IEC 60958-5

Edition 1.0 2021-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio interface – Part 5: Consumer application enhancement

Interface audionumérique – Partie 5: Amélioration de l'application grand public

IEC 60958-5:2021-02(en-fr)

Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC online collection - oc.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

IEC 60958-5

Edition 1.0 2021-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Digital audio interface – Part 5: Consumer application enhancement

Interface audionumérique – Partie 5: Amélioration de l'application grand public

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.160.01; 33.160.30

ISBN 978-2-8322-9325-6

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope 6
2 Normative references 6
3 Terms and definitions 7
4 Interface format 9
5 Operation modes 9
5.1 General 9
5.2 Multichannel linear PCM operation mode 9
5.3 One-bit audio operation mode 10
5.4 High-precision multi-bit linear audio operation mode 11
6 Channel status 12
6.1 General 12
6.2 Application 12
6.2.1 Channel status general format 12
6.2.2 Mode 0 channel status format for digital audio equipment for enhanced consumer use 13
7 Stream change 16
Annex A (informative) Audio and vibrotactile applications 17
A.1 General 17
A.2 Channel assignments of vibrotactile signals 17
Annex B (informative) Audio and MIDI application 19
B.1 General 19
B.2 Audio and MIDI 2.0 application 19
Bibliography 20

Figure 1 – Example: multichannel group and subgroups 10
Figure 2 – One-bit audio subframe 11
Figure 3 – 32/64-bit mode subframe 11
Figure 4 – 32-bit mode frame 11
Figure 5 – 64-bit mode frame 12
Figure 6 – Switching from one linear PCM audio mode to the other linear PCM audio mode 16
Figure B.1 – Subframe format 19

Table 1 – Example: multichannel group and subgroups 10
Table 2 – Mode 0 channel status format for enhanced consumer use 13
Table 3 – Multichannel configuration 15
Table A.1 – Vibrotactile channel assignments 17
Table B.1 – Audio and MIDI 2.0 order 19

Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DIGITAL AUDIO INTERFACE –

Part 5: Consumer application enhancement

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 60958-5 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.

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

Draft	Report on voting
100/3449/CDV	100/3517/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.

AVA Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

INTRODUCTION

IEC 60958-3 edition 1.0 was released in 1999 specifying the consumer applications of the interface for the inter-connection of digital audio equipment defined in IEC 60958-1. The applications have enhanced their quality including multichannel modes, high-precision bit length, and multi-stream modes. These enhancements imply a new part in the IEC 60958 series, appropriately keeping backward compatibility with IEC 60958-3 and providing a new enhanced digital audio interface.

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

DIGITAL AUDIO INTERFACE –

Part 5: Consumer application enhancement

1 Scope

This part of IEC 60958 enhances the consumer application of the interface for the interconnection of digital audio equipment defined in IEC 60958-1 and IEC 60958-3, introducing:

– multichannel;
– multi-stream;
– high-resolution;
– multimedia extension;
– related applications.

NOTE IEC 60958-3 specifies a consumer application to carry stereophonic programmes with a resolution of up to 24 bits per sample. This part of IEC 60958 enhances the application, allowing programmes with up to 64 channels, 64 bits per sample, and two simultaneous streams.

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 60958-1:20—[1], *Digital audio interface – Part 1: General*

IEC 60958-3:20—[2], *Digital audio interface – Part 3: Consumer applications*

IEC 62574:2020, *Audio, video and multimedia systems – General channel assignment of multichannel audio*

ISO/IEC 23001-8:2016, *Information technology – MPEG systems technologies – Part 8: Coding-independent code points*[3]

ITU-R BS.2094-1:2017, *Common definitions for the audio definition model*

ITU-R BS.2051-2:2018, *Advanced sound system for programme production*

[1] Under preparation. Stage at the time of publication: IEC CCDV 60958-1:2021.

[2] Under preparation. Stage at the time of publication: IEC CCDV 60958-3:2021.

[3] This publication was withdrawn and replaced with ISO/IEC 23091-3:2018, ISO/IEC 23091-1:2018 and ISO/IEC 23091-2:2019.

AVA Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
one-bit audio
one-bit length audio data stream

Note 1 to entry: A one-bit audio data stream can be directly played back through the analogue low-pass filter bit by bit (MSB first).

3.2
high-precision multi-bit linear audio
linear PCM audio data longer than 25 bits length per sample

Note 1 to entry: This document supports 32- and 64-bit lengths.

3.3
sampling frequency
frequency of the samples representing an audio signal.

Note 1 to entry: When more than one signal is transmitted through the same interface, the sampling frequencies are identical.

[SOURCE: IEC 60958-1:20—, 3.1]

3.4
audio sample word
value of a digital audio sample

Note 1 to entry: Representation is linear in 2's complement binary form.

Note 2 to entry: Positive numbers correspond to positive analogue voltages at the input of the analogue-to-digital converter (ADC).

[SOURCE: IEC 60958-1: 20—, 3.2]

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

Note 1 to entry: IEC 60958-3 specifies the mode 0 channel status format for digital audio equipment for consumer use.

EXAMPLE 1 Length of audio sample words.

EXAMPLE 2 Sampling frequency.

[SOURCE: IEC 60958-1:20—, 3.5, modified – Modification of the Note to entry, and addition of two examples.]

3.6
preamble
specific patterns used for synchronization.

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

Note 1 to entry: There are three different preambles: “B”; “M”; and “W”.

[SOURCE: IEC 60958-1:20—, 3.8, modified – Modification of the Note to entry.]

3.7
sub-frame
fixed structure used to carry information

[SOURCE: IEC 60958-1:20—, 3.9]

3.8
frame
sequence of two successive and associated sub-frames

[SOURCE: IEC 60958-1:20—, 3.10]

3.9
block
group of 192 consecutive frames

Note 1 to entry: The start of a block is designated by a special sub-frame preamble.

[SOURCE: IEC 60958-1:20—, 3.11]

3.10
channel number
number that shows channel order in two-channel operation mode

3.11
channel label ID
label of ID

[SOURCE: IEC 62574:2020, 3.73]

3.11.1
multichannel number
number that identifies multichannel addressing

Note 1 to entry: Same as IEC 62574 channel number

3.12
multichannel group
group composed of one or two multichannel subgroups

3.13
multichannel count
count of channels in a multichannel group

3.14
multichannel subgroup
subgroup, in a multichannel group, composed of several multichannel

Note 1 to entry: Multichannel subgroup A is set according to multichannel configuration.

Note 2 to entry: Multichannel subgroup B is set according to multichannel map.

3.15
multichannel configuration
configuration of multichannel addressing

Documents
Document Sharing Hub

Full document details: IEC 60958-5-2021

3.16
multichannel order
order of multichannel in a multichannel group

3.17
multichannel map
map of multichannel selections

4 Interface format

The interface format as defined in IEC 60958-1 and IEC 60958-3 shall be used unless otherwise specified in this document.

5 Operation modes

5.1 General

IEC 60958-1 specifies single- and two-channel operation modes. This document introduces several new operation modes based on the same interface format of IEC 60958-1 without the pre-emphasis function defined in IEC 60958-3. Channel status information identifies these modes in operation. This document shares the information with IEC 60958-1 and IEC 60958-3 and specifies new usages.

5.2 Multichannel linear PCM operation mode

In multichannel linear PCM operation mode, the samples taken from multichannel linear PCM are transmitted by time multiplexing in consecutive sub-frames.

A multichannel group is composed of several multichannel by consecutive frames. The number of multichannels included in the group is identified by the multichannel count of channel status bits 44 to 47. The group starts with preamble “B” and repeats itself with no break in the block and without un-grouped frames. The group is divided into one or two multichannel subgroups by the multichannel configuration of channel status bits 49 to 60 and the multichannel map of channel status bits 64 to 165. The subgroup is composed of some specific multichannels by consecutive sub-frames. Each multichannel within the multichannel subgroup B is re-numbered according to the multichannel number of channel status bits 64 to 165. Each channel carries consecutive audio sample words.

An example is shown in Figure 1 and Table 1. The multichannel group is composed of eight multichannels. This number of eight is identified by the multichannel count value of “1110”. The multichannel subgroup A is composed of three multichannels identified by the multichannel configuration value of “100001010000”, which includes FrontLeft channel, FrontRight channel and FrontCenter channel given in ITU-R BS.2094-1. The multichannel subgroup B is composed of the 77th multichannel (channel label ID name of HFL) and 78th multichannel (channel label ID name of HFR) by setting the channel status bit 77 to “1” and the channel status bit 78 to “1”. Channels of multichannel order 6, 7 and 8 are not used in this example.

Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021

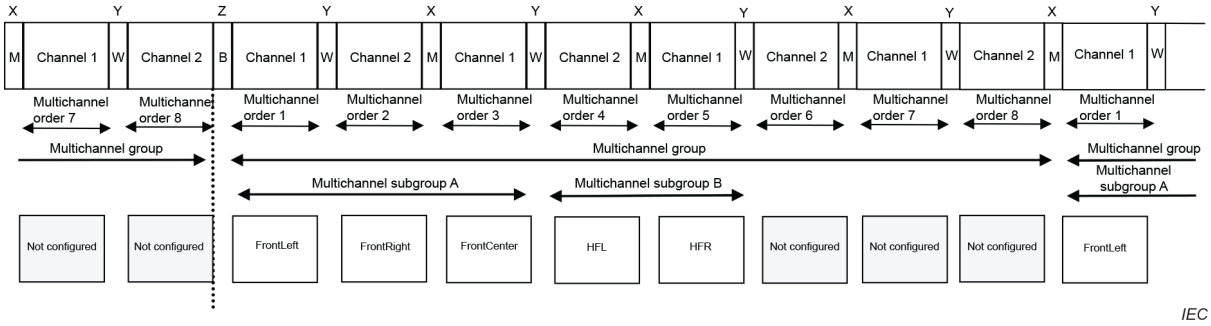

Figure 1 – Example: multichannel group and subgroups

The sampling frequency of each audio multichannel is identical and identified by the original sampling frequency of channel status bits 36 to 39. The sampling frequency of channel status bits 24 to 27, 30 and 31 identifies the IEC 60958 frame rate in operation.

Table 1 – Example: multichannel group and subgroups

Preamble	Channel number	Multichannel order	Multichannel subgroup A	Multichannel subgroup B
			ITU-R BS.2094-1; audioPackFormatID, audioChannelNames	Multichannel map C-Bit 64-191; Multichannel number value: Channel label ID name
B	1	1	AP_0001000a FrontLeft FrontRight FrontCenter	
W	2	2		
M	1	3		
W	2	4		77: HFL
M	1	5		78: HFR
W	2	6		
M	1	7		
W	2	8		
M	1	1	AP 0001000a FrontLeft FrontRight FrontCenter	
W	2	2		
M	1	3		
W	2	4		77: HFL
M	1	5		78: HFR
W	2	6		
M	1	7		
W	2	8		
M	1	1	AP_0001000a	
⋮	⋮	⋮	⋮	⋮
M	1	7		
W	2	8		
B	1	1	AP 0001000a FrontLeft FrontRight FrontCenter	
M	2	2		
W	1	3		

5.3 One-bit audio operation mode

In one-bit audio operation mode, the samples taken from multichannel one-bit audio stream are transmitted by time multiplexing in consecutive sub-frames. The sub-frame format is shown in Figure 2.

Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021

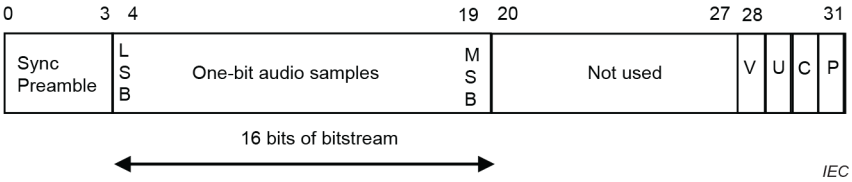

Figure 2 – One-bit audio subframe

Time slots 4 to 19 carry on-bit audio samples composed of 16 bits of the consecutive one-bit audio stream. Significant bit (MSB) is carried by time slot 19.

Time slots 20 to 17 are not used; they are filled with zeros or a few fixed patterns and ignored.

The frame format as defined in multichannel linear PCM operation mode is used for multichannel one-bit audio operation mode.

The sampling frequency of each one-bit audio channel is identical and identified by the original sampling frequency of the channel status bits 36 to 39, which is 16 multiples of that of the multichannel linear PCM. The sampling frequency of channel status bits 24 to 27, 30 and 31 identifies the IEC 60958 frame rate in operation. IEC 60958-3 defines the original sampling frequency where one-bit audio multiples 16 and sampling frequency as the IEC 60958 frame rate.

5.4 High-precision multi-bit linear audio operation mode

In the high-precision multi-bit linear audio operation mode, the samples taken from the multichannel high-precision multi-bit linear audio are transmitted by time multiplexing in consecutive sub-frames dividing of word. The sub-frame format of 32/64-bit mode is shown in Figure 3. The frame formats are shown in Figure 4 and Figure 5.

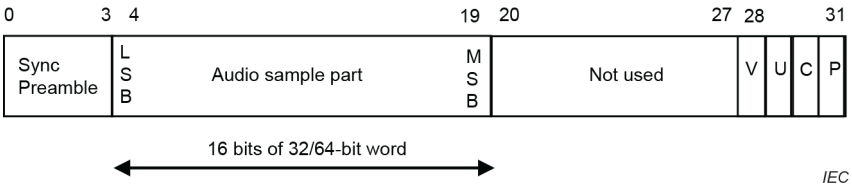

Figure 3 – 32/64-bit mode subframe

In 32-bit audio operation mode, time slots 4 to 19 carry 16-bit samples of 32-bit audio words. Significant bit (MSB) is carried by time slot 19. Time slots 20 to 17 are not used; they are filled with zeros or a few fixed patterns and ignored.

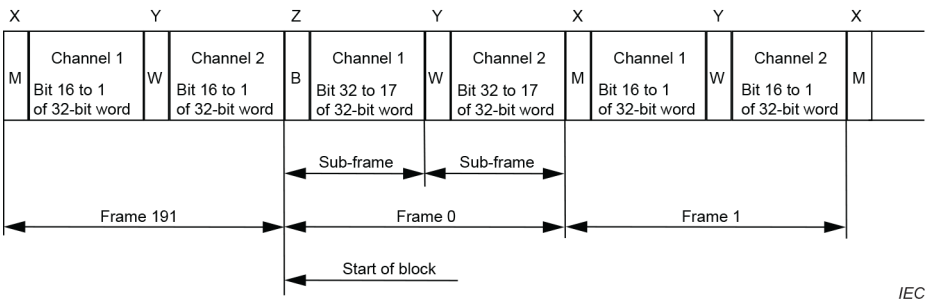

Figure 4 – 32-bit mode frame

The frame format as defined in the multichannel linear PCM operation mode is used for multichannel 32-bit operation modes.

AVA Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021

The original sampling frequency for the 32-bit mode corresponds to 1/2 of that of the multichannel linear PCM.

In 64-bit audio operation mode, time slots 4 to 19 carry 16-bit samples of 64-bit audio words. Most significant bit (MSB) is carried by time slot 19. Time slots 20 to 17 are not used; they are filled with zeros or a few fixed patterns and ignored.

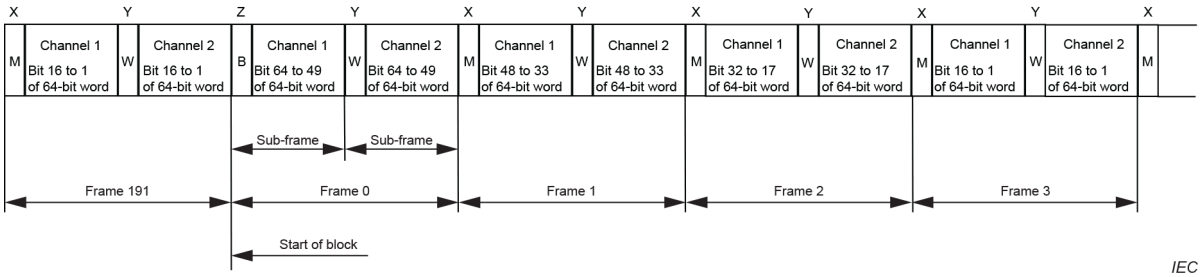

Figure 5 – 64-bit mode frame

The frame format as defined in the multichannel linear PCM operation mode is used for multichannel 64-bit operation modes.

The original sampling frequency for 64-bit mode corresponds to 1/4 of that of the multichannel linear PCM.

6 Channel status

6.1 General

The channel status format as defined in IEC 60958-1 and IEC 60958-3 shall be used unless this document specifies.

6.2 Application

6.2.1 Channel status general format

For each IEC 60958-5 channel, the channel status block provides the information described in this clause and summarized in Table 2.

Documents
Document Sharing Hub
Full document details: IEC 60958-5-2021