IEC 62537

Edition 1.0 2010-06

INTERNATIONAL STANDARD

Interface for loudspeakers with digital input signals based on IEC 60958

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

PRICE CODE U

ICS 33.160.30; 35.040

ISBN 978-2-88912-033-8

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms, definitions and abbreviations 7
3.1 Terms and definitions 7
3.2 Abbreviations 8
4 General 8
4.1 Feature set 8
4.2 Audio formats 9
5 Control data channel using the U-bit of IEC 60958-4 9
5.1 General 9
5.2 Formatting 9
5.3 Mode indication 9
5.4 Subchannel usage 10
6 Loudspeaker command set 10
6.1 General 10
6.2 Device identification and configuration 10
6.2.1 Device identification 10
6.2.2 Auto configuration 11
6.3 Parameters 11
6.3.1 Parameter identification 11
6.3.2 Value range 11
6.3.3 Setting a parameter 12
6.3.4 Device addressing 12
6.3.5 Timed parameter setting (optional) 12
6.4 Optional alternative parameter setting through NRPN and/or MIDI controllers 12
6.4.1 General 12
6.4.2 NRPN and MIDI continuous controller association 12
6.5 Control numbers 13
6.5.1 General 13
6.5.2 MIDI channel assignment (control number 0, low resolution, optional) 13
6.5.3 Volume (control number 1, high resolution, mandatory) 14
6.5.4 Volume ramp (control number 2, high resolution, optional) 14
6.5.5 Time delay (control number 3, high resolution, optional) 14
6.5.6 Sample delay (control number 4, high resolution, optional) 14
6.5.7 Volume calibration (control number 5, high resolution, optional) 14
6.5.8 Panning (control number 6, high resolution, optional) 14
6.5.9 Phase left (control number 7, binary, optional) 14
6.5.10 Phase right (control number 8, binary, optional) 15
6.5.11 Dimming (control number 9, binary, optional) 15
6.5.12 Indicator (control number 10, binary, optional) 15
6.5.13 High-pass frequency (control number 11, high resolution, optional) 15
6.5.14 High-pass filter in/out (control number 12, binary, optional) 15
6.5.15 Low-pass frequency (control number 13, high resolution, optional) 15
6.5.16 Low-pass filter in/out (control number 14, binary, optional) 15

6.6 Additional MIDI messages 15
6.6.1 General 15
6.6.2 All off and restore commands (mandatory) 16
6.6.3 Program change (optional) 16
7 Power transmission and backward channel (optional) 16
7.1 Power transmission 16
7.2 Backwards data channel 17
7.2.1 General 17
7.2.2 Protocol 17
7.2.3 Simultaneous reception 17
Annex A (informative) Security aspects 18
Annex B (informative) Signal routing 21
Annex C (informative) Application examples 23
Annex D (informative) Implementation using current hardware 25
Bibliography 26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTERFACE FOR LOUDSPEAKERS WITH DIGITAL INPUT SIGNALS BASED ON IEC 60958

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.

International Standard IEC 62537 has been prepared by technical area 4: Digital system interfaces and protocols, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/1433/CDV	100/1700/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.

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 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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

The IEC 60958 interface allows transmission of 2-channel digital audio with up to 24 bit word length at 192 kHz sampling rate. This is adequate for loudspeakers, however, there are additional needs in practice that require standardisation, which go beyond what's currently defined in IEC 60958. This standard is aimed at fulfilling those needs.

IEC 60958 features a user bit that can form the basis of a control data channel that addresses those additional requirements. The format of this user bit data channel is based on the existing MIDI standard.

Beyond the needs given in IEC 60958, the following offers an exemplary, but incomplete list of of what a digital loudspeaker interface should support:

- Remote control of operating parameters of the loudspeaker.
- Remote power-on of the loudspeaker – preferably without requiring standby power in the loudspeaker.
- Remote configuration of loudspeaker, for example crossover configuration, or firmware update.
- Remote supervision of loudspeakers, for example chassis temperature or amplifier integrity.
- Remote identification of loudspeakers, to allow auto-configuration of the entire system.
- Control of individual or groups of loudspeakers through a single interface.
- Remote control of Audio System through remote control receiver mounted in loudspeaker enclosure (allowing Audio System to be placed out of sight).
- Extensions to allow for future applications.

NOTE 1 Level and mute control in the loudspeaker is preferred over digital attenuation by the signal source, as this allows the full audio data word length for the filter network; level should be controlled at the last stage in front of power amplifiers. In this case, the advantage is that the full audio word length of the given format is available at any time and at any volume setting. Especially, if a fully digitally constructed crossover network has been implemented, more precise arithmetical operations can also be made at low volumes. Volume control can thus be carried out after the crossover network or even after the relevant final amplifier. Even under the most unfavourable conditions (digital pre-attenuation and analogue gain) the filters and controllers receive the full audio word width under all operating conditions (ideal state).

NOTE 2 Not all of the listed features are required in all applications. It should therefore be up to the implementer to select from this standard the parts that are required in his application, and omit the unnecessary features. See Annex D for application examples.

INTERFACE FOR LOUDSPEAKERS WITH DIGITAL INPUT SIGNALS BASED ON IEC 60958

1 Scope

This International Standard specifies the requirements for a digital loudspeaker interface based on the IEC 60958 series of standards and the MIDI specification. It maximizes flexibility and value by combining these previously separate standards. Together, the two standards provide a simple and flexible digital interface for loudspeakers.

Examples for applications of the interface can be found in Annex C of this standard.

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 60958 (all parts), *Digital audio interface*

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

The Complete MIDI 1.0 Detailed Specification v96.1:2001, (Second edition)