

# TECHNICAL SPECIFICATION



**Guideline for synchronization of audio and video –  
Part 2: Methods for synchronization of audio and video systems**

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IEC TS 62312-2:2018

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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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### GUIDELINE FOR SYNCHRONIZATION OF AUDIO AND VIDEO –

### Part 2: Methods for synchronization of audio and video systems

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62312-2, which is a technical specification, has been prepared by technical area 11: Quality for audio, video and multimedia systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) fingerprint is newly introduced;
- b) addition of the synchronization information from fingerprint (SMPTE spec.);
- c) addition of the method for using the above information.

The text of this Technical Specification is based on the following documents:

Draft TS	Report on voting
100/3049/DTS	100/3106/RVDTS

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the parts of IEC 62312, published under the general title *Guideline for synchronization of audio and video*, can be found on the IEC website.

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

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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## INTRODUCTION

Audio, video and multimedia systems and equipment have begun to use digital technologies. Digital systems or equipment may cause delay of audio and video signals because digital signal processing causes latency and delay. The unevenness of the delay between audio and video ~~may~~ can cause synchronization problems.

For instance, a digital broadcasting system uses signal compression of audio and video. A receiver has signal decoders, and this ~~may~~ can cause unevenness of the delay between audio and video. Digital video signal processing of the display causes a significant delay in the reproduction time of the video image. Another example is an audio-video system consisting of a digital media player, an audio amplifier and a display. A digital media player outputs audio and video signals separately to the amplifier and display through digital interfaces. This may cause synchronization problems of audio and video when ~~each~~ the processing time of ~~the~~ each piece of equipment is different.

To solve synchronization problems of audio and video reproduction on the user side, this document gives guidelines for general methods for the synchronization of audio and video.

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# GUIDELINE FOR SYNCHRONIZATION OF AUDIO AND VIDEO –

## Part 2: Methods for synchronization of audio and video systems

### 1 Scope

The IEC 62312 series gives guidelines for methods of synchronization of audio and video.

This part of IEC 62312 describes the system model and general methods for the synchronization of audio and video. The methods exclude the synchronization of the signal source and the spatial delay of audio reproduction.

### 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, *Digital audio interface – Part 1: General*

IEC 60958-3:2006, *Digital audio interface – Part 3: Consumer applications*  
IEC 60958-3:2006/AMD2:2015

IEC 61883-6, *Consumer audio/video equipment – Digital interface – Part 6: Audio and music data transmission protocol*

SMPTÉ 12M, *Television, Audio and Film – Time and Control Code*

### 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

##### **latency**

inevitable delay of the signal that is caused by its principle or unavoidable signal processing

Note 1 to entry: Signal encoding and decoding, signal compression and de-compression, and signal transmission through interfaces cause latency.

#### 3.2

##### **delay**

general meaning of delay other than latency, including delay that is caused by functional signal processing and delay that is set intentionally

Note 1 to entry: The term "delay" is sometimes used as to meaning latency. In this technical specification, "delay" is defined as delay other than latency. Functional signal processing causes delay or delay is set intentionally.



### 3.3

#### latency information

information of the sum value of latency and delay

### 3.4

#### time-stamp address

quantized timing in which an event occurs on the basis of a reference clock

## 4 System model

### 4.1 Audio and video system

An audio and video system consists of audio and video devices and these devices ~~may~~ can include digital signal processing that causes latency and delay. Each device is connected to the other devices by analogue or digital signal interfaces. The final outputs from the audio and video system to the user are reproduction of audio with speakers and a visual image with a display device. These reproductions have no information of synchronization and the method for synchronization should be applied at the stage prior to the final reproduction.

To control synchronization of audio and video, synchronization information should be provided, and the controller should control the delay of the audio and video devices with the synchronization information. The synchronization information and the controller signal are transmitted through digital interfaces or a control line.

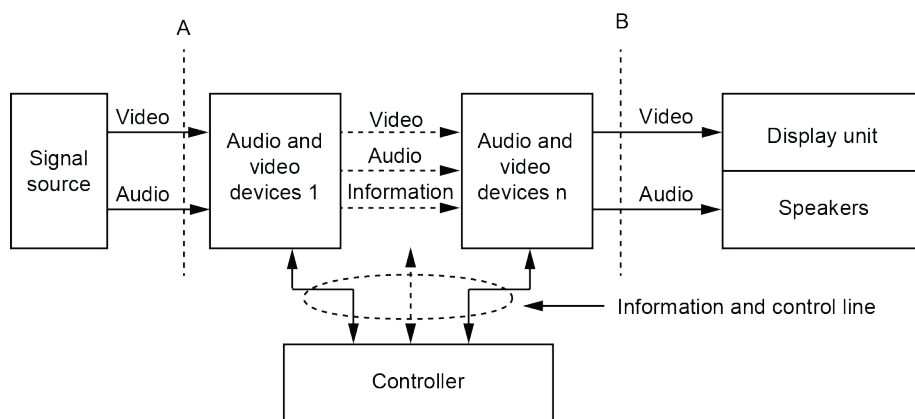
### 4.2 Latency and delay

~~Latency means an inevitable delay of signal in the audio and video device that is caused by principle or unavoidable signal processing. For instance, signal encoding and decoding, signal compression and de-compression, and signal transmission through interface cause latency.~~

~~The term “delay” is sometimes used as meaning latency. In this technical specification, “delay” is defined as delay other than latency. Functional signal processing causes delay or delay is set intentionally.~~

### 4.2 System model

Figure 1 shows the system model.



IEC

Figure 1 – System model

Audio and video synchronization of the signal source is out of the scope of this system model because this model cannot identify it or control it. The audio and video devices have latencies and delays because of their structure. The system consists of a number of audio and video

devices. The display unit is a visual reproducer, such as a CRT or a flat panel display device. The speakers are audio reproducers. These display units and speakers are defined as an ideal device that has no latency. A spatial delay of audio is outside the scope. The lines A and B in Figure 1 show the border of the control of synchronization; the controller controls latency and delay in the audio and video devices with the synchronization information.

### 4.3 Audio and video device

The audio and video device is defined as a device consisting of audio and video units. Each unit includes latency and delay.

Figure 2 shows a model for an audio and video device. This audio and video device consists of units that have latencies and delays and signal inputs and outputs.

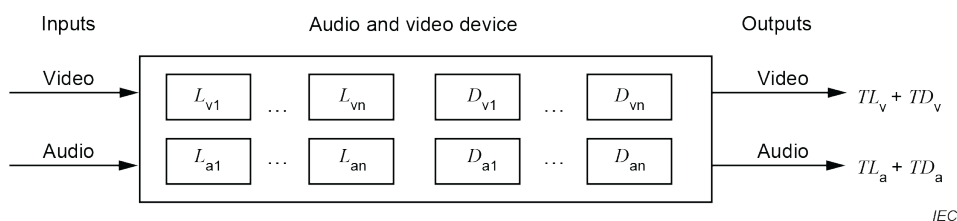


Figure 2 – Audio and video device

The latency of the unit is defined as  $L_{vn}$  for video and  $L_{an}$  for audio, and the delay of the unit is defined as  $D_{vn}$  for video and  $D_{an}$  for audio

where

$n$  is a numeric number of units;

$L_{vn}$  is the video latency of the video unit number  $n$ ;

$D_{vn}$  is the video delay of the video unit number  $n$ ;

$TL_v$  is the total latency of video;

$TD_v$  is the total delay of video;

$L_{an}$  is the audio latency of the audio unit number  $n$ ;

$D_{an}$  is the audio delay of the audio unit number  $n$ ;

$TL_a$  is the total latency of audio;

$TD_a$  is the total delay of audio.

The total value of latency and delay is the sum of each value.

$$TL_v = L_{v1} + L_{v2} + \dots + L_{vn}$$

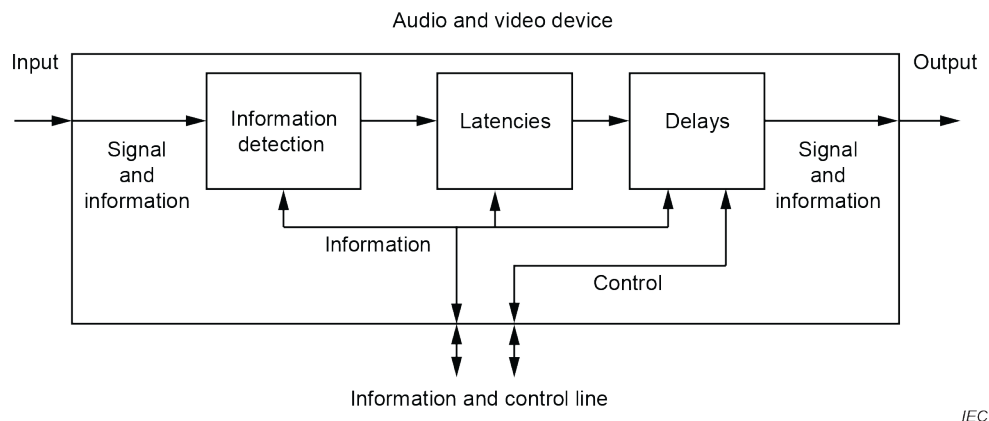
$$TD_v = D_{v1} + D_{v2} + \dots + D_{vn}$$

$$TL_a = L_{a1} + L_{a2} + \dots + L_{an}$$

$$TD_a = D_{a1} + D_{a2} + \dots + D_{an}$$

To control synchronization of audio and video, the audio and video devices should have the information and control function that processes the synchronization information and control delay.

The information and control function of the audio and video device is described in Figure 3. This is a general model that is applied for both the audio part and the video part independently.



**Figure 3 – Information and control in audio and video device**

The audio and video signal and the synchronization information from the previous audio and video device are input into the next audio and video device. The information detection unit detects the information of synchronization from the input signal, and the controller accesses the information through the information line.

Signal processing causes delays and latencies, which are  $TD_v$  and  $TL_v$  for video, and  $TD_a$  and  $TL_a$  for audio. The controller accesses the information of latencies and delays through the information line.

To control the delay of the audio and video signals of the audio and video device, at least one controllable delay unit is required. The controller controls the controllable delay unit through the control line.

#### 4.4 Controller

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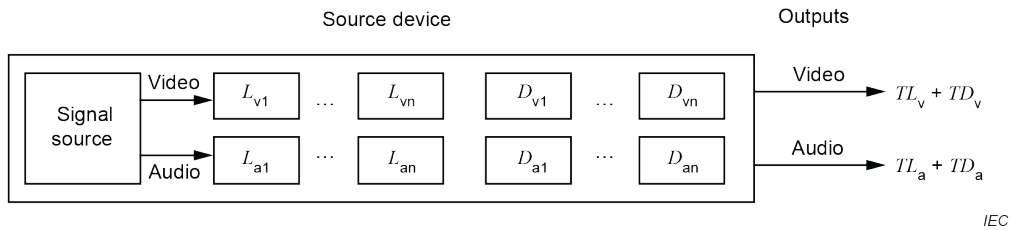
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The controller controls the delay of both audio and video or either audio or video signals with the controllable delay unit. The controller calculates the value of delay that is necessary to synchronize the audio and video signals. The method is described in Clause 5.

The controller may be included in the audio and video device, as described in 4.6.

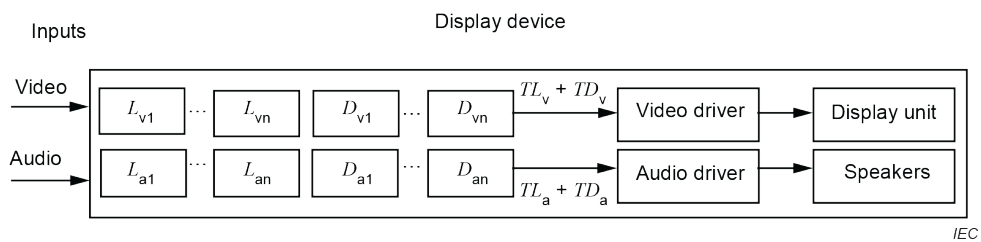
#### 4.5 Source device and display device

Figure 4 shows the source device. The source device is defined as the device that consists of the signal source and the audio and video device. The latency and delay of the signal source is outside the scope of this device. The latencies and delays of the source device are defined as being the same as those of the audio and video device. For instance, a DVD player consists of the signal source and the audio and video device. In a DVD player, the source signal is the contents of the DVD-disc, and it is assumed to have synchronized audio and video data. A digital TV tuner consists of the signal source and the audio and video device, and the signal source is a broadcasting content that is assumed to have synchronized audio and video data. The signal is carried by an RF signal or data stream with an encoded format, which causes latencies at the decoding process.



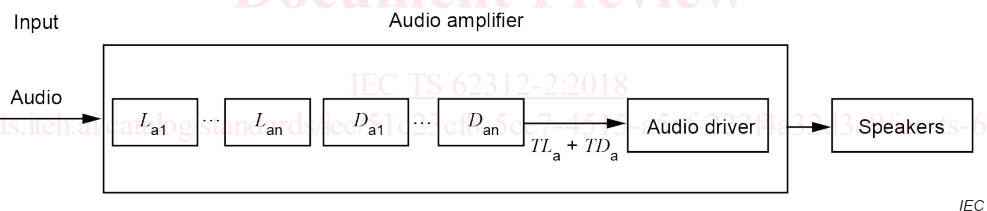
**Figure 4 – Source device**

Figure 5 shows the display device, such as a video monitor. The display device consists of an audio and video device and a display unit and speakers. The latencies and delays of the source device are defined as being the same as those of the audio and video device. The display device may have only a video part without an audio part.



**Figure 5 – Display device**

Figure 6 shows the audio amplifier. This consists of only an audio part and drive speakers.



**Figure 6 – Audio amplifier**

#### 4.6 Controller function of audio and video device

The controller can be equipped as a function of the audio and video device. This case is described in Figure 7. The information, or synchronization information, and control are transmitted between devices. The controller is located in the audio and video device that controls the synchronization.

The information and control line is provided by the digital interface or the network. For instance, IEC 60958 is a digital audio interface, which carries digital audio data and information including synchronization information, and IEEE 1394 is a network interface that carries similar information.