INTERNATIONAL STANDARD

IEC 61937-1

Second edition
2007-01

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

Part 1: General

Reference number
IEC 61937-1:2007(E)

Publication numbering

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Part 1: General

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Commission Electrotechnique Internationale
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Международная Электротехническая Комиссия

PRICE CODE S

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: General

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International Standard IEC 61937-1 has been prepared by technical area 4: Digital system interfaces and protocols, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition of IEC 61937-1 cancels and replaces the first edition published in 2000. This edition contains the following significant technical changes with respect to the previous edition.

a) The data-type field in Pc is expanded from bit 0-4 to bit 0-6.
b) A new additional definition of Pd is specified.
c) The numbers of times for symbol frequency are changed to refer to each part of IEC 61937.
d) The requirement for burst spacing is changed.

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

FDIS	Report on voting
100/1101/CDV	100/1192/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 IEC 61937, 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- withdrawn;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 1: General

1 Scope

This part of IEC 61937 applies to the digital audio interface using the IEC 60958 series for the conveying of non-linear PCM encoded audio bitstreams.

It describes the way in which this digital interface can be used in consumer applications.

The professional mode (AES/EBU) is not considered within the scope of this standard.

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*

3 Terms, definitions, abbreviations and presentation

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

3.1 Definitions

3.1.1
audio data-burst
data-burst with an encoded audio frame as burst-payload

3.1.2
audio data-word
16-bit data word

3.1.3
audio frame
fixed number of audio samples

NOTE 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.

3.1.4
audio gap
period in the sequence of baseband audio samples where valid samples of audio are not available

3.1.5
bitstream
non-linear PCM encoded audio source, represented in a sequence of bits

NOTE In this interface the bitstream consists of a sequence of data-bursts.

3.1.6
data-burst
packet of data, including the burst-preamble, to be transmitted across the interface

3.1.7
burst-payload
information content of the data-burst

3.1.8
burst-preamble
header for the data-burst, containing synchronization, and information about the data contained in the burst-payload

3.1.9
data-type
reference to the type of payload of the data-bursts

3.1.10
encoded audio frame
minimum decodable unit of an encoded data sequence

NOTE 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.

3.1.11
idle
state in which the interface is not used to convey any sequence of data-bursts or PCM data

NOTE The channel status data is still active (bit b1 is set to '1' when further non-linear PCM encoded audio is anticipated; see Figure 7).

3.1.12
length-code
code indicating the length of the data-burst-payload in bits or bytes

3.1.13
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

3.1.14
sampling frequency
sampling frequency of the encoded PCM audio samples (i.e. before encoding and after decoding)

3.1.15
sampling period
time period related to the sampling frequency of the PCM audio samples, represented in the encoded bitstream

3.1.16
stuffing
occupying the unused data capacity of the interface

3.1.17
stuffing subframe
occupying the unused data capacity in 16-bit audio data words

3.1.18
stream gap
period within the encoded audio bitstream without any audio frame; a discontinuity in the bitstream

NOTE Typically, a stream gap will occur between encoded audio frames.

3.2 Abbreviations

3.2.1
MPEG
Moving Pictures Expert Group, a joint committee of ISO and IEC

3.2.2

SMPTE
The Society of Motion Picture and Television Engineers

3.2.3

ETSI
European Telecommunication Standards Institute

3.2.4

ATSC
Advanced Television Standards Committee

3.3 Presentation convention

F872h
Value ‘F872’ in hexadecimal format

4 General description

The format of the IEC 60958 interface consists of a sequence of IEC 60958 subframes. Each IEC 60958 subframe is normally used to carry one linear PCM sample but may also be used to convey data. The non-linear PCM encoded audio bitstreams to be transported over this interface are formed into a sequence of data-bursts.

Each data-burst consists of a 64-bit burst-preamble, followed by the burst-payload. The burst-preamble consists of a sync-word, information about the burst-payload and a bitstream number.

The interface may convey one or more bitstreams. Each type of bitstream may impose a particular requirement for the repetition period for the data-bursts that make up the bitstream (see Clause 7).

The 16 bits of a data-burst are placed in time-slots 12-27 of an IEC 60958 subframe. Both odd and even IEC 60958 subframes (ch1, ch2) are simultaneously used to carry 32 bits of data. This allows IEC 60958, in the consumer mode, to convey either two-channel linear PCM audio, or a set of non-linear PCM encoded bitstreams (alternating data words), but not both simultaneously.

5 Interface format

The interface format as defined in IEC 60958-1 and IEC 60958-3 is used.

6 Mapping of the audio bitstream on to IEC 60958

6.1 Coding of the bitstream

The non-linear PCM encoded audio bitstream is transferred using the basic 16-bit data area of the IEC 60958 subframes, i.e. in time-slots 12 to 27. Because the non-linear PCM encoded audio bitstream to be transported is at a lower data rate than that supported by the IEC 60958 interface, the audio bitstream is broken into a sequence of discrete data-bursts, and stuffing between the data-bursts is necessary (see 6.3).

Each data-burst contains data of an encoded audio frame that is the encoded representation of a fixed number of audio samples per PCM audio channel. The number of samples to be encoded into an encoded audio frame depends on the particular encoding system.

It is possible for this interface to simultaneously convey multiple non-linear PCM encoded audio bitstreams. One of the applications of this capability would be to convey both a main audio service and an associated audio service.

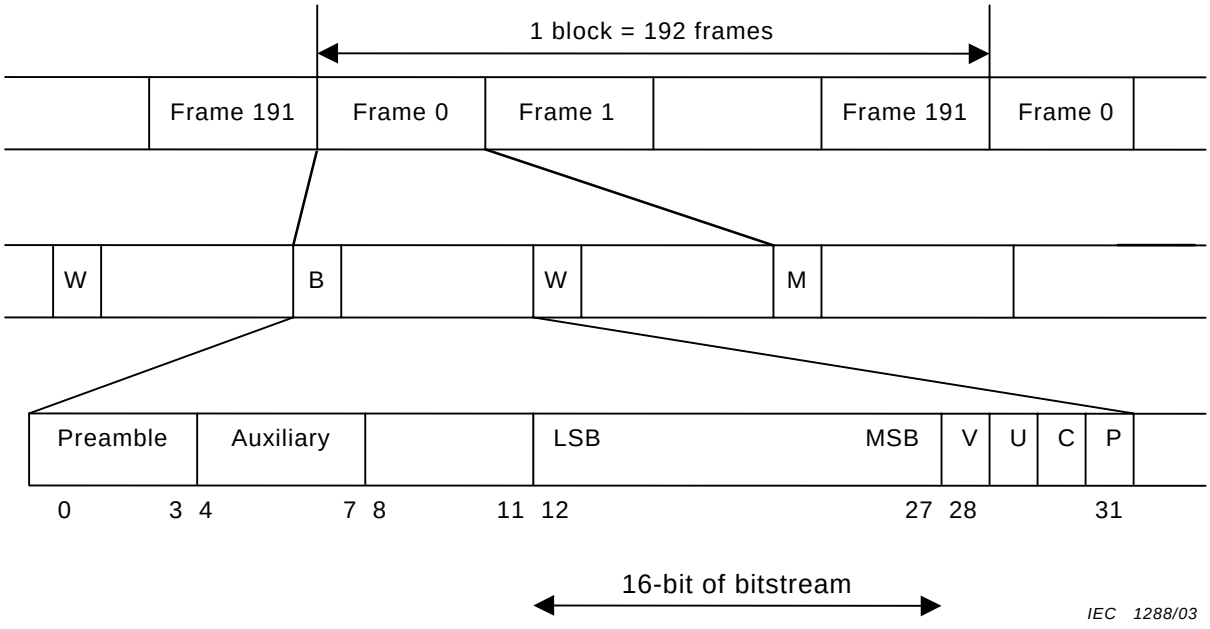

Figure 1 – IEC 60958 interface format

Table 1 – Bit allocation of the IEC 60958 frame

Field	IEC 60958 time-slot	Value
0 – 3	Preamble	IEC 60958 preamble
4 – 7	Auxiliary field	Not used, all “0”
8 – 11	Unused data bits	Not used, all “0”
12 – 27	16-bit data	Sections of the bitstream
28	Validity flag	According to IEC 60958
29	User data	According to IEC 60958
30	Channel status	According to IEC 60958
31	Parity bit	According to IEC 60958

6.1.1 Bit map of bitstream

The method of placing the data into the IEC 60958 bitstream is to format the data to be transmitted into data-bursts and to send each data-burst in a continuous sequence of IEC 60958 frames.

Table 2 – Bit allocation of data-burst in IEC 60958 subframes

Subframe	Bit of subframes				
	MSB b27	b26	b25 …… b14	b13	LSB b12
Frame 0; subframe B or M	0	1		14	15
Frame 0; subframe W	16	17		30	31
Frame 1; subframe B or M	32	33		46	47
Frame 1; subframe W	48	49		62	63
Frame 2; subframe B or M	64	65		78	79
----------			----------		
Last subframe B or M of data-burst	n-32	n-31		n-18	n-17
Last subframe W of data-burst	n-16	n-15		n-2	n-1

Considering the data within an IEC 60958 subframe as a 16-bit word out of a serial stream of bits, the first bit of the burst-payload in a data-burst would occupy the MSB of subframe 1 (time-slot 27), and the 32nd bit would occupy the LSB (or what would be the LSB for 16-bit PCM audio) of subframe 2 (time-slot 12). The next 32 bits of the burst-payload would occupy the next IEC 60958 frame. The last data bits of the audio data-burst might occupy only a fraction of the last frame. Any unused bits in the last frame will be ignored by the receiver. In the case where the audio data-burst contains a multiple of 16-bit, all used IEC 60958 sub-frames are completely filled. When it is not a multiple of 16-bit, the bits of the burst-payload to be conveyed in the last IEC 60958 subframe will be MSB aligned; the remaining bits shall be stuffed with ‘0’s.

6.1.2 IEC 60958 validity flag

It is recommended to set the validity bit to a logical ‘1’. This is intended to prevent accidental decoding of non-audio data to analogue before a complete channel status block is received.

6.1.3 IEC 60958 channel status bit 1

The purpose of channel status bit 1 is to indicate if IEC 60958 is used to convey linear PCM or to indicate that the interface is used for other purposes (see Annex A). This bit shall be set to ‘1’ when IEC 60958 is used to convey non-linear PCM encoded audio bitstreams.

6.1.4 Symbol frequency

When the IEC 60958 bitstream conveys linear PCM audio, the symbol frequency is 64 times the PCM sampling frequency (32 time-slots per PCM sample, times two channels). When a non-linear PCM encoded audio bitstream is conveyed by the interface, the symbol frequency is normally 64 times the sampling rate of the encoded audio within that bitstream, and other times should be referred to each parts of IEC 61937.

6.1.5 The format of the data-bursts

Each data-burst contains a burst-preamble consisting of four 16-bit words (Pa, Pb, Pc and Pd) followed by the burst-payload which contains data of an encoded audio frame.

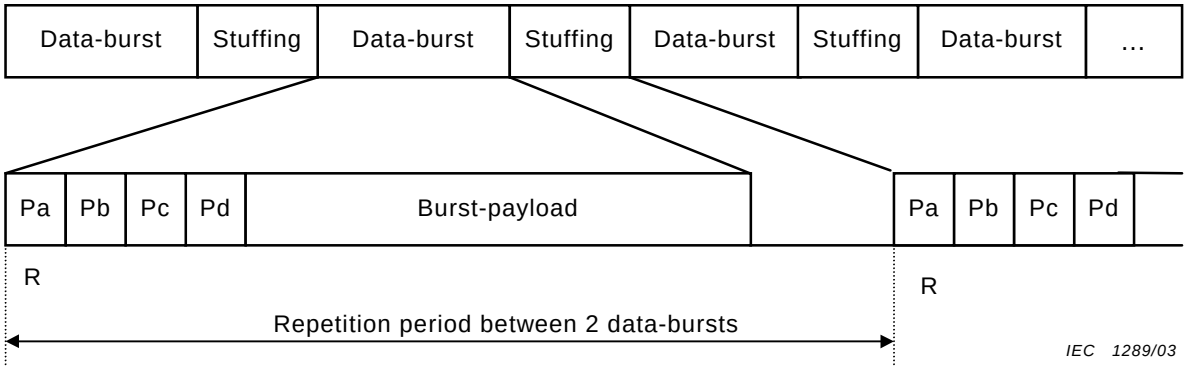

Figure 2 – Data-burst format

The repetition period of these bursts is defined as the length between the reference points R (measured in IEC 60958 frames) of one data-burst and the next data-burst (with the same bit-stream-number). The data representing each individual encoded audio frame is typically specified to be packaged into a single individual data-burst, with a repetition period (measured in IEC 60958 frames) for that data-burst equal to the number of encoded audio samples of each channel contained within that encoded audio frame.

It is possible for a number of data-bursts representing multiple bitstreams to be interleaved on the interface. When more than one non-linear PCM encoded audio bitstream are transmitted through the same interface, the audio sampling rates of these bitstreams are identical to each other.

6.1.6 Burst-preamble

The burst-preamble consists of four mandatory fields. Pa and Pb represent a synchronization word. Pc gives information about the type of data, and some information/control for the receiver. Pd gives the length of the burst-payload, limited to 65 535 bits in the case of Pd represent bits length, or limited to 65 535 bytes in the case of Pd represent bytes length.

The four preamble words are contained in two sequential IEC 60958 frames. The frame beginning the data-burst contains preamble word Pa in subframe 1, and Pb in subframe 2. The next frame contains Pc in subframe 1 and Pd in subframe 2. When placed into an IEC 60958 subframe, the MSB of a 16-bit burst-preamble word is placed into time-slot 27 and the LSB is placed into time-slot 12.

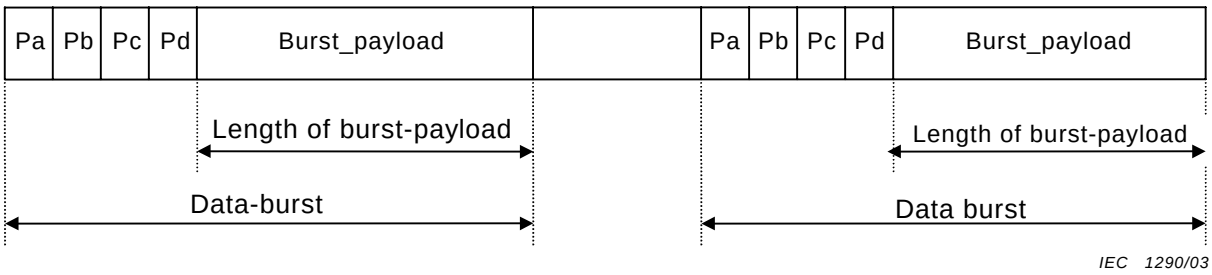

Figure 3 – Burst-preamble

Table 3 – Burst-preamble words

Preamble word	Length of field	Contents	Value MSB..LSB
Pa	16-bit	Sync word 1	F872h
Pb	16-bit	Sync word 2	4E1Fh
Pc	16-bit	Burst-info	Table 5
Pd	16-bit	Length-code	Number of bits or number of bytes according to data-type

Table 4 – Bit map of burst-preambles

IEC 60958 time-slot bit-number	27															12
Preamble bit-number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Pa	1	1	1	1	1	0	0	0	0	1	1	1	0	0	1	0
Pb	0	1	0	0	1	1	1	0	0	0	0	1	1	1	1	1
Pc	According to Table 5, burst-info values Pc, bit 15 = MSB															
Pd	Length-code, bit 15 = MSB															

6.1.7 Burst-info

The 16-bit burst-info contains information about the data which will be found in the data-burst.

Table 5 – Fields of burst-info

Bits of Pc	Value	Contents	Remark
0 – 6		Data-type	See IEC 61937-2
7	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	Bitstream-number	
NOTE The repetition period of pause data-bursts depends on the application in which IEC 60958 is used to convey encoded audio bitstreams.			

6.1.7.1 Data-type

The 7-bit data-type is defined in bits 0-6 of the burst-preamble Pc (see Table 5), bit 6 is the MSB. This data-type field indicates the format of the burst-payload, which will be conveyed in the data-burst. Typical properties of a data-type are the reference point and repetition period of the burst, which is the number of sampling periods of the audio between the reference point of the current data-burst and the reference point of the next data-burst. The reference point is inherently defined for each data-type.

The allocation of data-types is defined in IEC 61937-2. The data-types themselves are specified in each part of IEC 61937-3 and higher.

6.1.7.2 Extended data-type

When the burst-info Pc is equal to 1Fh (data-type = 31), the burst-preamble is extended with Pe and Pf. Figure 4 shows a burst-preamble with an extended preamble. Pe and Pf are included in the length of the burst-payload. The third frame of the IEC 60958 frames contains Pe in subframe 1 and Pf in subframe 2.

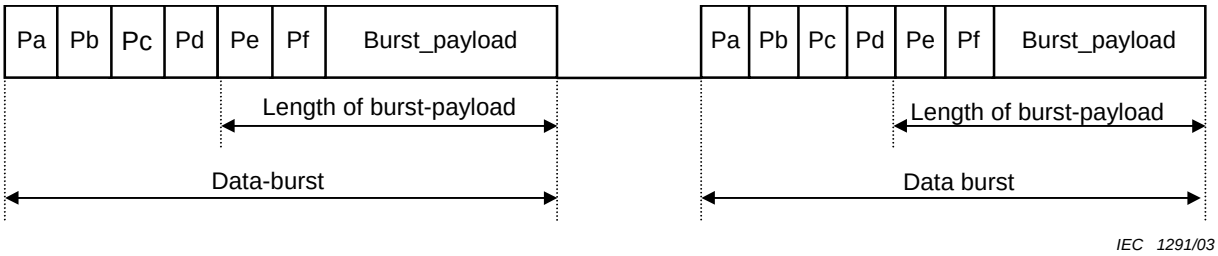

Figure 4 – Burst-preamble with extended preamble

Table 6 – Burst-preamble words

Preamble word	length of field	Contents	Value MSB..LSB
Pa	16-bit	Sync word 1	F872h
Pb	16-bit	Sync word 2	4E1Fh
Pc	16-bit	Burst-info	Table 5
Pd	16-bit	Length-code	Number of bits or number of bytes according to data-type
Pe (conditional)	16-bit	Extended data-type	Table 7
Pf (conditional)	16-bit	Reserved for future use	Table 8

6.1.7.2.1 Fields of Pe

Table 7 – Fields of Pe (extended data-type)

Bits of Pe	Value	Contents	Reference point R	Repetition period of data-burst in IEC 60958 frames
0 – 65 535	0 – 65 535	Extended data-type		

The reference point and repetition period of data-bursts with extended data-type depend on the properties of the data-type selected in the extension.

6.1.7.2.2 Fields of Pf

Table 8 – Fields of Pf

Bits of Pf	value	Contents
0 – 65 535	0 – 65 535	Reserved for future use

6.1.7.3 Error-flag

The error-flag bit is available to indicate if the contents of the data-burst contain data errors. If a data-burst is thought to be error-free, or if the data source does not know if the data contains errors, then the value of this bit is set to a '0'. If the data source does know that a particular data-burst contains some errors this bit may be set to a '1'. The use of this bit by receivers is optional.

6.1.7.4 Data-type-dependent info

The meaning of the 5-bit data-type-dependent info depends on the value of the data-type (see 7.2).

6.1.7.5 Bitstream-number

The 3-bit bitstream-number indicates to which bitstream the data-burst belongs. Eight codes (0-7) are available so that up to eight independent bitstreams may be multiplexed in one bitstream in a time multiplex. Each independent bitstream shall use a unique bit-stream-number. The MSB of the bit-stream-number is placed in bit number 15.

The following constraints apply. If a single bitstream is carried, the value of bitstream-number is 0h. In the case where a main audio service and an associated audio service are placed into this interface, the main service audio data-burst has its bitstream-number set to '0h'.

If a receiver is only capable of selecting and processing a single bitstream, it receives and processes bitstream-number 0h. The bitstream with bitstream-number 0h thus has the highest priority and should carry the most important data.

The data-type within a bitstream may change, but the bitstream-number is constant for a bitstream; for example, the pause data-burst used to bridge a stream gap between data-burst of an audio type contains the same bitstream-number.

6.1.8 Length-code

The length-code indicates the number of bits or bytes according to data-type within the data-burst, from 0 to 65 535. The size of the Pa, Pb, Pc and Pd is not counted in the value of the length-code. In other words, the length-code indicates the number of bits of the burst-payload in bits, plus the conditional length of Pe and Pf (see Figure 4), or the number of bytes of the burst-payload in bytes, plus the conditional length of Pe and Pf if exist.

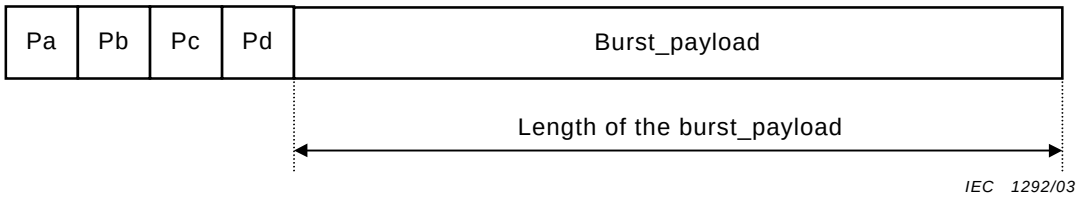

Figure 5 – Length of the burst-payload specified by Pd

6.2 Burst-payload

The format of the burst-payload is specified by means of the data-type in preamble Pc and is used to convey the information content. The data-bursts of several data-types are specified in IEC 61937-2.

6.3 Stuffing

Not all bits are occupied during the transfer of data-bursts (see Figure 2). In the case where the audio data-burst contains a multiple of 16-bit, all IEC 60958 subframes used are completely filled.

6.3.1 Stuffing within an IEC 60958 subframe

In the case where the audio data-burst does not contain a multiple of 16-bit, the bits of the burst payload to be conveyed in the last 16-bit data word shall be MSB aligned, and the remaining bits of that subframe are set to ‘0’ (stuffing).

6.3.2 Stuffing between data-bursts

An unoccupied space between two data-bursts shall be stuffed with 16-bit data words which are set to all ‘0’s.

6.3.3 Burst spacing

The following feature allows equipment reliably to detect whether the IEC 60958 signal is conveying PCM or non-linear PCM data without relying on bit 1 of the channel status (see Annex A). Four IEC 60958 subframes which have the contents of time slots 12 to 27 all set to ‘0’ shall be inserted between every data-burst.

All these four ‘0’ subframes with Pa and Pb will behave as an extended 96-bit sync code. In the case of PCM transmission, the false occurrence of the sync code will be extremely small. When the interface is not in the idle state, this requirement is automatically fulfilled unless there are sequences of data-bursts so tightly packed that there is never a sequence of all four ‘0’ subframes preceding any Pas.

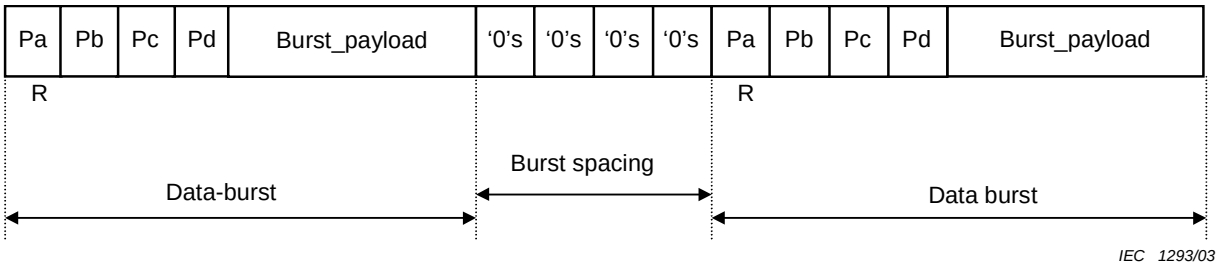

Figure 6 – Burst spacing

7 Format of data-bursts

Data-types are categorized into three classes: audio data-burst, pause data-burst and null data-burst. The type of the burst-payload is indicated by the data-type, bits 0 to 4 of Pc. Repetition periods apply to all data-types, except for the null data-type.

In cases where the IEC 60958 interface is idle, i.e. it is not used to convey any data but is anticipating transmission of the non-linear PCM audio bitstream, channel status bit 1 is kept ‘1’ (see Annex A). Null data-bursts may be transferred to assist some receivers (which do not observe channel status bit 1) in switching from non-linear PCM mode to linear PCM mode unexpectedly (see 7.3).

In cases where the interface is used to convey non-linear PCM audio bitstreams, the bitstream is broken into discrete data-bursts and stuffing is necessary between the data-bursts (see 6.3.2). If gaps occur within the bitstreams, these stream gaps are filled with bursts of the pause data-type.

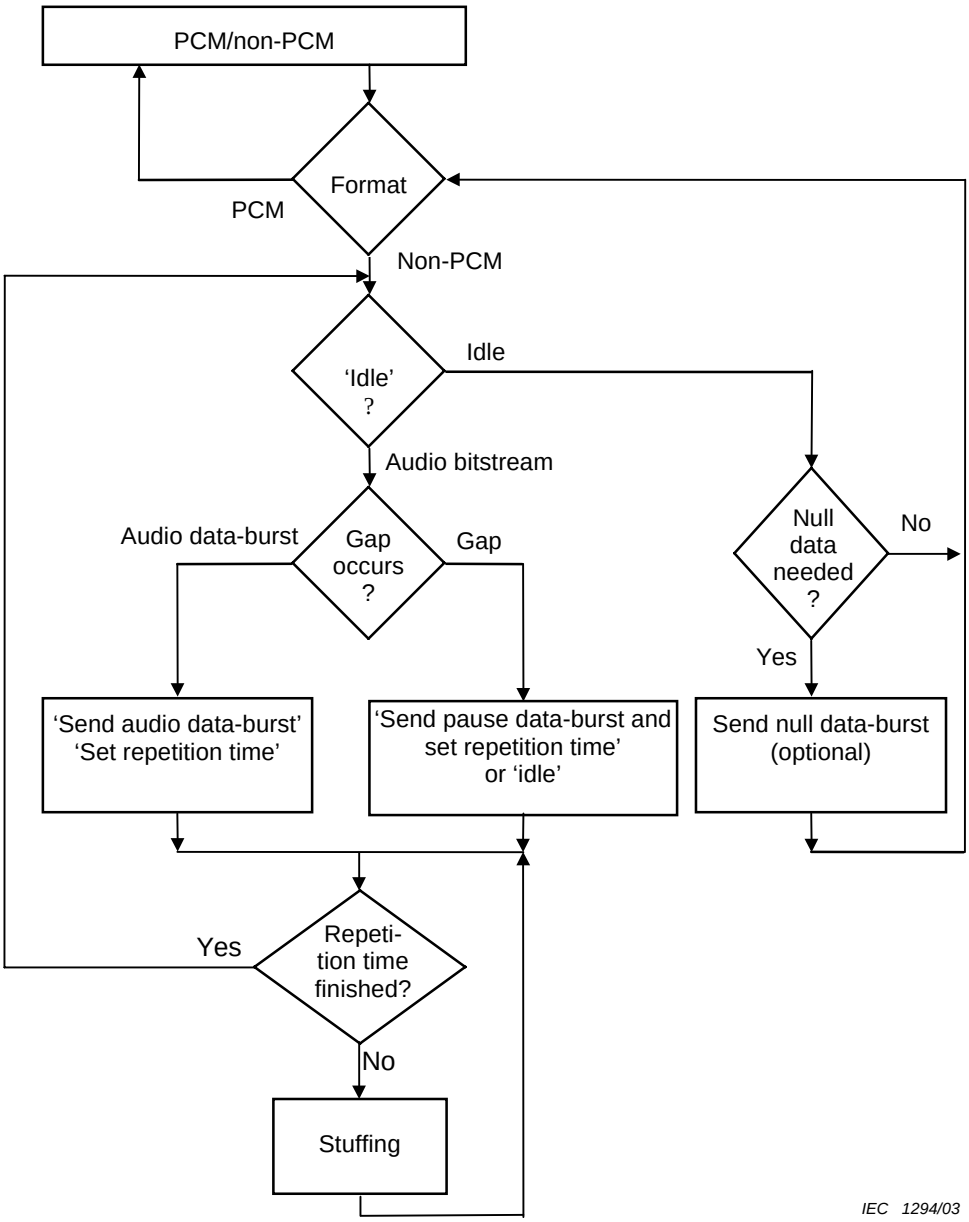

Figure 7 – Flow chart of transmission of a bitstream

7.1 Pause data-burst

Occasionally, "stream gaps" (which means small discontinuities of the bitstream) may occur between two audio data-bursts of a non-linear PCM encoded audio due to switching between bitstreams in a transmitter. When a stream gap exists in the encoded audio bitstream, an audio gap will exist in the decoded audio signal. Pause data-bursts are intended to be used to fill the stream gaps. As indicated in Figure 8, pause data-bursts (Ps) are located with the repetition period of the pause data-burst. The reference point R of a pause data-burst is bit 0 of its Pa, and it follows immediately after the stuffing, which follows the previous audio data-burst. (The length of the audio data-burst with stuffing is the repetition period of the audio data-burst.) If an unoccupied space exists following a pause data-burst, it is stuffed with all '0's (see 6.3.2).

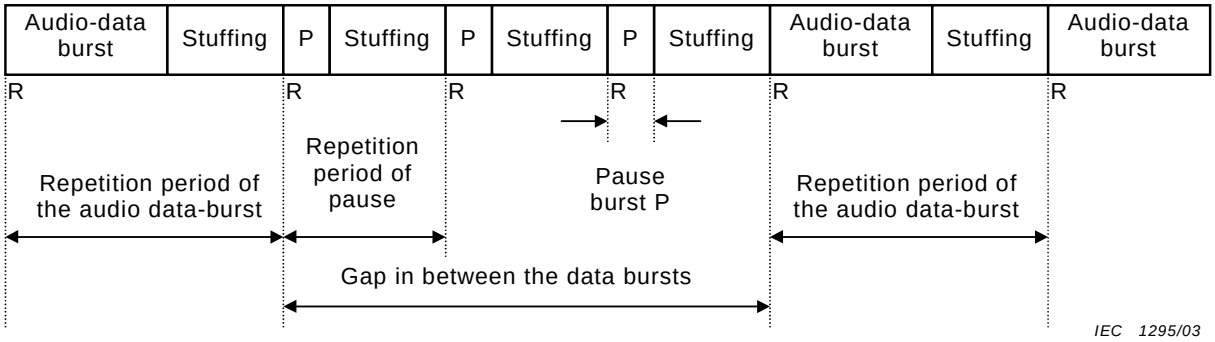

Figure 8 – Bridging gaps in-between data-bursts with three pause data-bursts

Pause data-bursts convey information to the audio decoder that a stream gap exists. The pause data-bursts may also (optionally) indicate either the actual length of the audio gap, or that the non-linear PCM audio data stream has stopped. This information may be used by the audio decoder to minimize (or conceal) the existence of the audio gap, or in the case where the bitstream stops, to trigger a fade-out of the audio. A sequence of pause data-bursts can also assist decoder synchronization prior to the beginning of a non-linear PCM audio bitstream. A short sequence of pause data-bursts may be sent immediately preceding the transmission of the first audio data-burst.

The pause data-burst shall be transferred with the same bitstream-number as the bitstream-number of the audio data stream which contains the stream gap to be filled with the pause data-bursts, or for which synchronization is being assisted. In the case where a main audio service bitstream and one or more associated audio service bitstreams are interleaved on the interface, the pause data-bursts shall have the same bit-stream-number as the main audio service. The pause data-burst is only used to fill the stream gaps between data-bursts of the main audio service bitstreams.

The pause data-burst contains the burst-preamble and a 32-bit payload. The first 16-bit of the payload contains the audio gap-length parameter. The remaining bits are reserved and are all set to '0'. The audio gap-length parameter is an optional indication of the actual audio gap length. This is the length, measured in sampling periods of the audio, between the anticipated reference point of the next audio burst (based on the repetition period for that data-type – see Table 5), and the actual reference point of the next audio data-burst. In the case of audio with normal sampling rate, this length is equal to the number of PCM audio samples which would be missing in the decoded output signal (in the case of half sampling-rate audio, the number of PCM audio samples in the audio gap will be twice the value indicated by the gap-length parameter). For the data-types with Pa as reference point, this length is equal to the length, measured in sampling periods of the audio, between the first bit of Pa of the first pause data-burst and the first bit of Pa of the next audio data-burst. The inclusion of non-zero values of gap-length is optional, data sources are not required to indicate the length of the audio gap.

The detailed use of the pause data-burst is dependent on the data-type of the audio data-burst. For example, it is recommended that stream gaps between AC-3 data-bursts be filled with a sequence of very short pause bursts, while the repetition period of pause data-bursts between the data-burst of an MPEG type is related to the algorithm. The gap-length parameter of the first pause data-burst of the sequence may (optionally) be used to indicate the length of the audio gap which will occur due to the stream gap. The pause data-bursts in the sequence which follows the first pause data-burst typically do not have a gap-length specified (gap-length = 0). It should be noted that for data-types which use Pa of the burst as the reference point, it is not necessary to differentiate between stream gaps and audio gaps; in this case both are of the same length.

A gap may be filled with one single sequence of pause data-bursts with a single indication of audio gap-length. For example, a stream gap resulting from an audio gap of 768 samples long may be filled with one sequence of pause data-bursts with an indication of gap-length = 768 in the first pause data-burst.

If the data source does not have the information about the full audio gap length at the time the stream gap begins, it may signal an initial value for gap-length. If the data source then determines that the audio gap will be longer than the initial indication, another sequence of pause data-bursts may be initiated (following the first sequence by the repetition period) with another gap-length value to signal to the decoder that the audio gap is being extended. If the gap is further extended, additional sequences may be initiated. For example, a stream gap could be filled with a number of smaller sequences of pause data-bursts, with the first pause data-burst in each sequence indicating the gap-length bridged by that sequence (for example, one sequence with a gap-length of 256 samples, followed by a sequence with gap-length of 512, together bridging a gap of 768 sample periods).

The information about the full length of the audio gap in the first pause data-burst will allow the decoder the possibility to perform the best concealment.

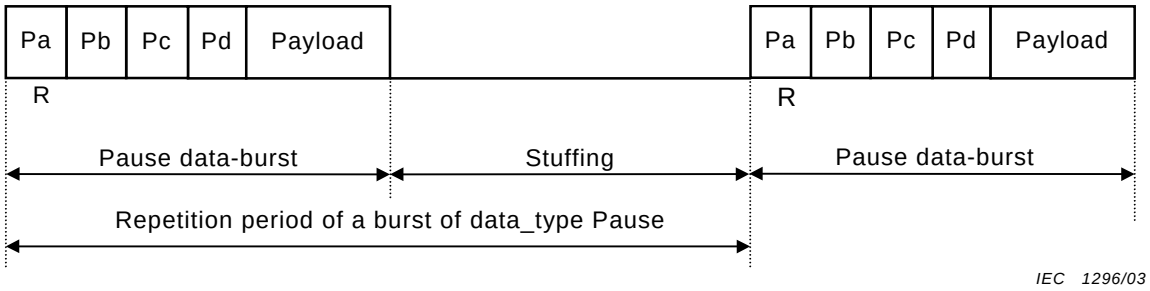

Figure 9 – Data-burst format of the data-type pause

The length of a gap is adjusted to be concealed completely with a sequence of pause data-bursts whose repetition periods are defined for each particular encoding system as indicated in each parts of IEC 61937. The repetition period of a pause data-burst gives the interval between Pa of a pause-burst and Pa of the next pause-burst.

The data-type-dependent info for pause data-bursts is given in Table 10.

Table 9 – Values of data-type-dependent info of the pause data-burst

Bits of Pc	Value	Contents
8 – 12	0	General use
	1	Stop, frame sequence discontinued
	2-31	Reserved
NOTE 1 A pause data-burst with data-type-dependent info set to ‘general use’ is used to fill a gap or preceding encoded audio bitstream.		
NOTE 2 Transmitters may optionally use the STOP value to indicate that the transmission of the current encoded audio bitstream is interrupted. When stopped, the interface becomes idle.		

Table 10 – Burst-payload of pause data-burst

Bits of payload LSB..MSB	Value	Contents	Remark
0 – 15	0	Not specified	Mandatory when data-type-dependent info = 1.
	1	Reserved	
	2	Reserved	
	3 – 65 535	Gap-length	Gap length measured in number of IEC 60958 frames
16 – 31	0	Reserved	All '0'
NOTE Non-zero values for gap-length are optional.			

7.2 Audio data-bursts

This clause 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, should be used by the transmitter to schedule data-bursts as necessary to establish synchronization between picture and decoded audio.

The summary of the audio data-bursts is specified in IEC 61937-2.

7.3 Null data-burst

A null data-type is provided to be inserted occasionally in case the interface is idle, to allow receivers which do not observe channel status bit 1 to determine if the interface is conveying PCM or non-linear PCM encoded audio. The contents of a data-burst with the data-type null are fixed (data-type = 00h). In a null data-burst, the length-code, error-flag, and data-type-dependent values are all set to '0h'. The bit-stream-number is set to 7h. When placed into an IEC 60958 subframe, the MSB of each burst-preamble word is placed into time-slot 27, the LSB into time-slot 12.

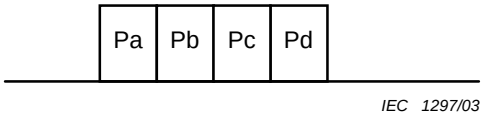

Figure 10 – Null data-burst

There is no requirement on the repetition period, but, when used, it is recommended thata null data-burst be inserted at least once every 4 096 sampling periods in case the interface is idle. This could potentially enhance reliable auto-detection of whether or not the subframe contents contain linear PCM audio or non-linear PCM bitstreams. The use of the null data-burst is optional.

Table 11 – Fields of a null data-burst

Burst-preamble word	Length of field	Contents	Value MSB..LSB
Pa	16-bit	Sync word 1	F872h
Pb	16-bit	Sync word 2	4E1Fh
Pc	16-bit	Burst-info	E000h
Pd	16-bit	Length-code	0000h

Annex A
(normative)

Channel status when IEC 60958 is used in consumer applications

The primary bit of interest in the channel status word is bit 1 which indicates whether the subframe contains PCM audio or data. This bit should be set to '1' to indicate non-linear PCM samples. Consumer applications may use this bit to determine if the IEC 60958 signal should be interpreted as stereo linear PCM audio or digital data. This bit can be used to protect audio devices from converting the non-linear PCM samples into audio.

The allocation of channel status bits of IEC 60958, when used to convey non-linear PCM encoded audio bitstreams is shown in Table A.1.

Table A.1 – Allocation of the channel status bits

Bit number LSB..MSB	Value LSB..MSB	Comments
Bit 0	0	Consumer use
Bit 1	1	Audio sample word used for other purpose than linear PCM
Bit 2	0	Software for which copyright is asserted
	1	Software for which no copyright is asserted
Bit 3.. 5	000	Non-linear PCM audio samples, according to IEC 60958
Bit 6.. 7	00	Mode 0
Bit 8.. 15	xxxxxxxL	Category code, Lbit
Bit 16.. 19	0000	Source number
Bit 20.. 23	0000	Channel number
Bit 24.. 31		Sampling frequency and clock accuracy (see IEC 60958-3)
Bit 32.. 191	All 0	As defined in IEC 60958-3

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ISBN 2-8318-8956-1

ICS 33.160.30

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND