient for Object Audio which also requires the display height and to be able to accommodate projector screens that are larger than the maximum that can be described in Table 74 (~2.5m) consequently the screen size may also defined here using the same coordinate system as the speakers.

Normalized parameters are represented in 1.6 signed two's complement format, as in Table 2 below:

Bit	7	6	5	4	3	2	1	0
	S	I	F	F	F	F	F	F

Table 2 Coordinate Value Format

S = sign bit (MSB). If the sign bit (S) equals zero, then the Coordinate Value is positive. If the sign bit (S) equals one, then the Coordinate Value is negative.

[1] 1dm = 10cm = 100mm = approximately 4 inches

I = integer portion.

F = fractional portion. Since there are 6 fractional bits, the scaling factor is $1/2^6$ = 1/64. For example, a value of 11111111b = -1/64.

The Coordinate Value Format represents values from -2 to +1.984375 in steps of .015625 or (1/64).

For example, if Xmax = 30 dm, (3 m), then the unit resolution of the axis is about 5 cm.

3.3 Room Configuration Descriptor (RCD)

The Room Configuration Descriptor and Speaker Location Descriptors are capable of fully describing the playback environment using the room coordinate system defined in section 3.2.

Information here can be in excess of, or in conflict with, the speaker definitions in the Speaker Allocation Data Block. A souce wanting to use the audio delivery described here shall use this Room Configuration information, if present, instead of the Speaker Allocation information.

3.3.1 Room Configuration Descriptor Data Block

The Room Configuration Descriptor Data Block is shown in Table 3 below.

Byte #	7	6	5	4	3	2	1	0
1	Tag Code = 7			Length of following block payload (bytes)				
2	Extended Tag Code (0x13)							
3	Display	Speaker	SLD	Speaker Count				
SPM1	FLW/FRW	F46=0	FLC/FRC	BC	BL/BR	FC	LFE1	FL/FR
SPM2	TpSiL/TpSiR	SiL/SiR	TpBC	LFE2	LS/RS	TpFC	TpC	TpFL/TpFR
SPM3	F67=0	F66=0	F65=0	F64=0	TpLS/TpRS	BtFL/BtFR	BtFC	TpBL/TpBR
MAX1	Xmax							
MAX2	Ymax							
MAX3	Zmax							
DISP1	DisplayX							
DISP2	DisplayY							
DISP3	DisplayZ							

Table 3 Room Configuration Descriptor Data Block

Speaker – If **Speaker** = 1 then **Speaker Count** is valid. If **Speaker** = 0, then **Speaker Count** is undefined. A valid **Speaker Count** is optional for configurations described only with a SPM flag, and mandatory for configurations described using at least one Speaker Location Descriptor.

SPM1 – SPM3 – **Speaker Presence Mask**. Channel-name mnemonics used in this register are found in Table 1. The flags in this 3 byte register indicate the presence of speakers by name. If a flag is set to one then the indicated position is present, and if the flag is set to zero then the respective position is not present.

For L/R paired positions, the corresponding flag in the SPM is set to 1 only if both speakers exist. Speakers that are a part of an incomplete pairing can only be represented using the spatial coordinates.

SLD – If **SLD** = 1, then Speaker Location Descriptors are available, and **Xmax**, **Ymax** and **Zmax** are set to meaningful values. If **SLD** = 0, then Speaker Location Descriptors are not available and only the SPM register is used to describe the speaker layout. Xmax, Ymax and Zmax shall be ignored.

Speaker Count – This is a 5 bit unsigned integer value equal to the total number of LPCM channels – 1. Speaker Count is required if the Speaker Location Descriptor is used.

Note that a discrepancy between **SPM1 – SPM3** and Speaker Count is possible for systems using spatial coordinates.

Xmax – An 8-bit integer equal to the absolute value of the maximum distance along the X axis from the PLP to the furthest speaker in decimeters (dm). This parameter is required in order to use spatial coordinates for advanced room configurations.

Ymax – An 8-bit integer equal to the absolute value of the maximum distance along the Y axis from the PLP to the furthest speaker in dm. This parameter is required in order to use spatial coordinates for advanced room configurations.

Zmax – An 8-bit integer equal to the absolute value of the maximum distance along the Z axis from the PLP to the furthest speaker in dm. This parameter is required in order to use spatial coordinates for advanced room configurations.

Display – If **Display** = 1, then the display values in bytes **DISP1** through **DISP3** contain valid data. Display shall be 0 if **SLD** is 0.

DisplayX – A Coordinate Value normalized to **Xmax** equal to distance between the PLP and the center of the display along the x-axis.

DisplayY – A Coordinate Value normalized to **Ymax** equal to distance between the PLP and the center of the display along the y-axis.

DisplayZ – A Coordinate Value normalized to **Zmax** equal to distance between the PLP and the center of the display along the z-axis.

> **Note**: Only the location of the display is expressed here. The display's width and height are available from the 'Max Horizontal Image Size' and 'Max Vertical Image Size' fields that are assigned on address 0x15 and 0x16 in the VESA E-EDID specification. HDMI provides additional means to define the value range of the VESA Image Size parameter, and that feature should be set accordingly.

3.4 Speaker Location Descriptor

The Speaker Location Descriptor is a data structure for providing additional information about a particular channel. The use of the Speaker Location Descriptor shall only be used when the corresponding parameters SLD and Speaker Count have been set in the Room Configuration Descriptor Data Block.

This Speaker Location Descriptor describes the PCM channel, speaker type, and/or speaker coordinates. It occupies 2 or 5 bytes, depending on the flags in the first byte.

Byte \ Bit#	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel	F17=0	COORD	Active	Channel Index (0 to 31)				
ID	F27=0	F26=0	F35=0	Speaker ID (0 to 31) (from Table 1)				
COORD1	X							
COORD2	Y							
COORD3	Z							

Table 4 Speaker Location Descriptor

Channel Index: Index of the audio channel where the audio for the described speaker is to be transmitted.

A source shall order the channels following these implementation guidelines:

1. The channel indices (from 0 to 31) will indicate the ordering of the LPCM feeds being delivered.
2. Pairs should be kept together, with the "R" on the second channel of a channel pair.

3. Duplicate speaker IDs are in consecutive channel numbers, with no special regard to pairing.

As a consequence of these guidelines, a Source delivering OBA will have the information necessary to render to all available speaker feeds.

In OBA, where both Source and Sink support speaker locations based on room coordinates, there exists the possibility that some channels will share a name – e.g. there may be 2 'center' channels, so default channel ordering is not possible. Consequently the Audio InfoFrame Data Byte 4 shall be set to 0xFF (see Table 6).

Active – If Set to 1, then the channel shall be rendered on a speaker by the Sink. If set to 0, the respective channel is unused. The total number of Active flags set to 1 shall match the Speaker Count in the Room Configuration Descriptor Data Block.

COORD – If Set to 1, then the three bytes COORD1, COORD2 and COORD3 shall be present and the X, Y and Z fields shall contain valid data. If set to 0, the COORD1, COORD2, and COORD3 bytes shall not be present in the Speaker Location Descriptor.

Speaker ID – Shall identify the type of speaker being described (see Table 1 in 3.1)

X – The normalized position of this speaker on the X axis relative to the PLP represented by a Coordinate Value.

Y – The normalized position of this speaker on the Y axis relative to the PLP represented by a Coordinate Value.

Z – The normalized position of this speaker on the Z axis relative to the PLP represented by a Coordinate Value.

3.4.1 Speaker Location Descriptor Data Block

Byte #	7	6	5	4	3	2	1	0
1	Tag Code = 7			Length of following block payload (bytes)				
2	Extended Tag Code (0x14)							
3 through Length + 1	Speaker Location Descriptors							

Table 5 Speaker Location Descriptor Data Block

3.5 Enhanced Audio Infoframe

The reserved bytes of Table 31 in section 6.6.2 of CEA-861-F [1] are being modified to indicate if the signal was sourced from an HCCA based source or an OBA source.

0	0	1	1	0	0	1	0	0x32	Reserved
…									
1	1	1	1	1	1	0	1	0xFD	
1	1	1	1	1	1	1	0	0xFE	Channels delivered according to the Speaker Mask (see 3.6, below)
1	1	1	1	1	1	1	1	0xFF	Channels delivered according to Channel Index (see 3.7, below)

Table 6 Audio InfoFrame Data Byte 4 (Table 31)

0xFE shall indicate that channel to speaker association is by speaker names (based on RCD)

0xFF shall indicate that channel to speaker association is by channel index (available with speakers located using room coordinates)

3.6 Delivery According to the Speaker Mask

When the Audio InfoFrame Data Byte 4 = 0xFE, Data Bytes 6,7,8 shall be described as in Table 7 below:

InfoFrame Type Code	InfoFrame Type = 0x04							
InfoFrame Version Number	Version = 0x01							
Length of Audio InfoFrame	Length of Audio InfoFrame = 10							
Data Byte 1	CT3	CT2	CT1	CT0	F13=0	CC2	CC1	CC0
Data Byte 2	F27=0	F26=0	F25=0	SF2	SF1	SF0	SS1	SS0
Data Byte 3	F37=0	F36=0	F35=0	CXT4	CXT3	CXT2	CXT1	CXT0
Data Byte 4	CA7	CA6	CA5	CA4	CA3	CA2	CA1	CA0
Data Byte 5	DM_INH	LSV3	LSV2	LSV1	LSV0	F52=0	LFEPBL1	LFEPBL0
Data Byte 6	FLW/ FRW	F66=0	FLC/ FRC	BC	BL/ BR	FC	LFE1	FL/ FR
Data Byte 7	TpSiL/ TpSiR	SiL/ SiR	TpBC	LFE2	LS/RS	TpFC	TpC	TpFL/ TpFR
Data Byte 8	F87=0	F86=0	F85=0	F84=0	TpLS/ TpRS	BtFL/ BtFR	BtFC	TpBL/ TpBR
Data Byte 9	F97=0	F96=0	F95=0	F94=0	F93=0	F92=0	F91=0	F90=0
Data Byte 10	F107=0	F106=0	F105=0	F104=0	F103=0	F102=0	F101=0	F100=0

Table 7 Audio InfoFrame for RCD audio delivery

Data Bytes 6 to 8 of the InfoFrame correspond to the SPM Bytes defined in Table 3 and these bytes constitute the Speaker Mask. The source shall not declare channels in the InfoFrame that were not declared as available in the RCD. All channels declared in the InfoFrame shall be present in the audio delivery.

In the SPM of the RCD (Table 3), many of the flags describe a pair of speakers (e.g. FL/FR), but some describe a single speaker (e.g. LFE1). When a source device is preparing audio for a room described in this manner, both speakers of a pair are always assumed to be present.

For systems conforming to ISO 60958 [4], speaker feeds are always packed in channel pairs. For example in a 5.1 speaker system, LFE1 and FC are packed together in a LPCM transmission.

The ordering of the LPCM channels feeding into the speakers shall be according to the following rules:

1. Channels shall be sent consecutively in the order indicated in the SPM portion of the Room Configuration Descriptor Data Block, starting from bit 0, byte 1.
2. Channel pairs shall always be sent together in the order of Left/Right
3. Single channels shall be sent in the order of the first flag/next flag, e.g. LFE1/Center.
4. If one or more channel pairs exists between two single channels, then the second single channel shall be brought forward to fill the vacancy ahead of the pairs.

5. If an odd number of channels are being presented, then an inactive channel shall occupy the second channel of the channel pair carrying the single channel.

Example:

A source is sending the following channels:

FL, FR, LFE1, FC, BL, BR, BC, TpFL, TpFR, LFE2

The order of the channel pairs shall be as follows:

FL/FR,

LFE1/FC,

BL/BR,

BC/LFE2,

TpFL/TpFR

3.7 Delivery by Channel Index

A Source shall only deliver audio data by channel index when a Speaker Location Data Block is available for all channels being utilized by the Source.

If the delivery by Channel Index is used, it will be used exclusively, and delivery by speaker mask (as described in Section 3.6) will not be used.

When Data Byte 4 = 0xFF, Data Bytes 6, 7, 8 and 9 in the Audio InfoFrame, shown in Table 8, indicate which channels are being delivered. Bits CID00 to CID31 correspond to Channel Index 0 to Channel Index 31 respectively, as assigned in the Speaker Location Descriptors.

The Source shall only deliver audio to Channel Indices that were declared in a Speaker Location Data Block. For each Channel Index that is represented in the audio transmission, the corresponding CID flag of the InfoFrame shall be set to 1. All other CID flags shall be set to 0.

The ordering of the LPCM channels in the audio transmission shall directly correspond to the Channel Index from the lowest value to the highest, not make any exception for paired (L/R) channels, and only include active indicated channels.

InfoFrame Type Code	InfoFrame Type = 0x04							
InfoFrame Version Number	Version = 0x01							
Length of Audio InfoFrame	Length of Audio InfoFrame = 10							
Data Byte 1	CT3	CT2	CT1	CT0	F13=0	CC2	CC1	CC0
Data Byte 2	F27=0	F26=0	F25=0	SF2	SF1	SF0	SS1	SS0
Data Byte 3	F37=0	F36=0	F35=0	CXT4	CXT3	CXT2	CXT1	CXT0
Data Byte 4	CA7	CA6	CA5	CA4	CA3	CA2	CA1	CA0
Data Byte 5	DM_INH	LSV3	LSV2	LSV1	LSV0	F52=0	LFEPBL1	LFEPBL0
Data Byte 6	CID07	CID06	CID05	CID04	CID03	CID02	CID01	CID00
Data Byte 7	CID15	CID14	CID13	CID12	CID11	CID10	CID09	CID08
Data Byte 8	CID23	CID22	CID21	CID20	CID19	CID18	CID17	CID16
Data Byte 9	CID31	CID30	CID29	CID28	CID27	CID26	CID25	CID24
Data Byte 10	F107=0	F106=0	F105=0	F104=0	F103=0	F102=0	F101=0	F100=0

Table 8 Audio InfoFrame for Channel Index based audio delivery

3.8 Additional Audio InfoFrame Information

The value of the LFEPBL field, in Audio InfoFrame Data Byte 5, shall apply to all LFE channels in use (i.e., LFE1 and LFE2).

3.9 Data Block Tag Codes

Table 46 of CEA-861-F [1] is modified by adding two new Extended Tag Codes as in Table 9 below:

Extended Tag Codes	Type of Data Block
0	Video Capability Data Block
1	Vendor-Specific Video Data Block
2	VESA Display Device Data Block [81]
3	VESA Video Timing Block Extension
4	Reserved for HDMI Video Data Block
5	Colorimetry Data Block
6…12	Reserved for video-related blocks
13	Video Format Preference Data Block
14	YC_BC_R 4:2:0 Video Data Block
15	YC_BC_R 4:2:0 Capability Map Data Block
16	Reserved for CEA Miscellaneous Audio Fields
17	Vendor-Specific Audio Data Block
18	Reserved for HDMI Audio Data Block
19	Room Configuration Descriptor Data Block
20	Speaker Location Descriptor Data Block
21…31	Reserved for audio-related blocks
32	InfoFrame Data Block (includes one or more Short InfoFrame Descriptors)
33…255	Reserved

Table 9 CEA Data Block Tag Codes (Table 46)

4 Additional Audio Format Codes

CEA-861-F [1], Table 29 is extended as shown in Table 10 below:

CXT	Audio Coding Extension Type	Audio Stream Encoding Standard	Audio Stream Transport Standard
0x00	**Refer to Audio Coding Type (CT) field in Data Byte 1**		
0x01	**Not in use**		
0x02	**Not in use**		
0x03	**Not in use**		
0x04	MPEG-4 HE AAC	ISO/IEC 14496-3 [25]	IEC 61937-11 [21]
0x05	MPEG-4 HE AAC v2	ISO/IEC 23003-1 [26]	IEC 61937-11[21]
0x06	MPEG-4 AAC LC	ISO/IEC 14496-3 [25]	IEC 61937-11 [21]
0x07	DRA	GB/T 22726 [39]	IEC 61937-12 [22]
0x08	MPEG-4 HE AAC + MPEG Surround	ISO/IEC 14496-3 [25], ISO/IEC 23003-1 [26]	IEC 61937-11 [21]
0x09	**Reserved**		
0x0A	MPEG-4 AAC LC + MPEG Surround	ISO/IEC 14496-3 [25], ISO/IEC 23003-1 [26]	IEC 61937-11 [21]
0x0B	MPEG-H 3D Audio	ISO/IEC 23008-3 [3]	IEC 61937-13 [6]
0x0C	AC-4	ESTI TS 103 190 [5]	IEC 61937-14 [7]
0x0D	L-PCM 3D Audio	IEC 60958-3 [8]	
0x0E – 0x1F	**Reserved**		

Table 10 Additional Audio Format Code Extension Values (Data Byte 3) (Table 29)

Section 7.5.2 of CEA-861-F [1] is extended to include tables 11, 12, and 13 that define new Short Audio Descriptors identified by the new Audio Format Code Extension Values described in Table 10.

	bits							
Byte#	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	F17=0	Audio Format Code=1111				F12=0	F11=0	F10=0
2	F27=0	192 kHz	176.4 kHz	96 kHz	88.2 kHz	48 kHz	44.1 kHz	32 kHz
3	Audio Coding Extension Type Code=0x0B					Audio Format Code dependent value		

Table 11 CEA Short Audio Descriptor for Audio Extension Type Code 11 (MPEG-H 3D Audio)

	bits							
Byte#	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	F17=0	Audio Format Code=1111				F12=0	F11=0	F10=0
2	F27=0	192 kHz	F25=0	96 kHz	F23=0	48 kHz	44.1 kHz	F20=0
3	Audio Coding Extension Type Code=0x0C					Audio Format Code dependent value		

Table 12 CEA Short Audio Descriptor for Audio Extension Type Code 12 (AC-4)

	bits							
Byte#	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
1	MC3	Audio Format Code=1111				MC2	MC1	MC0
2	MC4	192 kHz	176.4 kHz	96 kHz	88.2 kHz	48 kHz	44.1 kHz	32 kHz
3	Audio Coding Extension Type Code=0x0D					24 bit	20 bit	16 bit

Table 13 CEA Short Audio Descriptor for Audio Extension Type Code 13 (L-PCM 3D Audio)

For Audio Coding Extension Type 0x0D (L-PCM 3D Audio), bits MC4:MC0 of bytes 1 and 2 indicate *Max Number of Channels -1*.

Annex A Change in Audio Speaker Names from CEA-861-F to CEA-861.2 (Informative)

CEA-861.2 uses the speaker naming convention defined in ISO/IEC 62574 [2]. This Annex defines the relationship between the naming convention used in CEA-861-F [1] and this extension. Note that some positions defined are new and don't have an equivalent position in CEA-861-F [1].

ISO/IEC 62574 and CEA-861.2 Label	Position Description	CEA-861-F Label
FL	Front Left	FL
FR	Front Right	FR
FC	Front Center	FC
LFE1	Low Frequency Effects 1	LFE
BL	Back Left	
BR	Back Right	
FLc	Front Left of Center	FLC
FRc	Front Right of Center	FRC
BC	Back Center	RC, RLC/RRC[1]
LFE2	Low Frequency Effects 2	
SiL	Side Left	
SiR	Side Right	
TpFL	Top Front Left	FLH[2]
TpFR	Top Front Right	FRH[2]
TpFC	Top Front Center	FCH[2]
TpC	Top Center	TC
TpBL	Top Back Left	
TpBR	Top Back Right	
TpSiL	Top Side Left	
TpSiR	Top Side Right	
TpBC	Top Back Center	
BtFC	Bottom Front Center	
BtFL	Bottom Front Left	
BtFR	Bottom Front Right	
FLw	Front Left Wide	FLW
FRw	Front Right Wide	FRW
LS[3]	Left Surround	RL
RS[3]	Right Surround	RR
TpLS	Top Left Surround	
TpRS	Top Right Surround	

Table 14 Speaker Label Changes from CEA-861-F to CEA-861.2

[1] The split rear center is an artifact of the matrix surround era, where only a total of 4 channels existed, which were L, R, C, S. Some manufacturers in that brief era chose to array the S channel into two physical speakers, but with the same signal to each speaker.

[2] In IEC 62574 [2] labeling, Top Channels (Tp) are equivalent to Height (H) in various naming conventions

Consumer Technology Association Document Improvement Proposal

If in the review or use of this document a potential change is made evident for safety, health or technical reasons, please email your reason/rationale for the recommended change to standards@ce.org.

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