

# INTERNATIONAL STANDARD

**IEC**  
**62356-3**

First edition  
2003-11

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**Video recording –  
12,65 mm type D-11 format –**

**Part 3:  
Data mapping over SDTI**



Reference number  
IEC 62356-3:2003(E)

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## VIDEO RECORDING – 12,65 mm TYPE D-11 FORMAT –

## Part 3: Data mapping over SDTI

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International Standard IEC 62356-3 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

It was submitted to the national committees for voting under the Fast Track Procedure as the following documents:

CDV	Report on voting
100/631/CDV	100/701/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 committee has decided that the contents of this publication will remain unchanged until 2008-11. At this date, the publication will be

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- withdrawn;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

## VIDEO RECORDING – 12,65 mm TYPE D-11 FORMAT –

### Part 3: Data mapping over SDTI

#### 1 Scope

This International Standard specifies the mapping of type D-11 compressed picture data stream into the SDTI payload area (SMPTE 305.2M) together with the mapping of four channels of AES3 data and time-code data into H-ANC packets. Type D-11 compressed picture data-stream mapping is defined for source-coded picture rates of 24/1,001/P, 24/P, 25/P, 50-I, 30/1,001/P and 60/1,001. For the transmission of compressed picture data coded at source picture rates of 25/P and 50/I, the SDTI interface operates at a frame rate of 25 Hz. For the transmission of compressed picture data coded at source picture rates of 30/1,001P and 60/1,001I, the SDTI interface operates at a frame rate of 30/1,001 Hz.

The transmission of compressed picture data coded at the source picture rates of 24/1, 001/P and 24/P require the SDTI interface to operate at frame rates of 24/1, 001Hz and 24 Hz with the parameters defined in Annexes A and B of this standard.

#### 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 62356-2: *Video recording – 12,65 mm type D-11 format – Part 2: Picture compression and data stream*<sup>1</sup>

SMPTE 259M:1997, *Television – 10-Bit 4:2:2 Component and 4fsc Composite Digital signals – Serial Digital Interface*

SMPTE 272M:1994, *Television – Formatting AES/EBU Audio and Auxiliary Data into Digital Video Ancillary Data Space*

SMPTE 291M:1998, *Television – Ancillary Data Packet and Space Formatting*

SMPTE 305.2M:2000, *Television – Serial Data Transport Interface (SDTI)*

SMPTE RP165:1994, *Error Detection Check words and Status Flags for Use in Bit-Serial Digital Interfaces for Television*

SMPTE RP188:1999, *Transmission of Time Code and Control Code in the Ancillary Data Space of a Digital Television Data Stream*

AES3:1992, *Serial transmission format for two-channel linearly represented digital audio data*

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<sup>1</sup> To be published.

### 3 General specifications

This standard specifies the mapping of type D-11 data stream packets over SMPTE 305.2M (SDTI). Type D-11 data stream comprises packets of basic blocks containing compressed picture data and auxiliary picture data as specified in IEC 62356-2.

Four channels of 24-bit AES3 data are optionally mapped into the H-ANC space of the interface according to SMPTE 272M. In addition, VITC may also be mapped into the H-ANC space.

Type D-11 data-stream packets are grouped into six equal data segments of which the first three data segments are mapped onto the first field of the SDTI and the last three data segments are mapped onto the second field of the SDTI, as shown in Figure 1 and Table 1.

Figure 1 also includes the optional four channels of 24-bit AES3 data mapped into the H-ANC space. VITC data may also be mapped into the H-ANC space.

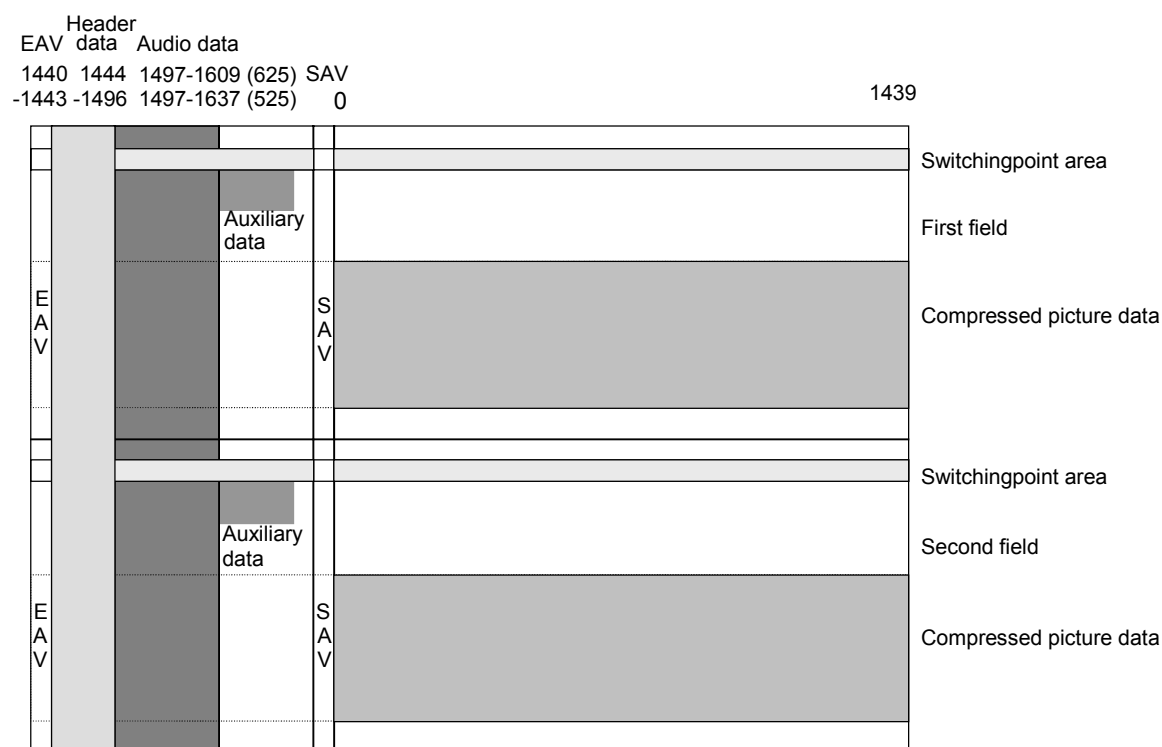


Figure 1 – SDTI mapping



**Table 1 – Total number of lines and total number of samples per line  
for each frame rate of the interface**

Frame rate of the interface	24/1,001Hz	24Hz	25Hz	30/1,001Hz
Total number of lines	525	625	625	525
Total number of samples per line	2 145	1 800	1 728	1 716
NOTE The 24/1,001 Hz and 24 Hz interface details are contained in Annexes A and B.				

## 4 Header data

### 4.1 Location of the header data

Header data shall be placed in H-ANC space and shall be located immediately following the EAV as shown in Figure 1 and as defined by SMPTE 305.2M.

### 4.2 Structure of the header data

The structure of the header data shall conform to SMPTE 305.2M and the contents shall be as shown in Table 2.

**Table 2 – Contents of header data (total words: 53)**

Word No.	Data name	Value	Comment
0	ADF	000h	
1	ADF	3FFh	
2	ADF	3FFh	
3	DID	140h	
4	SDID	101h	
5	Data count	22Eh	Data: 46 words
6	Line No.0	XXX	
7	Line No.1	XXX	
8	Line No. CRC 0	XXX	
9	Line No. CRC 1	XXX	
10	CODE & AAI	101h	Payload: 1440 words, AAI: Unspecified
11 – 26	Destination address	200h	
27 – 42	Source address	200h	
43	Block type	241h	Fixed block size with ECC: 1438 words
44	CRC flag	101h	Payload CRC
45	Reserved 0	XXX	
46	Reserved 1	XXX	
47	Reserved 2	XXX	
48	Reserved 3	XXX	
49	Reserved 4	XXX	
50	Header CRC 0	XXX	
51	Header CRC 1	XXX	
52	Check sum	XXX	

## 5 Payload data

### 5.1 Location of type D-11 stream data

Type D-11 data-stream packets (comprising compressed picture and auxiliary data) shall be mapped into the payload space of the SDTI and shall be located as defined in Table 3 and shown in Figure 1.

**Table 3 – Location of compressed picture data**

SDTI frame rate	24/1,001 Hz and 30/1,001 Hz	24 Hz and 25 Hz
Total number of interface lines	525	625
Horizontal mapping location	Samples 0 to 1 439	
Vertical mapping location		
First field	Lines 50 to 261	Lines 59 to 270
Second field	Lines 313 to 524	Lines 372 to 583
NOTE The line numbering of the vertical mapping location is the same as that defined in SMPTE 259M.		

Each compressed picture data stream is divided into six equal segments, numbered 0 to 5, as defined in IEC 62356-2.

All the packets from segments 0 to 2 shall be mapped into the first field of the SDTI. All the packets from segments 3 to 5 shall be mapped into the second field of the SDTI.

Figure 2 defines how the data packets are mapped into each field of the SDTI.

### 5.2 Structure and contents of the SDTI payload lines

#### 5.2.1 Payload line formatting

The SDTI payload lines shall contain the information defined in Table 4 and Figure 2.

**Table 4 – Contents of compressed picture data**

Word No.	Data name	Value	Comment
0	Data type	248h	Data type of type D-11
1	User data	200h or 1FEh or 1FDh	Valid data not exist Valid data start line Valid data line
2 to 1 437	User data	XXX	Type D-11 compressed picture data
1 438	Payload CRC 0	XXX	
1 439	Payload CRC 1	XXX	

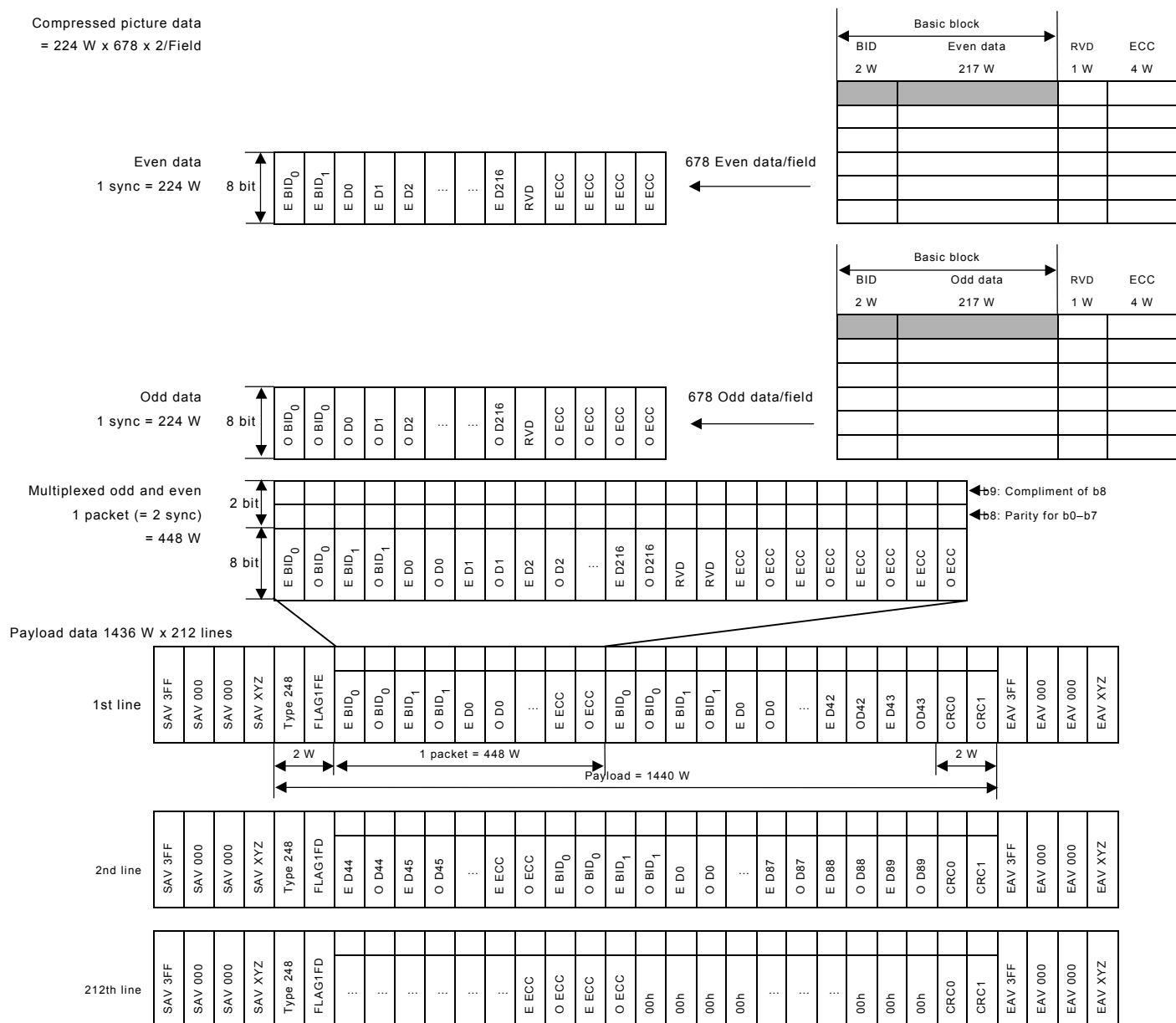


Figure 2 – Payload data-stream structure

For each field of the SDTI, 1 356 basic blocks of type D-11 compressed picture data shall be mapped into the SDTI payload area on contiguous lines. In each SDTI field, 678 odd and 678 even data blocks are respectively selected from channel 0 and channel 1 as specified in IEC 62356-2.

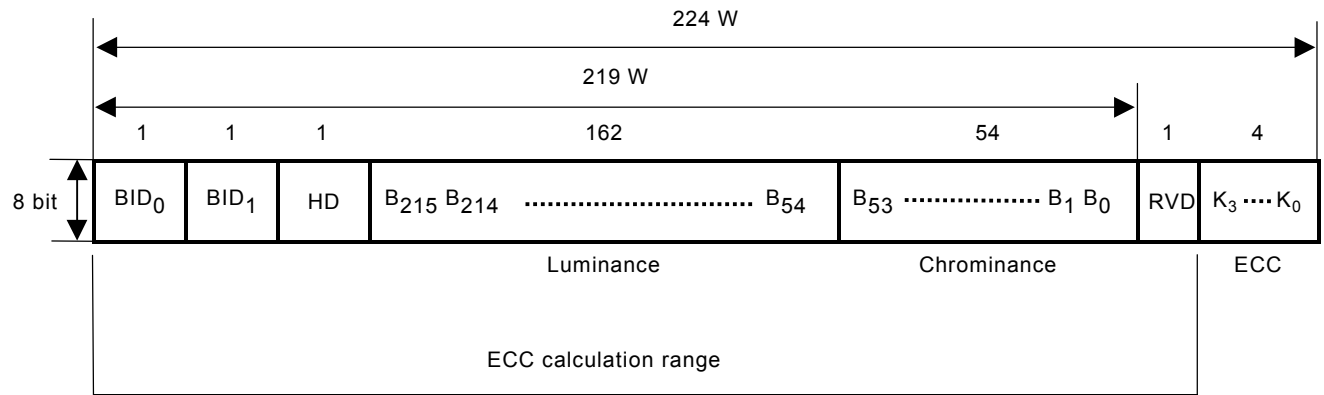
### 5.2.2 Basic block formatting

The compressed picture and auxiliary basic block format of type D-11 compressed data shall conform to IEC 62356-2.

For the purpose of transporting the basic blocks over SDTI, four bytes of Reed-Solomon ECC shall be added to each basic block. Between the end of each basic block and the start of the ECC a 1-byte reserved word shall be added.

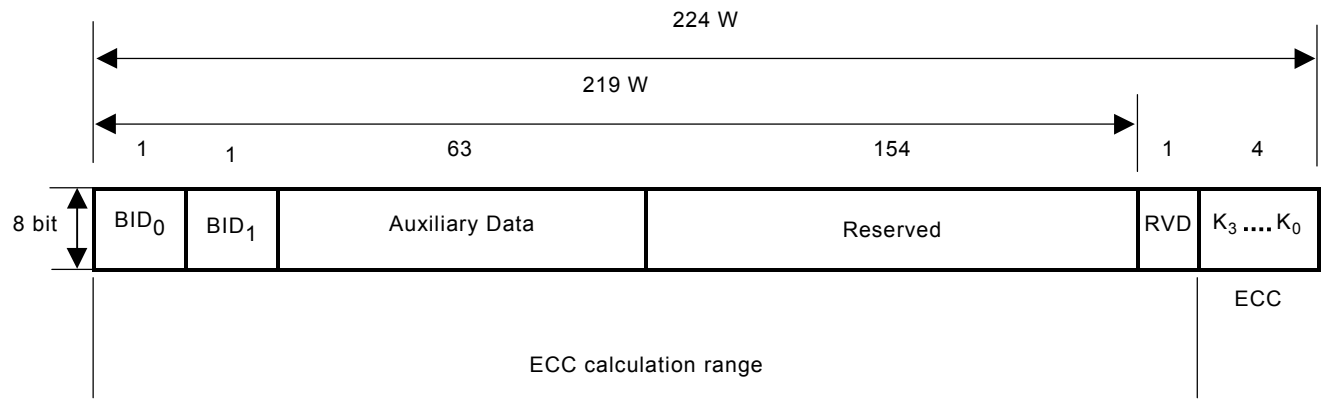
The default value of the reserved word is zero.

Figure 3 illustrates the addition of the reserved word and the 4-byte RS ECC to a compressed picture basic block.



**Figure 3 – Addition of reserved word and ECC to a compressed picture basic block**

Figure 4 illustrates the addition of the reserved word and the 4-byte RS ECC to an auxiliary basic block



**Figure 4 – Addition of reserved word and ECC to an auxiliary basic block**

### 5.2.3 Error correction code (Reed-Solomon ECC)

Four words of Reed-Solomon ECC shall be added immediately after the reserved word (RVD).

The field generator polynomial of Reed-Solomon (RS) Error Correction Code shall be as follows:

Galois Field: GF(256)

Field generator polynomial:  $X^8 + X^4 + X^3 + X^2 + 1$

where  $X^i$  are place-keeping variables in GF(2), the binary field. Note that the '+' sign for this and the following equations indicates modulo 256 addition.

The code generator polynomial (GF(256)) is defined as:

$$G(X) = (X+1)(X+\alpha)(X+\alpha^2)(X+\alpha^3)$$

where  $\alpha$  is given by 02<sub>h</sub> in GF(256).

The RS check characters are defined as  $K_3, K_2, K_1, K_0$  in

$$K(X) = K_3 X^3 + K_2 X^2 + K_1 X^1 + K_0,$$

obtained as the remainder after dividing polynomial  $X^4 D(X)$  by  $G(X)$ ,

where  $K_i$  is shown in Figures 3 and 4, and  $D(X)$  is the polynomial given by the following equation:

$$D(X) = BID_0 X^{219} + BID_1 X^{218} + HD X^{217} + B_{215} X^{216} + B_{214} X^{215} + \dots + B_1 X^2 + B_0 X^1 + RVD$$

The equation of the full RS ECC code block (  $C(X)$  ) is expressed as follows:

$$C(X) = X^4 D(X) + K(X)$$

## 6 AES3 data

### 6.1 General

AES 3 data, if present, shall contain four audio channels in a single group and conform to the following mapping parameters.

### 6.2 Location of AES3 data

Mapping of AES3 data onto the serial digital interface shall comply with SMPTE 272M-C.

AES3 data comprises 24-bit words. The contents of the AES3 data stream is not part of this standard.

**Table 5 – Location of AES3 Data**

Frame rate	24/1,001 Hz and 30/1,001 Hz	24 Hz and 25 Hz
Total number of lines of the interface	525	625
Horizontal sample count	Samples 1 497 to 1 637	Samples 1 497 to 1 609
Mapping of AES3 data	Lines 1 to 525 except for lines 10, 11, 273 and 274	Lines 1 to 625 except for lines 6, 7, 319 and 320
NOTE This standard does not support the optional audio control data defined in SMPTE 272M.		

## 7 Auxiliary data

### 7.1 General

Auxiliary data packet may be used to map time code data (VITC). If present, the mapping shall comply with the following parameters.

### 7.2 Location of auxiliary data

Auxiliary data shall be located in the H-ANC space immediately following the extended data packet. The vertical position of each auxiliary data line shall be as shown in Table 6. The structure and location of the H-ANC auxiliary data packets shall conform to SMPTE 291M.

**Table 6 – Location of auxiliary data (vertical position)**

<b>Frame rate</b>	24/1,001 Hz and 30/1,001 Hz	24 Hz and 25 Hz
<b>Total lines</b>	525	625
<b>VITC</b>	Line 14 and 277	Lines 10 and 323

### 7.3 VITC

If present, mapping of VITC data on to the serial digital interface shall comply with SMPTE RP188 and shall be as specified in Table 7.

This VITC data shall have the same time-code value as the VITC carried in the auxiliary data packets of IEC 62356-2.

**Table 7 – VITC H-ANC packet**

Word No.	Name	Value	Comment
0 – 2	ADF	000h 3FFh 3FFh	
3	DID	260h	
4	DBN	260h	
5	Data count	110h	
6 – 21	UDW 0-15	XXX	
22	Checksum	XXX	

## 8 EDH

EDH checkwords may be added in H-ANC space and be located as defined by SMPTE RP165.

## Annex A (normative)

### SDI and SDTI Operation at 24/1,001Hz

#### A.1 Scope

The scope of this annex is to provide information and specifications for an interface based on SMPTE 259M and SMPTE 305.2M using a frame rate of 24/1,001 frames/s.

#### A.2 General

Based upon the introduction of 1 920 × 1 080 television equipment having a progressive capture frame rate of 24/1,001 frames/s, there is a need to define an interface for transporting and monitoring of the compressed signal over SDTI.

For the transporting of compressed signals coded at a source picture rate of 24/1,001 frames/s and formatted according to IEC 62356-2, the SDTI interface shall operate at 24/1,001 frames/s, interlaced, with parameters as defined in Table A.1.

**Table A.1 – Interface sampling structure/formatting**

Parameter	Value	Comments
Frame rate	24/1,001	Per second
Total number of lines	525	(As per SMPTE 125M)
EAV/SAV structure	3FF,000,000,XYZ	As per SMPTE 125M/259M
Signal levels		As per SMPTE 259M
Serial bit rate	270Mb/s	
Total number of words per line	2 145	
User data words	1 440	(As per SMPTE 305.2M)
Ancillary data words	697	Total line length minus user data and EAV/SAV words
AES3 data formatting	1 497 – 1 637	(As per SMPTE 272M)
Auxiliary data formatting		(As per SMPTE 291M/RP188)
EDH		(As per SMPTE RP 165)
Switching	Line 10	As this is a segmented frame payload, switching must only be on the frame boundary
Compressed picture data mapping	Lines 50 – 261	Segments 0 to 2
	Lines 313 – 524	Segments 3 to 5
Auxiliary data	1 638 – 2 141	The auxiliary data space of this format is greater than SMPTE 259M

## Annex B (informative)

### SDI and SDTI Operation at 24 Hz

#### B.1 Scope

The scope of this annex is to provide information and specifications for an interface based on SMPTE 259M and SMPTE 305.2M using a frame rate of 24 frames/s.

#### B.2 General

Based upon the introduction of 1 920 × 1 080 television equipment having a progressive capture frame rate of 24,00 frames/s, there is a need to define an interface for transporting and monitoring of the compressed signal over SDTI.

For the transporting of compressed signals coded at a source picture rate of 24 frames/s and formatted according to IEC 62356-2, the SDTI interface should operate at 24 frames/s, interlaced, with parameters as defined in Table B.1.

**Table B.1 – Interface sampling structure/formatting**

Parameter	Value	Comments
Frame rate	24	Per second
Total number of lines	625	(As per SMPTE 125M)
EAV/SAV structure	3FF,000,000,XYZ	As per SMPTE 125M/259M
Signal levels		As per SMPTE 259M
Serial bit rate	270Mb/s	
Total number of words per line	1 800	
User data words	1 440	(As per SMPTE 305M)
Ancillary data words	352	Total line length minus user data and EAV/SAV words
AES3 data formatting	1 497 – 1 609	(As per SMPTE 272M)
Auxiliary data formatting		(As per SMPTE 291M/RP188)
EDH		(As per SMPTE RP 165)
Switching	Line 10	As this is a segmented frame interface, switching must only be on the frame boundary
Compressed picture data mapping	Lines 50 – 261 Lines 313 – 524	Segments 0 to 2 Segments 3 to 5
Auxiliary data	1 610 – 1 796	The auxiliary data space of this format is greater than SMPTE 259M



## **Bibliography**

SMPTE 125M:1995, *Television – Component Video Signal 4:2:2 – Bit-Parallel Interface*

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

ITU-R Recommendation BT.709-5:2002, *Parameter values for the HDTV\* standards for production and international programme exchange*

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