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

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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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 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- withdrawn;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.

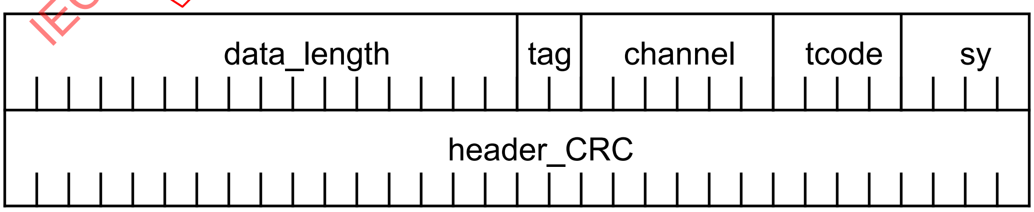


Figure 1 – Isochronous packet header

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.

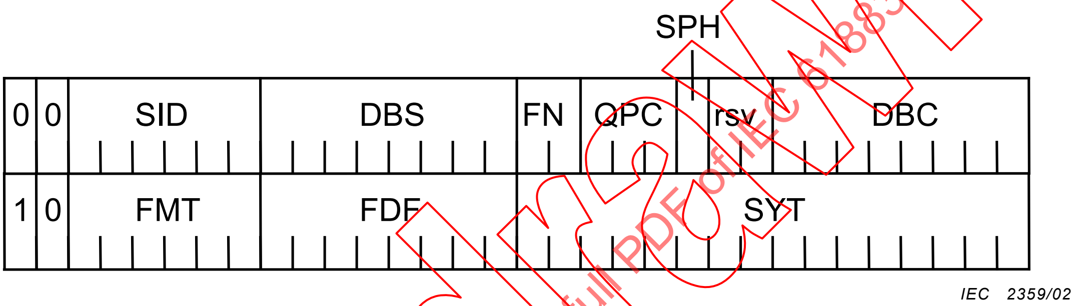


Figure 2 – Common isochronous packet (CIP) format

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:

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

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:

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

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.

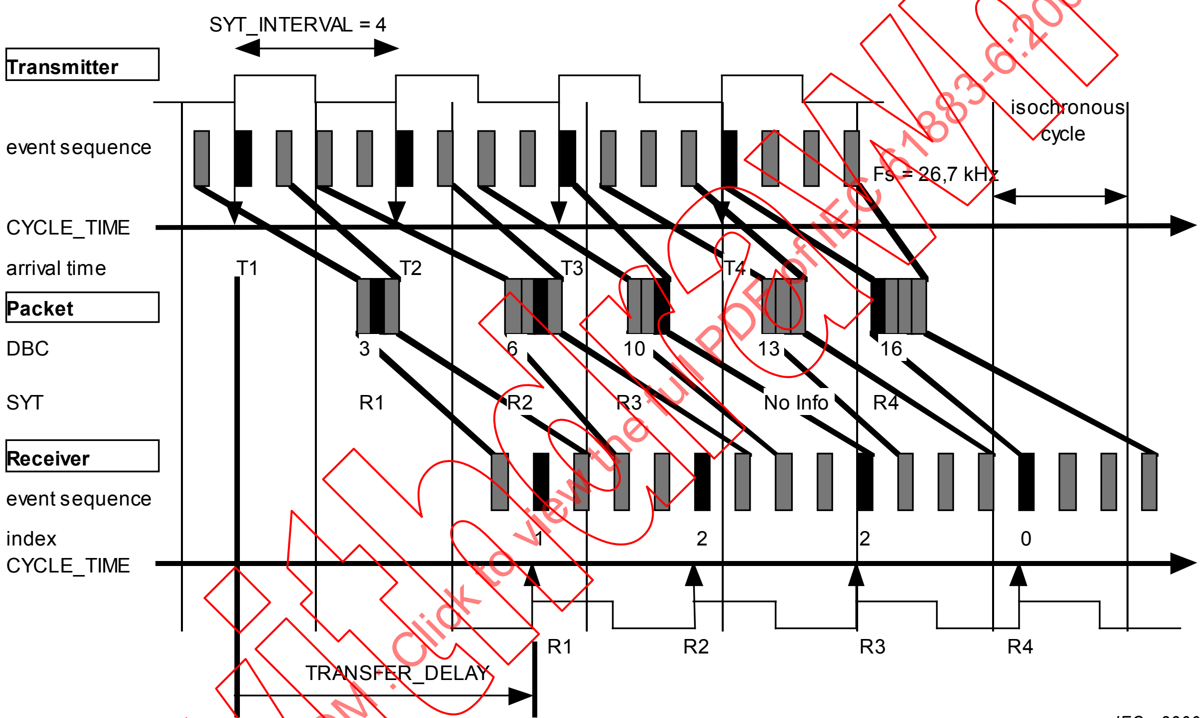
If a function block receives a CIP, processes it and subsequently re-transmits it, the SYT of the outgoing CIP shall be the sum of the incoming SYT and the processing delay.

The transmitter shall add TRANSFER_DELAY to the quantized timing of an event to construct the SYT. The TRANSER_DELAY value is initialized with the DEFAULT_TRANSFER_DELAY value. For professional use, TRANSFER_DELAY may be changed to achieve a shorter TRANSFER_DELAY value, according to the bus configuration. Products for consumer use are not required to support the modification of TRANSFER_DELAY.

The DEFAULT_TRANSFER_DELAY value is 354,17 + 125 μs, which accommodates the maximum latency time of CIP transmission through an arbitrated short bus reset.

6.4 Transmission control

Figure 3 illustrates the non-blocking transmission method.



IEC 2360/02

Figure 3 – Non-blocking transmission method

The transmitter shall construct a packet in every nominal isochronous cycle. Each packet shall comply with the following constraint:

$$0 \le N \le \mathit{SYT\_INTERVAL} \qquad (3)$$

where

N is the number of events in the packet;

In normal operation the transmitter shall not transmit events late, and shall not transmit packets early. The resulting conditions may be expressed as follows:

$$\mathit{Packet\_arrival\_time\_L} \le \mathit{Event\_arrival\_time[0]} + \mathit{TRANSFER\_DELAY} \qquad (4)$$

$$\mathit{Event\_arrival\_time[N\text{-}1]} \le \mathit{Packet\_arrival\_time\_F} \qquad (5)$$

where

Packet_arrival_time_F is the time (measured in μs) when the first bit of the packet arrives at the receiver;

Packet_arrival_time_L is the time (measured in µs) when the last bit of the packet arrives at the receiver;

Event_arrival_time[M] is the time (measured in µs) of the arrival at the transmitter of event *M* of the packet. The first event of the packet has *M*=0;

Figure 4 illustrates the transmission control rules as described in this clause.

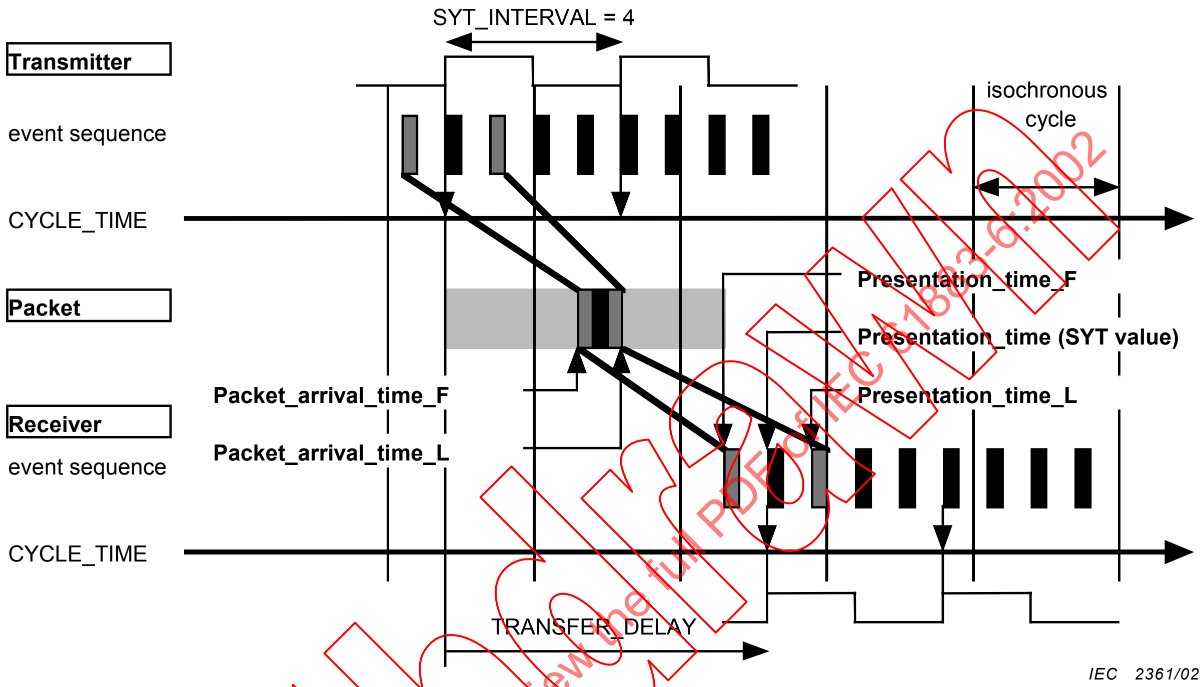


Figure 4 – Transmission parameters

In the event of lost opportunities to transmit non-blocking packets, a method of catching up may be provided. Refer to Annex C.

7 Event Types

7.1 General

All the subformats described in this standard shall use only 32-bit aligned events.

If multiple event sequences are synchronized, it is possible to convert the sequences into a single event which consists of an ordered collection of those sequences which occurred at the same time. The ordered collection is called a *cluster*. A cluster consists of ordered *units*. In the case of *data,* a unit consists of a single sequence. In the case of a *pack*, the unit may consist of several sequences packed together. The number of units in a single cluster is called the *dimension*, and is denoted by CLUSTER_DIMENSION. Figure 5 illustrates these concepts.

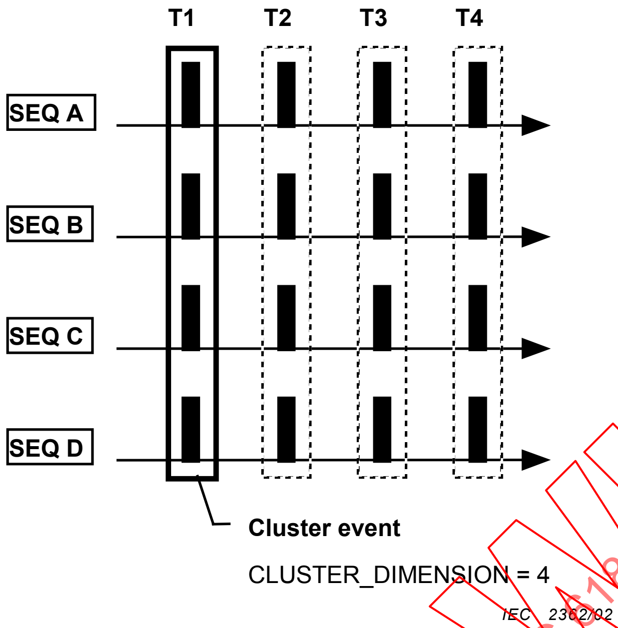


Figure 5 – Cluster events

In order to efficiently cluster non-32-bit aligned sequences which occur at the same time, the *pack* event type is defined. For example, four events of 24-bit data can be collected into a pack of three quadlets.

An event which is neither a cluster nor a pack is simply called *data*.

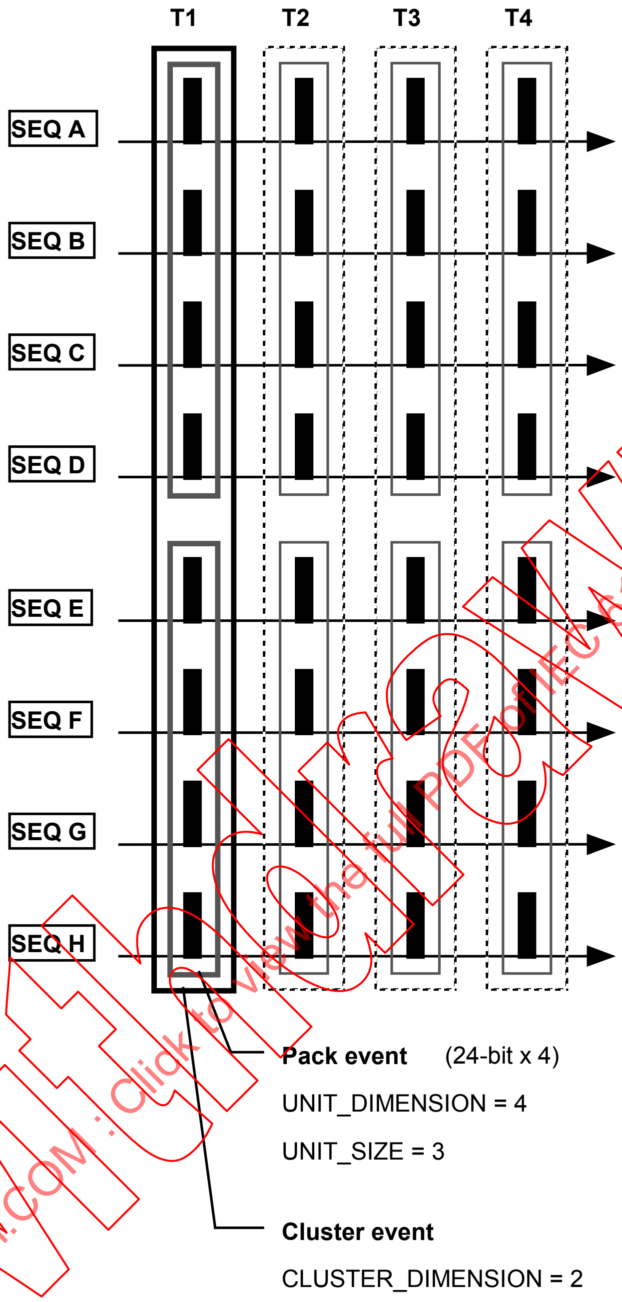
Only the pack and data types can be combined into *units* to make a *cluster*. All events in a *cluster* shall be of the same type.

UNIT_SIZE is the number of quadlets in a unit.

UNIT_DIMENSION is the number of sequences in a unit.

The UNIT_DIMENSION of data is always 1.

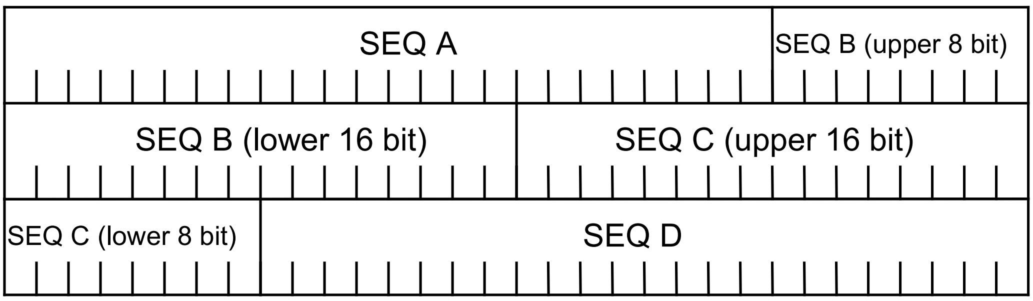
Figure 6 illustrates pack and cluster events.



IEC 2363/02

Figure 6 – Pack and cluster events

Figure 7 illustrates the structure of a pack which consists of four 24-bit event sequences (UNIT_DIMENSION = 4, UNIT_SIZE = 3).



IEC 2364/02

Figure 7 – Pack event with 24-bit event sequence

Since the cluster is an abstract event, only pack or data shall be specified as an event type for a subformat. However, the DBS shall reflect the size in quadlet of all cluster events in a data block. In case of a clustered sequence:

$$DBS = \sum_{n=0}^{(clusters-1)} (Unit\_Size_n \times CLUSTER\_DIMENSION_n) \qquad (6)$$

where

clusters	is the number of clusters in the event;
$Unit\_Size_n$	*is the number of quadlets per unit of the n^{th} cluster;*
$CLUSTER\_DIMENSION_n$	*is the number of units per cluster of the n^{th} cluster.*

Generally the number of elementary sequences in a CIP is given by the following:

$$number\ of\ sequences = DBS \times UNIT\_DIMENSION / UNIT\_SIZE \qquad (7)$$

For the pack illustrated in Figures 6 and 7, DBS = 6, CLUSTER_DIMENSION = 2, UNIT_DIMENSION = 4, UNIT_SIZE = 3.

The number of successive events in a CIP is equal to the number of Data Blocks in a CIP and given by:

$$NEVENTS\_SUCCESSIVE = (data\_length / 4 - CIPH\_SIZE) / DBS \qquad (8)$$

where

data_length	size of the payload of an isochronous packet (in byte);
CIPH_SIZE	size of the CIP header (in quadlet).

The ordering of sequences in an event is application-specific and is not within the scope of this standard. For example, the identification of audio channels in a multichannel transmission will be defined elsewhere.

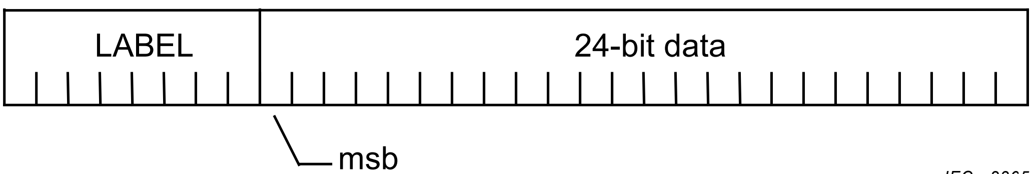
7.2 AM824 Data

A 32-bit data consisting of an 8-bit label and 24-bit data are called AM824 data.

7.2.1 Generic Format

(see Figure 8 and Table 3)

UNIT_SIZE = 1 quadlet/unit
UNIT_DIMENSION = 1 sequence/unit



IEC 2365/02

Figure 8 – Generic AM824 format

Table 3 – Generic AM824 format

LABEL definition	
Value	**Description**
00_{16} - $3F_{16}$	IEC 60958 conformant
40_{16} - 43_{16}	Raw audio
44_{16} - $7F_{16}$	Reserved
80_{16} - 83_{16}	MIDI conformant
84_{16} - FF_{16}	Reserved

A receiver capable of processing AM824 data shall check the label for each AM824 data in a sequence being received.

7.2.2 IEC 60958 conformant data

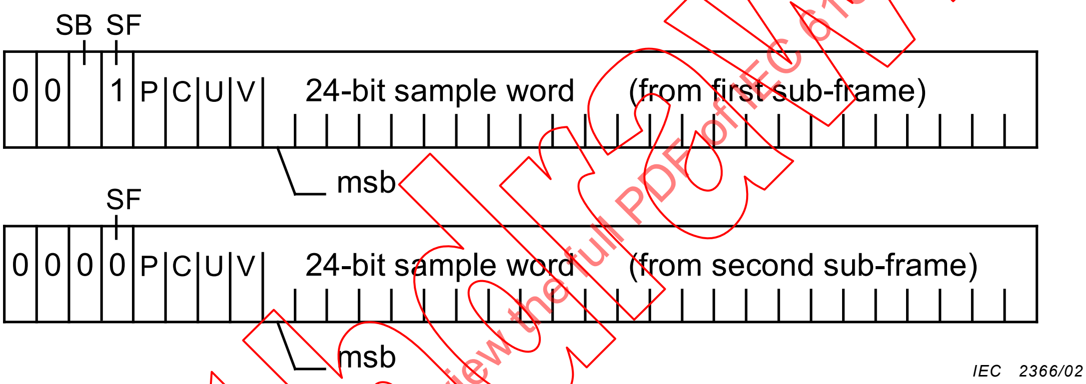


Figure 9 – IEC 60958 conformant data format

Table 4 – IEC 60958 conformant data format

SB (Start of Block) and SF (Start of Frame) definitions				
LABEL	**SB**	**SF**	**Description**	**Equivalent IEC 60958 preamble codes**
00_{16} - $0F_{16}$	0	0	Second subframe of IEC 60958 frames 0 to 191	W,Y
10_{16} - $1F_{16}$	0	1	First subframe of IEC 60958 frames 1 to 191	M,X
20_{16} - $2F_{16}$	1	0	Reserved	-
30_{16} - $3F_{16}$	1	1	First subframe of IEC 60958 frame 0	B,Z

All information defined in IEC 60958 is mapped into the data format shown in Figure 9 and Table 4. For each IEC 60958 frame, both sub-frames shall be transmitted together in the same event. The corresponding quadlets may be consecutive or non-consecutive. If multiple IEC 60958 streams are transmitted, then their sub-frames shall not be interleaved. Applications which use this data type shall follow IEC 60958.

7.2.3 Raw audio data

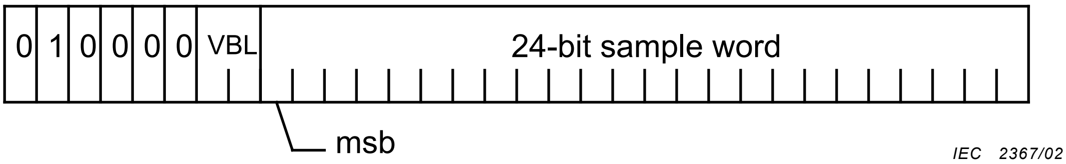


Figure 10 – Raw audio data format

Table 5 – Raw audio data format

VBL (Valid Bit Length code) definition	
Value (binary)	**Description**
00	24 bit
01	20 bit
10	16 bit
11	Reserved

The audio data shall be expressed in 24-bit 2's complement format. If the data active word length is less than 24 bit, the correct number of zero bit shall be padded below the least significant bit to make a 24-bit data structure.

For example, a 20-bit audio data shall be placed in a 24-bit field as shown in Figure 11 and Table 5 (note the four zero pad bit at the right end of the structure):

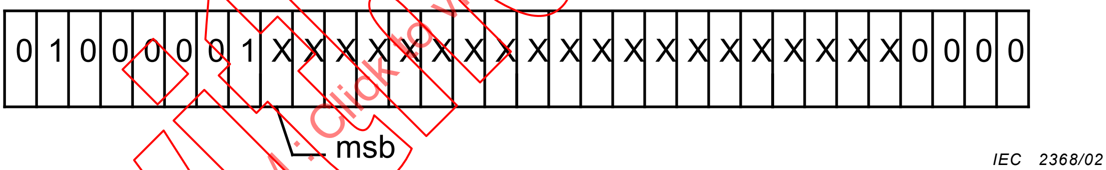


Figure 11 – Alignment of 20-bit data in 24-bit field

NOTE For audio data word lengths of less than 24 bit, the VBL indication can be used by receivers to determine if the data can be truncated to less than 24 bit without changing the value. If the word length is not known or is variable, the data should be aligned at the most significant bit and the VBL code for 24 bit indication should be used.

7.2.4 MIDI Conformant Data

(see Figure 12 and Table 6)

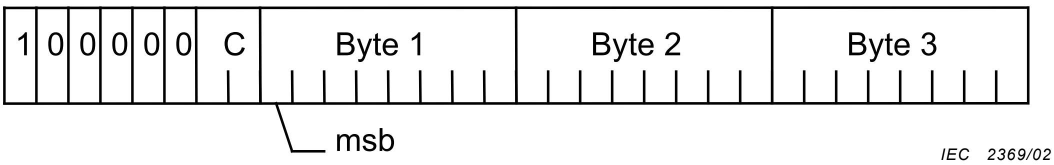


Figure 12 – MIDI conformant data format

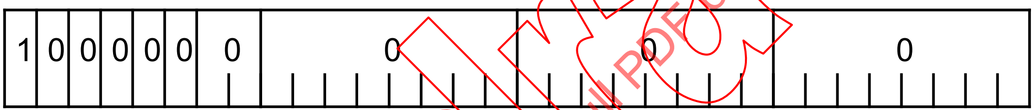
Table 6 – MIDI conformant data format

C (Counter) definition	
Value (decimal)	**Description**
0	No Data (Byte 1 = Byte 2 = Byte 3 = 0)
1	Byte 1 is valid
2	Byte 1 and 2 are valid
3	Byte 1, 2 and 3 are valid

If the CIP carries only MIDI conformant data or cluster, and there are no MIDI data to be packed into a CIP, the packet should be an empty packet rather than a packet of all "No Data" codes.

The "No Data" code defined in MIDI conformant data may be used as "No Data" for other AM824 data types if necessary. The usage of "No Data" described above should be applied to the AM824 data types which use "No Data".

Figure 13 illustrates the “No Data” structure.



IEC 2370/02

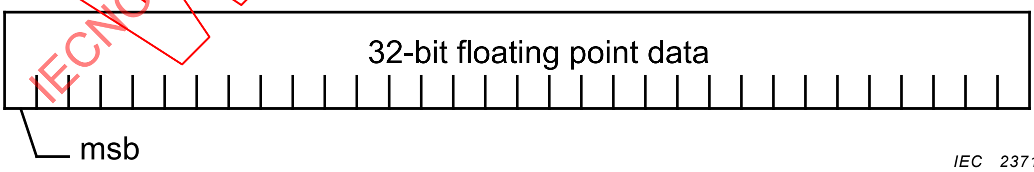
Figure 13 – "No Data" format

Successful implementation of MIDI conformant data may require additional information. Attention is drawn to 1394 Trade Association document 2001003: *Audio and Music Data Transmission Protocol 2.0*, and MMA/AMEI Recommended Practice 027.

7.3 32-bit floating point data

UNIT_SIZE = 1 quadlet/unit
UNIT_DIMENSION = 1 sequence/unit

Figure 14 illustrates the structure of 32-bit floating point data.



IEC 2371/02

Figure 14 – 32-bit floating point data format

7.4 24-bit x 4 Audio Pack

UNIT_SIZE = 3 quadlet/unit
UNIT_DIMENSION = 4 sequences/unit

Figure 15 illustrates the structure of a 24-bit x 4 audio pack.

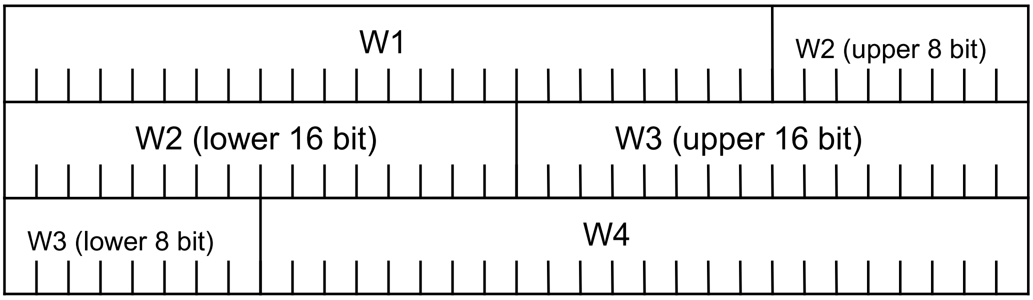


Figure 15 – 24-bit * 4 audio pack format

W1, W2, W3, W4: 24-bit raw audio data

The audio data shall be expressed in 24-bit 2's complement. In case of less than 24 bit, the correct number of zero bit shall be padded below the least significant bit to make a 24-bit data structure. For an example of this, refer to 7.2.3.

8 Subformat

Table 7 defines the subformat and format dependent field (FDF) allocations.

Table 7 – Subformat and FDF allocations

FDF definition	
Value (binary)	**Description**
0000 0xxx	Basic format for AM824
0000 1xxx	Reserved
0001 0xxx	Basic format for 24-bit x 4 audio pack
0001 1xxx	Reserved
0010 0xxx	Basic format for 32-bit floating point data
0010 1xxx	Reserved
0011 0xxx	Reserved
0011 1xxx	Reserved
0100 0000	Reserved
…	…
1111 1110	Reserved
1111 1111	Packet for NO-DATA

Each subformat may use a "cluster" for synchronized multiple sequences unless otherwise specified.

8.1 Basic format

(see Tables 8 to 11)

Table 8 – DBS for AM824 and 32-bit floating point data

DBS for AM824 data and 32-bit floating point data	
Value (decimal)	**Description**
0	CLUSTER_DIMENSION = 256
1 - 255	CLUSTER_DIMENSION = DBS

Table 9 – DBS for 24-bit x 4 audio pack

DBS for 24-bit x 4 audio pack	
Value (decimal)	**Description**
3 - 255	CLUSTER_DIMENSION = DBS/3

Figure 16 illustrates a generic FDF definition.

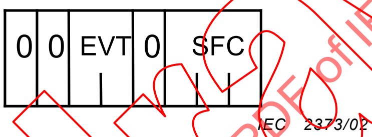


Figure 16 – Generic FDF definition

Table 10 – Event type (EVT) code definition

EVT code definition	
Value (decimal)	**Description**
0	AM824 Data
1	24-bit x 4 audio pack
2	32-bit floating point data
3	Reserved

Table 11 – SFC (Nominal Sampling Frequency Code) definition

SFC definition		
Value (decimal)	**Sample transmission frequency**	**SYT_INTERVAL**
0	32 kHz	8
1	44,1kHz	8
2	48 kHz or not indicated	8
3	88,2 kHz	16
4	96 kHz or not indicated	16
5	176,4 kHz	32
6	192 kHz or not indicated	32
7	Reserved	

If a packet of AM824 data contains only IEC 60958 conformant data and a transmitter functions as a gateway, the transmitter should estimate the sample transmission frequency for the SFC rather than copying the sampling frequency code embedded in the original IEC 60958 data.

Equation 9 can be used to determine the required bus bandwidth allocation. The required isochronous bandwidth is given below:

$$BW = (\mathrm{int}\,(\max(Fs)/8000) + 1) \times \sum_{n=0}^{clusters\,-1} (UNIT\_SIZE_n \times CLUSTER\_DIMENSION_n) \times 8000 \qquad (9)$$

where

BW	is the required isochronous bandwidth (in quadlet/s);
FS	is the sample rate (in Hz);
$UNIT\_SIZE_n$	is the number of quadlet in a unit of the nth cluster;
$CLUSTER\_DIMENSION_n$	is the number of units in the nth cluster;
CLUSTERS	is the number of clusters in an event.

8.2 Special Format

1	1	1	1	1	1	1	1

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Figure 17 – FDF code for NO-DATA packet

The transmitter shall use the FDF code shown in Figure 17 when a packet is a NO-DATA packet only for blocking transmission. The transmitter shall not use this FDF code for non-blocking transmission. The receiver shall ignore all the data in a CIP with this FDF code.

Annex A
(informative)

Blocking transmission method

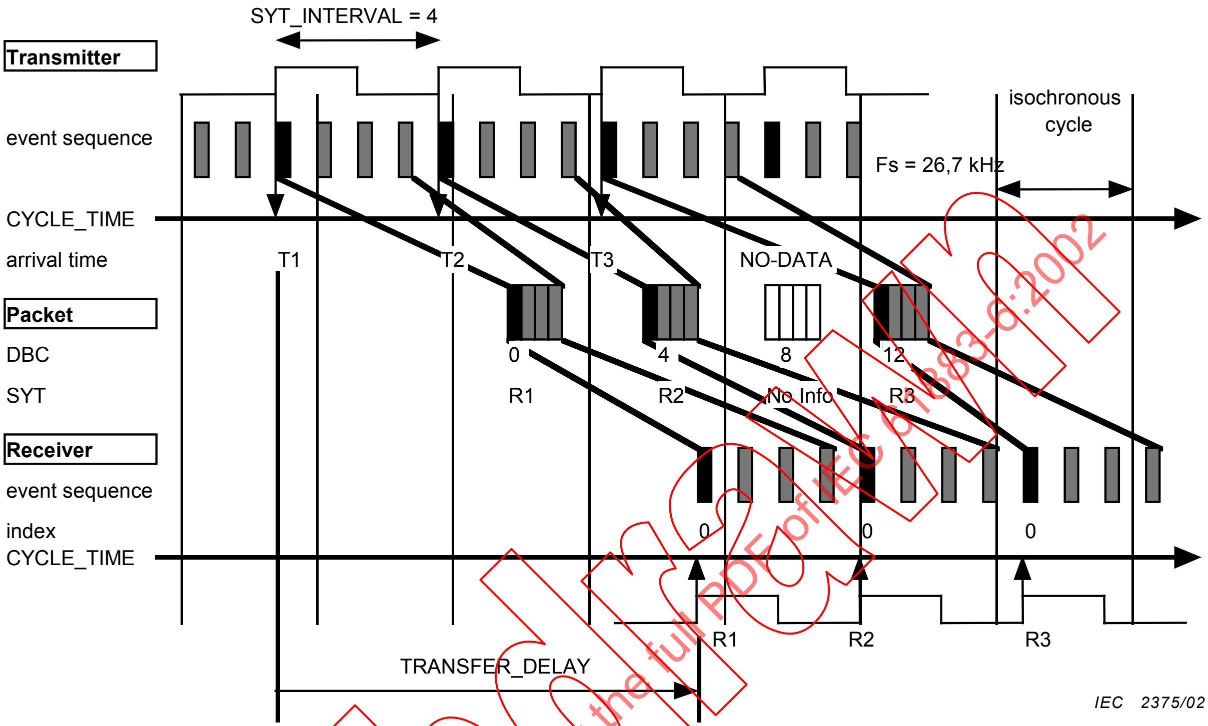

Figure A.1 – Blocking transmission method

The blocking method (see Figure A.1) may be used by a transmitter which has only the ability to transmit packets of the same size. In order to indicate "no data", the transmitter may transmit an empty packet or a special non-empty packet which has the "NO-DATA" code in its FDF and has the same size of dummy data as a non-empty packet. It is necessary for the transmitter to set the time stamp of the first data block in a packet.

For blocking, the duration of the successive events in a CIP must be added to DEFAULT_TRANSFER_DELAY.

If a CIP contains N audio samples of a stream at Sampling Transmission Frequency (STF), then:

$$TRANSFER\_DELAY >= DEFAULT\_TRANSFER\_DELAY + 1/STF \times N \times 1000 \qquad (A.1)$$

where

TRANSFER_DELAY	is the latency of transmission;
DEFAULT_TRANSFER_DELAY	is the initialised value of TRANSFER_DELAY;
STF	is the sampling transmission frequency;
N	is the number of audio samples in a CIP

The TRANSFER_DELAY for each STF when DEFAULT_TRANSFER_DELAY = 479,17 μs is defined in Table A.1.

Table A.1 – TRANSFER_DELAY for differing values of STF

STF	TRANSFER_DELAY
32 kHz	479,17 + 250,00 = 729,17 [µs]
44,1 kHz	479,17 + 181,41 = 660,58 [µs]
48 kHz	479,17 + 166,67 = 645,84 [µs]
88,2 kHz	479,17 + 181,41 = 660,58 [µs]
96 kHz	479,17 + 166,67 = 645,84 [µs]
176,4 kHz	479,17 + 181,41 = 660,58 [µs]
192 kHz	479,17 + 166,67 = 645,84 [µs]
Reserved	Not defined

Annex B
(informative)

Synchronization Issues

The following synchronization issues have been identified:

a) rate matching between the transmitter and receiver;

b) adjusting the presentation time at a receiver;

c) adjusting the location at a transmitter.

This annex focuses on rate matching in terms of sampling clock delivery, which is very familiar to audio engineers. It only applies for real time transfer which occurs when the sample transmission frequency is used to define the sampling frequency.

Since a CIP without a source packet header (SPH) has only one time stamp in the SYT field, the maximum synchronization clock frequency has to be limited to the isochronous cycle of 8 kHz.

Delivery of sampling clock of arbitrary frequency

Assume that a transmitter carries an audio stream with sampling frequency *STF* and that *STF* > 8 kHz.

The transmitter derives a "synchronization clock" with frequency *Fsync* according to the equation B.1:

$$Fsync = STF / SYT\_INTERVAL \le 8\,000 \qquad \text{(B.1)}$$

where

Fsync is the synchronization clock frequency (in Hz);

STF is the sampling transmission frequency (in Hz);

SYT_INTERVAL denotes the number of events between two successive valid SYTs, which includes one of the events with a valid SYT.

The transmitter quantizes the timing of the "synchronization clock", for instance the rising edge of the clock, by referring to its own CYCLE_TIME. It transmits the sum of the timing and TRANSFER_DELAY by using the SYT field of the CIP. The resolution of the time stamp is 1/(24,576 MHz), or approximately 40 ns, and CYCLE_TIME may have 40 ns of jitter due to this quantization. If the timing information is not available for a CIP, the SYT has to indicate the "No Information" code.

A receiver can reproduce the "synchronization clock" in terms of the pulse generated when the SYT equals its own CYCLE_TIME.

The sampling clock can be reproduced by multiplying the "synchronization clock" by the SYT_INTERVAL, which must be determined before receiving begins.

This sampling clock delivery does not require synchronization of the sampling clock and the isochronous cycle.

The reproduced synchronisation clock will have jitter. This jitter can degrade audio quality unless adequate jitter attenuation is used.