

SMPTE STANDARD

D-Cinema Packaging — DCP Operational Constraints for Additional Frame Rates



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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 Part XIII of its Administrative Practices.

SMPTE ST 429-13 was prepared by Technology Committee 21DC

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.

1 Introduction

This standard provides the additional information necessary for the adoption of additional frame rates as defined by SMPTE 428-11 in a D-Cinema Package.

2 Scope

This document defines the operational constraints required for the use of additional frame rates as defined by SMPTE 428-11 in a D-Cinema Package (DCP).

3 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.

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.

4 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.

SMPTE 428-11-2009, Additional Frame Rates for D-Cinema

SMPTE 429-2-2009, D-Cinema Packaging — Operational Constraints

5 Glossary of Terms and Acronyms

Terms and acronyms used in this document shall be as defined in SMPTE 429-2 and in SMPTE 428-11.

6 DCP Operational Constraints

All non-frame rate related provisions defined in SMPTE 429-2 shall be normative to this standard. This standard defines additional information necessary to provide support for additional frame rates as defined in SMPTE 428-11.

7 Composition Constraints

This section requires the provisions defined in SMPTE 429-2 and the additional frame rates as defined in SMPTE 428-11.

7.1 Edit Rate

The composition may support any one or more of the AFR levels defined in SMPTE 428-11, Table 1. Implementations using this standard shall indicate the values of AFR level that are supported.

Note: The values of AFR level that are supported could be indicated in the technical specification of the implementation.

7.2 Picture Essence Encoding

Picture essence encoding shall be as specified in SMPTE 428-1.

For each of the AFRs listed, the pixel array size and frame rate shall be one of the formats listed in Table 1. Monoscopic picture essence tracks shall have matching frame rate and edit rate. Stereoscopic picture essence tracks shall be limited to the 2K formats and shall have the frame rates of 50/1 or 60/1 with an edit rate equal to half the frame rate ($r_e = r_f / 2$).

Source images having an aspect ratio not listed in Table 1 should be encoded so that the image fills either the horizontal or vertical dimension of the desired full pixel array (2K or 4K). To fill the pixel array in the opposite dimension, the image should be padded with an equal number of black pixels on each side, *i.e.*, "letter-box" (top side, bottom side) or "pillar-box" (left side, right side).

Table 1 – Pixel Array Dimensions

Format	Horizontal Pixels	Vertical Pixels	Frame Rate
2K Scope (2.39:1)	2048	858	25/1, 30/1, 50/1 or 60/1
2K Flat (1.85:1)	1998	1080	25/1, 30/1, 50/1 or 60/1
2K Full (1.90:1)	2048	1080	25/1, 30/1, 50/1 or 60/1
4K Scope (2.39:1)	4096	1716	25/1 or 30/1
4K Flat (1.85:1)	3996	2160	25/1 or 30/1
4K Full (1.90:1)	4096	2160	25/1 or 30/1

7.3 Sound Essence Encoding

The number of sound essence samples per edit unit for each edit unit rate shall be as defined by SMPTE 428-11, Table 2.

Sound essence tracks shall have the parameter values defined in SMPTE 429-2.