

Helical-scan compressed digital video cassette system using 6,35 mm magnetic tape — Format D-7 —

Part 2: Compression format

The European Standard EN 62071-2:2006 has the status of a British Standard

ICS 33.160.40

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 62071-2:2006. It is identical with IEC 62071-2:2005. This standard, together with BS EN 62071-1:2006 and BS EN 62071-3:2006, supersedes BS EN 62071:2001, which will be withdrawn on 1 June 2009.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

A list of organizations represented on EPL/100 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2006

© BSI 2006

ISBN 0 580 49478 0

Amendments issued since publication

Amd. No.	Date	Comments

**Helical-scan compressed digital video cassette system
using 6,35 mm magnetic tape -
Format D-7
Part 2: Compression format
(IEC 62071-2:2005)**

Système de magnétoscope numérique à
cassette à balayage hélicoïdal à
signal compressé utilisant une bande
magnétique de 6,35 mm -
Format D-7
Partie 2: Format de compression
(CEI 62071-2:2005)

Videokassettensystem mit komprimierter
digitaler Schrägspuraufzeichnung auf
Magnetband 6,35 mm -
Format D-7
Teil 2: Kompressionsformat
(IEC 62071-2:2005)

This European Standard was approved by CENELEC on 2006-06-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in two official versions (English and German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 62071-2:2005, prepared by IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the formal vote and was approved by CENELEC as EN 62071-2 on 2006-06-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2007-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2009-06-01

Endorsement notice

The text of the International Standard IEC 62071-2:2005 was approved by CENELEC as a European Standard without any modification.

CONTENTS

1	Scope	7
2	Normative references.....	7
3	Abbreviations and acronyms	7
4	Interface	8
4.1	Introduction	8
4.2	Data structure.....	9
4.3	Header section	12
4.4	Subcode section	15
4.5	VAUX section	20
4.6	Audio section.....	24
4.7	Video section.....	30
5	Video compression	32
5.1	Video structure	32
5.2	DCT processing.....	48
5.3	Quantization	51
5.4	Variable length coding (VLC)	53
5.5	The arrangement of a compressed macro block	56
5.6	The arrangement of a video segment	59
	Annex A (informative) Differences between IEC 61834 and IEC 62071-2.....	64
	Annex B (normative) Digital filter for sampling-rate conversion from 4:2:2 to 4:1:1 colour difference signals	65
	Annex C (informative) Block diagram of D-7 recorder	66
	Annex ZA (normative) Normative references to international publications with their corresponding European publications.....	00
	Bibliography	67
	Figure 1 – Block diagram on the digital interface.....	8
	Figure 2 – Data structure of one video frame for 50 Mb/s structure	10
	Figure 3 – Data structure of one video frame for 25 Mb/s structure	10
	Figure 4 – Data structure of a DIF sequence.....	11
	Figure 5 – Data in the subcode section.....	16
	Figure 6 – Pack in SSYB	17
	Figure 7 – Data in the VAUX section.....	21
	Figure 8 – Data in the audio section	24
	Figure 9 – conversion of audio sample to audio data bytes	26
	Figure 10 – Arrangement of AAUX packs in audio auxiliary data	26
	Figure 11 – Transmitting samples of 525/60 system for 4:2:2 compression	34
	Figure 12 – Transmitting samples of 625/50 system for 4:2:2 compression	35
	Figure 13 – Transmitting samples of 525/60 system for 4:1:1 compression	36
	Figure 14 – Transmitting samples of 625/50 system for 4:1:1 compression	37
	Figure 15 – DCT block and the pixel coordinates	38

Figure 16 – The rightmost DCT block in colour difference signal for 4:1:1 compression mode	38
Figure 17 – DCT block arrangement for 4:2:2 compression.....	39
Figure 18 – DCT block arrangement for 4:1:1 compression.....	40
Figure 19 – Macro block and DCT blocks for 4:2:2 compression	40
Figure 20 – Macro block and DCT blocks for 4:1:1 compression	40
Figure 21 – Super blocks and macro blocks in one TV frame for 525/60 system for 4:2:2 compression.....	42
Figure 22 – Super blocks and macro blocks in one TV frame for 525/60 system for 4:1:1 compression.....	43
Figure 23 – Super blocks and macro blocks in one TV frame for 625/50 system for 4:2:2 compression.....	44
Figure 24 – Super blocks and macro blocks in one TV frame for 625/50 system for 4:1:1 compression.....	45
Figure 25 – Macro block order in a super block for 4:2:2 compression	47
Figure 26 – Macro block order in a super block for 4:1:1 compression	47
Figure 27 – The output order of a weighted DCT block	50
Figure 28 – Area numbers	52
Figure 29 – Arrangement of a compressed macro block for 4:2:2 compression	56
Figure 30 – The arrangement of a compressed macro block for 4:1:1 compression.....	57
Figure 31 – The arrangement of a video segment after the bit rate reduction for 4:2:2 compression	62
Figure 32 – The arrangement of a video segment after the bit rate reduction for 4:1:1 compression	63
Figure 33 – The video error code.....	63
Figure B.1 – Template for insertion loss frequency characteristics	65
Figure B.2 – Passband ripple tolerance	65
Figure C.1 – Block diagram of D-7 recorder.....	66
Table 1 – ID data of a DIF block	12
Table 2 – Section type.....	13
Table 3 – DIF sequence number (525/60 system)	13
Table 4 – DIF sequence number (625/50 system)	14
Table 5 – DIF block number	14
Table 6 – Data (payload) in the Header DIF block.....	15
Table 7 – SSYB ID	17
Table 8 – Pack header table.....	18
Table 9 – Mapping of packet in SSYB data	18
Table 10 – Mapping of time code pack	19
Table 11 – Mapping of binary group pack	20
Table 12 – Mapping of VAUX pack in a DIF sequence	21
Table 13 – Mapping of VAUX source pack.....	21
Table 14 – Mapping of VAUX source control pack.....	23
Table 15 – Mapping of AAUX pack in a DIF sequence	26
Table 16 – Mapping of AAUX Source pack	27

Table 17 – Mapping of AAUX Source Control pack	28
Table 18 – Video DIF blocks and compressed macro blocks for 50 Mb/s structure – 4:2:2 compression.....	31
Table 19 – Video DIF blocks and compressed macro block for 25 Mb/s structure – 4:1:1 compression	32
Table 20 – Construction of video signal sampling (4:2:2)	33
Table 21 – Class number and the DCT block	51
Table 22 – An example of the Classification for reference.....	51
Table 23 – Quantization step	53
Table 24 – Length of codewords.....	54
Table 25 – Codewords for variable length coding	55
Table 26 – Definition of STA.....	57
Table 27 – Codewords of the QNO	58
Table A.1 – Abstract of differences between IEC 61834 and IEC 62071-2.....	64

HELICAL-SCAN COMPRESSED DIGITAL VIDEO CASSETTE SYSTEM USING 6,35 mm MAGNETIC TAPE – FORMAT D-7 –

Part 2: Compression format

1 Scope

This part of IEC 62071 defines the DV-based data structure for the interface of digital audio, subcode data and compressed video with the following parameters:

525/60 system – 4:1:1 image sampling structure, 25 Mb/s data rate;

525/60 system – 4:2:2 image sampling structure, 50 Mb/s data rate;

625/50 system – 4:1:1 image sampling structure, 25 Mb/s data rate;

625/50 system – 4:2:2 image sampling structure, 50 Mb/s data rate.

This standard does not define the DV compliant data structure for interface, of digital audio, subcode data and compressed video with the following parameters:

625/50 system – 4:2:0 image sampling structure, 25 Mb/s data rate

The compression algorithm and the DIF structure conform to the DV data structure as defined in IEC 61834. Differences between the DV-based data structure defined in this standard and IEC 61834 are shown in Annex A.

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.

ITU-R BT.601-5: 1995, *Studio encoding parameters of digital television for standard 4:3 and wide-screen 16:9 aspect ratios*

AES3-2003: *Serial transmission format for two-channel linearly represented digital audio data*

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

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
B/W	Black and white flag
CGMS	Copy generation management system

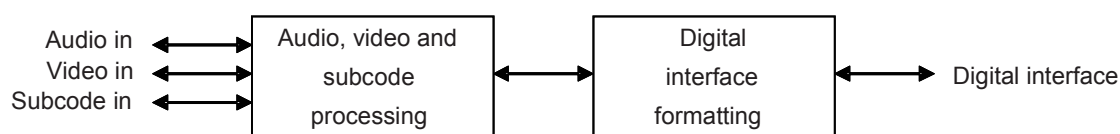
CM	Compressed macro block
DBN	DIF block number
DCT	Discrete cosine transform
DIF	Digital interface
DRF	Direction flag
Dseq	DIF sequence number
DSF	DIF sequence flag
DV	Identification of a compression family
EFC	Emphasis audio channel flag
EOB	End of block
FR	Identification for the first half or the second half of each channel
FSC	Identification of a DIF block in each channel
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 (see Note)	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

NOTE STYPE as used in this standard is different from that in ANSI/IEEE 1394.

4 Interface

4.1 General

As shown in Figure 1, processed audio, video and subcode data, are output for different applications through a digital interface port.



IEC 1905/05

Figure 1 – Block diagram on the digital interface

4.2 Data structure

The data structure of the compressed stream at the digital interface is shown in Figures 2 and 3. Figure 2 shows the data structure for a 50 Mb/s structure, and Figure 3 shows the data structure for a 25 Mb/s structure.

In the 50 Mb/s structure, the data of one video frame are divided into two channels. Each channel is divided into 10 DIF sequences for the 525/60 system and 12 DIF sequences for the 625/50 system.

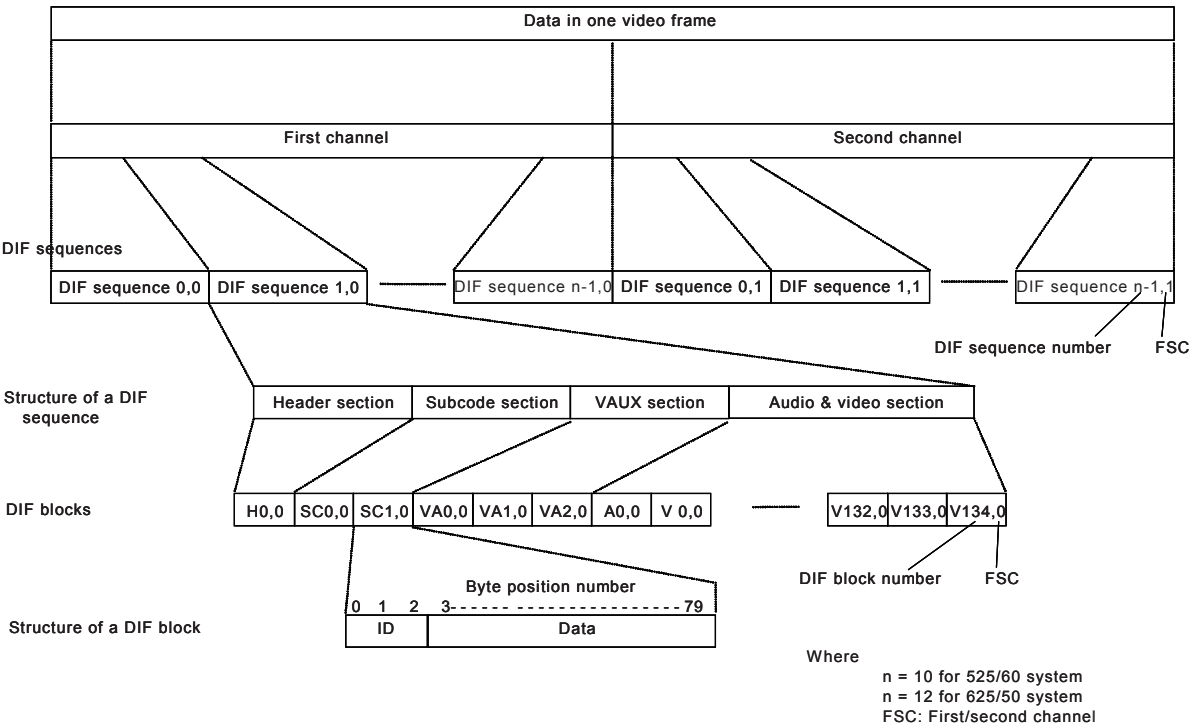
In the 25 Mb/s structure, the data of one video frame are divided into 10 DIF sequences for the 525/60 system and 12 DIF sequences for the 625/50 system.

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.

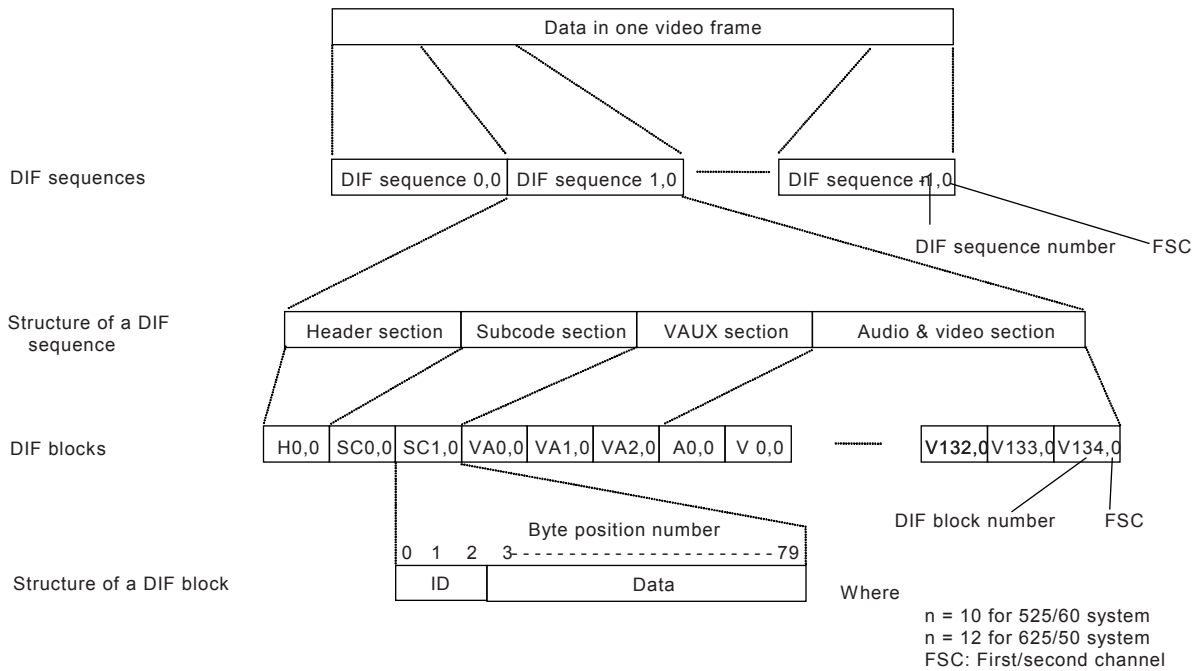
As shown in Figures 2 and 3, each DIF block consists of a 3-byte ID and 77 bytes of data. DIF data bytes are numbered 0 to 79.

Figure 4 shows the data structure of a DIF sequence for a 50 Mb/s or 25 Mb/s structure.



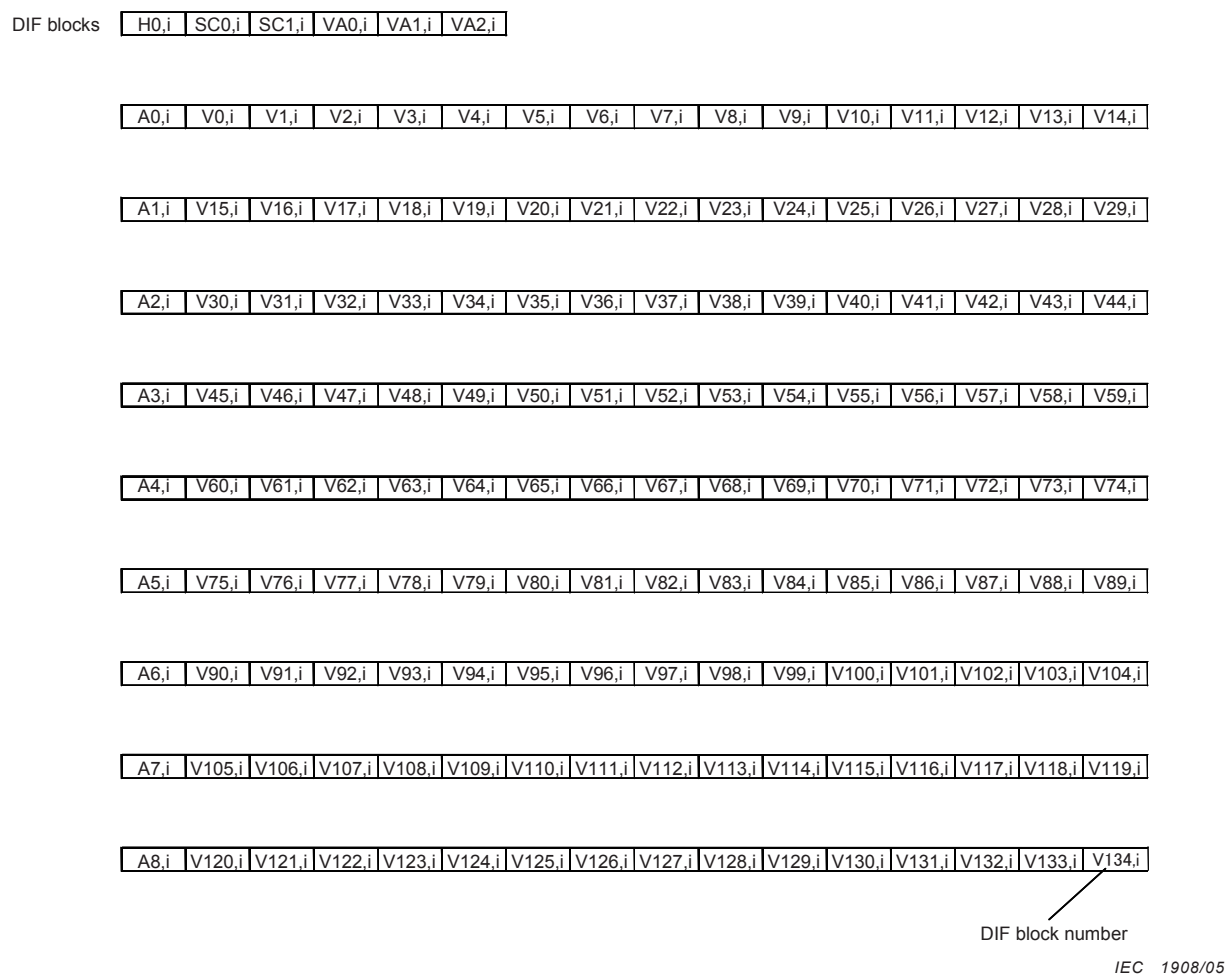
IEC 1906/05

Figure 2 – Data structure of one video frame for 50 Mb/s structure



IEC 1907/05

Figure 3 – Data structure of one video frame for 25 Mb/s structure



where

i : FSC
i = 0 for 25 Mb/s structure
i = 0,1 for 50 Mb/s structure

H0,i : DIF block in header section

SC0,i to SC1,i : DIF blocks in subcode section

VA0,i to VA2,i : DIF blocks in VAUX section

A0,i to A8,i : DIF blocks in audio section

V0,i to V134,i : DIF blocks in video section

Figure 4 – 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 Figures 2 and 3, 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	SCT ₂	Dseq ₃	DBN ₇
	SCT ₁	Dseq ₂	DBN ₆
	SCT ₀	Dseq ₁	DBN ₅
	Res	Dseq ₀	DBN ₄
	Arb	FSC	DBN ₃
	Arb	Res	DBN ₂
	Arb	Res	DBN ₁
LSB	Arb	Res	DBN ₀

The ID contains the following:

- SCT: Section type (see Table 2)
- Dseq: DIF sequence number (see Tables 3 and 4)
- FSC: Identification of a DIF block in each channel
 - 50 Mb/s structure
 - FSC = 0: first channel
 - FSC = 1: second channel
 - 25 Mb/s structure
 - FSC = 0
- DBN: DIF block number (see Table 5)
- 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
SCT ₂	SCT ₁	SCT ₀	
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 (525/60 system)

DIF sequence number bit				Meaning
Dseq ₃	Dseq ₂	Dseq ₁	Dseq ₀	
0	0	0	0	DIF sequence number 0
0	0	0	1	DIF sequence number 1
0	0	1	0	DIF sequence number 2
0	0	1	1	DIF sequence number 3
0	1	0	0	DIF sequence number 4
0	1	0	1	DIF sequence number 5
0	1	1	0	DIF sequence number 6
0	1	1	1	DIF sequence number 7
1	0	0	0	DIF sequence number 8
1	0	0	1	DIF sequence number 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 (625/50 system)

DIF sequence number bit				Meaning
Dseq ₃	Dseq ₂	Dseq ₁	Dseq ₀	
0	0	0	0	DIF sequence number 0
0	0	0	1	DIF sequence number 1
0	0	1	0	DIF sequence number 2
0	0	1	1	DIF sequence number 3
0	1	0	0	DIF sequence number 4
0	1	0	1	DIF sequence number 5
0	1	1	0	DIF sequence number 6
0	1	1	1	DIF sequence number 7
1	0	0	0	DIF sequence number 8
1	0	0	1	DIF sequence number 9
1	0	1	0	DIF sequence number 10
1	0	1	1	DIF sequence number 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

Table 5 – DIF block number

DIF block number bit								Meaning
DBN ₇	DBN ₆	DBN ₅	DBN ₄	DBN ₃	DBN ₂	DBN ₁	DBN ₀	
0	0	0	0	0	0	0	0	DIF block number 0
0	0	0	0	0	0	0	1	DIF block number 1
0	0	0	0	0	0	1	0	DIF block number 2
0	0	0	0	0	0	1	1	DIF block number 3
:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:
:	:	:	:	:	:	:	:	:
1	0	0	0	0	1	1	0	DIF block number 134
1	0	0	0	0	1	1	1	Not used
:	:	:	:	:	:	:	:	:
1	1	1	1	1	1	1	1	Not used

4.3.2 Data

The data part (payload) of each DIF block in the header section is shown in Table 6, bytes 3 to 7 are active and bytes 8 to 79 are reserved.

Table 6 – Data (payload) in the Header DIF block

Byte position number of Header DIF block								
	3	4	5	6	7	8	-----	79
MSB	DSF	Res	TF1	TF2	TF3	Res	-----	Res
	0	Res	Res	Res	Res	Res	-----	Res
	Res	Res	Res	Res	Res	Res	-----	Res
	Res	Res	Res	Res	Res	Res	-----	Res
	Res	Res	Res	Res	Res	Res	-----	Res
	Res	APT2	AP12	AP22	AP32	Res	-----	Res
LSB	Res	APT1	AP11	AP21	AP31	Res	-----	Res
	Res	APT0	AP10	AP20	AP30	Res	-----	Res

DSF: DIF sequence flag

DSF = 0: 10 DIF sequences included in a channel (525/60 system)

DSF = 1: 12 DIF sequences included in a channel (625/50 system)

APT_n, AP1_n, AP2_n, AP3_n: These data shall be identical as track application IDs (APT_n = 001, AP1_n = 001, AP2_n = 001, AP3_n = 001), if the source signal comes from a digital VCR. If the signal source is unknown, all bits for these data shall be set to 1.

TF: Transmitting flag

TF1: Transmitting flag of audio DIF blocks

TF2: Transmitting flag of VAUX and video DIF blocks

TF3: Transmitting flag of subcode DIF blocks

TF_n = 0: Data shall be valid.

TF_n = 1: Data shall be invalid.

Res: Reserved bit for future use
Default value shall be set to 1.

4.4 Subcode section

4.4.1 ID

The ID part of each DIF block in the subcode section is described in 4.3.1. The section type shall be 001.

4.4.2 Data

The data part (payload) of each DIF block in the subcode section is shown in Figure 5. The subcode data consists of 6 SSYBs, each 48 bytes long, and a reserved area of 29 bytes in each DIF block. SSYBs in a DIF sequence are numbered 0 to 11. Each SSYB is composed of SSYB ID equal to 2 bytes, FFh, and an SSYB data payload of 5 bytes.

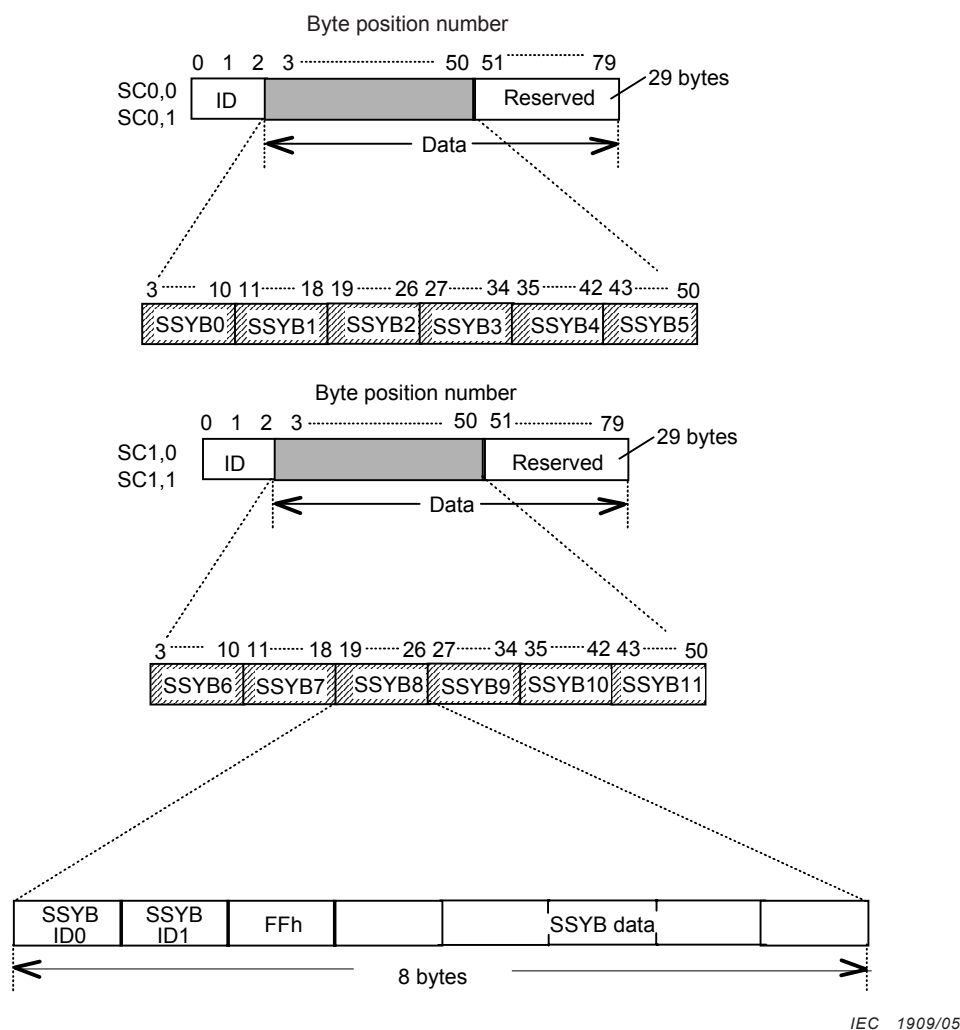


Figure 5 – Data in the subcode section

4.4.2.1 SSYB ID

Table 7 shows SSYB ID (ID0, ID1). These data contain FR ID, application ID (AP32, AP31, AP30), and SSYB number (Syb3, Syb2, Syb1, Syb0).

FR ID is an identification for the first or second half of each channel:

FR = 1: the first half of each channel
FR = 0: the second half of each channel

The first half of each channel

DIF sequence number 0, 1, 2, 3, 4 for 525/60 system
DIF sequence number 0, 1, 2, 3, 4, 5 for 625/50 system

The second half of each channel

DIF sequence number 5, 6, 7, 8, 9 for 525/60 system
DIF sequence number 6, 7, 8, 9, 10, 11 for 625/50 system

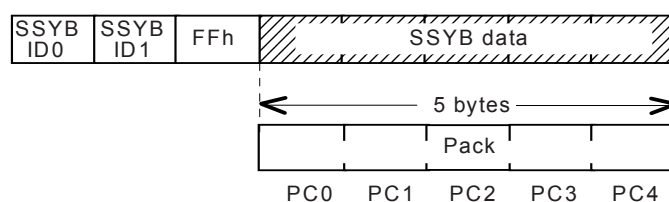
If information is not available, all bits shall be set to 1.

Table 7 – SSYB ID

Bit position	SSYB number 0 and 6		SSYB number 1 to 5 and 7 to 10		SSYB number 11	
	ID0	ID1	ID0	ID1	ID0	ID1
b7 (MSB)	FR	Arb	FR	Arb	FR	Arb
b6	AP3 ₂	Arb	Res	Arb	APT ₂	Arb
b5	AP3 ₁	Arb	Res	Arb	APT ₁	Arb
b4	AP3 ₀	Arb	Res	Arb	APT ₀	Arb
b3	Arb	Syb ₃	Arb	Syb ₃	Arb	Syb ₃
b2	Arb	Syb ₂	Arb	Syb ₂	Arb	Syb ₂
b1	Arb	Syb ₁	Arb	Syb ₁	Arb	Syb ₁
b0 (LSB)	Arb	Syb ₀	Arb	Syb ₀	Arb	Syb ₀
NOTE Arb: Arbitrary bit						

4.4.2.2 SSYB data

Each SSYB data payload consists of a pack of 5 bytes as shown in Figure 6. Table 8 shows pack header table (PC0 byte organization). Table 9 shows the pack arrangement in SSYB data for each channel.



IEC 1910/05

Figure 6 – Pack in SSYB

Table 8 – Pack header table

UPPER LOWER	0000	0001	0010	0011	0100	0101	0110	0111	-----	1111
0000						AUDIO SOURCE	VIDEO SOURCE			
0001						AUDIO SOURCE CONTROL	VIDEO SOURCE CONTROL			
0010										
0011		TIME CODE								
0100		BINARY GROUP								
0101										
I										
1111										NO INFO

Table 9 – Mapping of packet in SSYB data

SSYB number	The first half of each channel	The second half of each channel
0	Reserved	Reserved
1	Reserved	Reserved
2	Reserved	Reserved
3	TC	TC
4	BG	Reserved
5	TC	Reserved
6	Reserved	Reserved
7	Reserved	Reserved
8	Reserved	Reserved
9	TC	TC
10	BG	Reserved
11	TC	Reserved
NOTE 1 TC: Time code pack. NOTE 2 BG: Binary group pack. NOTE 3 Reserved = default value of all bits is set to 1. NOTE 4 TC and BG data are the same within a single video frame. The time code data is an LCT type.		

4.4.2.2.1 Time code pack (TC)

Table 10 shows a mapping of the time code pack. Time code data mapped to the time code packs remain the same within each video frame.

Table 10 – Mapping of time code pack

525/60 system

MSB					LSB			
PC0	0	0	0	1	0	0	1	1
PC1	CF	DF	TENS of FRAMES		UNITS of FRAMES			
PC2	PC	TENS of SECONDS			UNITS of SECONDS			
PC3	BGF0	TENS of MINUTES			UNITS of MINUTES			
PC4	BGF2	BGF1	TENS of HOURS		UNITS of HOURS			

625/50 system

MSB					LSB			
PC0	0	0	0	1	0	0	1	1
PC1	CF	Arb	TENS of FRAMES		UNITS of FRAMES			
PC2	BGF0	TENS of SECONDS			UNITS of SECONDS			
PC3	BGF2	TENS of MINUTES			UNITS of MINUTES			
PC4	PC	BGF1	TENS of HOURS		UNITS of HOURS			

NOTE Detailed information is given in ANSI/SMPTE 12M.

CF: Colour frame

0 = unsynchronized mode
1 = synchronized mode

DF: Drop frame flag

0 = Non-drop frame time code
1 = Drop frame time code

PC: Biphase mark polarity correction

0 = even
1 = odd

BGF: Binary group flag

Arb: Arbitrary bit

4.4.2.2.2 Binary group pack (BG)

Table 11 shows the mapping of the binary group pack. Binary group data mapped to the binary group packs remain the same within each video frame.

Table 11 – Mapping of binary group pack

	MSB				LSB			
PC0	0	0	0	1	0	1	0	0
PC1	BINARY GROUP2				BINARY GROUP1			
PC2	BINARY GROUP4				BINARY GROUP3			
PC3	BINARY GROUP6				BINARY GROUP5			
PC4	BINARY GROUP8				BINARY GROUP7			

4.5 VAUX section

4.5.1 ID

The ID part of each DIF block in the VAUX section is described in 4.3.1. The section type shall be 010.

4.5.2 Data

The data part (payload) of each DIF block in the VAUX section is shown in Figure 7. This figure shows the VAUX pack arrangement for each DIF sequence.

There are 15 packs, each 5 bytes long, and two reserved bytes in each VAUX DIF block payload. A default value for the reserved byte is set to FFh.

Therefore, there are 45 packs in a DIF sequence. VAUX packs of the DIF blocks are sequentially numbered 0 to 44. This number is called a video pack number.

Table 12 shows the mapping of the VAUX packs of the VAUX DIF blocks. A VAUX source pack (VS) and a VAUX source control pack (VSC) must be present in each of the video compressed frames. The remaining VAUX packs of the DIF blocks in a DIF sequence are reserved and the value of all reserved words is set to FFh.

If VAUX data are not transmitted, a NO INFO pack, which is filled up by FFh shall be transmitted.