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SMPTE STANDARD

for Television — Mapping of Vertical Ancillary Data Packets (VANC) into VAUX DIF Blocks of DV-Based 100 Mb/s DIF Stream Format



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1 Scope

This standard specifies the mapping of vertical ancillary data packets (VANC) into the payload area of the DV-based 100 Mb/s digital interface format (DIF) structure VAUX DIF blocks as defined in SMPTE 370M. Metadata and data essence may be contained in VANC packets present in vertical blanking interval (VBI) of the uncompressed high-definition serial digital interface (HD-SDI). The purpose of this standard is to define how such data is mapped into the video auxiliary (VAUX) DIF blocks of the 100 Mb/s DV-based compressed signal stream format. This mapping is applicable to the 1080/60i, 1080/50i, and 720/60p signal formats present on the HD-SDI.

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 editions of the standards indicated below.

SMPTE 291M-1997, Television – Ancillary Data Packet and Space Formatting

SMPTE 292M-1998, Television – Bit-Serial Digital Interface for High-Definition Television Systems

SMPTE 370M-2002, Television – Data Structure for DV Based Audio, Data and Compressed Video at 100 Mb/s 1080/60i, 1080/50i, 720/60p

SMPTE RP 168-2002, Definition of Vertical Switching Point for Synchronous Video Switching

3 General description

Metadata and Data Essence can be carried in the Ancillary space of the HD-SDI stream structure. These data that are formatted according SMPTE 291M as VANC packets are located in a VBI space. The VANC packets can be converted/transformed and subsequently mapped into an available data space of the 100 Mb/s DV-based DIF stream. The space that is used for the mapping of these VANC packets is located in multiple VAUX DIF blocks of a DIF frame. Multiple DIF blocks (each 80 bytes long) form a DIF Sequence. Several DIF Sequences form a DIF frame, all defined in the SMPTE 370M (see figure 1).

The conversion process converts VANC packets into DIF ancillary data packet (DANC). Every VANC packet is converted into a DANC packet of an identical length, as is the originating VANC packet. The resulting DANC packets are then assembled into a string of DANC packets and this string is then mapped into the available space of the VAUX DIF blocks.

Due to the limited total VAUX DIF block space, and to achieve maximum benefit of the available space for the user, management of the data space by the user should be established (see note 1). A specific data management method is beyond the scope of this standard.

NOTE 1: Designers should be aware that the size of VANC data can exceed the capacity of the VAUX packs. It is the responsibility of the application to manage the mapping of VANC data into VAUX packs such that only complete VANC packets are mapped into VAUX DIF blocks. Where the VAUX capacity is exceeded, it is the responsibility of the application to manage this mapping in such a way as to minimize the effect on system performance, of not mapping all of the VANC data

The ancillary packet conversion to DANC packet is a direct conversion technique, fully transparent for the data content, and is defined in this standard.

3.1 Data capacity of the mapped space (VAUX DIF block space) and its structure

Figure 1 shows the typical organization of a DIF frame and DIF Sequence for a DV-based 100 Mb/s stream structure as described in SMPTE 370M.

The basic VAUX DIF block space that is used for mapped VANC packets consists of three VAUX DIF blocks VA 0,i; VA 1,i; and VA 2,i located in multiple DIF sequences. These DIF sequences form a DIF frame. The payload space of these three VAUX DIF blocks is subdivided into smaller entities called VAUX packs. These VAUX packs exist in 5-byte, 45-byte, and 75-byte long form (see figure 3a, 3b, and 3c).

i) 5-byte long VAUX pack —

The 5-byte long VAUX pack is defined in the SMPTE 370M. These 5-byte long VAUX packs (see figure 3a) may be used in any of the VAUX DIF blocks, regardless of odd or even DIF sequence.

ii) 45-byte or 75-byte long VAUX pack —

Additionally, this standard defines a different payload structure of the VAUX DIF block that is not defined in SMPTE 370M (see figures 3b and 3c). These new structures are based on a 45-byte or 75-byte long VAUX pack. The reason for these additional structures is to increase payload efficiency. However, the structure of a used VAUX pack is determined by the actual structure of a VAUX DIF block and if this block is located in an odd or even DIF sequence (see figure 2).

The user available payload capacity of all VAUX DIF blocks in a single DIF frame using different VAUX pack structures is shown below:

In the case of a VAUX DIF block that uses the 5-byte VAUX pack structure:

1080/60i system:	4 bytes x (15 + 15 + 9) packs x 40 DIF sequences = 6240 bytes/frame
1080/50i system:	4 bytes x (15 + 15 + 9) packs x 48 DIF sequences = 7488 bytes/frame
720/60p system:	4 bytes x (15 + 15 + 9) packs x 40 DIF sequences = 6240 bytes/2frames

In the case of a VAUX DIF block that uses the 45-byte or 75-byte VAUX pack structure:

1080/60i system:	$(72 \times 2 + 42)$ bytes $\times$ 40 DIF sequences = 7440 bytes/frame
1080/50i system:	$(72 \times 2 + 42)$ bytes $\times$ 48 DIF sequences = 8928 bytes/frame
720/60p system:	$(72 \times 2 + 42)$ bytes $\times$ 40 DIF sequences = 7440 bytes/2frames

4 VAUX DIF block space structure and payload format (VAUX packs)

The format of the VAUX DIF block space available for data mapping is shown in figure 2. Each DIF sequence of a DIF frame contains 3 VAUX DIF blocks, but depending on if the VAUX DIF block is located in the odd or even DIF sequence, the formatting of the data payload is slightly different for one of the three VAUX DIF blocks (see figure 2).

The differently formatted VAUX DIF block in a DIF sequence contains control information called VS (VAUX source pack) and VSC (VAUX source control pack) which contains essential information for identification of the DIF frame signal parameters. The control information is carried in the 5-byte long VAUX packs form and is defined SMPTE 370M.

The size of the available mapping space in 3 VAUX DIF blocks is identical for both DIF sequences, odd or even.

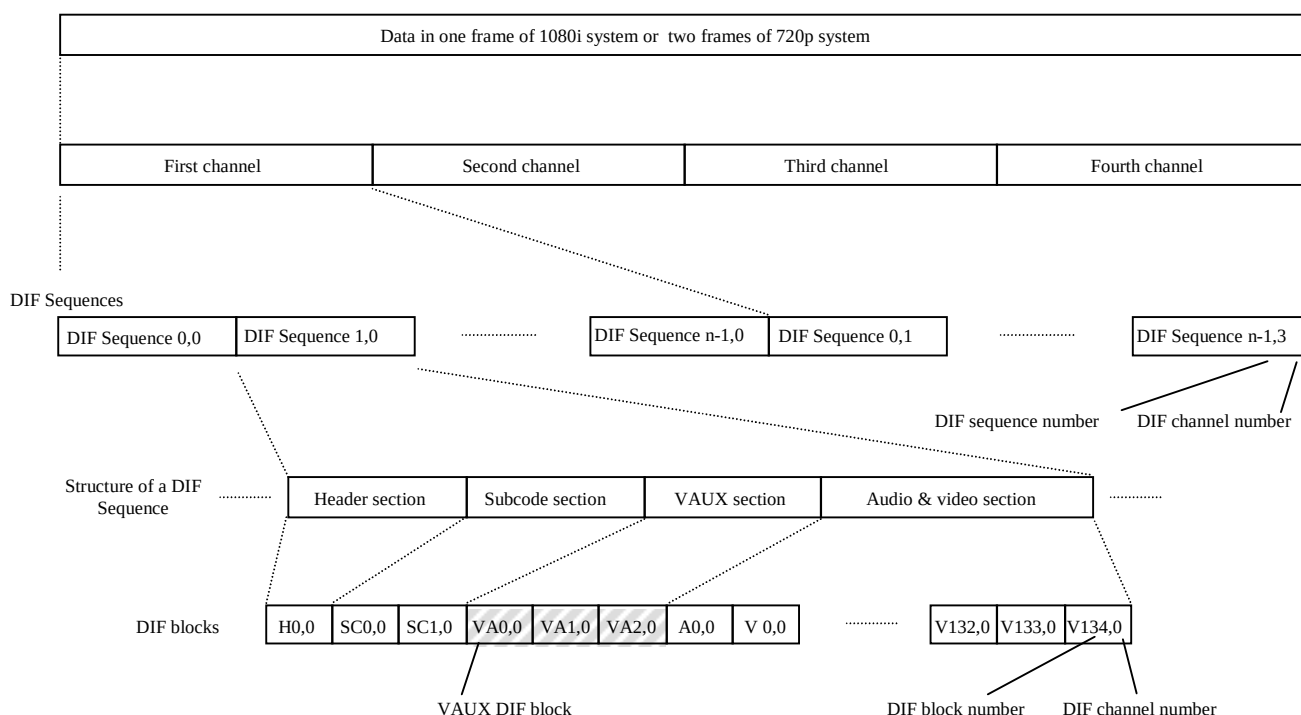
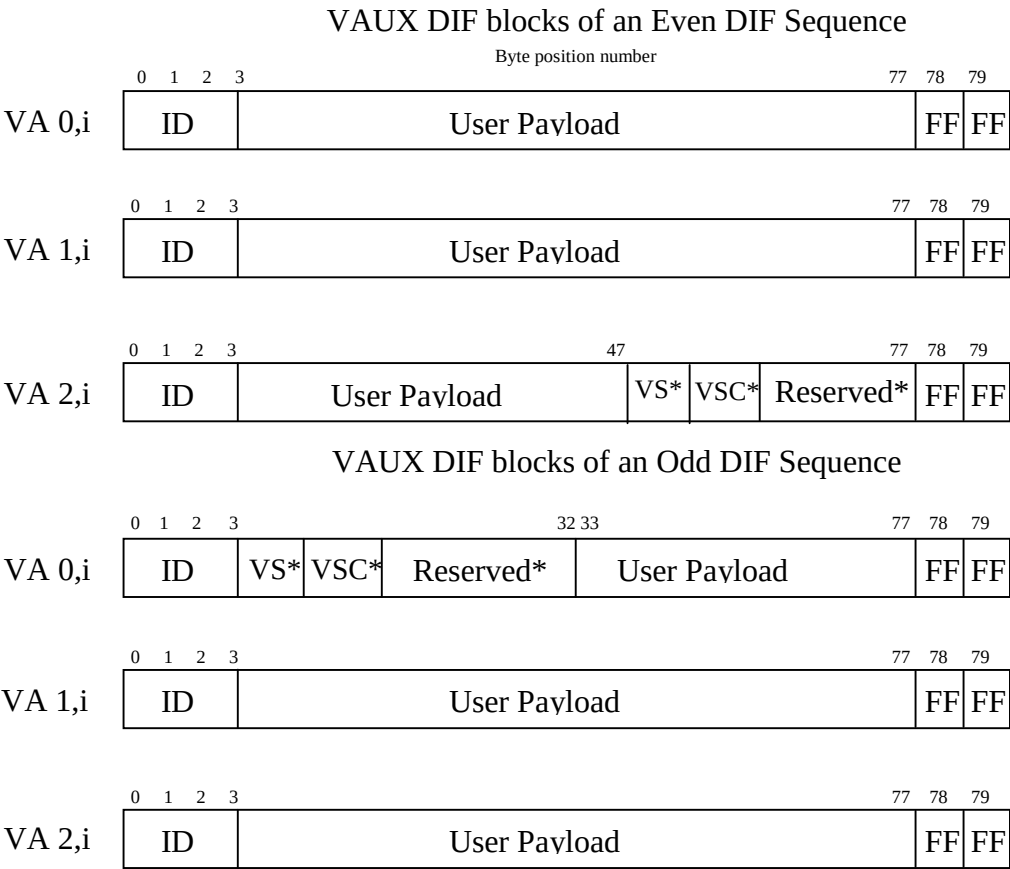
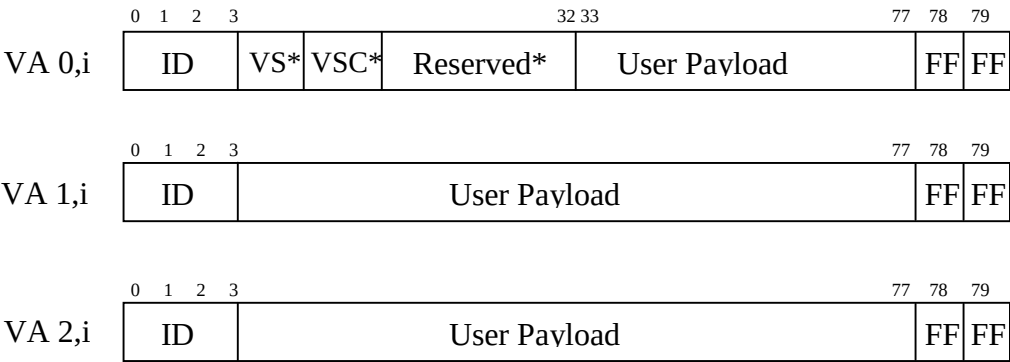


Figure 1 – Structure of a DIF frame for DV-based 100 Mb/s stream



VAUX DIF blocks of an Odd DIF Sequence



Where i: DIF channel number
i= 0,1, 2, 3
VS: VAUX Source pack
VSC: VAUX Source control pack
Byte 78,79: Reserved, filled with FFh
(*): See SMPTE 370M

Figure 2 – Payload structure of VAUX DIF blocks of DV-based 100Mb/s DIF frame

For higher payload efficiency of the VAUX DIF block space, two additional VAUX pack structures are defined in this standard. In these two VAUX pack structures, (45-byte, 75-byte) the header of the VAUX pack is repeated only once per VAUX DIF block, therefore providing more space for data mapping.

The formats of all three of VAUX packs are shown in figure 3.