

INTERNATIONAL STANDARD



Digital audio – Interface for non-linear PCM Encoded audio bitstreams applying
IEC 60958 –
Part 1: General (<https://standards.iteh.ai>)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERFACE FOR NON-LINEAR PCM ENCODED
AUDIO BITSTREAMS APPLYING IEC 60958 –****Part 1: General****FOREWORD**

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IEC 61937-1 has been prepared by technical area 20: Analogue and digital audio, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 2007, and amendment 1 published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Activation of Pe field;
- b) Enhanced usage of channel status bits.
- c) Addition of Annex B.

The text of this International Standard is based on the following documents:

Draft	Report on voting
100/3447/CDV	100/3522/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

The contents of the corrigendum 1 (2024-03) have been included in this copy.

INTRODUCTION (to Amendment 1)

~~The revision of IEC 61937-1 (2007) has become necessary to specify the additional definition of length code. Amendment 1 contains the following significant technical changes with respect to the base publication (IEC 61937-1, second edition).~~

~~— New 8-bytes unit definition of length code is added.~~

~~— An erratum in Clause 7 as for indication of the burst payload type is corrected.~~

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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 document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60958-1, *Digital audio interface – Part 1: General*

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

IEC 60958-5, *Digital audio interface – Part 5: Consumer application enhancement*

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

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

3 Terms, definitions, ~~abbreviations~~ and presentation

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 Terms and 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 1 to entry: The number of samples in an audio frame is dependent on the particular encoding system that 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 1 to entry: 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 1 to entry: Each encoded audio frame is the encoded representation of a fixed number of audio samples (for each original audio channel). The number of samples that are encoded into an encoded audio frame depends on the particular encoding system that 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 1 to entry: 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, bytes or ~~8-bytes-unit~~ 8-byte units

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 1 to entry: 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~~

3.2 Presentation convention**3.2.1****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 to 27 of an IEC 60958 subframe. Both odd and even IEC 60958 subframes (channel 1, channel 2) 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

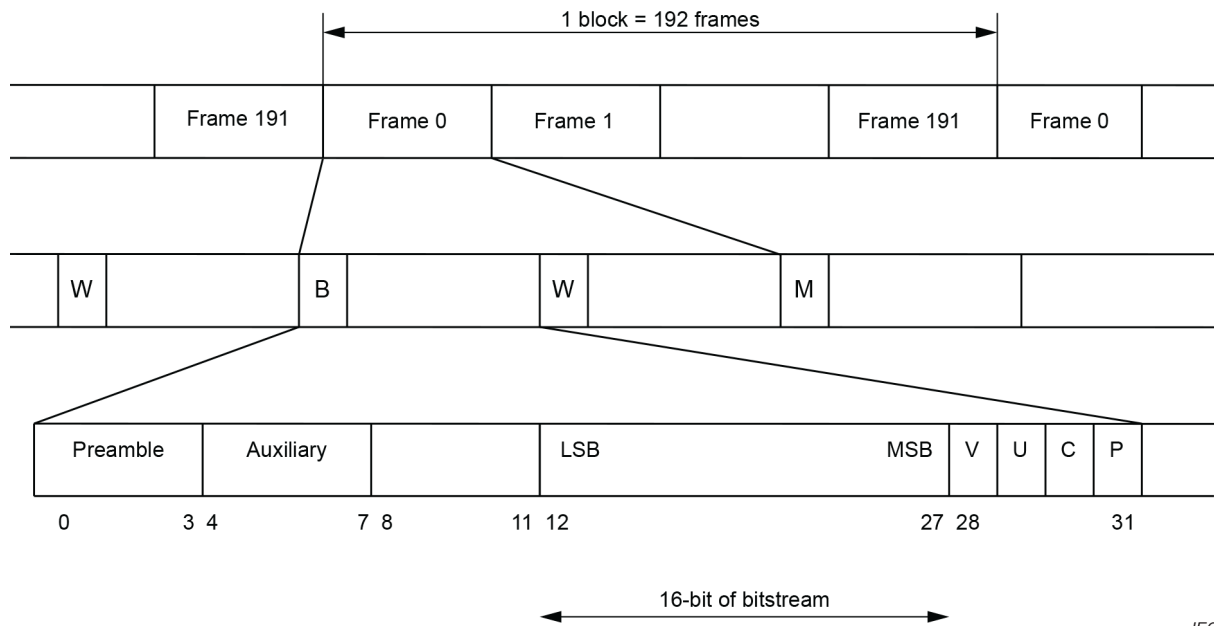
6.1 Coding of the bitstream

6.1.1 General

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 (see Figure 1 and Table 1). 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.



IEC

Figure 1 – IEC 60958 interface format

Table 1 – Bit allocation of the IEC 60958 frame

Field	IEC 60958 time-slot	Value
0 to 3	Preamble	IEC 60958 preamble
4 to 7	Auxiliary field	Not used, all "0" or partial of linear PCM
8 to 11	Unused data bits	Not used, all "0" or partial of linear PCM
12 to 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

6.1.2 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 (see Table 2).

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~~ 16 bits, all used IEC 60958 sub-frames are completely filled. When it is not a multiple of ~~16-bit~~ 16 bits, 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 zeros.

6.1.3 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.

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6.1.4 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.

6.1.5 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.

6.1.6 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 that contains data of an encoded audio frame (see Figure 2).