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CONSOLIDATED VERSION

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Digital audio interface – Part 1: General

Interface audionumérique – Partie 1: Généralités

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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DIGITAL AUDIO INTERFACE –

Part 1: General

FOREWORD

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This Consolidated version of IEC 60958-1 bears the edition number 3.1. It consists of the third edition (2008-09) [documents 100/1252/CDV and 100/1337/RVC] and its amendment 1 (2014-04) [documents 100/2164/CDV and 100/2253/RVC]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through. A separate Final version with all changes accepted is available in this publication.

This publication has been prepared for user convenience.

International Standard 60958-1 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

Electrical and optical requirements are removed from IEC 60958-3; they are specified in IEC 60958-1.

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.

A list of all parts of the IEC 60958 series, under the general title *Digital audio interface*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment 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

- 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- withdrawn,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 publication using a colour printer.

INTRODUCTION to Amendment 1

The revision of IEC 60958-1:2008 has become necessary in order to revise Annexes B and C, and the Bibliography. Additional information for the use of the IEC 60958 conformant data format has also been included.

DIGITAL AUDIO INTERFACE –

Part 1: General

1 Scope

This part of IEC 60958 describes a serial, uni-directional, self-clocking interface for the interconnection of digital audio equipment for consumer and professional applications.

It provides the basic structure of the interface. Separate documents define items specific to particular applications.

The interface is primarily intended to carry monophonic or stereophonic programmes, encoded using linear PCM and with a resolution of up to 24 bits per sample.

When used for other purposes, the interface is able to carry audio data coded other than as linear PCM coded audio samples. Provision is also made to allow the interface to carry data related to computer software or signals coded using non-linear PCM. The format specification for these applications is not part of this standard.

The interface is intended for operation at audio sampling frequencies of 32kHz and above. Auxiliary information is transmitted along with the programme.

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 60268-11, *Sound system equipment – Part 11: Application of connectors for the interconnection of sound system components*

IEC 60874-17, *Connectors for optical fibres and cables – Part 17: Sectional specification for fibre optic connector – Type F-05 (friction lock)*

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

IEC 60958-4, *Digital audio interface – Part 4: Professional applications*

3 Terms and definitions

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

3.1
sampling frequency
frequency of the samples representing an audio signal

NOTE When more than one signal is transmitted through the same interface, the sampling frequencies are identical.

3.2
audio sample word
value of a digital audio sample; representation is linear in 2's complement binary form

NOTE Positive numbers correspond to positive analogue voltages at the input of the analogue-to-digital converter (ADC).

3.3
auxiliary sample bit
the four least significant bits (LSBs) which can be assigned as auxiliary sample bits and used for auxiliary information when the number of audio sample bits in the main data field is less than or equal to 20

3.4
validity bit
bit indicating whether the main data field bits in the sub-frame (time slots 4 to 27 or 8 to 27, depending on the audio word length as described in 4.1.1) are reliable or not

3.5
channel status
the channel status carries, in a fixed format, information associated with each main data field channel which is decodable by any interface user

NOTE Examples of information to be carried in the channel status are: length of audio sample words, pre-emphasis, sampling frequency, time codes, alphanumeric source and destination codes.

3.6
user data
the user data channel is provided to carry any other information

3.7
parity bit
bit provided to permit the detection of an odd number of errors resulting from malfunctions in the interface

3.8
preamble
specific patterns used for synchronization

NOTE There are three different preambles (see 4.3).

3.9
sub-frame
fixed structure used to carry information (see 4.1.14.1.1 and 4.1.2)

3.10
frame
sequence of two successive and associated sub-frames

3.11
block
group of 192 consecutive frames

NOTE The start of a block is designated by a special sub-frame preamble (see 4.3).

3.12
channel coding
coding method by which the binary digits are represented for transmission through the interface

3.13
unit interval (UI)
the shortest nominal time interval in the coding scheme

NOTE There are 128 UI in a sample frame.

3.14
interface jitter
deviation in the timing of interface data transitions (zero crossings) when compared with an ideal clock

3.15
intrinsic jitter
output interface jitter of a device that is either free-running or is synchronized to a jitter-free reference

3.16
jitter gain
ratio of the amplitude of jitter components at the output to their amplitude at the synchronization input to the device under test

4 Interface format

4.1 Structure of format

4.1.1 Sub-frame format

Each sub-frame is divided into 32 time slots, numbered from 0 to 31 (see Figure 1).

Time slots 0 to 3 (preambles) carry one of the three permitted preambles (see 4.1.2 and 4.3; also see Figure 2).

Time slots 4 to 27 (main data field) carry the audio sample word in linear 2's complement representation. The most significant bit (MSB) is carried by time slot 27.

When a 24-bit coding range is used, the LSB is in time slot 4 (see Figure 1).

When a 20-bit coding range is used, time slots 8 to 27 carry the audio sample word with the LSB in time slot 8. Time slots 4 to 7 may be used for other applications. Under these circumstances, the bits in the time slots 4 to 7 are designated auxiliary sample bits (see Figure 1).

If the source provides fewer bits than the interface allows (either 20 or 24), the unused LSBs are set to a logical "0".

For a non-linear PCM audio application or a data application the main data field may carry any other information.

Time slot 28 (validity bit) carries the validity bit associated with the main data field (see 4.4).

Time slot 29 (user data bit) carries 1 bit of the user data channel associated with the main data field channel transmitted in the same sub-frame. For the applications, refer to the other parts of IEC 60958.

Time slot 30 (channel status bit) carries 1 bit of the channel status information associated with the main data field channel transmitted in the same sub-frame. For details refer to the other parts of IEC 60958.

Time slot 31 (parity bit) carries a parity bit such that time slots 4 to 31 inclusive carry an even number of ones and an even number of zeroes (even parity).

NOTE The preambles have even parity as an explicit property.

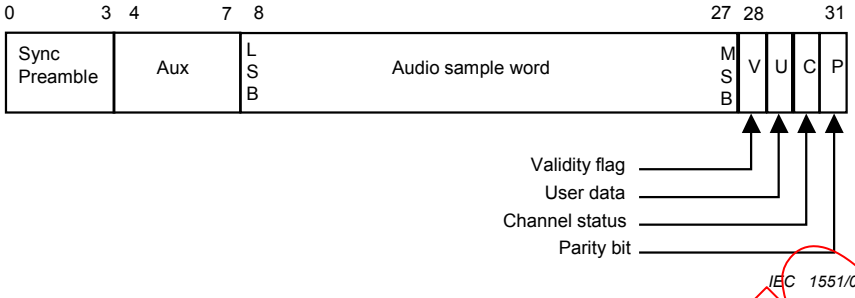

Figure 1 – Sub-frame format (linear PCM application)

4.1.2 Frame format

A frame is uniquely composed of two sub-frames (see Figure 2). For linear coded audio applications, the rate of transmission of frames normally corresponds exactly to the source sampling frequency.

In 2-channel operation mode, the samples taken from both channels are transmitted by time multiplexing in consecutive sub-frames. The first sub-frame (left or "A" channel in stereophonic operation and primary channel in monophonic operation) normally starts with preamble "M". However, the preamble changes to preamble "B" once every 192 frames to identify the start of the block structure used to organize the channel status information. The second sub-frame (right or "B" channel in stereophonic operation and secondary channel in monophonic operation) always starts with preamble "W".

In single channel operation mode in a professional application, the frame format is the same as in the 2-channel mode. Data is carried in the first sub-frame and may be duplicated in the second sub-frame. If the second sub-frame is not carrying duplicate data, then time slot 28, (validity flag) shall be set to logical "1".

NOTE For historical reasons preambles "B", "M" and "W" are, for use in professional applications, referred to as "Z", "X" and "Y", respectively.

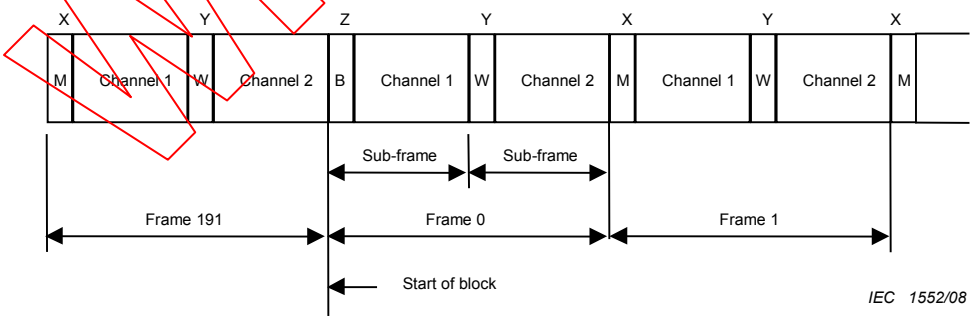

Figure 2 – Frame format

4.2 Channel coding

To minimize the direct current (d.c.) component on the transmission line, to facilitate clock recovery from the data stream and to make the interface insensitive to the polarity of connections, time slots 4 to 31 are encoded in biphase-mark.

Each bit to be transmitted is represented by a symbol comprising two consecutive binary states. The first state of a symbol is always different from the second state of the previous