

SMPTE STANDARD

Format for Non-PCM Audio and Data in AES3 — ATSC A/52 Digital Audio Compression Standard for AC-3 and Enhanced AC-3 Data Types



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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.

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

SMPTE ST 340 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 describes how both AC-3 and E-AC-3 ("Enhanced AC-3") data rate reduced (non PCM) audio streams conforming to ATSC A/52 Annex E (and to ETSI TS 102 366) are packed into an AES3 data stream, following the methods described by SMPTE ST 337. The AC-3 and E-AC-3 data types are identified by a data type number listed in SMPTE ST 338 and carried in the burst information word of the data burst preamble. The standard describes how the AC-3 data is packed into the AES3 data stream, then extends the technique to E-AC-3.

1 Scope

This standard specifies data type specific format requirements for both AC-3 and E-AC-3 ("Enhanced AC-3") data bursts carried within an AES3 interface according to 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; followed by 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 recommended practice. 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.

ATSC A/52:2012, Digital Audio Compression (AC-3, E-AC-3) Standard, 17 December 2012

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

SMPTE ST 339:2015, Format for Non-PCM Audio and Data in AES3 — Generic Data Types

4 AC-3

4.1 Overview

As defined in A/52, an AC-3 synchronization frame (or as used hereafter, “Sync Frame”) is a unit of the AC-3 serial bit stream capable of being fully decoded. A Sync Frame begins with a sync word and contains 1536 coded audio samples. The coded data representing 1536 samples of the audio from all the audio channels of one program forms a Burst Payload. A burst preamble (defined by SMPTE ST 337) containing information about the payload is prepended to the Burst Payload and enough padding words are appended to it to make the resulting data burst duration exactly match that of the 1536 samples of baseband (PCM) audio that it represents. The resulting data bursts are placed in the audio sample word/aux data fields of AES3 subframes at regular intervals in either the frame or subframe mode (see SMPTE ST 337, section 5). Multiple streams of data may be multiplexed into the AES3 transport per SMPTE ST 337. Data bursts are placed in the AES3 transport using either 16, 20, or 24 bits of the available data space. While the 24-bit mode allows more efficient use of the AES3 capacity, the 16- and 20-bit modes allow use with existing equipment limited to 16- or 20-bit operation.

A single AC-3 Sync Frame forms the Burst Payload, as shown in Figure 1. Each AC-3 Sync Frame contains 6 coded audio blocks (AB), each of which represent 256 new audio samples per channel. A synchronization word at the beginning of each Sync Frame contains information needed to acquire and maintain synchronization. A bit stream information (BSI) header follows the sync word, and contains parameters describing the coded audio service. The coded audio blocks may be followed by an auxiliary data (Aux) field. At the end of each frame is an error check field that includes a CRC word for error detection.

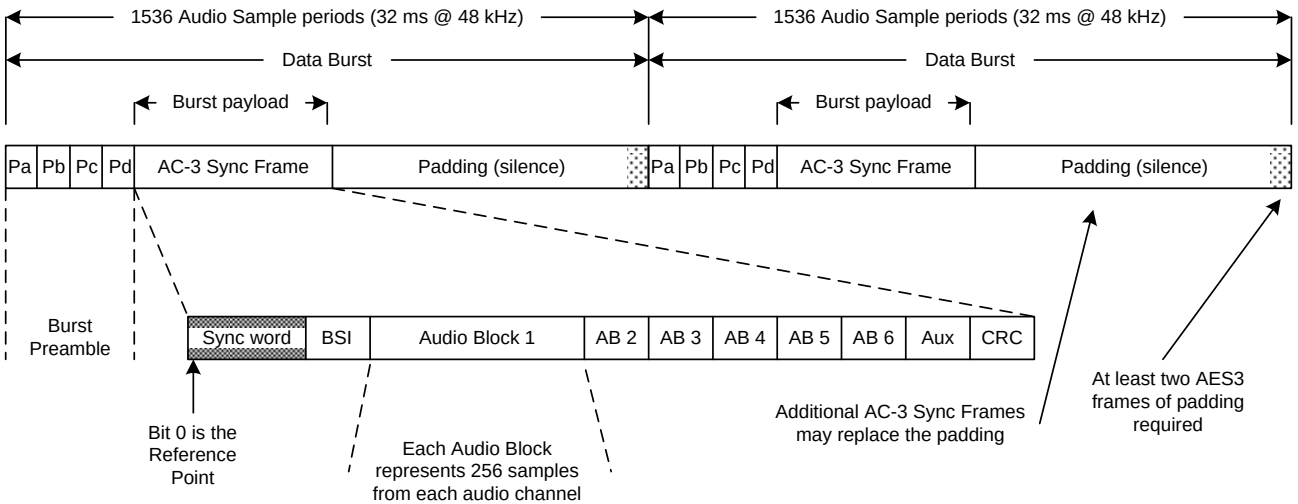


Figure 1 – Structure of an AC-3 Data Burst

4.2 burst_preamble

The Pc word (burst_info value) of the burst_preamble carries the data_type identifier, the data_type_dependent and the data_stream_number information (see SMPTE ST 337, Table 7).