SMPTE STANDARD

Format for Non-PCM Audio and Data in AES3 — Carriage of Metadata of Serial ADM (Audio Definition Model)

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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.

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Intellectual Property

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Introduction

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

Recommendation ITU-R BS.2076 specifies the Audio Definition Model (ADM), which is the audio-related metadata used to play back audio programs of an advanced sound system. The ADM can be stored in the BW64 audio file specified in Recommendation ITU-R BS. 2088 along with audio signals.

Linear PCM audio signals are widely conveyed utilizing the AES3 standard. SMPTE ST 337:2015 defines how to convey non-PCM audio and data in the AES3 format.

This standard provides the method based on SMPTE ST 337:2015 to convey the Serial ADM metadata accompanying synchronized audio signals over multiple AES3 interfaces.

1 Scope

This standard specifies the method used to convey Serial ADM metadata with synchronized audio signals in professional applications using the AES3 serial digital audio interface. This standard supports only subframe mode of SMPTE ST 337.

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 that, through their references in this text, constitute the provisions of this engineering document. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this engineering document are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

AES3-3-2009, AES Standard for Digital Audio — Digital Input-Output Interfacing — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data — Part 3: Transport

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

SMPTE ST 338:2016, Format for Non-PCM Audio and Data in AES3 — Data Types
Amendment 1:2019 to SMPTE ST 338:2016

Recommendation ITU-R BS.2125 (01/2019), A serial representation of the Audio Definition Model
https://www.itu.int/rec/R-REC-BS.2125/en

Internet Engineering Task Force (IETF) RFC 1952 (05/1996), GZIP file format specification version 4.3
[online viewed 2018-12-04] http://tools.ietf.org/html/rfc1952

4 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

4.1 Serial ADM metadata

metadata in the ADM metadata frame specified in Recommendation ITU-R BS.2125

4.2 Data burst

one of a continuous sequence of preambles and payload pairs, which implement the data stream format specified in SMPTE ST 337

4.3 changedMetadata_flag

flag to indicate whether or not the Serial ADM metadata have a difference between the previous and current ADM metadata frames (see Section 5.2.2.3)

4.4 assemble_flag

flag to indicate whether or not the assemble_info word and the method used to convey the Serial ADM metadata using multiple Data bursts are used (see Section 5.2.2.4)

4.5 format_flag

flag to indicate whether or not the format_info word and the optional encoding format type of the Serial ADM are used (see Section 5.2.2.5)

4.6 chunk

subset of metadata elements in the ADM metadata frame as specified in Recommendation ITU-R BS.2125

4.7 multiple_chunk_flag

flag to indicate the status of the ADM metadata frame divided into multiple chunks (see Section 5.2.2.6)

4.8 assemble_info

data space for information used to convey the Serial ADM metadata by multiple Data bursts and to assemble separated parts of the Serial ADM metadata in the burst_payload (see Section 5.3.2)

4.9 in_timeline_flag

flag to indicate the availability of the conveying method using the multiple Data bursts in the multiple in-timeline mode (see Section 5.3.2.2.1)

4.10 over_track_flag

flag to indicate the availability of the conveying method using the multiple Data bursts in the multiple over-track mode (see Section 5.3.2.2.2)

4.11 track_numbers

parameter to indicate the number of AES3 tracks used in the multiple over-track mode (see Section 5.3.2.2.2)

Note 1 to entry: The value of (track_numbers +1) indicates the number of AES3 tracks used.

4.12 track_ID

index to express the order of AES3 tracks used in the multiple over-track mode (see Section 5.3.2.2.3)

4.13 format_info

data space for information about optional encoding format types of the Serial ADM metadata in the burst_payload (see Section 5.3.3)

4.14 SADM_metadata_container

data space to contain the Serial ADM metadata in the burst_payload (see Section 5.3.4)

4.15 multiple in-timeline mode

method used to convey the Serial ADM metadata using the multiple continuous Data bursts in the same AES3 track (see Section 6.4)

4.16 multiple over-track mode

method used to convey the Serial ADM metadata using the multiple simultaneous Data bursts in different AES3 tracks (see Section 6.5)

5 Data burst Structure to Convey the Serial ADM metadata

5.1 General

The Serial ADM metadata shall be mapped to the AES3 interfaces as defined in SMPTE ST 337. This section defines additional constraints.

5.2 burst_preamble

5.2.1 General

The six-subframe version shall be used.

5.2.2 burst_info (the burst_preamble word “Pc”)

5.2.2.1 General

The burst_info includes the data_type, the data_type_dependent and the data_stream_number (See Table 7 in SMPTE ST 337).

The data_type_dependent shall include three 1-bit flags and the multiple_chunk_flag shown in Table 1.

Table 1 – burst_info for conveying the Serial ADM

Bit(s)			value		
24-bit mode	20-bit mode	16-bit mode			
0-7	0-3	-	Reserved	See SMPTE ST 337. The data_type shall be set to 31.	
8-12	4-8	0-4	data_type		
13-14	9-10	5-6	data_mode		
15	11	7	error_flag		
16	12	8	data_type_dependent	changedMetadata_flag	0 indicates the Serial ADM metadata does not have any difference between the previous and current ADM metadata frames. 1 indicates the Serial ADM metadata has a difference between the previous and current ADM metadata frames.
17	13	9		assemble_flag	0 indicates the assemble_info word is not present. The Serial ADM metadata is conveyed by a single Data burst. 1 indicates the assemble_info word is present. The Serial ADM metadata is conveyed by multiple Data bursts.
18	14	10		format_flag	0 (default) indicates the format_info word is not present. The Serial ADM metadata is encoded as UTF-8. 1 indicates the format_info word is present. The Serial ADM is coded with optional encoding format type.
19-20	15-16	11-12		multiple_chunk_flag	00 indicates that a single chunk is used in the frame type of “header”, “full”, “intermediate” or “all” to convey the Serial ADM metadata. 01 indicates the last chunk in the frame type of “divided”. 10 indicates the intermediate chunks in the frame type of “divided”. 11 indicates the first chunk in the frame type of “divided”.
21-23	17-19	13-15	data_stream_number	See SMPTE ST 337. The data_stream_number shall be set to the same number when multiple Data bursts convey the Serial ADM metadata.	

5.2.2.2 data_type

Bits 8-12 in 24-bit mode, bits 4-8 in 20-bit mode or bits 0-4 in 16-bit mode indicate the data_type. The data_type identifier shall be set to 31, indicating that the data_type in the extended_data_type (the burst_preamble word “Pe”) is used.

5.2.2.3 changedMetadata_flag

Bit 16 in 24-bit mode, bit 12 in 20-bit mode or bit 8 in 16-bit mode indicates the changed Metadata_flag. The value “1” indicates that the Serial ADM metadata have a difference between the previous and current ADM metadata frames.

5.2.2.4 assemble_flag

Bit 17 in 24-bit mode, bit 13 in 20-bit mode or bit 9 in 16-bit mode indicates the assemble_flag. The value “1” indicates that multiple burst_payloads are used to convey the Serial ADM metadata and the burst_payload includes the assemble_info. The value “0” indicates that a single burst_payload is used to convey the Serial ADM metadata and the burst_payload does not include the assemble_info.

5.2.2.5 format_flag

Bit 18 in 24-bit mode, bit 14 in 20-bit mode or bit 10 in 16-bit mode indicates the format_flag. The value “1” indicates that the burst_payload includes the format_info; in this case, the Serial ADM metadata shall be encoded with the optional format type. The value “0” indicates that the burst_payload does not have the format_info; in this case, the Serial ADM metadata shall be encoded with UTF-8 (8 bits) as a default format type.

5.2.2.6 multiple_chunk_flag

Bits 19-20 in 24-bit mode, bits 15-16 in 20-bit mode or bits 11-12 in 16-bit mode indicate the multiple_chunk_flag.

The value “00” indicates the frame type of “header”, “full”, “intermediate” or “all”. A single chunk is used to convey the Serial ADM metadata in each ADM metadata frame. The first bit of the burst_payload following the burst_preamble is aligned with the first sample of the segmented audio essence associated with the Serial ADM metadata.

The value “01” indicates the last chunk in the frame type of “divided”. Two chunks or more are used to convey the Serial ADM metadata in each ADM metadata frame.

The value “10” indicates the intermediate chunks in the frame type of “divided”. Three chunks or more are used to convey the Serial ADM metadata in each ADM metadata frame.

The value “11” indicates the first chunk in the frame type of “divided”. Two chunks or more are used to convey the Serial ADM metadata in each ADM metadata frame. The first bit of the burst_payload following the burst_preamble is aligned with the first sample of the segmented audio essence associated with the Serial ADM metadata.

5.2.3 extended_data_type (the burst_preamble word “Pe”)

5.2.3.1 General

The extended_data_type includes an additional data_type. The range of the data_type is 0x0000 to 0xFFFF (see Table 6 in SMPTE ST 337).

5.2.3.2 data_type value in the extended_data_type

The data_type value in the extended_data_type shall be set to 0x0001 (in accordance with Table 2 in Amendment 1:2019 to SMPTE ST 338:2016).

5.3 burst_payload

5.3.1 General

The burst_payload shall contain the assemble_info, the format_info and the SADM_metadata_container. The assemble_info and format_info shall be placed before the SADM_metadata_container if one or both of them are required.

5.3.2 assemble_info

5.3.2.1 General

The assemble_info consists of one word of the AES3 subframe and, if present, it is positioned in the first word of the burst_payload.

5.3.2.2 assemble_info Value

The assemble_info value is shown in Table 2.

Table 2 – assemble_info

Bit(s)			Value	
24-bit mode	20-bit mode	16-bit mode		
0-3	-	-	Reserved	
4-7	0-3	-	Reserved	
8-9	4-5	0-1	in_timeline_flag	00 indicates that the multiple in-timeline mode is not used 01 indicates the last Data burst in the multiple in-timeline mode 10 indicates the intermediate Data bursts in the multiple in-timeline mode 11 indicates the first Data burst in the multiple in-timeline mode
10-15	6-11	2-7	track_numbers (over_track_flag)	6-bit unsigned integer = 0 to 63. (track_numbers +1) indicates the total number of AES3 tracks conveying the Serial ADM metadata. 0 indicates that the multiple over-track mode is not used Not 0 indicates that the multiple over-track mode is used
16-21	12-17	8-13	Track_ID	6-bit unsigned integer = 0 to 63. Index of tracks conveying the Serial ADM metadata.
22-23	18-19	14-15	Reserved	

5.3.2.2.1 in_timeline_flag

Bits 8-9 in 24-bit mode, bits 4-5 in 20-bit mode or bit 0-1 in 16-bit mode indicate the in_timeline_flag. It indicates the availability of the multiple in-timeline mode. When the in_timeline_flag is set to 11, 10 or 01, it indicates that the multiple in-timeline mode is available. The in_timeline_flag of 11, 10 and 01 indicates the Data burst is the first, the intermediate and the last one in the multiple in_timeline mode. When the in_timeline_flag is set to 00, it indicates that the multiple in-timeline mode is not available (see Section 6.4).

5.3.2.2.2 track_numbers (over_track_flag)

Bits 10-15 in 24-bit mode, bits 6-11 in 20-bit mode or bits 2-7 in 16-bit mode indicate the track_numbers (over_track_flag). The over_track_flag indicates the availability of the multiple over-track mode. When the over_track_flag is not set to 0, it indicates that the multiple over-track mode is available. When the over_track_flag is set to 0, it indicates that the multiple over-track mode is not available. The value of (track_numbers +1) indicates the total number of AES3 tracks conveying the Serial ADM metadata in the multiple over-track mode (see Section 6.5). A fixed number of tracks should be used in AES3 streams to convey the Serial ADM metadata. Each of the audio tracks of S-ADM shall use the same data_stream_number.

5.3.2.2.3 track_ID

Bits 16-21 in 24-bit mode, bits 12-17 in 20-bit mode or bits 8-13 in 16-bit mode are an index to express the order of AES3 tracks in the multiple over-track mode (see Section 6.5).

5.3.3 format_info

5.3.3.1 General

The format_info consists of one word of the AES3 subframe. When the assemble_info is used, the format_info, if present, shall be positioned in the second word of the burst_payload. When the assemble_info is not used, the format_info, if present, shall be positioned in the first word of the burst_payload.

5.3.3.2 format_info Value

The format_info value are shown in Table 3.

Table 3 – format_info

Bit(s)			Value	
24-bit mode	20-bit mode	16-bit mode		
0-3	-	-	Reserved	
4-7	0-3	-	Reserved	
8-11	4-7	0-3	format_type	0000: UTF-8 (8-bit text) 0001 to 1111: See Table 4
12-23	8-19	4-15	Reserved	

5.3.3.3 format_type

Bits 8-11 in 24-bit mode, bits 4-7 in 20-bit mode or bits 0-3 in 16-bit mode indicate the encoding format type of the Serial ADM metadata. When the format_type is set to “0000”, the Serial ADM metadata are encoded as UTF-8 (8-bit text).

The format_type for the other encoding format types of the Serial ADM are shown in Table 4.

Table 4 – format_type

format_type	Value
0000	UTF-8 (8-bit text)
0001	gzip (as specified in RFC 1952)
0010 to 1111	Reserved

5.3.4 SADM_metadata_container

5.3.4.1 General

The SADM_metadata_container shall contain the Serial ADM metadata. The SADM_metadata_container consists of the time series of the 16-, 20- or 24-bit data fields specified as the AES3 subframe.

5.3.4.2 SADM_metadata_container Value

The SADM_metadata_container word is filled with 16-, 20- or 24-bit data in accordance with the 16-, 20- or 24-bit mode, respectively. The encoded Serial ADM metadata are separated into 16-, 20- or 24- bit data fields respectively starting from the first data sample.

When the format_flag is set to “0” or the format_type is set to “0000”, the Serial ADM metadata encoded as 8-bit characters with UTF-8 are packed as shown in Table 5. One word can convey data of three or two characters in the 24- or 16-bit mode, respectively, and two words can convey data of five characters in the 20-bit mode.

Table 5 – SADM_metadata_container values for UTF-8 text

24-bit mode	value
0-7	First character of trio
8-15	Second character of trio
16-23	Third character of trio

20-bit mode	value for odd AES3 subframe	20-bit mode	value for even AES3 subframe
0-3	N/A	0-3	N/A
4-11	First character of pentad	4-7	Lower 4 bits of third character of pentad
12-19	Second character of pentad	8-15	Fourth character of pentad
20-23	Upper 4 bits of third character of pentad	16-23	Fifth character of pentad

16-bit mode	value
0-7	N/A
8-15	First character of a pair
16-23	Second character of a pair

When the format_flag is set to “1” and the format_type is set to “0001”, the Serial ADM metadata encoded with UTF-8 are compressed with gzip (as specified in RFC 1952). The compressed data are divided into 24, 20 or 16-bit blocks and the divided data are packed as shown in Table 6.

Table 6 – SADM_metadata_container values for gzip

24-bit mode	value
0-23	24-bit data of compressed Serial ADM metadata

20-bit mode	value
0-3	N/A
4-23	20-bit data of compressed Serial ADM metadata

16-bit mode	value
0-7	N/A
8-23	16-bit data of compressed Serial ADM metadata

In the multiple over-track mode, the series of the SADM_metadata_container words are divided into multiple tracks (see Section 6.5).

6 Mapping of the Data burst to Convey the Serial ADM metadata

6.1 General

This section specifies the mapping of the Data burst to convey the Serial ADM metadata. The Data burst shall have the structure shown below.

```
Data_burst
{
        [burst_preamble (Pa … Pf)]

        If assemble_flag == 0 and format_flag == 0
                [burst_payload (SADM_metadata_container)]
        else if assemble_flag == 1 and format_flag == 0
                [burst_payload (assemble_info, SADM_metadata_container)]
        else if assemble_flag == 0 and format_flag == 1
                [burst_payload (format_info, SADM_metadata_container)]
        else
                [burst_payload (assemble_info, format_info, SADM_metadata_container)]
        end

}
```

The Serial ADM metadata shall be conveyed by multiple Data bursts according to the multiple in-timeline mode (see Section 6.4), the multiple over-track mode (see Section 6.5) or both modes (see Section 6.6).

Burst Spacing as specified in Section 7.4 of SMPTE ST 337 shall be followed. A single AES3 track shall convey stream of the Serial ADM metadata therefore time slots 8-27 of AES3 subframe in Burst spacing shall be filled by “0”.

6.2 Fundamental Structure of the Data burst

This section defines a mapping to the subframe mode of SMPTE ST 337. Figure 1 shows the fundamental structure of the Data burst sequence conveying the Serial ADM metadata.

In this case, the Serial ADM metadata are contained in a single SADM_metadata_container. The first sample of PCM audio signals associated with the Serial ADM metadata is synchronized with the first burst_preamble word “Pa” in each Data burst.

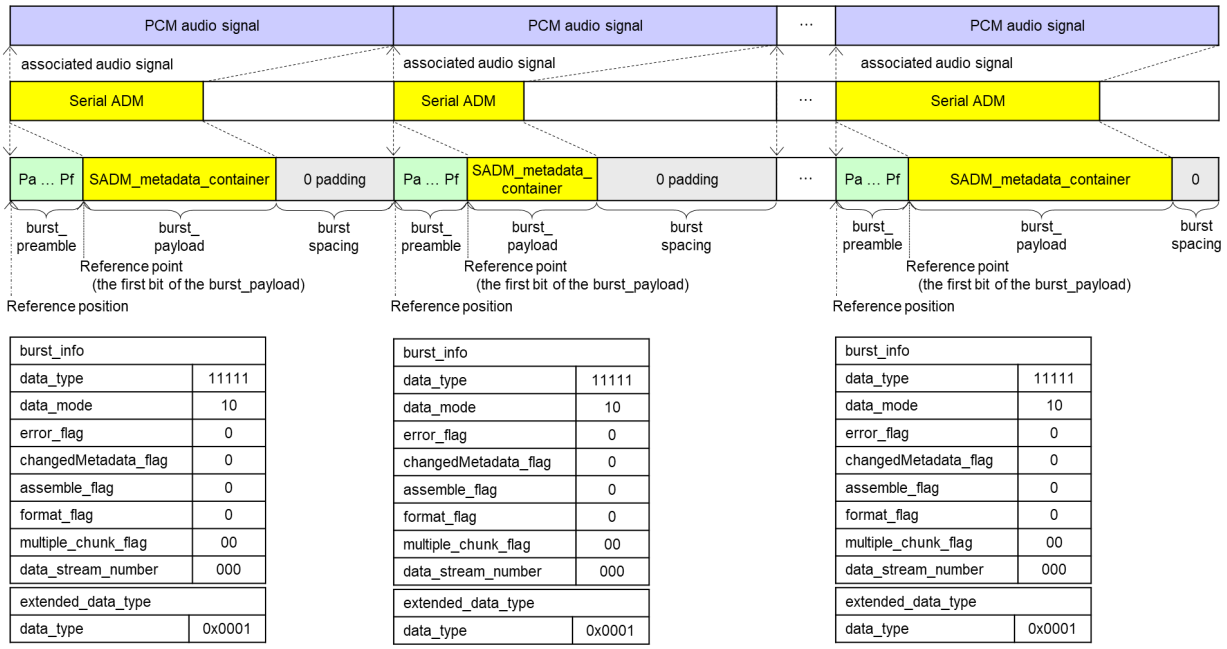


Figure 1 – Fundamental structure of the Data burst sequence conveying the Serial ADM metadata

6.3 Structure of the Data burst with the format_info

When the Serial ADM metadata are coded with an optional encoding format type, the format_flag is set to “1”. Figure 2 shows the structure of the Data burst sequence conveying the Serial ADM metadata. In this case, the format_info is conveyed by the first word of the burst_payload.

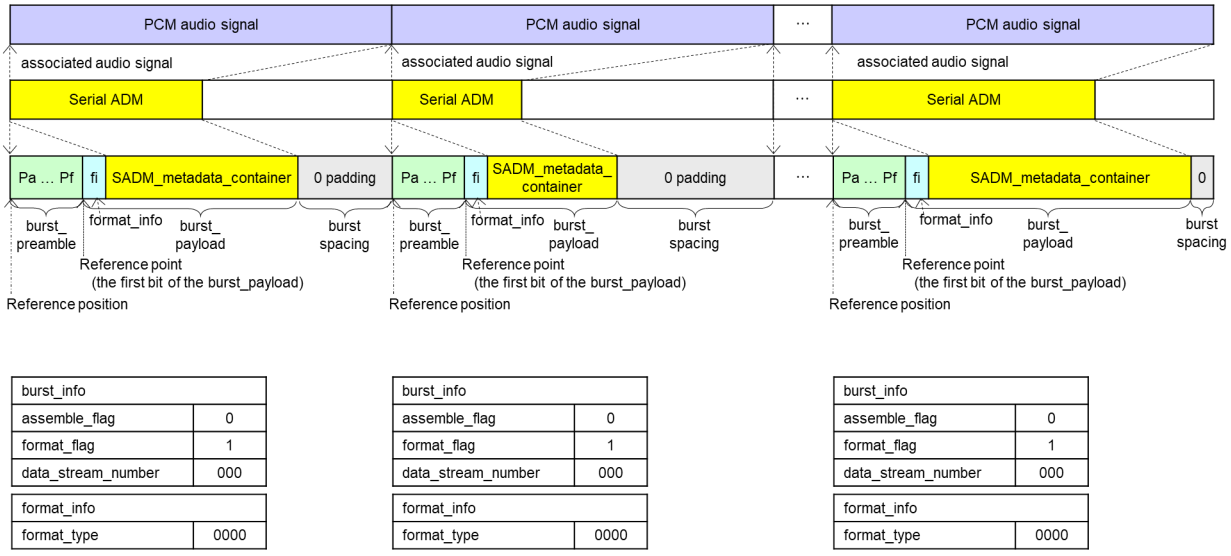


Figure 2 – Structure of the Data burst sequence with the format_info conveying the Serial ADM metadata

6.4 Structure of the Data bursts in the multiple in-timeline mode

The multiple in-timeline mode is used to convey the Serial ADM metadata over multiple continuous Data bursts. Figure 3 shows an example of the Data burst structure. In this case, the Serial ADM metadata are divided into three continuous Data bursts in the same track. The in_timeline_flags in the assemble_info words of the first, second and third Data bursts are set to 11, 10 and 01, respectively. The data_stream_numbers in the preamble words “Pc” of both Data bursts are set to the same value “000”. The track_numbers (over_track_flags) in the assemble_info words of all Data bursts are also set to the same value “000000”. The first and second Data bursts have the last four AES3 subframes in which time slots 8-27 are filled with “0”.

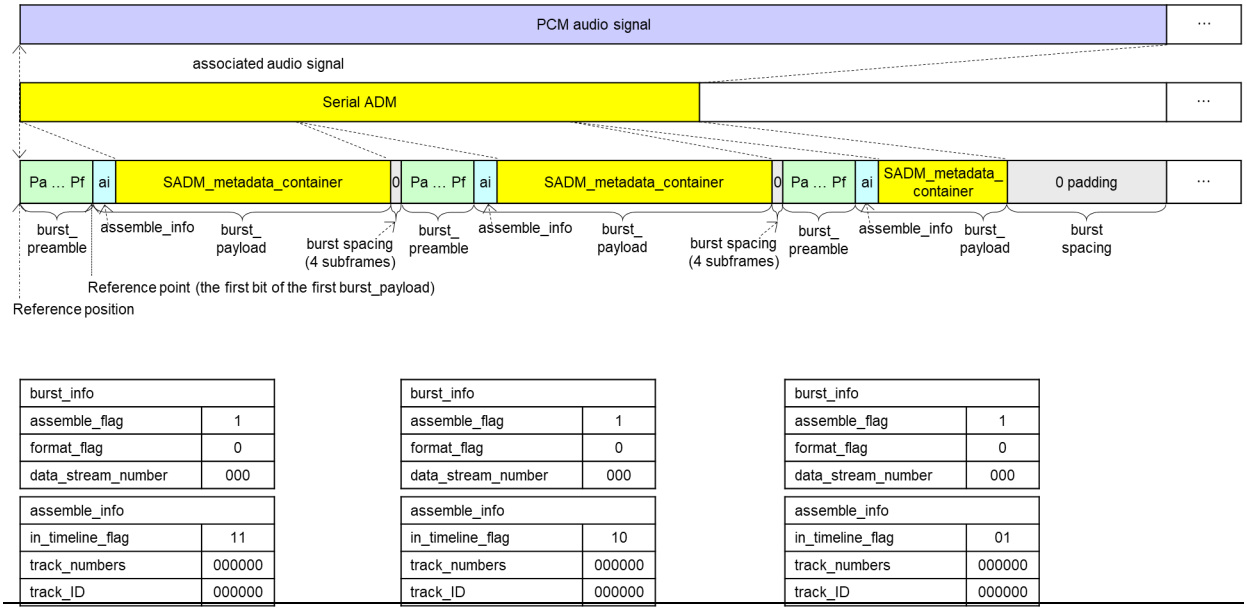
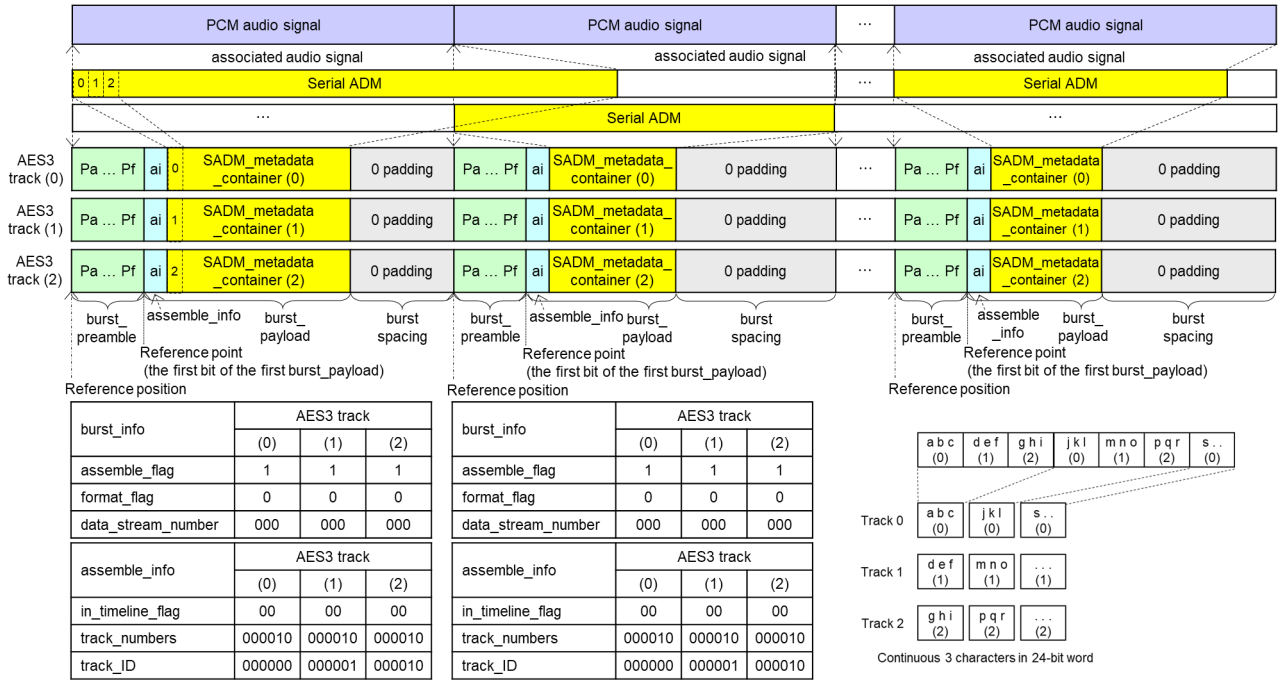


Figure 3 – Example of the Data burst structure in the multiple in-time mode. In this case, the Serial ADM metadata are divided into two continuous Data bursts in the same track.

6.5 Structure of the Data bursts in the multiple over-track mode

The multiple over-track mode is used to convey the Serial ADM metadata over multiple simultaneous Data bursts. The synchronized burst_payloads with a continuous track_ID and the same data_stream_number are combined. Figure 4 shows an example of the Data burst structure. In this case, the Serial ADM metadata are divided into three simultaneous Data bursts in different tracks. The track_numbers (over_track_flag) in the assemble_info of each Data burst is set to the same value “000010”. The track_IDs in the assemble_info of the first, second and third Data bursts are “000000”, “000001” and “000010”, respectively. The data_stream_number in the burst_preamble word “Pc” of each Data burst is set to the same value “000”.



burst_info	AES3 track		
	(0)	(1)	(2)
assemble_flag	1	1	1
format_flag	0	0	0
data_stream_number	000	000	000

assemble_info	AES3 track		
	(0)	(1)	(2)
in_timeline_flag	00	00	00
track_numbers	000010	000010	000010
track_ID	000000	000001	000010

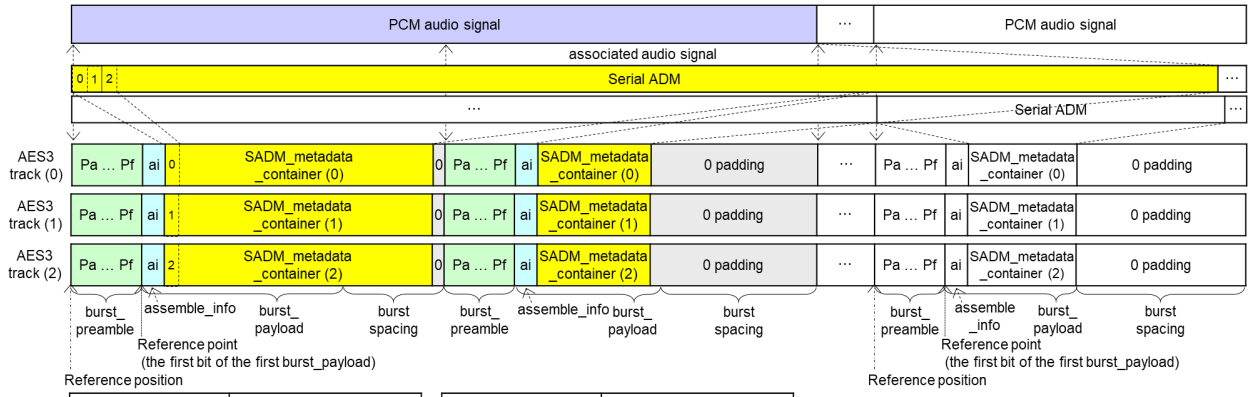
burst_info	AES3 track		
	(0)	(1)	(2)
assemble_flag	1	1	1
format_flag	0	0	0
data_stream_number	000	000	000

assemble_info	AES3 track		
	(0)	(1)	(2)
in_timeline_flag	00	00	00
track_numbers	000010	000010	000010
track_ID	000000	000001	000010

Figure 4 – Example of the Data burst structure in the multiple over-track mode. In this case, the Serial ADM metadata are divided into three simultaneous Data bursts over different tracks.

6.6 Structure of the Data bursts in the multiple over-track and in-timeline modes

Both the multiple over-track mode and the multiple in-timeline mode can be used at the same time. Figure 5 shows an example of the Data burst structure. In this case, the Serial ADM metadata are divided into a continuous pair of three simultaneous Data bursts. The track_numbers (over_track_flag) in the assemble_info of each Data burst is set to the same value “000010”. The track_IDs in the assemble_info of the first / fourth, second / fifth and third / sixth Data bursts are “000000”, “000001” and “000010”, respectively. The in_timeline_flags in the assemble_info words of the first three and second three Data bursts are set to “11” and “01”, respectively. The first three Data bursts have the last four AES3 subframes which time slots 8-27 are filled with “0”. The data_stream_number in the burst_preamble word “Pc” of each Data burst is set to the same value “000”.



burst_info	AES3 track		
	(0)	(1)	(2)
assemble_flag	1	1	1
format_flag	0	0	0
data_stream_number	000	000	000

assemble_info	AES3 track		
	(0)	(1)	(2)
in_timeline_flag	11	11	11
track_numbers	000010	000010	000010
track_ID	000000	000001	000010

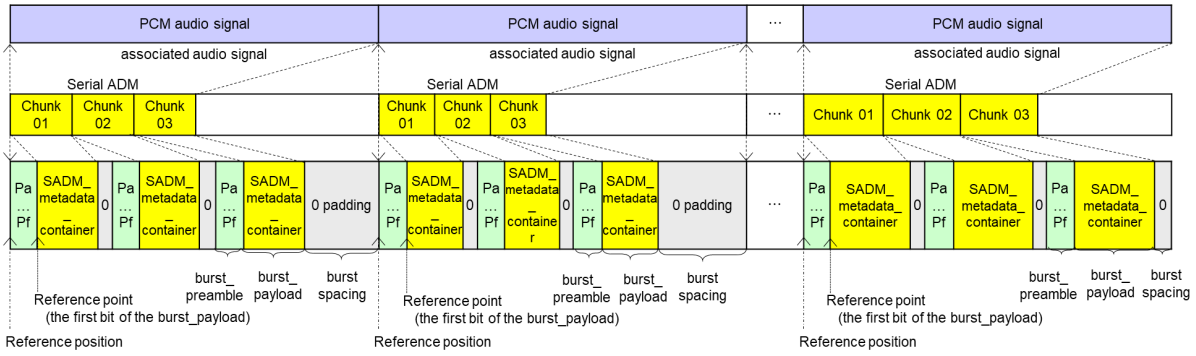
burst_info	AES3 track		
	(0)	(1)	(2)
assemble_flag	1	1	1
format_flag	0	0	0
data_stream_number	000	000	000

assemble_info	AES3 track		
	(0)	(1)	(2)
in_timeline_flag	01	01	01
track_numbers	000010	000010	000010
track_ID	000000	000001	000010

Figure 5 – Example of the Data burst structure in the multiple over-track and in-timeline modes. In this case, the Serial ADM metadata are divided into a continuous pair of three simultaneous Data bursts.

6.7 Fundamental Structure of the Data burst for multiple chunks

When the Serial ADM metadata is divided into multiple chunks, multiple continuous Data bursts are used. Figure 6 shows an example of the Data burst structure for multiple chunks. In this case, the Serial ADM metadata are divided into three chunks in each ADM metadata frame. The multiple_chunk_flag in the burst_info words of the first, second and third Data bursts are set to “11”, “10” and “01”, respectively.



burst_info for the first chunk	
data_type	11111
data_mode	10
error_flag	0
changedMetadata_flag	0
assemble_flag	0
format_flag	0
multiple_chunk_flag	11
data_stream_number	000

extended_data_type	
data_type	0x0001

burst_info for the intermediate chunks	
data_type	11111
data_mode	10
error_flag	0
changedMetadata_flag	0
assemble_flag	0
format_flag	0
multiple_chunk_flag	10
data_stream_number	000

extended_data_type	
data_type	0x0001

burst_info for the last chunk	
data_type	11111
data_mode	10
error_flag	0
changedMetadata_flag	0
assemble_flag	0
format_flag	0
multiple_chunk_flag	01
data_stream_number	000

extended_data_type	
data_type	0x0001

Figure 6 – Fundamental structure of the Data burst sequence for multiple chunks

6.8 Reference Point of the Serial ADM metadata

The Reference Point of the Serial ADM metadata shall be the first bit of the burst_payload (the burst_payload that has the track_ID "000000" and the in_timeline_flag "00" or "11" when multiple burst_payloads are used) following the burst_preamble as shown in Figure 1.

6.9 Reference Position

The SADM_metadata_container is defined as being in the Reference Position when the Reference Point of the burst_payload is aligned with the first sample of the segmented audio essence associated with the Serial ADM metadata in the SADM_metadata_container.

7 Profiles for Implementation

7.1 General

Interfaces conforming to this standard shall implement at a minimum the levels defined in Table 7 of Section 7.2. Interfaces conforming to this standard should specify the levels of Tables 7 to 9 of Sections 7.2 to 7.4, respectively, which are supported when indicating conformance to this standard.

7.2 Specifications of single AES3 interface (two sub-frames) for real-time application

The length of Data burst and the numbers of tracks for the multiple over-track mode and continuous Data bursts for the multiple in-timeline mode are limited depending on use cases. Multiple over-track mode requires synchronized AES3 interfaces. Multiple AES3 interfaces, however, might not be synchronized with each other sample by sample. Therefore, at least one of the single AES3 interfaces with the parameters of Data burst defined in Table 7 shall be used to convey the Serial ADM metadata for real-time applications.

Table 7 – Profiles of single AES3 interface for real-time application

System Parameters	SI Profile		
	Level A1	**Level B2**	**Level C2**
Length of Data burst (Audio sample)	Up to 3,200 samples	Up to 3,200 samples	Up to 4,096 samples
assemble_info			
multiple over-track mode	N/A (1 track)	Up to 2 tracks*1	Up to 2 tracks*1
multiple in-timeline mode	N/A*2	Up to 2 continuous Data bursts	Up to 3 continuous Data bursts
format_info			
format type	N/A*3	N/A*3	N/A*3
Bit depth (bits)	24	24	24
Maximum Latency for 48,000 Hz (ms)	- 66.7 ms	- 133.3 ms with 2 Data bursts	- 256 ms with 3 Data bursts

*Note 1: A pair of sub-frames within a single AES3 interface is used to transport the Serial ADM metadata using multiple over-track mode.
*Note 2: The multiple in-timeline mode is not supported for real time applications because low latencies are required.
*Note 3: The format type “0000” is used in this case. The Serial ADM metadata are encoded as UTF-8.

7.3 Specifications of multiple AES3 interfaces

The Serial ADM metadata are conveyed by multiple AES3 interfaces using the parameters of Data burst as shown in Table 8. Maximum number of multiple over-track mode is 2, 4/8/16, 64 audio tracks for AES3, SDI, MADI. Typical size of the Serial ADM is at most 100 kbytes or so. 16 audio tracks, therefore, are enough to transport the Serial ADM.

Table 8 – Profiles for multiple AES3 interfaces

System Parameters	MI Profile		
	Real-time applications		Non-real-time application
	Level A	Level B	Level D
Length of Data burst (Audio sample)	Up to 3,200 samples	Up to 3,200 samples	Up to 4,096 samples
assemble_info			
multiple over-track mode	Up to 4 tracks (A4) Up to 8 tracks (A8) Up to 16 tracks (A16)	Up to 4 tracks (B4) Up to 8 tracks (B8) Up to 16 tracks (B16)	Up to 4 tracks (D4) Up to 8 tracks (D8) Up to 16 tracks (D16)
multiple in-timeline mode	N/A*1	Up to 2 continuous Data bursts	Up to 6 continuous Data bursts
format_info			
format type	N/A*2	N/A*2	N/A*2
Bit depth (bits)	24	24	24
Maximum Latency for 48,000 Hz (ms)	- 66.7 ms*3	- 133.3 ms with 2 Data bursts*3 - 66.7 ms with a Data burst*3	- 512 ms with 6 Data bursts - 85.3 ms with a Data burst

*Note 1: The multiple in-timeline mode is not supported for real time applications because low latencies are required.

*Note 2: The format type “0000” is used in this case. The Serial ADM metadata are encoded as UTF-8.

*Note 3: 66.7 and 133.3 ms are corresponding with two and four video frames of 60i video format.

7.4 Specifications of multiple AES3 interfaces using compression tool

The compressed Serial ADM metadata are conveyed using the parameters of Data burst as shown in Table 9.

Table 9 – Profiles for multiple AES3 interfaces using compression tool

System Parameters	MIC Profile		
	Real-time applications		Non-real-time applications
	Level AX	Level BX	Level DX
Length of Data burst (Audio sample)	Up to 3,200 samples	Up to 3,200 samples	Up to 4,096 samples
assemble_info			
multiple over-track mode	N/A (1 track) (AX1) Up to 2 tracks (AX2) Up to 4 tracks (AX4)	NA (1 track) (BX1) Up to 2 tracks (BX2) Up to 4 tracks (BX4)	NA (1 track) (DX1) Up to 2 tracks (DX2) Up to 4 tracks (DX4)
multiple in-timeline mode	N/A	Up to 2 continuous Data bursts	Up to 6 continuous Data bursts
format_info			
format type	0001 (gzip)	0001 (gzip)	0001 (gzip)
Bit depth (bits)	24	24	24
Maximum Latency for 48,000 Hz (ms)	- 66.7 ms with a Data burst	- 133.3 ms with 2 Data bursts - 66.7 ms with a Data burst	- 512 ms with 6 Data bursts - 85.3 ms with a Data burst

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