SMPTE EG 40:2016
Revision of SMPTE EG 40:2012

SMPTE ENGINEERING GUIDELINE

Conversion of Time Values between SMPTE ST 12-1 Time Code, MPEG-2 PCR Time Base and Absolute Time

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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 EG 40 was prepared by Technology Committee 32NF.

Introduction

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

This Engineering Guideline provides a set of formulas for common time related conversions in the hope that implementers will do these calculations in a similar and interoperable manner.

An earlier revision of this document used the term "absolute time" to refer to time that may be more clearly termed "local wall clock time." This is the time of day in the local time zone typically measured by "the clock on the wall" and not necessarily tightly tied to an International standardized time reference (UTC, GPS, etc.).

Other SMPTE Engineering documents may provide for defined calculations to convert "local wall clock time" to an International standardized time reference (UTC, GPS, etc.).

1 Scope

This guideline specifies a set of formulas for converting between “SMPTE 12M time code” (correctly SMPTE ST 12-1 time code), MPEG-2 systems layer program clock reference (PCR) time base, and local wall clock time. Included are formulas for converting SMPTE ST 12-1 time address values and MPEG-2 PCR time base values to local wall clock time, and formulas for converting SMPTE ST 12-1 time address values directly to/from MPEG-2 PCR time base values. Local wall clock time conversion formulas are useful for converting between different frame rates of SMPTE ST 12-1 time code; e.g., a 24-fps SMPTE time code running at 23.976 fps could be converted to true time and then to a 29.97 drop frame SMPTE time code value. Finally, a discussion of how ST 12-1 time code may be carried within the coded video structures of both MPEG-2 and MPEG-4 AVC is provided.

2 Conformance Notation

This Engineering Guideline is purely informative and meant to provide tutorial information to the industry. It does not impose Conformance Requirements and avoids the use of Conformance Notation.

Engineering Guidelines frequently provide tutorial information about a Standard or Recommended Practice and when this is the case, the user should rely on the Standards and Recommended Practices referenced for interoperability information.

3 Informative References

At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this guideline 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 170:2004, Television — Composite Analog Video Signal — NTSC for Studio Applications

SMPTE ST 272:2004, Television — Formatting AES Audio and Auxiliary Data into Digital Video Ancillary Data Space

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

SMPTE ST 340:2015, 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 Compression Standard for AC-3 and Enhanced AC-3 Data Types

AES11-2009 (r2014): AES Recommended Practice for Digital Audio Engineering — Synchronization of Digital Audio Equipment in Studio Operations

IEC 60461:2010, Time and Control Code

ISO/IEC 14496-2:2004, Information Technology — Coding of Audio-Visual Objects — Part 2: Visual

Recommendation ITU-R BT.1700 (02/2005), Characteristics of Composite Video Signals for Conventional Analogue Television Systems

Recommendation ITU-T H.222.0 | ISO/IEC 13818-1 (2014), Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Systems

Recommendation ITU-T H.262 | ISO/IEC 13818-2 (2012), Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Video

Recommendation ITU-T H.264 | ISO/IEC 14496-10 (2014), Advanced Video coding for Generic Audiovisual Services