

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Digital audio interface –
Part 4: Professional applications**

**Interface audionumérique –
Partie 4: Applications professionnelles**

IEC 60958-4:2003

<https://standards.iteh.ai/catalog/standards/iec/5d456655-a0f6-4d8f-949c-f4026dfe2026/iec-60958-4-2003>



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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*:

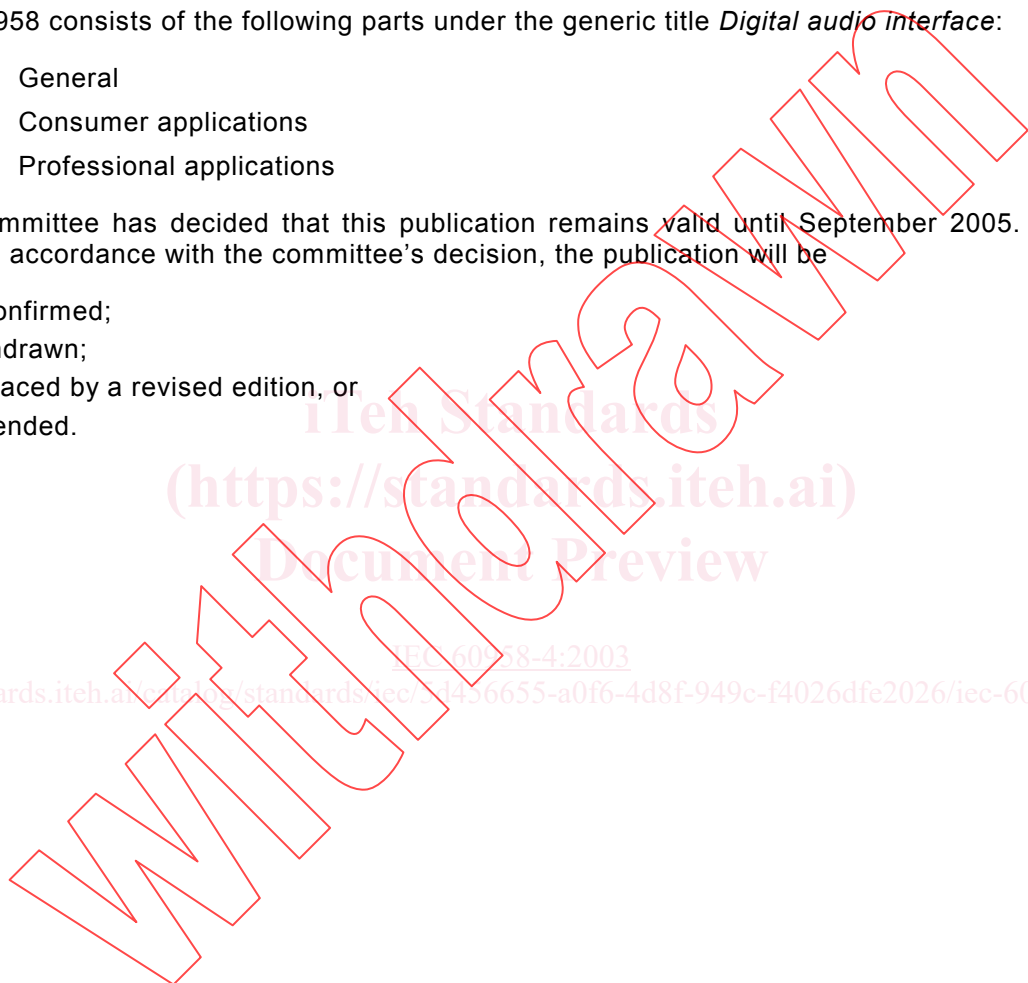
Part 1: General

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.



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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.

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

a: use of channel status block	j: indication of alignment level
b: linear PCM identification	k: channel number
c: audio signal pre-emphasis	l: channel number
d: lock indication	m: multichannel mode number
e: sampling frequency	n: multichannel mode
f: channel mode	o: digital audio reference signal
g: user bits management	p: reserved but undefined at present
h: use of auxiliary sample bits	q: sampling frequency
i: source word length	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 μ s/15 μ s 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.