RECOMMENDATION ITU-R BT.1617

Format for transmission of DV compressed video, audio and data over interfaces complying with Recommendation ITU-R BT.1381

(Question ITU-R 12/6)

(2003)

The ITU Radiocommunication Assembly,

considering

a) that applications within professional television production and post-production have been identified where DV-compliant video compression can offer operational and economic advantages when used on serial digital interface (SDI)-based operations;

b) that an implementation exists based on a sampling raster of 4:2:0 at a data rate of 25 Mbit/s based on IEC 61834-2 known as DVCAM;

c) that the audio, data and compressed video elements in DV-compliant systems are formatted differently compared to DV-based systems;

d) that the formatting is optimized for interconnection between DV-compliant VCRs and disk systems;

e) that transfer speeds up to five times faster than real-time can be achieved;

f) that agile decoders are being developed to integrate data streams based on DVCAM into DV-based production,

recommends

1 that for applications in professional television production and post-production employing DV compression, the parameters given in the SMPTE 322M-1999 – Format for Transmission of DV Compressed Video, Audio and Data Over a Serial Data Transport Interface, be used.

Summary of SMPTE Standard 322M-1999

This Standard specifies the data structure and the transmission format of DV compressed video, audio and data over a serial data transport interface (SDTI) as defined by Recommendation ITU-R BT.1381 and SMPTE 305M. The Standard is a combination of video, audio, sub-code and control data optimized for the connection between DV-compliant VCRs and disk systems. It provides for high-speed data stream transfer up to five times faster than real-time. The video, audio and sub-code data comply with IEC 61834-2 for both 525/60 and 625/50 systems. The bit stream consists of 77-byte digital interface (DIF) data blocks, which are common to other DV-based signals. The DIF blocks are mapped onto SDTI using a frame-bounded algorithm preserving ease of manipulating the video and audio data.

NOTE 1 – SMPTE Standard 322M-1999 is given in Annex 1 and Standard 305M can be found at: http://ties.itu.int/u/itu-r/ede/rsg6/SMPTE/. SMPTE Standard 322M-1999 and its summary refer to version 1999 only, which is the version approved, by Administrations of Member States of the ITU in application of Resolution ITU-R 1-3 on 03-05-03. By agreement between ITU and SMPTE, this Version was provided and authorized for use by SMPTE and accepted by ITU-R for inclusion in this Recommandation. Any subsequent version of SMPTE Standard 322M, which has not been accepted and approved by Radiocommunication Study Group 6 is not part of this Recommendation. For subsequent versions of SMPTE documents, the reader should consult the SMPTE website: http://www.smpte.org/.

SMPTE 322M-1999

SMPTE STANDARD

for Television — Format for Transmission of DV Compressed Video, Audio and Data Over a Serial Data Transport Interface

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1 Scope

This standard specifies the data structure and the transmission format of DV compressed video, audio, and data over a serial data transport interface (SDTI [SMPTE 305M]). The standard is a combination of video, audio, subcode, and control data optimized for the connection between DV-compliant VCRs and disk systems. It ensures high-speed data stream transfer up to five times faster than real time. The video, audio, and subcode data comply with IEC 61834-2 for both 525/60 and 625/50 systems. The bitstream consists of 77-byte DIF data blocks, which are common to other DV based signals. The DIF blocks are mapped onto SDTI using a frame-bounded algorithm preserving ease of manipulating the video and audio data.

The layers of signal processing and related standards are shown in figure 1.

NOTE – For descriptions of the SDTI, refer to SMPTE 305M, and for descriptions of video, audio, and subcode data, refer to IEC 61834-2. The standard corresponds to data type [241_h] registered as DVCAM-1 in SMPTE 305M.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 305M-1998, Television — Serial Data Transport Interface

IEC 61834-2 (1998-08), Recording — Helical-Scan Digital Video Cassette Recording System Using 6,35 mm Magnetic Tape for Consumer Use (525-60, 625-50, 1125-60 and 1250-50 Systems) — Part 2: SD Format for 525-60 and 625-50 Systems

3 SDTI header data

The SDTI header data as specified in SMPTE 305M shall contain the parameters shown in table 1, and shall be repeated on every line. The SDTI header data structure is as shown in figure 2.

4 Data structure

The following clause describes the basic data structure and the system parameters of the bitstream. The data structure of the SDTI paybad is shown in figure 3. The data block consists of a control data block and five vertical data slots, in which one compressed video stream shall be contained. The empty space and reserved area shall be set to all zeros (200_h) as default value.

4.1 Data block

The control data block and the DIF data shall be contained in B0 (LSB) through B7 (8 bits). B8 shall be a reserved data bit for future expansion, which is normally set to zero. B9 shall be the complement of B8.

Approved
December 7, 1999

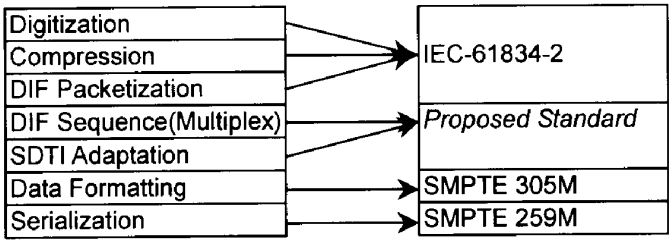

Figure 1 – Layers of signal processing and related standards

Table 1 – Header data packet

Parameters	Length	Value
ADF	3 words	[000$_h$][3FF$_h$][3FF$_h$]
DID	1 word	[140$_h$]
SDID	1 word	[101$_h$]
DC	1 word	[22E$_h$]
Line number	2 words	—
Line number CRC	2 words	—
Code	4 bits	[1$_h$]
AAI	4 bits	—
Destination address	16 words	—
Source address	16 words	—
Block type	1 word	[1C1$_h$]
CRC flag	1 word	[101$_h$]
Data extension flag	1 word	[200$_h$]
Reserved data	4 words	[200$_h$][200$_h$][200$_h$][200$_h$]
Header CRC	2 words	—
CS	1 word	—

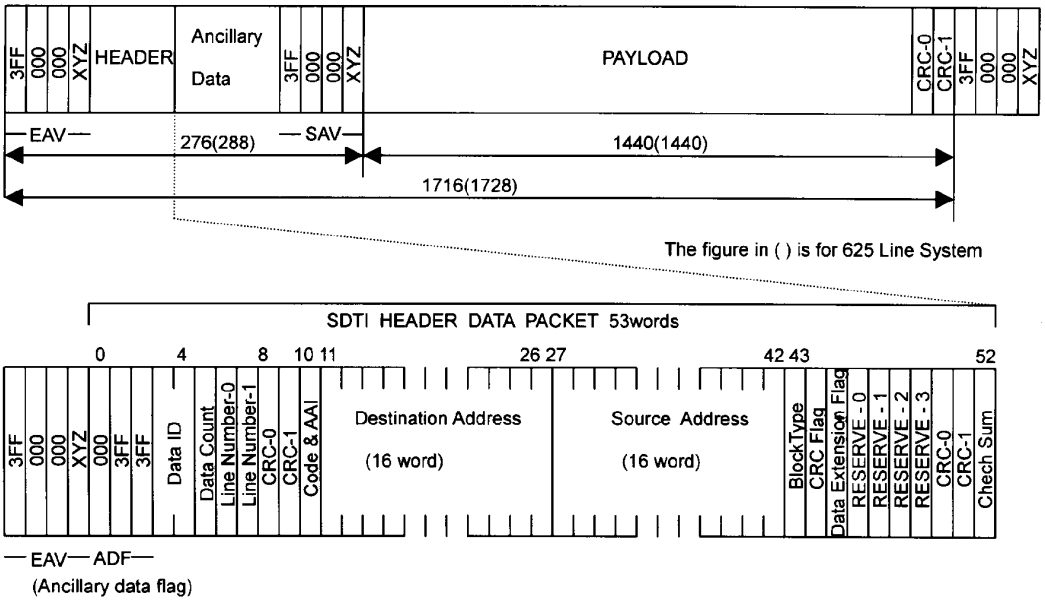

Figure 2 – SDTI header data structure

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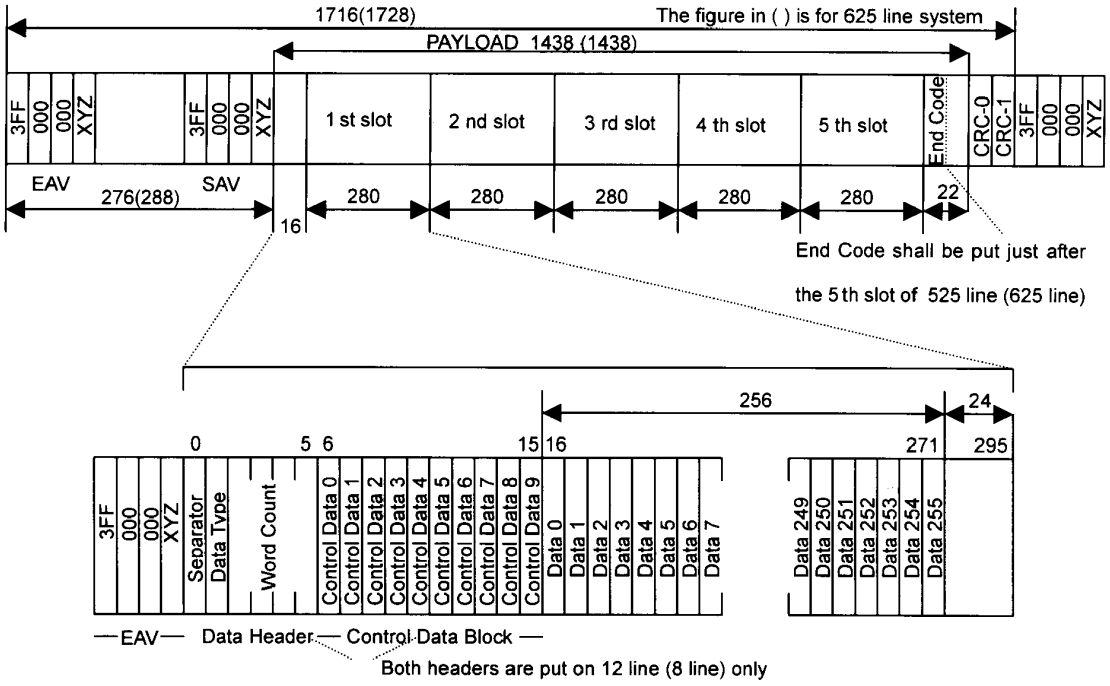

Figure 3 – Data structure

4.2 Data block header

The data block header, as specified in SMPTE 305M, shall contain the parameters shown in table 2. The data block header shall exist on line 12 for the 525/60 system or line 8 for the 625/50 system (refer to figures 4 and 7).

Table 2 – Data block header

Parameters	Length	Value
Separator	1 word	[309$_h$]
Data type	1 word	[241$_h$]
Word count	4 words	[B4720$_h$] (525/60 system) [D8F50$_h$] (625/50 system)

4.3 Control data block

Followed by the data block header, a control data block shall be inserted (immediately after the SDTI data block header). The control data block shall consist of 10 words (see figure 2), and the bits are allocated as shown in table 3. The control data block has some areas of commonality with the header section specified in IEC 61834-2, and also provides specific data required for data transfer between storage devices.

Byte 1: Indicates the data type (secondary).

Byte 2: Indicates the transfer conditions (transfer speed, bcked/unbcked, audio and video validity).

Bytes 3-10: Common information to IEC 61834-2.

4.3.1 Secondary data type

The control data block and the data slots are preceded with a secondary data type (1 word), with which the entire data block is defined. The initial code shall be set to all zero, and the receiver shall attempt to decode the data as soon as the desired secondary data type is detected.

Value	Description
0000 0000	Initial code
0000 0001	Data block as defined
0000 0010	
|	Reserved
1111 1111	

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Table 3 – Control data block structure

	MSB							LSB
Byte 1	Secondary data type							
Btye 2	0 0 (RESERVE)		VIDEO INVALID	AUDIO INVALID	LOCK	TRANSFER MODE		
Byte 3	V 50/60	V STYPE	A 50/60	A STYPE	AP3	AP2	AP1	APT
Byte 4	FF	FS	V REC MODE	BCSYS		DISP		
Byte 5	A-1 LF	A-1 CHN		A-1 PA	A-1 AUDIO MODE			
Byte 6	A-1 REC ST	A-1 REC END	A-1 REC MODE	A-1 EF	A-1 SMP		A-1 QU	
Byte 7	A-1 DRF	A-1 SPEED						
Byte 8	A-2 LF	A-2 CHN		A-2 PA	A-2 AUDIO MODE			
Byte 9	A-2 REC ST	A-2 REC END	A-2 REC MODE	A-2 EF	A-2 SMP		A-2 QU	
Byte 10	A-2 DRF	A-2 SPEED						

4.3.2 Transfer mode

The transfer mode specifies the desired transfer speed of the compressed video stream. The following transfer speed can be selected:

Value	Description
000	Reserved
001	Normal speed (1X)
010	2X speed
011	3X speed
100	4X speed
101	5X speed
110	Reserved
111	Reserved

LOCK: Indicates whether the VCR is being servo locked or not during the data transfer.

Value	Description
0	VCR servo unlocked
1	VCR servo locked

AUDIO INVALID: Indicates the validity of the audio data. When the AUDIO INVALID flag is active (1), the receiver shall not attempt to decode the audio data.

Value	Description
0	Audio data valid
1	Audio data invalid

VIDEO INVALID: Indicates the validity of the video data. When the VIDEO INVALID flag is active (1), the receiver shall not attempt to decode the video data.

Value	Description
0	Video data valid
1	Video data invalid

4.3.6 Common parameters

Other parameters contained in bytes 3 to 10 are common information to the international standard (IEC 61834).

4.4 Data slot

Each data slot consists of 280 words, and shall start from the word number address shown below. The data shall be contained in the first 256 bytes, and the last 24 bytes are reserved for future extensions.

Word address	Number
Slot 1	16
Slot 2	296
Slot 3	576
Slot 4	856
Slot 5	1136

4.5 Endcode

The endcode as specified in SMPTE 305M shall be present at the word number address 1416 on line 525 for the 525/60 system, or line 625 for the 625/50 system.

Parameters	Length	Value
Encode	1 word	[30A$_h$]

5 Transmission Format

The following clause describes the overall transmission format and the detailed data structure of the compressed video stream.

5.1 Digital interface format (DIF)

The data structure of the video, audio, and subcode in the DIF blocks shall be as specified in IEC 61834-2. However, the 3-byte ID shall not be carried over the interface (see figures 4, 5, and 6). The DIF blocks shall be mapped onto the data slots using a frame-bounded algorithm, which is different in sequence from the one specified in IEC 61834-2.

5.2 525/60 system

The data block shall be transmitted from line 12 through line 525, provided that valid data shall not exist on lines 9-11 and 272-274 for the 525/60 system as shown in figure 7. The areas in lines 247-271 and 510-8 are reserved for future extensions.

5.2.1 Video sections

The video sections are contained in lines 12-223 and 275-486 (see figure 8):

(n, V0) – (n, V134); n = 0 to 9

5.2.2 SC/VAUX sections

The SC/VAUX sections are contained in lines 224-231 and 487-494 (see figure 9):

(n, SC0), (n, SC1), n, VA0), (n, VA1), (n, VA2);
n = 0 to 9

5.2.3 Audio/AAUX sections

The audio/AAUX sections are contained in lines 232-246 and 495-509 (see figure 9):

(n, A0) – (n, A8); n = 0 to 9

5.3 625/50 system

The data block shall be transmitted from line 8 through line 625, provided that valid data shall not exist on lines 5-7 and 318-320 for the 625/50 system as shown in figure 10. The areas in lines 289-317 and 602-4 are reserved for future extensions.

5.3.1 Video sections

The video sections are contained in lines 8-261 and 321-574 (see figure 11):

(n, V0) – (n, V134); n = 0 to 11

5.3.2 SC/VAUX sections

The SC/VAUX sections are contained in lines 262-271 and 575-584 (see figure 12):

(n, SC0), (n, SC1), (n, VA0), (n, VA1), (n, VA2);
n = 0 to 11

5.3.3 Audio/AAUX sections

The audio/AAUX sections are contained in lines 272-288 and 585-601 (see figure 12):

(n, A0) – (n, A8); n = 0 to 11

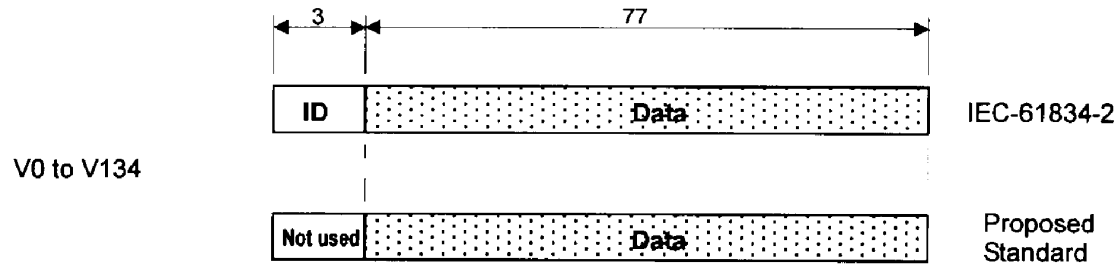

Figure 4 – Data in the video sections

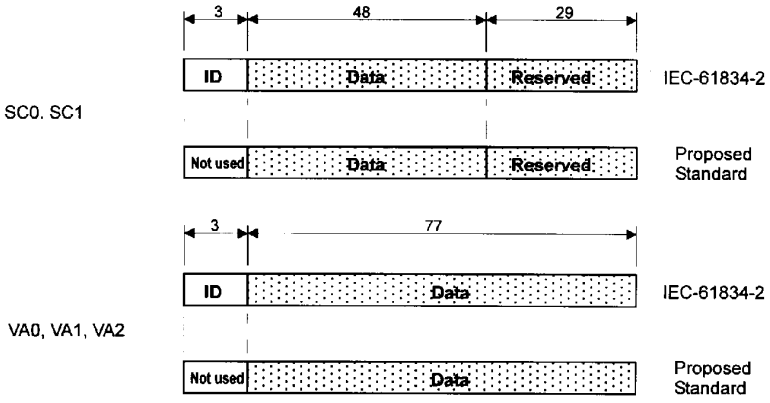

Figure 5 – Data in the SC/VAUX sections

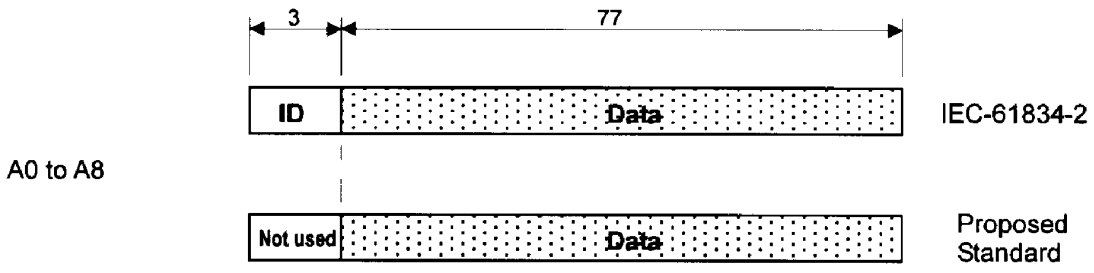

Figure 6 – Data in the audio/AAUX sections

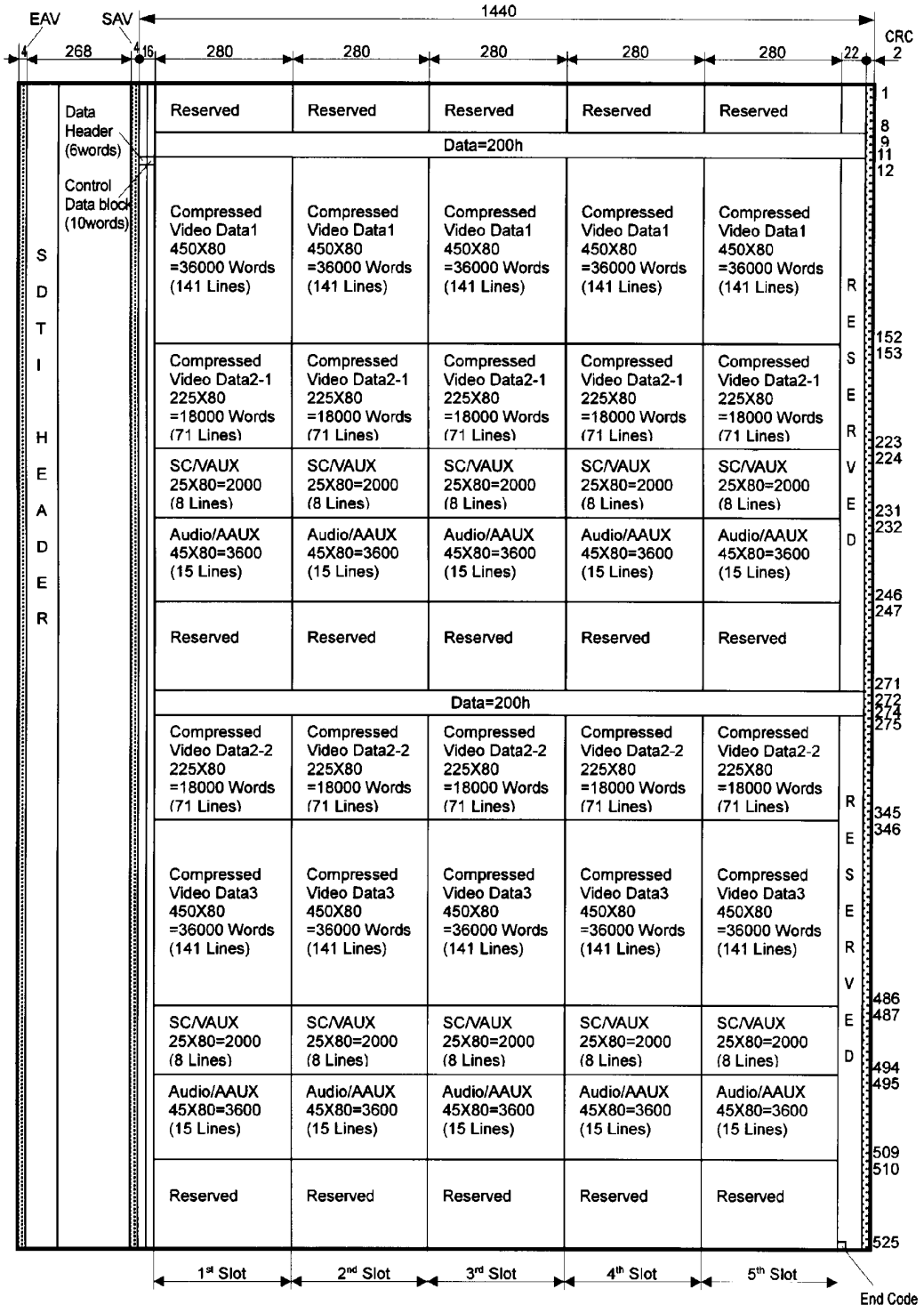

Figure 7 – Transmission format for 525/60 system

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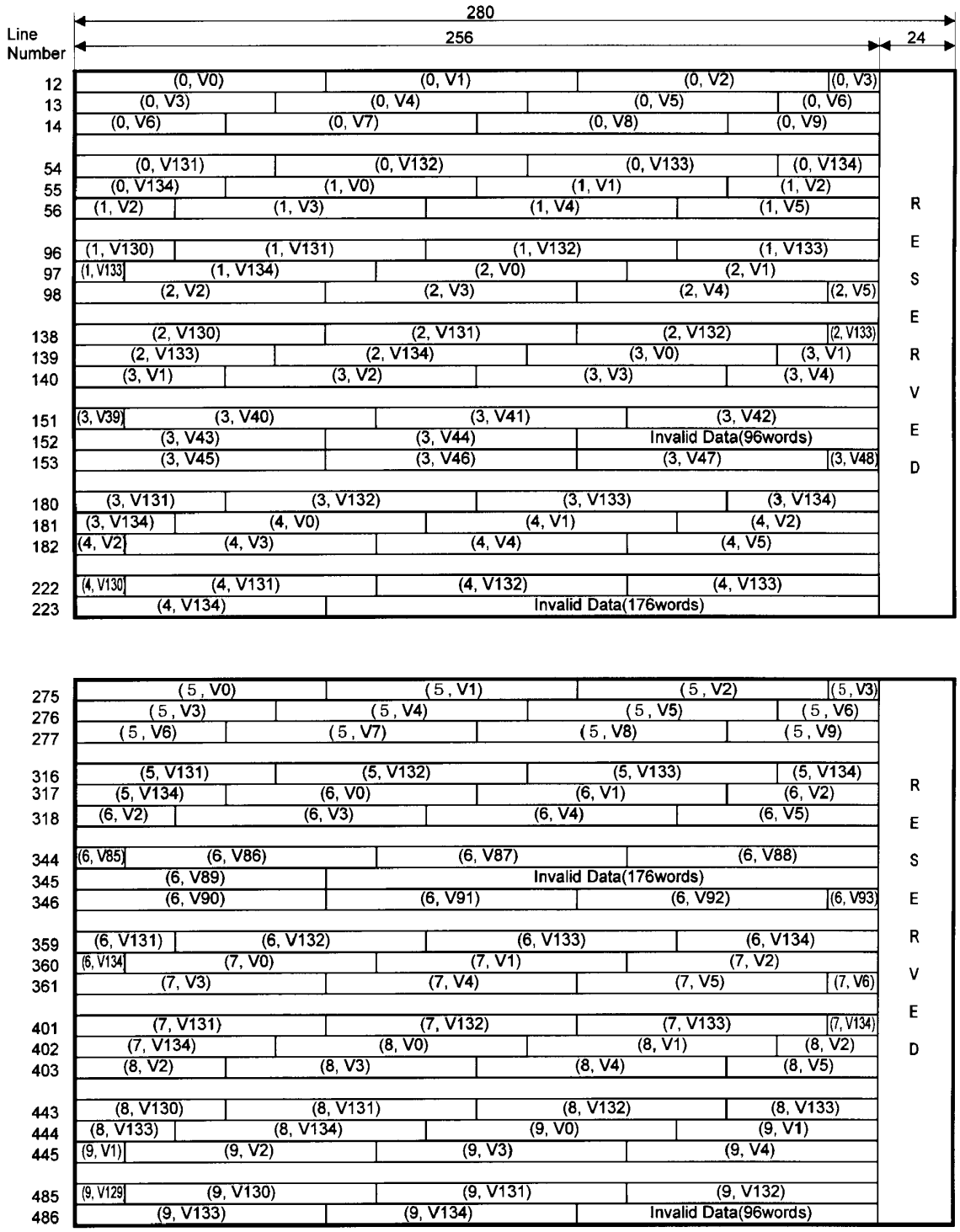

Figure 8 – Video sections for 525/60 system

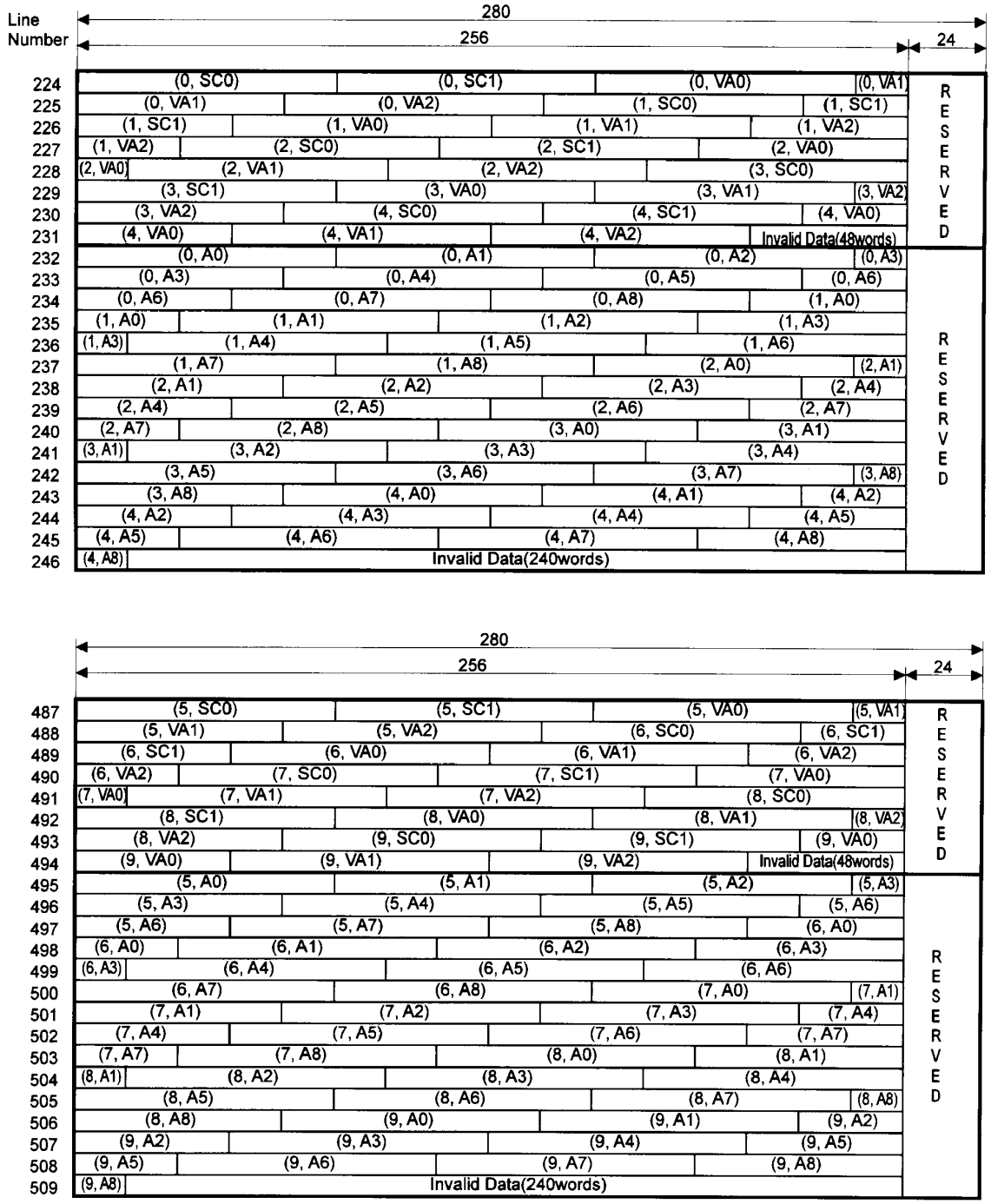

Figure 9 – SC/VAUX and audio/AAUX sections for 525/60 system

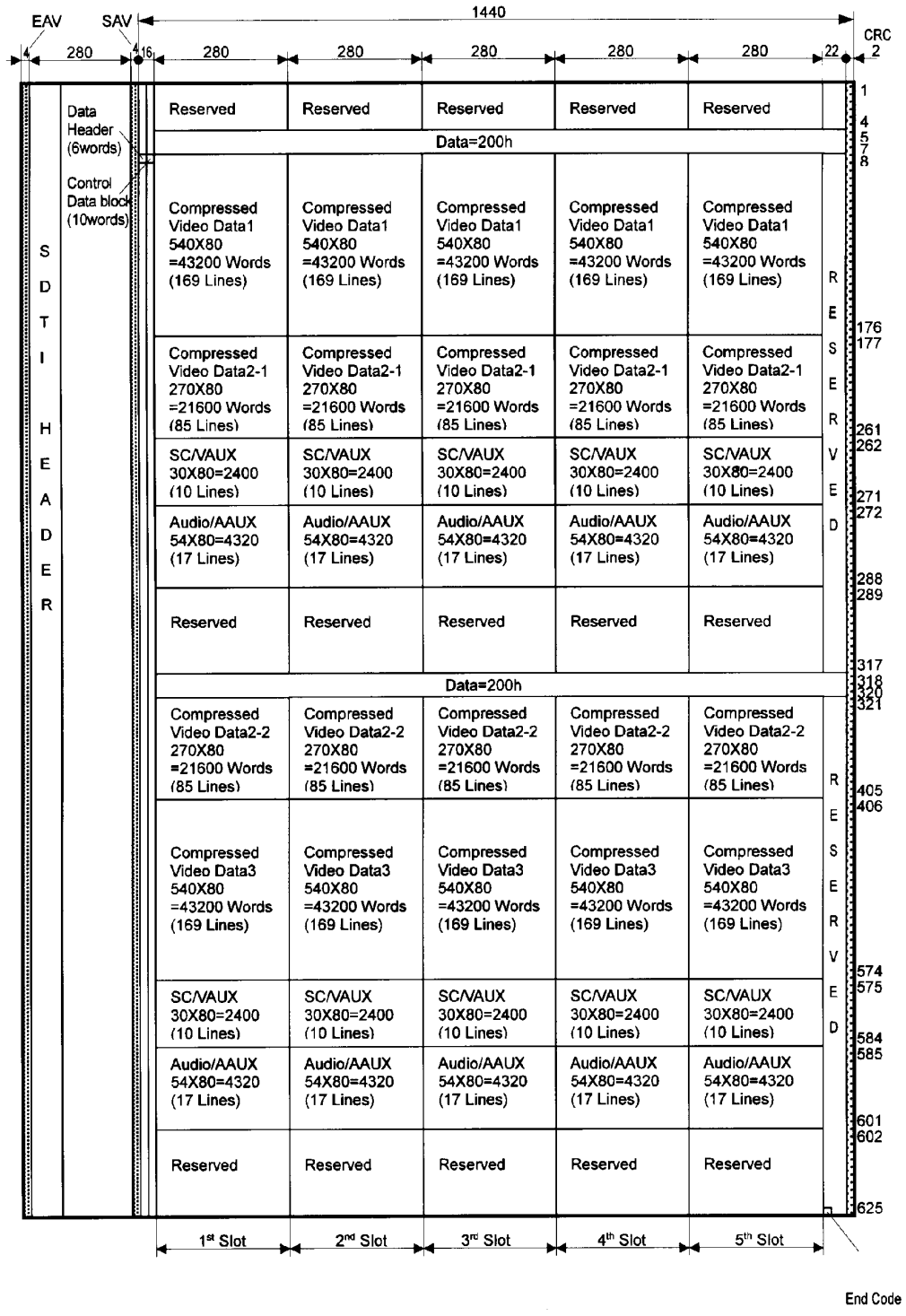

Figure 10 – Transmission format for 625/50 system

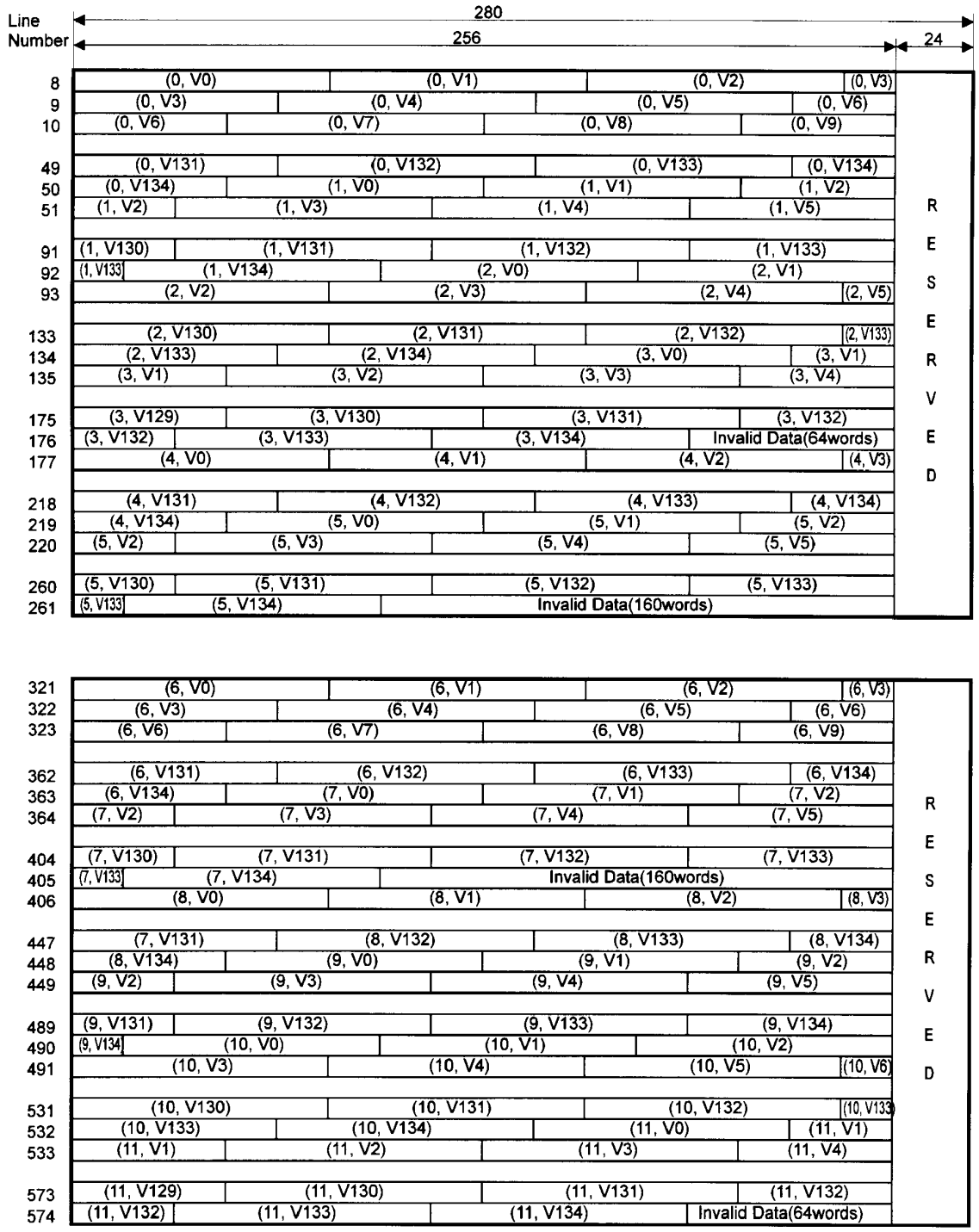

Figure 11 – Video sections for 625/50 system

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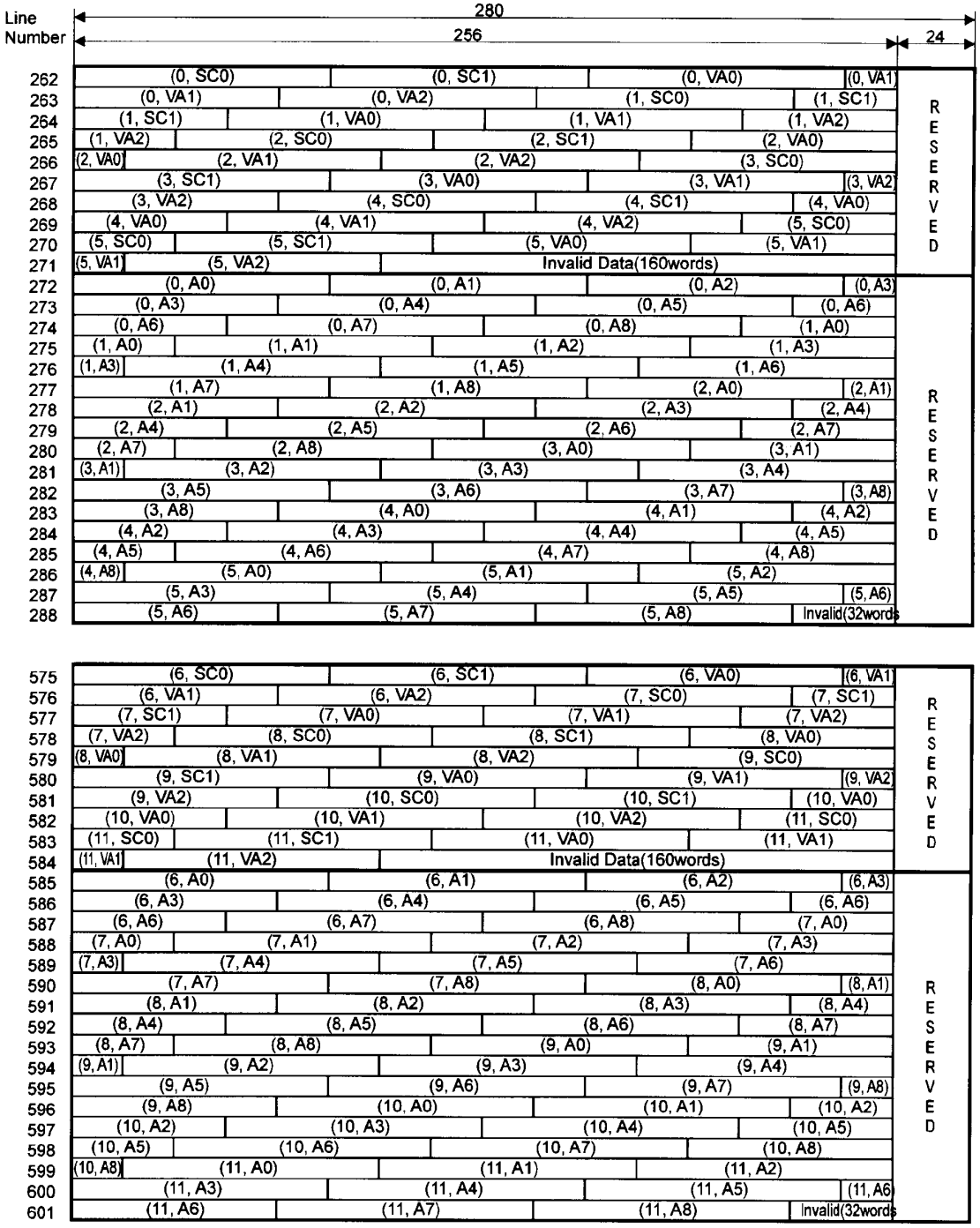

Figure 12 – SC/VAUX and audio/AAUX sections for 625/50 system

Annex A (informative)
Bibliography

ANSI/SMPTE 259M-1997, Television — 10-Bit 4:2:2 Component and 4f_{sc} Composite Digital Signals — Serial Digital Interface

SMPTE RP 168-1993, Definition of Vertical Interval Switching Point for Synchronous Video Switching

ITU-R BT.656-3, Interface for Digital Component Video Signals in 525-Line and 625-Line Television Systems Operating at the 4:2:2 Level of Recommendation ITU-R BT.601