INTERNATIONAL STANDARD

IEC 62447-2

First edition
2007-06

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-12 –

Part 2: Compression format

Reference number
IEC 62447-2:2007(E)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: 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 corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:

Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 62447-2

First edition
2007-06

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-12 –

Part 2: Compression format

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE XB

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-12 –

Part 2: Compression format

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
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 62247-2 has been prepared by 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
100/1092/CDV	100/1187/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 list of all the parts of the IEC 62247 series, under the general title *Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape – Format D-12,* can be found on the IEC website.

This part 2 describes the specifications for encoding process and data format for 1080i, 1080p and 720p systems.

Part 1 describes the VTR specifications which are tape, magnetization, helical recording, modulation method and basic system data for video compressed data.

Part 3 describes the specifications for transmission of DV-based compressed video and audio data stream over 360 Mb/s serial digital interface.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-12 –

Part 2: Compression format

1 Scope

This part of IEC 62247 defines the data structure for the interface of DV-based digital audio, subcode data, and compressed video at 100 Mb/s. This standard defines the processes required to decode the DV-based data structure into eight channels of AES-3 digital audio at 48 kHz, subcode data, and high-definition video at 1080/60i, 1080/50i, and 720/60p.

The following high-definition video parameters are used in this standard:

1080/60i system

Input video format: 1920 × 1080 image sampling structure, 59,94 Hz field rate, interlace format. Compressed video data rate: 100 Mb/s

1080/50i system

Input video format: 1920 × 1080 image sampling structure, 50 Hz field rate, interlace format. Compressed video data rate: 100 Mb/s

720/60p system

Input video format: 1280 × 720 image sampling structure, 59,94 Hz frame rate, progressive format. Compressed video data rate: 100 Mb/s

In this standard, the 60 Hz system nomenclature refers to both 1080/60i and 720/60p systems; whereas the 50 Hz system refers only to the 1080/50i system. The nomenclature 1080-line system refers to both 1080/60i and 1080/50i systems, while the 720-line system refers only to the 720/60p system.

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.

SMPTE 12M:1999, *Television, Audio and Film – Time and Control Code*

SMPTE 274M:1998, *Television, 1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates*

SMPTE 260M:1999, *Television, 1125/60 High-Definition Production System – Digital Representation and Bit Parallel Interface*

SMPTE 296M:1997, *Television, 1280 x 720 Scanning, Analog and Digital Representation and Analog Interface*

AES3:1992, *Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data*

3 Abbreviations and acronyms

AAUX	Audio auxiliary data
AP1	Audio application ID
AP2	Video application ID
AP3	Subcode application ID
APT	Track application ID
Arb	Arbitrary
AS	AAUX source pack
ASC	AAUX source control pack
CGMS	Copy generation management system
CM	Compressed macro block
DBN	DIF block number
DCT	Discrete cosine transform
DIF	Digital interface
DRF	Direction flag
Dseq	DIF sequence number
DSF	DIF sequence flag
EFC	Emphasis audio channel flag
EOB	End of block
LF	Locked mode flag
QNO	Quantization number
QU	Quantization
Res	Reserved for future use
SCT	Section type
SMP	Sampling frequency
SSYB	Subcode sync block
STA	Status of the compressed macro block
STYPE	Signal type
Syb	Subcode sync block number
TF	Transmitting flag
VAUX	Video auxiliary data
VLC	Variable length coding
VS	VAUX source pack
VSC	VAUX source control pack

4 Data processing

4.1 General

As shown in Figure 1, processed audio, video and subcode data are output for recording on a D-xx recorder. Additionally, these data are output in DIF format data for a different application through a digital interface port. Details of this process are shown in Figure 1 and described in Clauses 3 and 4. Dotted lines are related to the data flow described in the VTR document.

Annex A shows the block diagram of D-xx recorder. Figure A.1 of this standard shows the part defined by this compression format document.

4.1.1 Video encoding parameter

The source component signal to be processed shall comply with the video parameters as defined by SMPTE 274M and SMPTE 296M.

4.1.2 Audio encoding parameter

The audio signal is sampled at 48 kHz with 16-bit quantization defined by AES3.

4.1.3 Subcode data

The time code format in the subcode area complies with SMPTE 12M.

4.1.4 Frame structure

In 1080/60i and 1080/50i systems, video frame data, audio frame data, and subcode data are processed in each frame. The audio frame in this standard is defined as an audio-processing unit.

In the 720/60p system, data in two video frames are processed within one frame duration of the 1080/60i system. Consequently, audio data and subcode data are processed in the same way as the 1080/60i system.

Each frame of time code shows a frame number that corresponds to each video frame in the 1080-line system, and two video frames each in 720/60p system. Therefore, time codes of the 1080/60i and 720/60p systems are the same.

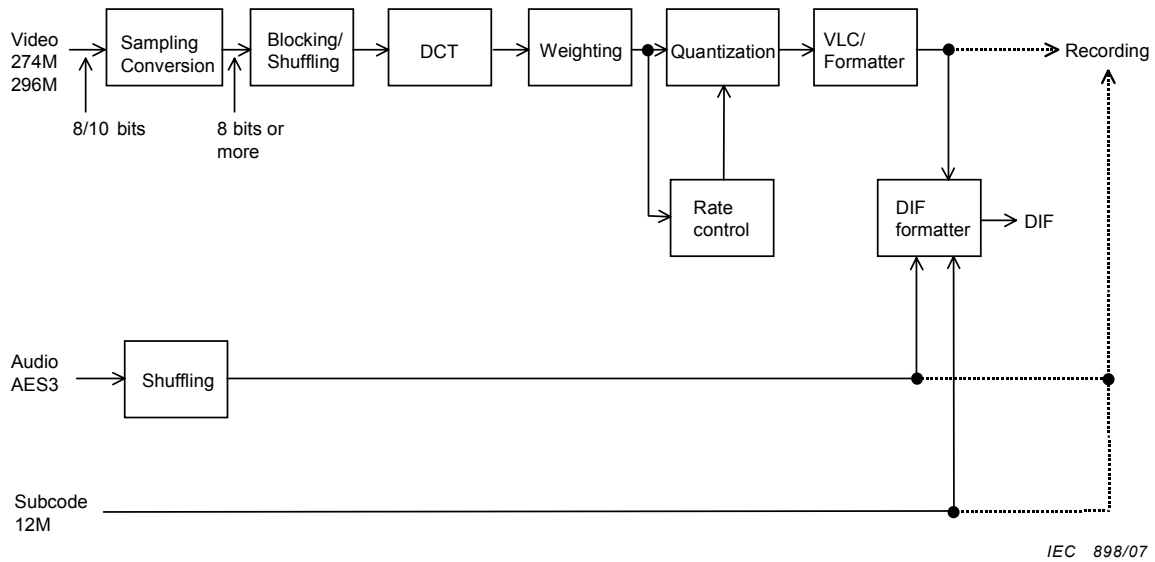


Figure 1 – Data processing block diagram

4.2 Data structure

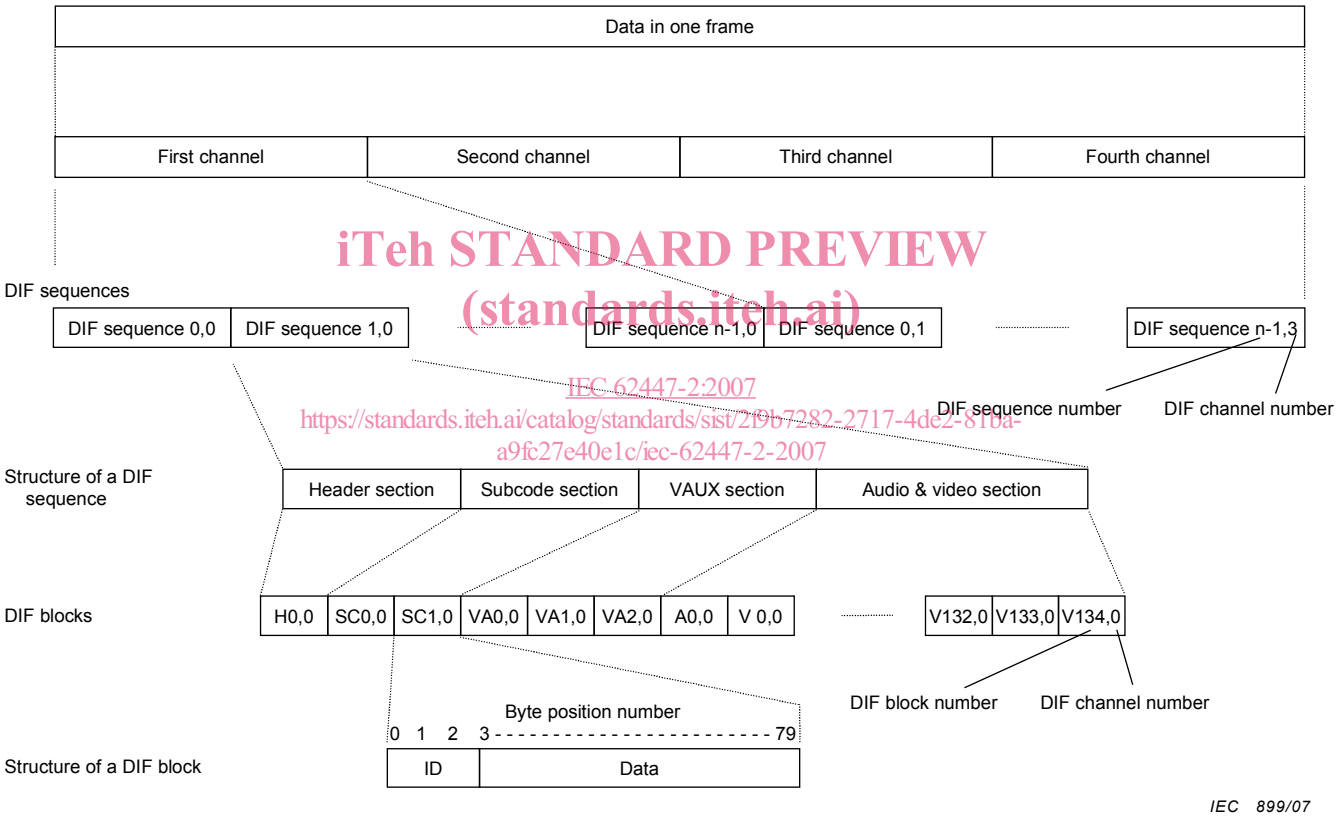
The data structure of the compressed stream at the digital interface is shown in Figure 2. The data of each frame are divided into four DIF channels.

Each DIF channel is divided into 10 DIF sequences for the 60 Hz system and 12 DIF sequences for the 50 Hz system.

Each DIF sequence consists of a header section, subcode section, VAUX section, audio section, and video section with the following DIF blocks respectively.

Header section:	1 DIF block
Subcode section:	2 DIF blocks
VAUX section:	3 DIF blocks
Audio section:	9 DIF blocks
Video section:	135 DIF blocks

As shown in Figure 2, each DIF block consists of a 3-byte ID and 77 bytes of data. DIF data bytes are numbered 0 to 79. Figure 3 shows the data structure of a DIF sequence.

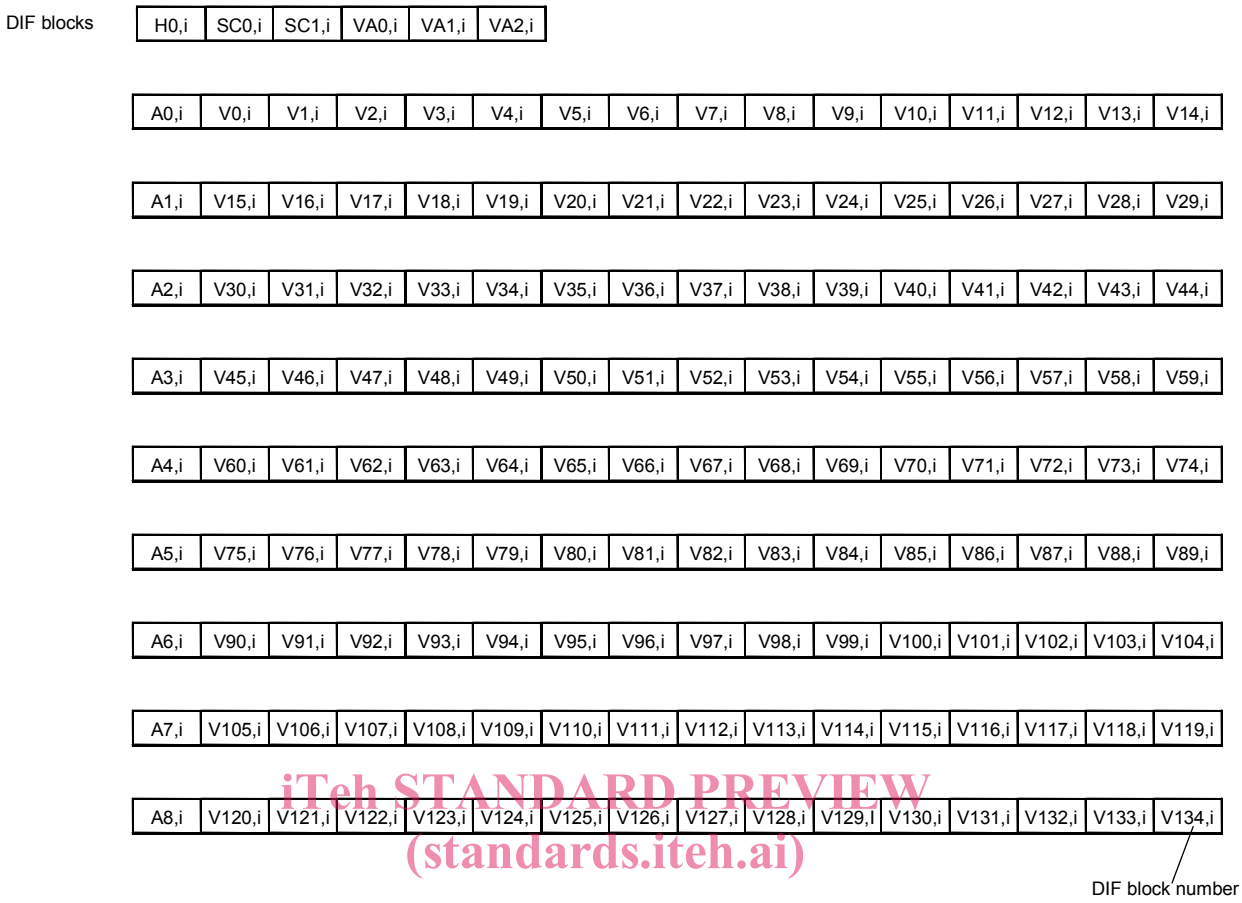


where

n = 10 for the 60 Hz system;

n = 12 for the 50 Hz system.

Figure 2 – Data structure



where

I is the DIF channel number;

i = 0,1,2,3;

H0,I is the DIF block in the header section;

SC0,i to SC1,I are the DIF blocks in the subcode section;

VA0,i to VA2,I are the DIF blocks in the VAUX section;

A0,i to A8,I are the DIF blocks in the audio section;

V0,i to V134,I are the DIF blocks in the video section.

Figure 3 – Data structure of a DIF sequence

4.3 Header section

4.3.1 ID

The ID part of each DIF block in the header section shown in Figure 2 consists of 3 bytes (ID0, ID1, ID2). Table 1 shows the ID content of a DIF block.

Table 1 – ID data of a DIF block

	Byte position number		
	Byte 0 (ID0)	Byte 1 (ID1)	Byte 2 (ID2)
MSB	SCT2	Dseq3	DBN7
	SCT1	Dseq2	DBN6
	SCT0	Dseq1	DBN5
	Res	Dseq0	DBN4
	Arb	FSC	DBN3
	Arb	FSP	DBN2
	Arb	Res	DBN1
LSB	Arb	Res	DBN0

The ID contains the following.

SCT: Section type (see Table 2)

Dseq: DIF sequence number (see Table 3 and 4)

FSC, FSP: Channel identification of a DIF block (see Table 5)

NOTE The FSP bit is reserved in SMPTE 314M.

DBN: DIF block number (see Table 6)

Arb: Arbitrary bit

Res: Reserved bit for future use

Default value shall be set to 1.

Table 2 – Section type

Section type bit			Section type
SCT2	SCT1	SCT0	
0	0	0	Header
0	0	1	Subcode
0	1	0	VAUX
0	1	1	Audio
1	0	0	Video
1	0	1	Reserved
1	1	0	
1	1	1	

Table 3 – DIF sequence number for the 60 Hz system

DIF sequence number bit				DIF sequence number
Dseq3	Dseq2	Dseq1	Dseq0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	Not used
1	0	1	1	Not used
1	1	0	0	Not used
1	1	0	1	Not used
1	1	1	0	Not used
1	1	1	1	Not used

Table 4 – DIF sequence number for the 50 Hz system

DIF sequence number bit				DIF sequence number
Dseq3	Dseq2	Dseq1	Dseq0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	Not used
1	1	0	1	Not used
1	1	1	0	Not used
1	1	1	1	Not used