INTERNATIONAL STANDARD

IEC 61883-6

First edition
2002-10

Consumer audio/video equipment – Digital interface –

Part 6: Audio and music data transmission protocol

Matériel audio/vidéo grand public – Interface numérique –

Partie 6: Protocole de transmission de données audio et musicales

Reference number
IEC 61883-6:2002(E)

Publication numbering

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International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE U

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONSUMER AUDIO/VIDEO EQUIPMENT – DIGITAL INTERFACE –

Part 6: Audio and music data transmission protocol

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.
2) The formal decisions or agreements of the 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 National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard 61883-6 has been prepared by Technical Area 4: Digital system interfaces, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

FDIS	Report on voting
100/526/FDIS	100/569/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.

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

This publication replaces IEC/PAS 61883-6:1998

The committee has decided that the contents of this publication will remain unchanged until 31 October 2005. At this date, the publication will be

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- withdrawn;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

IEC 61883 consists of the following parts, under the general title *Consumer audio/video equipment – Digital interface*

- Part 1: General
- Part 2: SD-DVCR data transmission
- Part 3: HD-DVCR data transmission
- Part 4: MPEG2-TS data transmission
- Part 5: SDL-DVCR data transmission
- Part 6: Audio and music data transmission protocol
- Part 7: Transmission of Rec. ITU-R BO.1294 System B Transport 1.0

CONSUMER AUDIO/VIDEO EQUIPMENT – DIGITAL INTERFACE –

Part 6: Audio and music data transmission protocol

1 Scope

This part of IEC 61883 describes a protocol for the transmission of audio and music data employing IEEE 1394, and specifies essential requirements for the application of the protocol.

This protocol can be applied to all modules or devices which have any kind of audio and/or music data processing, generation and conversion function blocks. This standard deals only with the transmission of audio and music data; the control, status and machine readable description of these modules or devices should be defined outside of this document according to each application area.

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 60958-1:1999, *Digital audio interface – Part 1: General*

IEC 60958-3:1999, *Digital audio interface – Part 3: Consumer applications*

IEC 60958-4:1999, *Digital audio interface – Part 4: Professional applications*

IEC 61883-1, *Consumer audio/video equipment – Digital interface – Part 1: General*

IEEE Std 754:1985, *Standard for Binary Floating-Point Arithmetic*

IEEE Std 1394:1995, *Standard for a High Performance Serial Bus – Firewire*

IEEE Std 1394A:2000, *Standard for a High Performance Serial Bus – Amendment 1*

3 Terms and definitions

For the purpose of this part of IEC 61883, the terms and definitions given in IEC 61883-1 apply, together with the following.

3.1.1
32-bit floating-point data
data type which is defined in IEEE 754:1985, Standard for Binary Floating-Point Arithmetic.

3.1.2
A/M Protocol
protocol for the transmission of audio and music data over IEEE 1394

3.1.3
MIDI
Musical Instrument Digital Interface

NOTE The Complete MIDI 1.0 Detailed Specification, Version 96.1, March 1996a, is a specification for the interconnection of digital music processing devices (e.g. keyboards, signal processors) and computers.

3.1.4
music data
data generally used for controlling a tone generator

NOTE The data defined in the MIDI specification, which may be called MIDI data, are an example of music data.

3.1.5
reserved
keyword used to describe objects - bit, byte, quadlet, octet, and field - or the code values assigned to these objects; the object or the code value is set aside for future standardization by the IEC

3.1.6
stream
uni-directional data transmission

3.1.7
time stamp
quantized timing in which an event occurs based on a reference clock

NOTE The reference clock is CYCLE_TIME unless otherwise specified in this standard.

4 Transport requirements

4.1 Arbitrated short bus reset

All modules or devices which implement this A/M Protocol should have the capability of "arbitrated short bus reset" in order to prevent the interruption of audio and music data transmission when a bus reset occurs.

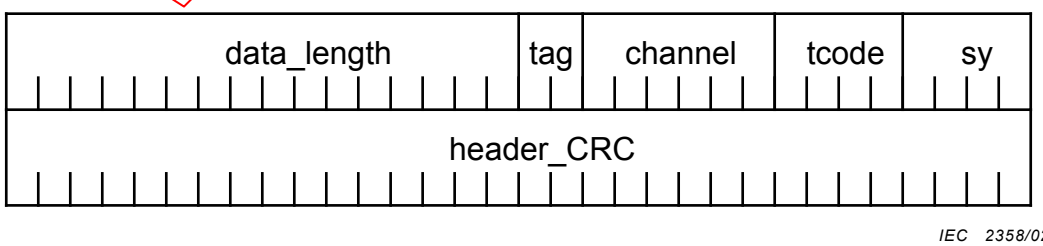
4.2 Bit, byte, and quadlet ordering

This document adopts the ordering of bit, byte, and quadlet for bus packets in accordance with the IEEE 1394 standard.

5 Packet header for audio and music data

5.1 Isochronous packet header format

The header for an isochronous packet which conforms to the A/M Protocol shall have the same format given in Figure 1, which is part of the isochronous packet format defined in IEEE 1394: 1995.



IEC 2358/02

Figure 1 – Isochronous packet header

The isochronous packet header fields are defined with unique values that are specified in Table 1.

Table 1 – Isochronous packet header fields

Field	Value	Comments
tag	01 b	This value indicates that a CIP header is included in the packet.
tcode	A_{16}	This value indicates that this is an isochronous data packet.
sy	xx	This field is reserved. The transmitter shall set this field to 0_{16} unless specified by another application.

5.2 CIP header format

IEC 61883-1 defines a two-quadlet CIP header for a fixed length source packet with SYT field, repeated here for clarity as Figure 2. The CIP header format for an isochronous packet which conforms to the Audio and music data transmission protocol shall use this CIP header.

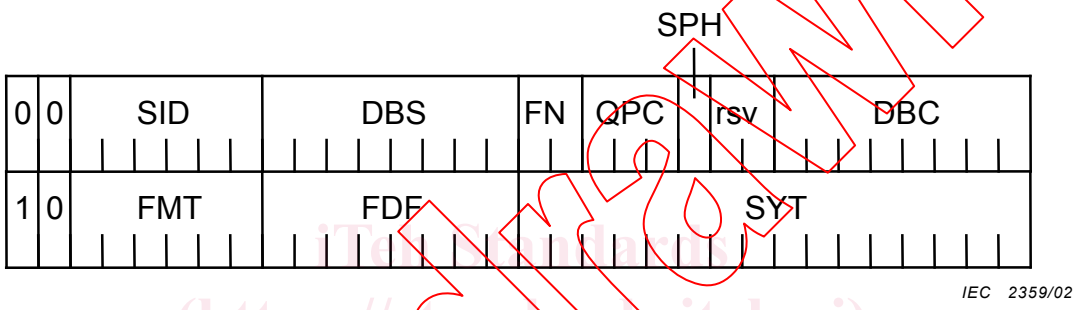


Figure 2 – Common isochronous packet (CIP) format

Table 2 defines the fields with unique values that are specified by this protocol.

Table 2 – CIP fields

Field	Value	Comments
FMT	10_{16}	This value indicates that the format is for Audio and Music.
FN	0_{16}	
QPC	0_{16}	
SPH	0_{16}	
SYT	xx	This field shall contain the time when the specified event is to be presented at a receiver.
FDF	xx	This field is defined in Clause 7.

6 Packetization

6.1 Packet transmission method

When a non-empty CIP is ready to be transmitted, the transmitter shall transmit it within the most recent isochronous cycle initiated by a cycle start packet. The behaviour of packet transmission depends on the definition of the condition in which “a non-empty CIP is ready to be transmitted.” There are two situations in which this condition is defined:

a) In order to minimize TRANSFER_DELAY, the condition of a non-empty CIP being ready for transmission is defined to be true if one or more data blocks have arrived within an *isochronous cycle*. This transmission method is called Non-Blocking transmission, and is described in detail in 6.4

b) The condition of "non-empty CIP ready" can also be defined as true when a fixed number of data blocks have arrived. This transmission method is called Blocking transmission, and is described in Annex A.

6.2 Transmission of timing information

A CIP without a source packet header (SPH) has only one time stamp in the SYT field. If a CIP contains multiple data blocks, it is necessary to specify which data block of the CIP corresponds to the time stamp.

The transmitter prepares the time stamp for the data block which meets this condition:

$$\textbf{mod}(\textit{data block count}, \textit{SYT\_INTERVAL}) = 0 \qquad (1)$$

where

data block count is running count of transmitted data blocks;

SYT_INTERVAL denotes the number of data blocks between two successive valid SYTs, which includes one of the data blocks with a valid SYT. For example, if there are three data blocks between two valid SYTs, then the SYT_INTERVAL would be 4.

The receiver can derive the index value from the DBC field of a CIP with a valid SYT using the following formula:

$$\textit{index} = \textbf{mod}((\textit{SYT\_INTERVAL} - \textbf{mod}(\textit{DBC}, \textit{SYT\_INTERVAL})), \textit{SYT\_INTERVAL}) \qquad (2)$$

where

index is the sequence number;

SYT_INTERVAL denotes the number of data blocks between two successive valid SYTs, which includes one of the data blocks with a valid SYT;

DBC is the data block count field of a CIP.

The receiver is responsible for estimating the timing of data blocks between valid time stamps. The method of timing estimation is implementation-dependent.

6.3 Time stamp processing

A data block contains all data arriving at the transmitter within an audio sample period. The data block contains all data which makes up an "event".

The transmitter shall specify the presentation time of the event at the receiver. A receiver for professional use shall have the capability of presenting events at the time specified by the transmitter. A consumer-use or cost-sensitive receiver is not required to support this presentation-time adjustment capability.

If a function block receives a CIP, processes it and subsequently re-transmits it, the SYT of the outgoing CIP shall be the sum of the incoming SYT and the processing delay.