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Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –

Part 2: Burst-info

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CONTENTS

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DIGITAL AUDIO – INTERFACE FOR NON-LINEAR PCM ENCODED AUDIO BITSTREAMS APPLYING IEC 60958

Part 2: Burst-info

FOREWORD

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International Standard IEC 61937-2 has been prepared by Technical Area 4, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition of IEC 61937-2 cancels and replaces the first edition published in 2000. This edition contains the following significant technical changes with respect to the previous edition.

a) New audio data-types of enhanced AC-3 data, MPEG-2 AAC low sampling frequency, MPEG-4 AAC, DTS type IV, ATRAC-X, WMA professional and MAT are added.
b) Data-type field in Pc is expanded from bit 0-4 to 0-6.

The text of this standard is based on the following documents:

CDV	Report on voting
100/1115/CDV	100/1221/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the parts of the IEC 61937 series, under the general title *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

DIGITAL AUDIO – INTERFACE FOR NON-LINEAR PCM ENCODED AUDIO BITSTREAMS APPLYING IEC 60958

Part 2: Burst-info

1 Scope

This part of IEC 61970 specifies the digital audio interface to convey non-linear PCM encoded audio bitstreams applying IEC 60958-1 and IEC 60958-3. This standard specifies burst-info which defines content information about the data contained in the burst payload.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60958-1, *Digital audio interface – Part 1: General*

IEC 60958-3, *Digital audio interface – Part 3: Consumer applications*

IEC 61937-1, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 1: General*

IEC 61937-3, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 3: Non-linear PCM bitstreams according to the AC-3 format*

IEC 61937-4, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 4: Non-linear PCM bitstreams according to the MPEG audio formats*

IEC 61937-5, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 5: Non-linear PCM bitstreams according to the DTS (Digital Theater Systems) format(s)*

IEC 61937-6, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 6: Non-linear PCM bitstreams according to the MPEG-2 AAC and MPEG-4 AAC formats*

IEC 61937-7, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 7: Non-linear PCM bitstreams according to the ATRAC, ATRAC2/3 and ATRAC-X formats*

IEC 61937-8, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 8: Non-linear PCM bitstreams according to the Windows Media Audio (WMA) Professional format*

IEC 61937-9, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 9: Non-linear PCM bitstreams according to the MAT format*[1]

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1 To be published.

ISO/IEC 11172-3: *Information technology – Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mb/s – Part 3: Audio*

ISO/IEC 13818-3, *Information technology – Generic coding of moving pictures and associated audio information – Part 3: Audio*

ISO/IEC 13818-7, *Information technology – Generic coding of moving pictures and associated audio information – Advanced Audio Coding (AAC)*

ISO/IEC 14496-3, *Information technology – Coding of audio-visual objects – Part 3: Audio*

ITU-R Recommendation BS.1196, *Audio coding for digital terrestrial television broadcasting*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purpose of this document, the following terms and definitions apply.

audio data-burst	data-burst with an encoded audio frame as burst-payload
audio data-word	16-bit data word
audio frame	fixed number of audio samples. The number of samples in an audio frame is dependent on the particular encoding system which is used to encode the audio frame into the encoded audio frame
audio gap	period in the sequence of baseband audio samples where valid samples of audio are not available
bitstream	non-linear PCM encoded audio source, represented in a sequence of bits. In this interface the bitstream consists of a sequence of data-bursts
data-burst	packet of data, including the burst-preamble, to be transmitted across the interface
burst-payload	information content of the data-burst
burst-preamble	header for the data-burst, containing synchronization and information about the data contained in the burst-payload
data-type	reference to the type of payload of the data-bursts
encoded audio frame	minimum decodable unit of an encoded data sequence. Each encoded audio frame is the encoded representation of a fixed number of audio samples (for each original audio channel). The number of samples which are encoded into an encoded audio frame depends on the particular encoding system which is used to encode the audio frame into the encoded audio frame
length-code	length of the data-burst-payload in bits
repetition period	period between the reference point of the current data-burst, and the reference point of the immediately following data-burst of the same data-type
sampling frequency	sampling frequency of the encoded PCM audio samples (i.e. before encoding and after decoding)
sampling period	period related to the sampling frequency of the PCM audio samples, represented in the encoded bitstream
stuffing	occupying the unused data capacity of the interface
stuffing sub-frame	occupying the unused data capacity in 16-bit audio data words
stream gap	period within the encoded audio bitstream without any audio frame; a discontinuity in the bitstream. Typically, a stream gap will occur between encoded audio frames

3.2 Abbreviations

ATRAC	Adaptive TRansform Acoustic Coding
ATRAC2	Adaptive TRansform Acoustic Coding 2
ATRAC3	Adaptive TRansform Acoustic Coding 3
ATRAC2/3	ATRAC2 and/or ATRAC3
ATRAC-X	Adaptive TRansform Acoustic Coding-X
ATSC	Advanced Television Systems Committee
IEC	International Electrotechnical Commission
ISO/IEC MPEG	Moving Pictures Expert Group, a joint committee of ISO and IEC
ITU-R	International Telecommunication Union, Radiocommunication Bureau
MPEG	Motion Pictures Expert Group, a joint committee of ISO and IEC
SMPTE	Society of Motion Picture and Television Engineers

4 Burst-info

4.1 General

The 16-bit burst-info contains information about the data which will be found in the data-burst. Fields of burst-info is specified in Table 1.

Table 1 – Fields of burst-info

Bits of Pc	Value	Contents
0-4		Data-type
	0-31	See Table 2
5-6		Subdata-type
	0-3	See Table 2
7		Error-flag
	0	Error-flag indicating a valid burst-payload
	1	Error-flag indicating that the burst-payload may contain errors
8-12		Data-type-dependent info
13-15	0-7	Bit-stream-number
NOTE Refer to IEC 61937-1, 6.1.7 and 6.1.7.1.		

4.2 Data-type and subdata-type

Data type defined in PC bits 0-6 in IEC 61937-1 consists of conventional data-type (0-4) and subdata-type (5-6) for historical reasons. All data-types are defined in Table 2.

Any combination of data-type and subdata-type which is not defined in Table 2 shall not be transmitted.

Table 2 – Data-types

Data-type Value of PC bit 0-4	Subdata-type Value of PC bit 5-6	Contents	Reference point R	Repetition period of data-burst measured in IEC 60958 frames
0	0	Null data		See Note 1
1	0	AC-3 data	R-AC-3	1 536
2	0 – 3	Refer to SMPTE 338M		
3	0	Pause	bit 0 of Pa	See Note 2
4	0	MPEG-1 layer 1 data	bit 0 of Pa	384
5	0	MPEG-1 layer 2 or 3 data or MPEG-2 without extension	bit 0 of Pa	1 152
6	0	MPEG-2 data with extension	bit 0 of Pa	1 152
7	0	MPEG-2 AAC	bit 0 of Pa	1 024
8	0	MPEG-2, layer-1 low sampling frequency	bit 0 of Pa	768
9	0	MPEG-2, layer-2 low sampling frequency	bit 0 of Pa	2 304
10	0	MPEG-2, layer-3 low sampling frequency	bit 0 of Pa	1 152
11	0	DTS type I	bit 0 of Pa	512
12	0	DTS type II	bit 0 of Pa	1 024
13	0	DTS type III	bit 0 of Pa	2 048
14	0	ATRAC	bit 0 of Pa	512
15	0	ATRAC 2/3	bit 0 of Pa	1 024
16	0	ATRAC-X	bit 0 of Pa	2 048
17	0	DTS type IV	bit 0 of Pa	See IEC 61937-5
18	0	WMA professional type I	bit 0 of Pa *3	2 048
	1	WMA professional type II	bit 0 of Pa	2 048
	2	WMA professional type III	bit 0 of Pa	1 024
	3	WMA professional type IV	bit 0 of Pa	512
19	0	MPEG-2 AAC low sampling frequency	bit 0 of Pa	2 048
	1	MPEG-2 AAC low sampling frequency	bit 0 of Pa	4 096
	2 – 3	MPEG-2 AAC low sampling frequency	reserved	reserved
20	0	MPEG-4 AAC	bit 0 of Pa	1 024
	1	MPEG-4 AAC	bit 0 of Pa	2 048
	2	MPEG-4 AAC	bit 0 of Pa	4 096
	3	MPEG-4 AAC	bit 0 of Pa	512
21	0	Enhanced AC-3	bit 0 of Pa	6 144
	1 – 3	Reserved	reserved	reserved
22	0	MAT	R-MAT	15 360
	1 – 3	Reserved	reserved	reserved
23 – 26	0 – 3	Reserved		
27 – 30	0 – 3	Refer to SMPTE 338M		
31	0 – 3	Extended data-type (not use until defined)		

NOTE 1 Refer to IEC 61937-1, 7.3.

NOTE 2 The repetition period of pause data-bursts depends on the application. The repetition period of pause data-bursts is defined for each audio data-burst.

NOTE 3 Refer to IEC 61937-8, 4.2.

4.3 Audio data-bursts

4.3.1 General

This subclause specifies the audio data-bursts. Specific properties such as reference points, repetition period, the method of filling stream gaps, and decoding latency are specified for each data-type.

The decoding latency (or delay), indicated for the data-types, shall be used by the transmitter to schedule data-bursts as necessary to establish synchronization between picture and decoded audio.

4.3.2 AC-3

The AC-3 bitstream consists of a sequence of AC-3-frames. The data-type of an AC-3 data-burst is 1 and the subdata-type of an AC-3 data-burst is 0. An AC-3 frame represents 1 536 samples of each encoded audio channel (left, centre, etc.). The data-burst is headed with a burst-preamble, followed by the burst-payload. The burst-payload of each data-burst of AC-3 data shall contain one complete AC-3-frame.

The length of the AC-3 data-burst will depend on the encoded bit rate (which determines the AC-3-frame length). The specification for the AC-3 bitstream may be found in ITU-R Recommendation BS.1196; the burst format is specified in IEC 61937-3.

4.3.3 MPEG-1 layer-1

An MPEG-1 layer-1 MPEG-frame represents 384 samples of each encoded channel and can be transferred using data-type 4 and the subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 11172-3 and IEC 61937-4.

4.3.4 MPEG-1 layer-2 or layer-3 or MPEG-2 without extension

The burst-payload of MPEG-1 layer-2, or layer-3, or MPEG-2 without extension, represents 1 152 samples of each encoded channel and can be transferred using data-type 5 and sub-data-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 11172-3, ISO/IEC 13818-3 and IEC 61937-4.

4.3.5 MPEG-2 with extension

The burst-payload of MPEG-2 with extension represents 1 152 samples of each encoded channel and can be transferred using data type 6 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-3 and IEC 61937-4.

4.3.6 MPEG-2 AAC

The payload of MPEG-2 AAC represents 1 024 samples of each encoded channel and can be transferred using data-type 7 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-7 and IEC 61937-6.

4.3.7 MPEG-2 layer-1 low sampling frequency

An MPEG-2 layer-1 frame with low sampling frequency represents 384 samples of each encoded channel and can be transferred using data-type 8 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-3 and IEC 61937-4.

4.3.8 MPEG-2 layer-2 low sampling frequency

The payload of MPEG-2 layer-2 frame with low sampling frequency represents 1 152 samples of each encoded channel and can be transferred using data-type 9 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-3 and IEC 61937-4.

4.3.9 MPEG-2 layer-3 low sampling frequency

The payload of MPEG-2 layer-3 frame with low sampling frequency represents 576 samples of each encoded channel and can be transferred using data-type 10 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-3 and IEC 61937-4.

4.3.10 DTS type I

The payload of DTS type I represents 512 samples of each encoded channel and can be transferred using data-type 11 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-5.

4.3.11 DTS type II

The payload of DTS type II represents 1 024 samples of each encoded channel and can be transferred using data-type 12 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-5.

4.3.12 DTS type III

The payload of DTS type III represents 2 048 samples of each encoded channel and can be transferred using data-type 13 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-5.

4.3.13 DTS type IV

The payload of DTS type IV represents samples of each encoded channel and can be transferred using data-type 17 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-5.

4.3.14 ATRAC

The payload of ATRAC represents 512 samples of each encoded channel and can be transferred using data-type 14 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-7.

4.3.15 ATRAC 2/3

The payload of ATRAC 2/3 represents 1 024 samples of each encoded channel and can be transferred using data-type 15 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-7.

4.3.16 ATRAC-X

The payload of ATRAC-X represents 2 048 samples of each encoded channel and can be transferred using data-type 16 and subdata-type 0. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-7.

4.3.17 MPEG-2 AAC low sampling frequency

The payload of MPEG-2 AAC low sampling frequency represents 2 048 samples of each encoded channel and can be transferred using data-type 19 and subdata-type 0 or it

represents 4 096 samples of each encoded channel and can be transferred using data-type 19 and subdata-type 1. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 13818-7 and IEC 61937-6.

4.3.18 MPEG-4 AAC

The payload of MPEG-4 AAC represents 1 024 samples of each encoded channel and can be transferred using data-type 20 and subdata-type 0. The payload of MPEG-4 AAC represents 2 048 samples of each encoded channel and can be transferred using data-type 20 and subdata-type 1. The payload of MPEG-4 AAC represents 4 096 samples of each encoded channel and can be transferred using data-type 20 and subdata-type 2. The payload of MPEG-4 AAC represents 512 samples of each encoded channel and can be transferred using data-type 20 and subdata-type 3. The data-burst is headed with a burst-preamble, followed by the burst-payload; see ISO/IEC 14496-3 and IEC 61937-6.

4.3.19 Windows Media Audio professional

The payload of WMA professional type I represents 2 048 samples of each encoded channel and can be transferred using data-type 18 and subdata-type 0. The payload of WMA professional type II represents 2 048 samples of each encoded channel and can be transferred using data-type 18 and subdata-type 1. The payload of WMA professional type III represents 1 024 samples of each encoded channel and can be transferred using data-type 18 and subdata-type 2. The payload of WMA professional type IV represents 512 samples of each encoded channel and can be transferred using data-type 18 and subdata-type 3. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-8.

4.3.20 Enhanced AC-3

The enhanced AC-3 bitstream consists of a sequence of enhanced AC-3-frames. The data-type of an enhanced AC-3 data-burst is 21 and the subdata-type of an enhanced AC-3 data-burst is 0. The contents of an enhanced AC-3 data-burst represent 1 536 samples of each encoded audio channel. The data-burst is headed with a burst-preamble, followed by the burst-payload; see IEC 61937-3.

4.3.21 MAT

The MAT bitstream consists of a sequence of frames. The data-type of an MAT data-burst is 22 and the subdata-type is 0. The data-burst is headed with a burst-preamble, followed by the burst-payload. The burst-payload of each data-burst of MAT data shall contain 1 complete MAT frame. The length of the MAT data-burst depends on the encoded bit rate (which determines the MAT frame length); see IEC 61937-9.

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