SMPTE ST 2020-3:2014
Revision of SMPTE 2020-3-2008

SMPTE STANDARD

Vertical Ancillary Data Mapping of Audio Metadata — Method B

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Approved
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Foreword

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SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual.

SMPTE ST 2020-3 was prepared by Technology Committee 24TB.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

This section is entirely informative and does not form an integral part of this document.

Audio data-rate reduction technologies use metadata which is multiplexed into the encoded audio bitstream, to describe the encoded audio and convey information that precisely controls downstream encoders and decoders.

Metadata is first created during program creation or mastering. It may need to be carried in the vertical ancillary data space of a digital television signal.

There are currently two methods of mapping the metadata into the vertical ancillary data space. The following suite of SMPTE standards, defines the basic characteristics of the audio metadata, its serial transport used to convey the metadata between devices, and both of the mappings into the VANC space.

SMPTE ST 2020-1, Format of Audio Metadata and Description of the Asynchronous Serial Bitstream Transport

SMPTE ST 2020-2, Vertical Ancillary Data Mapping of Audio Metadata – Method A

SMPTE ST 2020-3, Vertical Ancillary Data Mapping of Audio Metadata – Method B

1 Scope

This standard defines one of two methods of mapping the serial audio metadata stream related to encoded audio bitstreams into the 10-bit vertical ancillary (VANC) data space of a standard definition or high definition digital component television signal in accordance with SMPTE ST 291-1. This VANC mapping is intended for use as a means of transparently conveying the audio metadata elements through the video transport in a way which allows the metadata stream reconstituted by a VANC receiver to be effectively identical to that which arrived at the VANC transmitter.

An associated standard SMPTE ST 2020-1 defines the DID and SDID values assigned to the VANC packets carrying this metadata, the location where packets are to be located, the basic structure of the metadata, and the asynchronous serial data transport which is used to convey the metadata from device to device (when not embedded in a video signal).

Note: An associated standard SMPTE ST 2020-2 defines an alternate method of mapping the metadata into ancillary data packets.

2 Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any section explicitly labeled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword “reserved” indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword “forbidden” indicates “reserved” and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

3 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 ST 291-1:2011, Ancillary Data Packet and Space Formatting

SMPTE ST 2020-1:2014, Format of Audio Metadata and Description of the Asychronous Serial Bitstream Transport

4 Definition

4.1
Byte
Throughout this standard, the term "byte" shall refer to 8-bit values unless otherwise stated.

5 Format of VANC Data Packets

Each data packet shall comply with the format defined in SMPTE ST 291-1 for a type 2 ANC packet. It consists of the ancillary data flag (ADF), the data ID (DID), the secondary data ID (SDID), the data count (DC), the user data words (UDW), and the checksum (CS). The DID and SDID values are defined in SMPTE ST 2020-1. The ADF and CS are defined in SMPTE ST 291-1.

5.1 UDW Format

The ancillary space packet UDW shall be a sequence of 10-bit words. The audio metadata information is transmitted in bits b7 through b0 of the 10-bit data word. Bit b8 is the even parity for bits b7 through b0 of the 10-bit data word, and bit b9 equals the complement of bit b8.

5.2 Overview of the Audio Metadata Packets

The metadata frame structure is described in SMPTE ST 2020-1. The number of bytes in each metadata frame depends on the number of associated audio programs. Each metadata frame shall be carried in two VANC packets. In all cases, the VANC packet transmission order preserves the serial metadata byte order.

There shall be one packet in each field of interlaced video formats. For segmented-frame formats, there shall be one packet in each segment. For progressive video formats with frame rates greater than 30 Hz, there shall be one packet in each frame. For progressive formats with frame rates of 30 Hz or less, there shall be two packets in each video frame. Refer to Section 5.1 and Section 5.2 of SMPTE ST 2020-1 for a discussion of the timing of metadata with respect to standard-definition and high-definition interlaced and progressive video formats.

In this mapping, the audio metadata is carried with no additional protocol. The UDW of the VANC packets consists of metadata. The carriage in VANC packets of null characters occurring either before the metadata frame or between the two metadata subframes, is optional.

The first byte of the first VANC packet shall be the first byte received during the first field, frame or segment, and the following bytes shall be carried in order. If the number of bytes in the first metadata subframe is less than or equal to the number that can be carried on the serial interface in one field, frame or segment time, the first subframe shall be completely contained within the first VANC packet. The second metadata subframe shall be completely contained within the second VANC packet.

Note: For interlaced 59.94 field-per-second or progressive 59.94 frame-per-second systems, there will be 192 serial, 10-bit bytes at 115,200 baud in one field or frame interval. Similarly for video systems at 50 Hz there will be 230 bytes.

Note: A VANC DC value less than this nominal value (192 or 230) in the first VANC packet indicates that it completely contains the first metadata subframe and that subsequent nulls are not included. Designers of devices that convert these VANC data packets into a serial stream should be aware that null bytes must be reinserted into this gap between the two subframes.

Where more than one metadata stream must be carried in the VANC space (corresponding to multiple audio signals), a separate SDID shall be used for the ancillary data packets corresponding to each metadata stream. See Section 7 of SMPTE ST 2020-1 for the DID and SDID values.

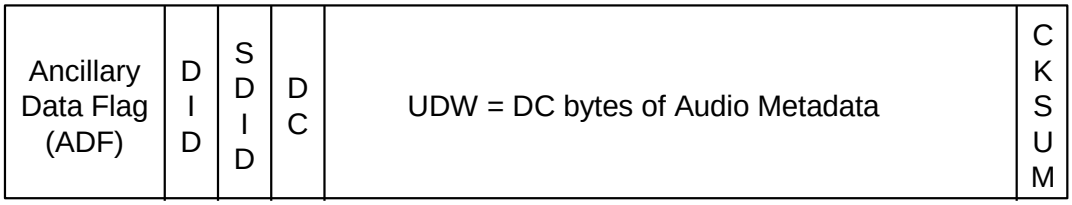

Figure 1 – Structure of Audio Metadata VANC Packet

6 Location of the Vertical Ancillary Data

The location for the ANC data packets is defined in SMPTE ST 2020-1, Section 8.

7 Levels of Operation

The level of support for the insertion or extraction of audio metadata VANC packets mapped according to this practice is SMPTE ST 2020-B. See SMPTE ST 2020-1, Section 9 for more information on levels of operation.