IEC 60958-4

Edition 2.0 2003-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio interface – Part 4: Professional applications

Interface audionumérique – Partie 4: Applications professionnelles

IEC 60958-4:2003

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX S

ICS 33.160.30

ISBN 978-2-83220-727-7

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DIGITAL AUDIO INTERFACE –

Part 4: Professional applications

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60958-4 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition of IEC 60958-4 cancels and replaces the first edition published in 1999 and constitutes a technical revision.

This bilingual version (2013-05) corresponds to the monolingual English version, published in 2003-05.

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

FDIS	Report on voting
100/643/FDIS	100/669/RVD

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 main changes with respect to the previous edition (1999) are listed below.

– The scope specifies the professional application of IEC 60958-1 (generalities have been removed to an introduction).

– A clause on terms and definitions has been added.

– In Table 1, expanded channel status assignments have been added and channel status definitions expanded to accommodate extended sampling frequencies, indication of alignment level and multi-channel options.

– Figure 1 and associated text has been revised to be more generalized. Three notes on cable performance factors have been added.

– The impedance specification is now dependent on maximum frame rate.

– The common-mode balance specification is now dependent on maximum frame rate

– The impedance specification is now dependent on maximum frame rate.

IEC 60958 consists of the following parts under the generic title *Digital audio interface*:

Part 1: General

Part 3: Consumer applications

Part 4: Professional applications

The committee has decided that this publication remains valid until September 2005. At this date, in accordance with the committee's decision, the publication will be

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

INTRODUCTION

The interface specified in this standard is primarily intended to carry monophonic or stereophonic programmes at a 48 kHz sampling frequency and with a resolution of up to 24 bits per sample. It may alternatively be used to carry signals sampled at other rates such as 32 kHz, 44,1 kHz, or 96 kHz. Note that conformity to this interface specification does not require equipment to utilize these rates and also that the capability of the interface to indicate other sample rates does not imply that it is recommended that equipment supports these rates. To eliminate doubt, equipment specifications should define the supported sampling frequencies.

The format is intended for use with shielded twisted-pair cables over distances of up to 100 m without transmission equalization or any special equalization at the receiver and at frame rates of up to 50 kHz. Longer cable lengths and higher frame rates may be used with cables better matched for data transmission, or with receiver equalization, or both.

In both cases, the clock references and auxiliary information are transmitted along with the audio data. Provision is also made to allow the interface to carry non-audio data.

DIGITAL AUDIO INTERFACE –

Part 4: Professional applications

1 Scope

This International Standard specifies the professional application of the interface for the interconnection of digital audio equipment defined in IEC 60958-1.

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 60268-12:1987, *Sound system equipment – Part 12: Application of connectors for broadcast and similar use*

IEC 60958-1, *Digital audio interface – Part 1: General*

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

ISO/IEC 646:1991, *Information technology – ISO 7-bit coded character set for information interchange*

ITU-T Recommendation J.17:1988, *Pre-emphasis used on sound-programme circuits*

ITU-T Recommendation V.11:1996, *Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s*

3 Terms and definitions

The terms and definitions given in IEC 60958-1 apply to this part of IEC 60958.

4 Interface format

4.1 General

The interface format as defined in IEC 60958-1 shall be used.

For historical reasons, preambles “B”, “M” and “W”, as defined in 4.3 of IEC 60958-1, shall, for use in professional applications, be referred to as “Z”, “X” and “Y”, respectively.

4.2 Validity bit

For this standard, the validity bit shall be used to indicate whether the main data field bits in the sub-frame are suitable for conversion to an analogue audio signal using linear PCM coding.

5 Channel status

5.1 General

The channel status for each audio signal carries information associated with that audio signal; thus it is possible for different channel status data to be carried in the two sub-frames 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 pre-emphasis.

Channel status information is organized in a 192-bit block, subdivided into 24 bytes, numbered 0 to 23 (see Table 1). The first bit of each block is carried in the frame with preamble "Z".

The individual bits of a block are numbered 0 to 191.

The primary application is indicated by channel status bit 0.

For the professional applications described here, this first channel status bit equals "1".

NOTE For consumer digital audio equipment, this first channel status bit equals "0", and this part of IEC 60958 does not apply.

Secondary applications may be defined within the framework of these primary applications.

5.2 Professional linear PCM application

The specific organization of the channel status data is defined in this clause and summarized in Table 1.

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. Also, a "professional use" transmission, defined in this part of IEC 60958, can be correctly identified by a "consumer use" receiver. Connection of a "consumer use" transmitter with a "professional use" receiver or vice versa might result in unpredictable operation. Thus, the byte definitions in this clause apply only when bit 0 = "1" and bit 1 = "0" (professional linear PCM use of the channel status block).

Table 1 – Channel status data format for professional linear PCM application

Byte									
0		a = “1”	b = “0”	C			d	e	
	Bit	0	1	2	3	4	5	6	7
1		f				g			
	Bit	8	9	10	11	12	13	14	15
2		h			i			j	
	Bit	16	17	18	19	20	21	22	23
3		k							n=”0”
		l				m			n=”1”
	Bit	24	25	26	27	28	29	30	31
4		o		p	q				r
	Bit	32	33	34	35	36	37	38	39
5		Reserved but undefined at present							
	Bit	40	41	42	43	44	45	46	47
6		Alphanumeric channel origin data							
	Bit	48	49	50	51	52	53	54	55
7		Alphanumeric channel origin data							
	Bit	56	57	58	59	60	61	62	63
8		Alphanumeric channel origin data							
	Bit	64	65	66	67	68	69	70	71
9		Alphanumeric channel origin data							
	Bit	72	73	74	75	76	77	78	79
10		Alphanumeric channel destination data							
	bit	80	81	82	83	84	85	86	87
11		Alphanumeric channel destination data							
	bit	88	89	90	91	92	93	94	95
12		Alphanumeric channel destination data							
	bit	96	97	98	99	100	101	102	103
13		Alphanumeric channel destination data							
	bit	104	105	106	107	108	109	110	111
14		Local sample address code (32-bit binary)							
	bit	112	113	114	115	116	117	118	119
15		Local sample address code (32-bit binary)							
	bit	120	121	122	123	124	125	126	127
16		Local sample address code (32-bit binary)							
	bit	128	129	130	131	132	133	134	135
17		Local sample address code (32-bit binary)							
	bit	136	137	138	139	140	141	142	143
18		Time of day code (32-bit binary)							
	bit	144	145	146	147	148	149	150	151
19		Time of day code (32-bit binary)							
	bit	152	153	154	155	156	157	158	159
20		Time of day code (32-bit binary)							
	bit	160	161	162	163	164	165	166	167
21		Time of day code (32-bit binary)							
	bit	168	169	170	171	172	173	174	175
22		Reliability flags							
	bit	176	177	178	179	180	181	182	183
23		Cyclic redundancy check character							
	bit	184	185	186	187	188	189	190	191

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 at present
q: sampling frequency
r: sampling frequency scaling flag

Byte 0

Bit 0	Use of channel status block	
State	"1"	Professional use of channel status block (note 1)
Bit 1	Linear PCM identification	
State	"0"	Audio sample word represents linear PCM samples (note 1)
	"1"	Audio sample word used for purposes other than linear PCM samples

NOTE 1 The functions of channel status bits 0 and 1 are defined in IEC 60958-1.

Bits 2 to 4	Encoded audio signal pre-emphasis.	
Bit	2 3 4	
State	"0 0 0"	Pre-emphasis not indicated. Receiver defaults to no pre-emphasis with manual override enabled.
	"1 0 0"	No pre-emphasis. Receiver manual override is disabled.
	"1 1 0"	50 μs/15 μs pre-emphasis. Receiver manual override is disabled.
	"1 1 1"	ITU-T Recommendation J.17 pre-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 shall not be used until further defined.	
Bit 5	Lock indication	
State	"0"	Default, lock condition not indicated.
	"1"	Source sampling frequency unlocked.
Bits 6 to 7	Encoded sampling frequency	
Bit	6 7	
State	"0 0"	Sampling frequency not indicated. Receiver defaults to 48 kHz and manual override or auto set is enabled.
	"0 1"	48 kHz sampling frequency. Receiver manual override or auto set is disabled.
	"1 0"	44,1 kHz sampling frequency. Receiver manual override or auto set is disabled.
	"1 1"	32 kHz sampling frequency. Receiver manual override or auto set is disabled.

NOTE 2 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, if the sampling frequency is unknown, or if 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.

NOTE 3 When bits 8 to 11 in byte 1 indicate single-channel double-sampling frequency mode, the sampling frequency of the audio signal is twice that indicated by bits 6 to 7 in byte 0.

Byte 1

The six modes of transmission are signalled by setting bits 8 to 11 of byte 1 of channel status.

- *Two-channel mode:* In two-channel mode, the samples from both channels are transmitted in consecutive sub-frames. Channel 1 is in sub-frame 1 and channel 2 is in sub-frame 2.
- *Stereophonic mode:* In stereophonic mode, the interface is used to transmit stereophonic signals, and the two channels are presumed to have been simultaneously sampled. The left, or "A", channel is in sub-frame 1 and the right, or "B", channel is in sub-frame 2.
- *Single-channel mode (monophonic):* In monophonic mode, the transmitted bit rate remains at the normal two-channel rate and the audio sample word is placed in sub-frame 1. Time slots 4 to 31 of sub-frame 2 either carry the bits identical to sub-frame 1 or are set to logical "0". A receiver normally defaults to channel 1, unless manual override is provided.
- *Primary/secondary mode:* In some applications requiring two channels where one of the channels is the main or primary channel while the other is a secondary channel, the primary channel is in sub-frame 1 and the secondary channel is in sub-frame 2.
- *Multichannel mode:* The one or two channels carried on the interface are part of a larger group. Channel identification within this group is in byte 3.
- *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 repetition 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.

Bits 8 to 11	Encoded channel mode	
Bit	8 9 10 11	
State	"0 0 0 0"	Mode not indicated. Receiver defaults to two-channel mode and manual override is enabled.
	"0 0 0 1"	Two-channel mode. Receiver manual override is disabled.
	"0 0 1 0"	Single-channel mode (monophonic). Receiver manual override is disabled.
	"0 0 1 1"	Primary/secondary mode (sub-frame 1 is primary). Receiver manual override is disabled.
	"0 1 0 0"	Stereophonic mode (sub-frame 1 is left channel). Receiver manual override is disabled.
	"0 1 0 1" and "0 1 1 0"	Reserved for user-defined applications.
	"0 1 1 1"	Single-channel double-sampling frequency mode – vector to byte 3 for channel identification.
	"1 0 0 0 "	Single-channel double-sampling frequency mode – stereophonic left.
	"1 0 0 1"	Single-channel double-sampling frequency mode – stereophonic right.
	"1 1 1 1"	Multichannel mode. Vector to byte 3.
	All other states of bits 8 to 11 are reserved and shall not be used until further defined.	