

SMPTE STANDARD

Format for Non-PCM Audio
and Data in AES3 —
Generic Data Types



Table of Contents	Page
Foreword	2
Intellectual Property	2
Introduction.....	2
1 Scope	3
2 Conformance Notation	3
3 Normative References	3
4 Null Data (data_type = 0)	4
4.1 Null Data burst_preamble	4
4.2 Null Data burst_payload	4
5 Time Stamp (data_type = 2)	4
5.1 Time Stamp burst_preamble.....	4
5.2 Time Stamp burst_payload	5
6 Pause (data_type = 3).....	7
6.1 General.....	7
6.2 The burst_preamble	8
6.3 Pause data_burst_payload	9
6.4 Burst Spacing.....	10
6.5 Multiplexed Data Streams	10
7 Utility (data_type = 26)	11
7.1 Utility Data burst_preamble.....	11
7.2 Utility Data burst_payload	11
8 User Defined (data_type = 30).....	14
8.1 User Data burst_preamble.....	14
8.2 User Data burst_payload	14
Annex A Bibliography (Informative)	15

Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally-recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices, and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

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

SMPTE ST 339 was prepared by Technology Committee 32NF.

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 Engineering Document.

This standard specifies data type specific format requirements for null data, time stamp data, user defined data, pause data and utility data which may include video frame synchronization information that may be carried within an AES3 interface according to SMPTE ST 337.

1 Scope

This standard specifies data type specific format requirements for several types of data bursts that may be carried within an AES3 interface according to SMPTE ST 337. Included are descriptions of the data type (defined in SMPTE ST 338), the format of the burst_payload for the data type, the coding of data type dependent fields in the burst_preamble, and additional data burst and bitstream formatting requirements not defined in SMPTE ST 337. This includes specific synchronization methods which may affect formatting.

This standard covers generic data types which include null data, time stamp data, user defined data, pause data, and utility data which may include video frame synchronization information.

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.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; then formal languages; then figures; and then any other language forms.

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 recommended practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE ST 12-1:2014, Time and Control Code

SMPTE ST 309:2012, Transmission of Data and Time Zone Information in Binary Groups of Time and Control Code

SMPTE ST 337:2015, Format for Non-PCM Audio and Data in an AES3 Serial Digital Audio Interface

SMPTE ST 338:2015, Format for Non-PCM Audio and Data in AES3 — Data Types

SMPTE RP 168:2009, Definition of Vertical Interval Switching Point for Synchronous Video Switching

4 Null Data (data_type = 0)

The null data type is provided so that the preamble sync codes may be intentionally inserted into the data stream. Null data bursts can be inserted in an AES3 transport stream to help receivers detect the fact that the stream is carrying non-PCM audio data. Null data bursts shall obey the burst spacing requirements specified by SMPTE ST 337, Section 7.3. The Null data burst should not be used as a sync run in sequence. The Pause data type should be used instead.

4.1 Null Data burst_preamble

The burst_preamble for a null data burst shall set the length_code, error_flag, and data_type_dependent values to 0. The data_stream_number shall be set to any valid number other than 0x7. The data_type shall be set to 0 as defined in SMPTE ST 338.

4.2 Null Data burst_payload

The null data burst shall not contain a burst_payload (a payload of length 0).

5 Time Stamp (data_type = 2)

The time stamp data type is used to convey time synchronization information associated with a specific data burst. This information shall include SMPTE ST 12-1 time code information and/or specific delay information. The use of time stamp bursts is optional. When present, the time stamp information shall apply to the data burst (which immediately follows in the AES3 interface). When time code information is present, the time stamp may contain date and time zone information coded in the time code binary groups according to SMPTE ST 309.

5.1 Time Stamp burst_preamble

The burst_preamble for a time stamp data burst shall include a data_type_dependent field set to a value of 0. The data_stream_number shall be set to 0x7. The data_mode parameter shall be set to 0. The data_type shall be set to 2 as defined in SMPTE ST 338.

When time code information is conveyed within time stamp data bursts, data stream number 7 should not be interpreted as a single data stream of time code information.

Note: Time stamp data bursts are independent and apply only to the data burst that immediately follows in the AES3 interface; therefore time code information from multiple time code sources can be contained within data stream number 7. Within an individual data burst time code information from at most one time code source will be present.

5.2 Time Stamp burst_payload

The time stamp burst_payload shall always be packed in the 16 bit data mode and shall have a length of six to nine 16-bit words. The burst_payload shall be in the format shown in Table 1.

The flag bit f2 in word 5 shall indicate the status of all SMPTE ST 12-1 LTC time code fields in words 0-5. If this bit is set to 0, SMPTE ST 12-1 time code information is present. If this bit is set to 1, SMPTE ST 12-1 time code information is not present and all bit fields in words 0 to 5 other than bit f2 are not defined.

In Table 1, numbers in brackets (e.g., [63]) shall refer to the corresponding bit numbers of the SMPTE ST 12-1 LTC time code words. The time code hours field is denoted by bit fields H20-H1, which correspond to the SMPTE ST 12-1 BCD coded hours bits (e.g., H20 corresponds to 20s of hours). The minutes, seconds, and frames address fields are indicated in a similar fashion by the bit fields M40-M1, S40-S1, and F20-F1 respectively.

The flag bit f1 in word 5 shall indicate the status of the binary group and flag bit fields in words 0 to 3. If this bit is set to a 1 the binary group and flag bit fields in words 0 to 3 have been copied from a source of SMPTE ST 12-1 time code. If this information has not been provided, flag bit f1 shall be set to a 0, and these binary group and flag bit fields shall be set to 0.

Bit fields a3-a0 of word 5 carry a 4 bit frame rate code. The frame rate code shall be encoded as shown in Table 2. Bit 0 of word 5 shall carry the drop-frame flag bit from bit 10 of the SMPTE ST 12-1 time code word. If the f1 bit (word 5, bit 1) is set to 1, bit 6 of word 3 shall also carry the drop-frame flag. Reserved bits (R) in word 5 shall not be used and shall be set to 0.

Note: The interpretation of the SMPTE ST 12-1 time code flag bits is dependent on the time code frame rate and whether or not the codeword is LTC or VITC.

Word 4 of the time stamp shall be used to associate the time code carried in words 0 to 3 with a specific sample of the linearly coded audio recovered from the data burst carrying (low bit rate) encoded audio immediately following the time stamp burst. The sample number is carried as an unsigned integer. For example, if an audio data burst represents 1536 linear PCM samples and the sample number is set to 1007, then the SMPTE ST 12-1 time code applies to sample 1007 of the 1536 samples of the linearly coded audio.

If the sample number contained in a time stamp is greater than the number of samples represented by the corresponding encoded audio data burst, then the time code shall be associated with a sample of the linearly coded audio recovered from the following data burst having the same stream number. As an example of this case, and again using an audio data burst that represents 1536 linear PCM samples, if word 4 is set to 1546, then the SMPTE ST 12-1 time code applies to sample 10 of the 1536 samples recovered from the next data burst with the same stream number. In such cases, the same SMPTE ST 12-1 time code information may be repeated more than once with different sample numbers in each case. In all cases, the sample number shall be accurate to within ± 0.5 ms of the ideal value.

When the time stamp is followed by a data burst that does not contain encoded audio, word 4 is not used, and shall be set to a value of 0.