

SMPTE STANDARD

Two-Frame Marker for 48(/1.001)- Hz, 50-Hz, and 60(/1.001)-Hz Progressive Digital Video Signals on 1.5 Gb/s and 3 Gb/s Interfaces



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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 2051 was prepared by Technology Committee 33TS.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. 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 informative and does not form an integral part of this Engineering Document.

Problems can arise in video formats of frame rate Fr that transport $Fr/2$ ancillary data services; 48/(1.001)-Hz, 50-Hz, and 60/(1.001)-Hz progressive video signals are examples of such formats and are the subject of the provisions of this Standard.

There is a 50% chance that a SMPTE RP 168 video switch will cut across the middle of an ancillary data block of length $2Tr = 2/Fr$, causing the entire ancillary data block to fail its continuity check, and be dropped. By forcing video switches to have two-frame (frame pair) granularity aligned with the boundaries between the $2Tr$ -length data blocks of the ancillary data service, this problem can be eliminated.

Other processing functions besides switches may also be dependent on frame pair alignment. These include Ancillary Time Code (ATC), de-interlacing processes that create video distortion with period $2/Fr$, and multi-channel audio program material encoded into data blocks spanning $2/Fr$ and embedded into ancillary data space.

1 Scope

This standard defines a Two-Frame Marker for progressive HDTV video formats at 48/1.001(47.95)-Hz, 48-Hz, 50-Hz, 60/1.001(59.94)-Hz, and 60-Hz frame rates. This Two-Frame Marker is multiplexed into serial streams carrying such a video format to govern the alignment of system actions such as switching to the data block boundaries of embedded ancillary data services having one half the frame rate ($Fr/2$) compared to the video frame rate (Fr). Requirements for use of this Two-Frame Marker are also defined in this standard.

Note1: Users should be aware that equipment manufactured prior to the publication of this standard typically will not comply with its requirements.

Note2: Use of the Two-Frame Marker is optional with progressive video streams at 48/1.001(47.95)-Hz, 48-Hz, 50-Hz, 60/1.001(59.94)-Hz, and 60-Hz frame rates mapped to interlaced serial interfaces at 24/1.001(23.98)-Hz, 24-Hz, 25-Hz, 30/1.001(29.97)-Hz, and 30-Hz frame rates, respectively.

Note3: Use of the Two-Frame Marker is optional with progressive segmented frame video streams at 24/1.001(23.98)-Hz, 24-Hz, 25-Hz, 30/1.001(29.97)-Hz, and 30-Hz frame rates mapped to interlaced serial interfaces at 24/1.001(23.98)-Hz, 24-Hz, 25-Hz, 30/1.001(29.97)-Hz, and 30-Hz frame rates, respectively.

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

Note: All references in this document to other SMPTE documents use the current numbering style (e.g. SMPTE ST 274:2008) although, during a transitional phase, the document as published (printed or PDF) may bear an older designation (such as SMPTE 274M-2008). Documents with the same root number (e.g. 274) and publication year (e.g. 2008) are functionally identical.

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.

SMPTE ST 12-2:2014, Transmission of Time Code in the Ancillary Data Space

SMPTE ST 274:2008, Television — 1920 x 1080 Image Sample Structure, Digital Representation and Digital Timing Reference Sequences for Multiple Picture Rates

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

SMPTE ST 296:2012, 1280 x 720 Progressive Image Sample Structure – Analog and Digital Representation and Analog Interface

SMPTE ST 318:1999, Television and Audio — Synchronization of 59.94- or 50-Hz Related Video and Audio Systems in Analog and Digital Areas — Reference Signals

SMPTE ST 337:2008, Format for Non-PCM Audio and Data in an AES3 Serial Digital Audio Interface

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

4 Definitions

4.1

Transcode

To decode a data service from a video stream and encode it into a video stream of a different format.

4.2

ATC

Ancillary Time Code

4.3

Fr

Frame rate in Hz of a video signal.

4.4

Tr

Frame period in seconds of a video signal; equal to $1/\text{Fr}$.

4.5

Frame Pair

Two time-consecutive frames of a video signal for which there is a first frame and a second frame.