IEC 60958-4-2

Edition 1.0 2016-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio interface – Part 4-2: Professional applications – Metadata and subcode

Interface audionumérique – Partie 4-2: Applications professionnelles – Métadonnées et sous-code

IEC 60958-4-2:2016-03(en-fr)

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DIGITAL AUDIO INTERFACE –

Part 4-2: Professional applications – Metadata and subcode

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International Standard IEC 60958-4-2 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 first edition, together with IEC 60958-4-1 and IEC 60958-4-4, cancels and replaces IEC 60958-4 published in 2003 and its Amendment 1:2008 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to IEC 60958-4:2003 with its Amendment 1:2008:

a) support for a wider range of physical media;

b) support for a wider range of audio sampling frequencies;

c) deprecation of "minimum implementation" of channel status data.

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

CDV	Report on voting
100/2453/CDV	100/2582/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.

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

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 website 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- withdrawn,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.

INTRODUCTION

The two-channel digital audio interface has been widely used in a variety of professional audio applications that have reached beyond the vision of the original standard. In particular, applications using increased sampling frequencies and alternative physical media.

Separating the standard into independently-maintainable parts allows, for example, additional transmission media to be introduced in the future by revising IEC 60958-4-4 without affecting the other parts of the IEC 60958-4 series. The parts comprise:

Part 4-1: Audio content: defines the format for coding audio used for the audio content. It specifies the semantics of the audio data, including the "validity" flag. It also specifies the sampling frequency by reference to AES5.

Part 4-2: Metadata and subcode: specifies the format for information, metadata, or subcode transmitted with the audio data: principally the "channel status" but also user data and the auxiliary bits. Implementors will note that the current implementation options ("Standard" and "Enhanced") both require that status data be implemented correctly in compliant equipment.

Part 4-4: Physical and electrical parameters: specifies the physical signals that convey the bit stream specified in IEC 60958-1. The transport format is intended for use with shielded twisted-pair cable of conventional design over distances of up to 100 m at frame rates of up to 50 kHz. Longer cable lengths and higher frame rates may be used, but with a rapidly increasing requirement for care in cable selection and possible receiver equalization, or the use of active repeaters. Provision is made in this standard for adapting the balanced terminals to use 75 Ω coaxial cable. Transmission by fibre-optic cable is under consideration.

DIGITAL AUDIO INTERFACE –

Part 4-2: Professional applications – Metadata and subcode

1 Scope

This part of IEC 60958 specifies the format for coding metadata, or subcode, that relates to the audio content and is carried with it. This part of IEC 60958, together with IEC 60958-1, IEC 60958-4-1, and IEC 60958-4-4, specifies an interface for serial digital transmission of two channels of periodically sampled and linearly represented digital audio data from one transmitter to one receiver.

2 Normative references

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

IEC 60958-1:2008, *Digital audio interface – Part 1: General*
IEC 60958-1:2008/AMD1:2014

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

IEC 60958-4-1, *Digital audio interface – Part 4-1: Professional applications – Audio content*

IEC 60958-4-4, *Digital audio interface – Part 4-4: Professional applications – Physical and electrical parameters*

ISO 646, *Information technology – ISO 7-bit coded character set for information interchange*

ITU-R Recommendation BS.450, *Transmission standards for FM sound broadcasting at VHF*[1]

ITU-T Recommendation J.17, *Pre-emphasis used on sound program circuits*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60958-1 and the following apply.

3.1.1
channel status
bits carrying, in a fixed format aligned with the block, specified in IEC 60958-1, information associated with each audio channel which is decodable by any interface user

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[1] Previously CCIR Recommendation 450-1.

3.1.2
metadata
information relating to the audio content in the same channel

3.1.3
subframe
smallest structural element in a digital audio interface transport stream, carrying one PCM sample and ancillary information

Note 1 to entry: The format of a subframe is specified in 4.1.1 of IEC 60958-1:2008.

3.2 Abbreviations

DARS Digital Audio Reference Signal

IRV International Reference Version

4 User data format

One bit of user data may be carried in each subframe. Different user data may be carried in each channel and may be related to the associated audio or not. Its capacity in kbit/s is therefore equal to the sampling frequency in use, in kilosamples/s, for each channel.

User data bits may be used in any way desired by the user.

Known possible formats for the user data channel are indicated by the channel status byte 1, bits 4 to 7.

Other possible formats may be used and may or may not be standardized in future.

The default value of the user data bit is logic 0.

5 Channel status format

5.1 Channel status bit

One bit of channel status data shall be carried in each sub-frame. Different channel status data may be carried in each channel. Their capacity in kbit/s is therefore equal to the sampling frequency in use, in kilosamples/s.

NOTE The channel status for each audio signal carries information associated with that audio signal, and thus it is possible for different channel status data to be carried in the two subframes of the digital audio signal. Examples of information to be carried in the channel status are: length of audio sample words, number of audio channels, sampling frequency, sample address code, alphanumeric source and destination codes, and emphasis.

5.2 Channel status block

Channel status information shall be organized in 192-bit blocks, subdivided into 8-bit bytes numbered from 0 to 23. The transmission format shall mark every 192nd frame to show that it carries the first bit of a block. Within each byte, the bits are numbered from 0 to 7, 0 being the first bit transmitted, so bit 0 of byte 0 is the first bit in the block. Where a byte holds a numerical value, bit 0 is the least significant bit.

NOTE In IEC 60958-1, the frame that begins with preamble Z contains the first bit of a block in both channels. In other transports (for example AES10 and IEC 62365) a block start flag is used to mark the first subframe in a block, and may be applied to each channel independently.

5.3 Implementation

5.3.1 Implementation levels

5.3.1.1 General

The following two implementations are defined: standard and enhanced. These terms are used to communicate in a simple manner the level of implementation of the interface transmitter involving the many features of channel status. Irrespective of the level of implementation, all reserved states of bits defined in 5.5 shall remain unchanged.

5.3.1.2 Standard level

The standard implementation provides a fundamental level of implementation which should prove sufficient for general applications in professional audio or broadcasting. In standard implementation, transmitters shall correctly encode and transmit all channel status bits in byte 0, byte 1, byte 2, and byte 23 (CRCC) in the manner specified in this standard.

NOTE This note applies to the French language only.

5.3.1.3 Enhanced level

In addition to conforming to the requirements described in 5.3.1.2 for the standard implementation, the enhanced implementation shall provide further capabilities.

5.3.2 Transmitter requirement

Transmitters shall encode channel status to follow all the formatting and channel coding rules to one of the two specified implementation levels. All transmitters shall correctly encode and transmit channel status with the correct juxtaposition with respect to the Z preamble or block start (see IEC 60958-1).

5.3.3 Receiver requirement

Receivers shall decode channel status as required by their application. Receivers shall interpret CRCC errors as needing to reject the channel status block with the error. Receivers shall not interpret any errors in a channel status block such as CRCC or block length errors as a reason to mute or alter the audio content.

The purpose of the CRCC in byte 23 is to indicate corruption of the channel status block due to switching or editing effects (for example). Due consideration should be given to the implications of any action on downstream equipment and the associated system in general.

5.4 Documentation

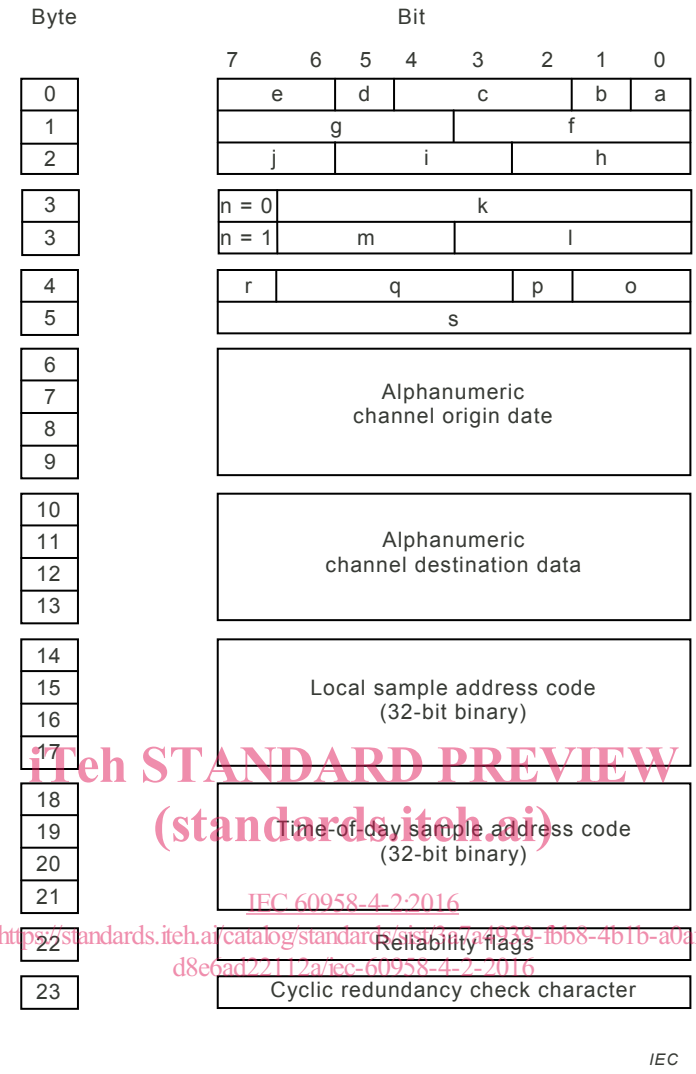
Documentation shall be provided describing the channel status features supported by interface transmitters and receivers.

To promote compatible operation between items of equipment built to this standard it is necessary to establish which information bits and operational bits shall be encoded and sent by a transmitter and decoded by an interface receiver.

5.5 Channel status content

5.5.1 General

The specific organization is presented in Figure 1. Multiple-bit quantities are shown in the tables with the most significant bit to the left. Note that the order in which the bits are transmitted is therefore from right to left.



Key

a Use of channel status block
b Linear PCM identification
c Audio signal pre-emphasis
d Lock indication
e Sampling frequency
f Channel mode
g User bits management
h Use of auxiliary sample bits
i Source word length
j Indication of alignment level
k Channel number
l Channel number
m Multichannel mode number
n Multichannel mode
o Digital audio reference signal
p Reserved but undefined
q Sampling frequency
r Sampling frequency scaling flag
s Reserved but undefined

Figure 1 – Channel status data format

5.5.2 Byte 0: Basic audio parameters

Bit	0	Use of channel status block.
state	0	Consumer use of channel status block. [a]
	1	Professional use of channel status block.

[a] The significance of byte 0, bit 0 is such that a transmission from an interface conforming to IEC 60958-3 consumer use can be identified, and a receiver conforming only to IEC 60958-3 consumer use will correctly identify a transmission from a professional-use interface as defined in this standard. Connection of a professional-use transmitter with a consumer-use receiver or vice versa might result in unpredictable operation. Thus, the following byte definitions only apply when bit 0 = logic 1 (professional use of the channel status block).

Bit	1	Linear PCM identification
state	0	Audio sample word represents linear PCM samples.
	1	Audio sample word used for purposes other than linear PCM samples.

Bits	4 3 2	Audio signal emphasis
states	0 0 0	Emphasis not indicated. Receiver defaults to no emphasis with manual override enabled.
	0 0 1	No emphasis. Receiver manual override is disabled.
	0 1 1	50 μs + 15 μs emphasis, see ITU-R BS.450. Receiver manual override is disabled.
	1 1 1	ITU-T J.17 emphasis (with 6.5 dB insertion loss at 800 Hz). Receiver manual override is disabled
	All other states of bits 2 to 4 are reserved and are not to be used until further defined.	

Bit	5	Lock indication
state	0	Default. Lock condition not indicated.
	1	Source sampling frequency unlocked.

Bits	7 6	Sampling frequency
states	0 0	Sampling frequency not indicated. Receiver default to interface frame rate and manual override or auto set is enabled.
	1 0	48-kHz sampling frequency. Manual override or auto set is disabled.
	0 1	44,1-kHz sampling frequency. Manual override or auto set is disabled.
	1 1	32-kHz sampling frequency. Manual override or auto set is disabled.

The following considerations for basic audio parameters have to be taken into account.

- The indication that the audio sample words are not in linear PCM form requires that the validity bit be set for that channel. See 5.6 and IEC 60958-4-1.
- The indication of sampling frequency, or the use of one of the sampling frequencies that can be indicated in this byte, is not a requirement for operation of the interface. The 00 state of bits 6 to 7 may be used if the transmitter does not support the indication of sampling frequency, the sampling frequency is unknown, or the sample frequency is not one of those that can be indicated in this byte. In the latter case for some sampling frequencies byte 4 may be used to indicate the correct value.
- When byte 1, bits 1 to 3 indicate single channel double sampling frequency mode then the sampling frequency of the audio signal is twice that indicated by bits 6 to 7 of byte 0.

5.5.3 Byte 1: Channel modes, user bits management

Bits	3 2 1 0	Channel mode
states	0 0 0 0	Mode not indicated. Receiver default to two-channel mode. Manual override is enabled.
	1 0 0 0	Two-channel mode. Manual override is disabled.
	0 1 0 0	Single-channel mode (monophonic). Manual override is disabled.
	1 1 0 0	Primary-secondary mode, subframe 1 is primary. Manual override is disabled.
	0 0 1 0	Stereophonic mode, channel 1 is left channel. Manual override is disabled
	1 0 1 0	Reserved for user-defined applications.
	0 1 1 0	Reserved for user-defined applications.
	1 1 1 0	Single channel double sampling frequency mode. Sub-frames 1 and 2 carry successive samples of the same signal. The sampling frequency of the signal is double the frame rate, and is double the sampling frequency indicated in byte 0, but not double the rate indicated in byte 4, if that is used. Manual override is disabled. Vector to byte 3 for channel identification.
	0 0 0 1	Single channel double sampling frequency mode – stereo mode left. Sub-frames 1 and 2 carry successive samples of the same signal. The sampling frequency of the signal is double the frame rate, and is double the sampling frequency indicated in byte 0, but not double the rate indicated in byte 4, if that is used. Manual override is disabled.
	1 0 0 1	Single channel double sampling frequency mode – stereo mode right. Sub-frames 1 and 2 carry successive samples of the same signal. The sampling frequency of the signal is double the frame rate, and is double the sampling frequency indicated in byte 0, but not double the rate indicated in byte 4, if that is used. Manual override is disabled.
	1 1 1 1	Multichannel mode. Vector to byte 3 for channel identification.
	All other states of bits 0 to 3 are reserved and are not to be used until further defined.	

Bits	7 6 5 4	User bits management
states	0 0 0 0	Default, no user information is indicated.
	1 0 0 0	192-bit block structure with user-defined content. Block start aligned with channel status block start.
	0 1 0 0	Reserved for the AES18 standard.
	1 1 0 0	User defined.
	0 0 1 0	User data conforms to the general user data format defined in IEC 60958-3.
	1 0 1 0	192-bit block structure as specified in AES52. Block start aligned with channel status block start.
	0 1 1 0	Reserved for IEC 62537.
	All other states of bits 4 to 7 are reserved and are not to be used until further defined.	

5.5.4 Byte 2: Auxiliary bits, word length and alignment level

Bits	2 1 0	Use of auxiliary bits
states	0 0 0	Maximum audio sample word length is 20 bit (default). Use of auxiliary bits not defined.
	1 0 0	Maximum audio sample word length is 24 bit. Auxiliary bits are used for main audio sample data.
	0 1 0	Maximum audio sample word length is 20 bit. Auxiliary bits in this channel are used to carry a single coordination signal. [a]
	1 1 0	Reserved for user defined applications.
	All other states of bits 0 to 2 are reserved and are not to be used until further defined	

[a] The signal coding used for the coordination channel is described in Annex B.

Bits	5 4 3	Encoded audio sample word length of transmitted signal [a, b, c]	
		Audio sample word length if maximum length is 24 bit as indicated by bits 0 to 2 above.	Audio sample word length if maximum length is 20 bit as indicated by bits 0 to 2 above.
states	0 0 0	Word length not indicated (default).	Word length not indicated (default).
	1 0 0	23 bit	19 bit
	0 1 0	22 bit	18 bit
	1 1 0	21 bit	17 bit
	0 0 1	20 bit	16 bit
	1 0 1	24 bit	20 bit
	All other states of bits 3 to 5 are reserved and are not to be used until further defined.		

[a] The default state of bits 3 to 5 indicates that the number of active bits within the 20-bit or 24-bit coding range is not specified by the transmitter. The receiver should default to the maximum number of bits specified by the coding range and enable manual override or automatic set.

[b] The nondefault states of bits 3 to 5 indicate the number of bits within the 20-bit or 24-bit coding range which might be active. This is also an indirect expression of the number of LSBs that are certain to be inactive, which is equal to 20 or 24 minus the number corresponding to the bit state.

[c] Irrespective of the audio sample word length as indicated by any of the states of bits 3 to 5, the MSB is in time slot 27 of the transmitted subframe as specified in IEC 60958-1:2008, 4.1.1.

Bits	7 6	Indication of alignment level
states	0 0	Alignment level not indicated
	1 0	Alignment to SMPTE RP155, alignment level is 20 dB below maximum code.
	0 1	Alignment to EBU R68, alignment level is 18,06 dB below maximum code.
	1 1	Reserved for future use.

5.5.5 Byte 3: Multichannel modes

Bit	7	Multichannel mode
state	0	Undefined multichannel mode (default)
	1	Defined multichannel modes

The definition of the remaining bit states depends on the state of bit 7.

EITHER

Bits	6 to 0	Channel number, when byte 3 bit 7 is 0
value	The channel number is the numeric value of the byte, plus one, with bit 0 as the least significant bit.	