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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 –
Part 12: Non-linear PCM bitstreams according to the DRA formats**

**Audionumérique – Interface pour les flux de bits audio à codage MIC non linéaire conformément à la CEI 60958 –
Partie 12: Flux de bits MIC non linéaire selon les formats DRA**

IEC 61937-12:2010

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This bilingual version, published in 2010-10, corresponds to the English version.

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

CDV	Report on voting
100/1578/CDV	100/1651/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.

The French version of this standard has not been voted upon.

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

The committee has decided that the contents of this publication will remain unchanged until the stability 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

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

Part 12: Non-linear PCM bitstreams according to the DRA formats

1 Scope

This part of IEC 61937 specifies the method for IEC 60958 to convey non-linear PCM bitstreams encoded in accordance with the DRA formats.

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 (all parts), *Digital audio interface*

IEC 61937 (all parts), *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*

IEC 61937-1:2007, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 1: General*

IEC 61937-2, *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958 – Part 2: Burst-info*

3 Terms and definitions

For the purposes of this document, the following terms, definitions, abbreviations and presentation conventions apply.

3.1 Terms and definitions

3.1.1
sub data-type
type of payload of the data-burst for use with the specified data-type

3.1.2
latency
delay time of an external audio decoder to decode a DRA data-burst

NOTE It is defined as the sum of two values of the receiving delay time and the decoding delay time.

3.1.3
length code
indicates the length of the data-burst payload in bits or bytes

NOTE See Table 3 of IEC 61937-1.

3.2 Abbreviations

DRA Digital Rise Audio

3.3 Presentation convention

01_2 Value “01” in binary format

4 DRA burst-info

The general coding method of the bitstream and data-burst is according to IEC 61937-1 and IEC 61937-2. The 16-bit burst-info (Pc) is defined in Table 1.

Table 1 – Fields of burst-info

Bits of Pc	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0 – 4		Data-type		
	0-22	In accordance with IEC 61937-2		
	23	DRA or other MPEG applications according to IEC 61937-2, depending on sub data-type		
	24-31	In accordance with IEC 61937-2		
5 – 6		Subdata-type		
	00_2-10_2	In accordance with IEC 61937-2		
	11_2	DRA	Bit 0 of Pa	Depending on bits 8-9 of Pc
7		In accordance with IEC 61937-1		
8 – 12		data-type-dependent information for data-type DRA		
13 – 15		In accordance with IEC 61937-1		

5 Format of DRA data-bursts

5.1 General

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

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

The data-type-dependent information assignment for DRA is given in Table 2. As shown in Table 2, bits 8-9 of Pc are used to identify the relation between the sampling frequencies of DRA and the IEC 60958 frame rate.

Table 2 – Data-type-dependent information for data-type DRA

Bits of Pc LSB...MSB	Value	Contents	Repetition period of data-burst in IEC 60958 frames
8 – 9	00_2	DRA	1 024
	01_2	DRA half-rate low sampling frequency	2 048
	10_2	DRA quarter-rate low sampling frequency	4 096
	11_2	Reserved	-
10 – 12	000_2	Reserved, shall be used until further definition	
	001_2 – 111_2	Reserved, shall not be used until further definition	

5.2 Pause data-burst

The pause data-burst for DRA is given in Table 3.

Table 3 – Repetition period of pause data-bursts

Type of audio data-burst indicated by bits 8-9 of Pc	Repetition period of pause data-burst	
	Mandatory	Recommended
DRA	-	32 IEC 60958 frames
DRA half-rate low sampling frequency	-	64 IEC 60958 frames
DRA quarter-rate low sampling frequency	-	128 IEC 60958 frames

5.3 Audio data-bursts

5.3.1 DRA condition

5.3.1.1 Data for DRA

The streams of the data-bursts of DRA consist of sequences of DRA frames. The data-type and sub-data-type of a DRA data-burst are 23 and 3 respectively with the bits 8-9 of Pc equal to 00_2. The data-burst is headed with a burst-preamble, followed by the burst-payload, and stuffed with stuffing bits. The burst-payload of each data-burst of DRA data shall contain one

complete DRA frame and represents 1 024 samples for each encoded channel. The length of the DRA data-burst depends on the encoded bit rate, which determines the DRA frame length. The specification of the DRA frame can be found in GB/T 22726-2008. The units of length-code (Pd) shall be in bytes.

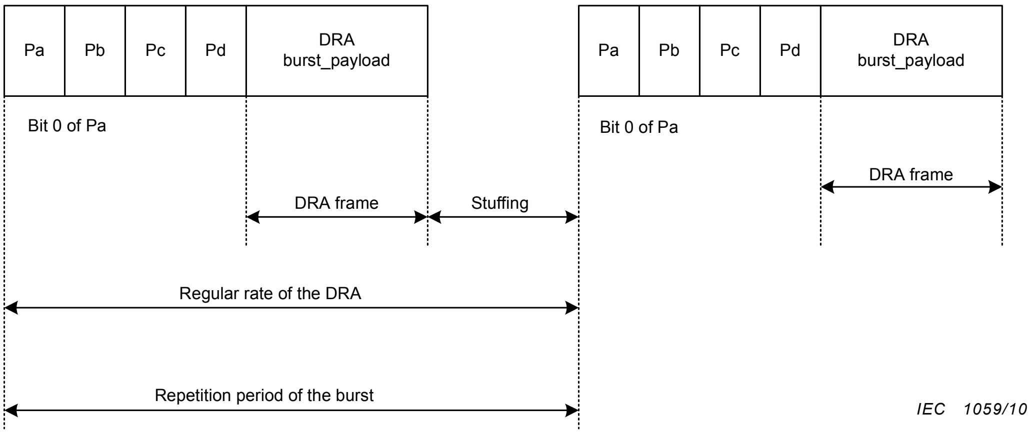

Figure 1 – DRA data-burst

The reference point of a DRA data-burst is bit 0 of Pa and occurs exactly once every 1 024 sampling periods. The data-burst containing DRA frames shall occur at a regular rate, with the reference point of each DRA data-burst beginning 1 024 IEC 60958 frames after the reference point of the preceding DRA data-burst of the same bitstream number.

It is recommended that pause data-bursts are used to fill stream gaps in the DRA bitstream as described in IEC 61937-1, and that pause data-bursts be transmitted with a repetition period of 32 IEC 60958 frames, except when other repetition periods are necessary to fill the precise stream-gap length, which may not be a multiple of 32 IEC 60958 frames, or to meet the requirement on burst spacing of IEC 61937.

When a stream gap in a DRA stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located at 1 024 sampling periods following the Pa of the previous DRA frame. It is recommended that the sequence(s) of pause data-bursts which fill the stream gap should continue from this point up to (as close as possible to, considering the 32 IEC 60958 frame length of the pause data-burst) the Pa of the DRA data-burst which follows the stream gap. The gap-length parameter contained in the pause data-burst is intended to be interpreted by the DRA decoder as an indication of the number of decoded PCM samples which are missing, due to the resulting audio gap.

5.3.1.2 Latency of DRA decoding

The latency of an external audio decoder to decode DRA is defined as the sum of the receiving delay time and the decoding delay time.

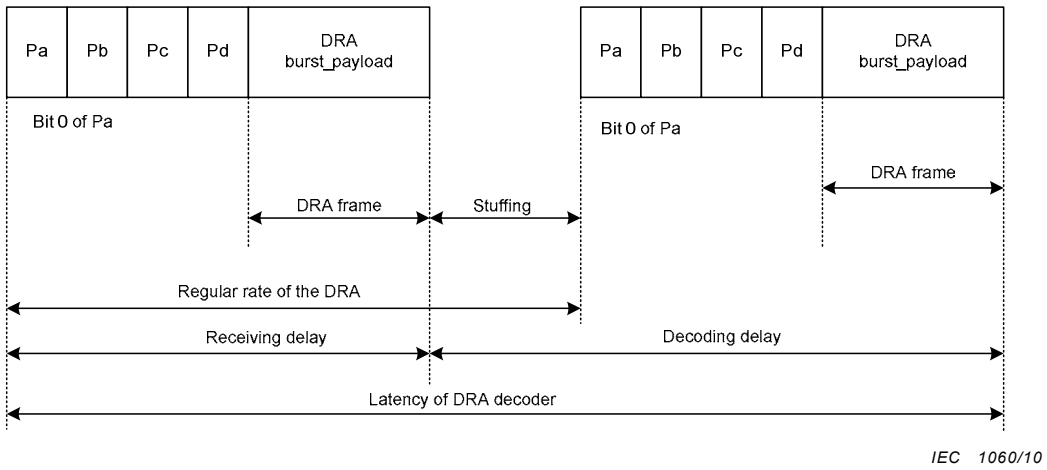

Figure 2 – Latency of DRA decoding

EXAMPLE The receiving delay time to receive a whole data-burst with maximum length is calculated as follows. The length of preamble is 64 bits. The maximum length of whole data payload is 4 096 bit for a maximum bit rate of 192 kbit/s. In this case, the maximum length of data-bursts is 4 160 bits. The receiving delay is 2,708 ms (4 160 × 2/48/64) at 48 kHz sampling frequency. The decoding delay is 21,333 ms, corresponding to one DRA frame. Hence, the latency of DRA decoding is approximately 24,041 ms.

The absolute maximum length of the data-burst is calculated as follows. Each data-burst contains a minimum of 4 stuffing 16-bit words. The repetition period of data-burst is 1 024 IEC 60958 frames. Therefore, the maximum length of data-burst leads as follows:

1 024 samples × 2 channels × 16 bits – 4 words × 16 bits = 32 704 bits

The receiving delay time is 21,292 ms (32 704 × 2/48/64) at 48 kHz sampling frequency, which leads to the absolute maximum DRA decoding latency of 42,625 ms with the decoding delay 21,333 ms as above.

5.3.2 DRA half-rate low sampling frequency condition

5.3.2.1 Data for DRA half-rate low sampling frequency

The streams of the data-bursts for DRA half-rate low sampling frequency consist of sequences of DRA half-rate low sampling frequency frames. The data-type and sub-data-type of a DRA data-burst are 23 and 3 respectively with the bits 8-9 of Pc equal to 01_2. The data-burst is headed with a burst-preamble, followed by the burst-payload, and stuffed with stuffing bits. The burst-payload of each data-burst of DRA half-rate low sampling frequency data shall contain one complete DRA half-rate low sampling frequency frame and represents 2 048 samples for each encoded channel. In the context of this standard, terms relating to “half-rate low sampling frequency” mean the sampling frequency of the IEC 60958 frame (i.e., IEC 60958 frame rate) increases to 2 × original sampling frequency for DRA encoding process. The units of length-code (Pd) shall be in bytes.

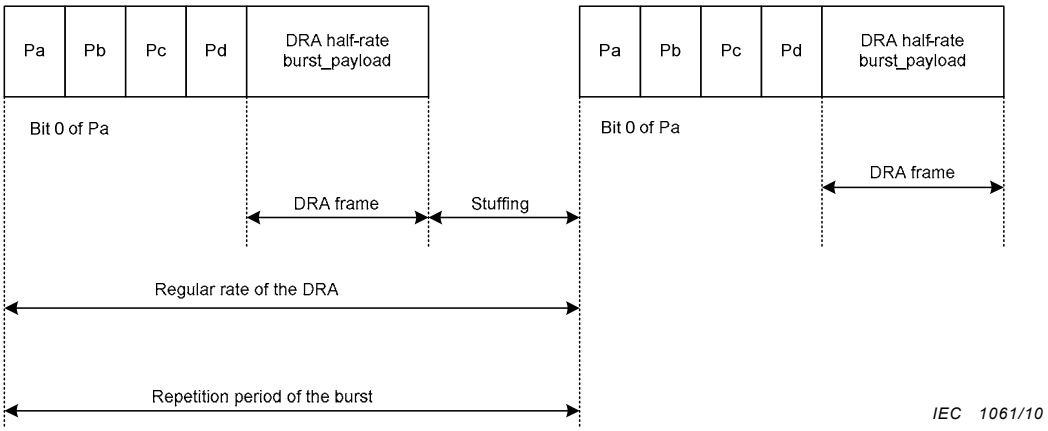

Figure 3 – DRA data-burst half-rate low sampling frequency

The reference point of a DRA half-rate low sampling frequency data-burst is bit 0 of Pa and occurs exactly once every 2 048 sampling periods. The data-burst containing DRA half-rate low sampling frequency frames shall occur at a regular rate, with the reference point of each DRA half-rate low sampling frequency data-burst beginning 2 048 IEC frames after the reference point of the preceding DRA half-rate low sampling frequency burst of the same bitstream number.

It is recommended that pause data-bursts are used to fill stream gaps in the DRA half-rate low sampling frequency bitstream as described in IEC 61937-1, and that pause data-bursts be transmitted with a repetition period of 64 IEC 60958 frames, except when other repetition periods are necessary to fill the precise stream-gap length, which may not be a multiple of 64 IEC 60958 frames, or to meet the requirement on burst spacing of IEC 61937.

When a stream gap in a DRA half-rate low sampling frequency stream is filled by a sequence of pause data-bursts, the Pa of the first pause data-burst shall be located at 2 048 sampling periods following the Pa of the previous DRA half-rate low sampling frequency frame. It is recommended that the sequence(s) of pause data-bursts which fill the stream gap should continue from this point up to (as close as possible to, considering the 64 IEC 60958 frame length of the pause data-burst) the Pa of the DRA half-rate low sampling frequency data-burst which follows the stream gap. The gap-length parameter contained in the pause data-burst is intended to be interpreted by the DRA decoder as an indication of the number of decoded PCM samples which are missing, due to the resulting audio gap.

5.3.2.2 Latency of DRA decoding half-rate low sampling frequency

The latency of an external audio decoder to decode DRA at half-rate low sampling frequency is defined as the sum of the receiving delay time and the decoding delay time.