

Encoding Film Transfer Information Using Vertical Interval Time Code



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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. This SMPTE Engineering Document was prepared by Technology Committee S22.

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 Scope

This practice specifies a method of encoding video tape time code, film edge numbers, and production time code into three vertical interval time code lines. This practice is intended for use in post-production as a means of conveying the essential address elements that define the film to tape transfer. Normally this information will not be in the final program version. This practice defines the encoding in two parts; the first part specifies the data that will be encoded and the second part specifies specific methods of encoding the data into three vertical interval lines for analog and digital video signals, and into digital video ancillary data time code.

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.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

SMPTE 12M-1-2008, Television — Time and Control Code

SMPTE 12M-2-2008, Television — Transmission of Time Code in the Ancillary Data Space

SMPTE 254-2008, Motion-Picture Film (35-mm) — Manufacturer-Printed Latent Image Identification Information

SMPTE 266M-2002, Television — 4:2:2 Digital Component Systems — Digital Vertical Interval Time Code

SMPTE 270-2008, Motion-Picture Film (65-mm) — Manufacturer-Printed Latent Image Identification Information — 80 Perforation Repeat

SMPTE 271-2008, Motion-Picture Film (16-mm) — Manufacturer-Printed Latent Image Identification Information

SMPTE 313-2008, Motion-Picture Film (65-mm) — Manufacturer-Printed Latent Image Identification Information — 120 Perforation Repeat

SMPTE RP 195-2004, Use of the Reference Mark in Manufacturer-Printed Latent Image Key Numbers for Unambiguous Film Frame Identification

4 Definitions and Glossary

4.1 Terms Defined by SMPTE 254, SMPTE 270, SMPTE 271, and SMPTE 313

4.1.1 key number: A number, sometimes referred to as an edge number or footage number, that is printed with ink or exposed onto the film at the time of manufacture. The numbers are placed at regular intervals — typically one foot. Film that conforms to SMPTE 254, SMPTE 270, SMPTE 271, or SMPTE 313 use a 12-character alphanumeric key number. For the purposes of this practice, references to key number will refer to the machine-readable key number.

4.1.2 key number repetition rate: The interval at which key numbers repeat on the film stock, measured in perforations.

4.2 Terms Defined by SMPTE RP 195

4.2.1 frame repetition rate: The interval at which exposed film images occur along the film, measured in perforations.

4.3 Terms Defined by This Practice

4.3.1 film feet: The least significant 4 digits of the key number. This number increments every n frame where n is calculated by dividing the key number repetition rate by the frame repetition rate.

4.3.2 film prefix: The part of the key number that is not contained in film feet. This number is used to identify the stock or batch of film. Normally this number does not increment during a single roll of film.

4.3.3 film frame offset: This is the frame offset away from the key number. It is not included as part of the key number. SMPTE RP 195 specifies the procedure for unambiguously identifying the film frame numbers from exposed latent-image key numbers.

4.3.4 feet frame count: This is the number of film frames in the current film foot. For film formats where the key number repetition rate is not evenly divisible by the frame repetition rate, the feet frame count identifies which foot has an extra frame.

5 Definition of the Data Blocks

The encoded data are split into three distinct blocks of data — video tape data, film data, and production data.

5.1 Video Tape Data Block

The video tape data block contains the video tape time information in the time bits. The frame rate of this time code will be 25 frame-per-second time for 625/50 systems, and 29.97 frame-per-second drop frame or nondrop frame for 525/60 systems.

The contents of the user bits will be the VTR user bits or video tape reel number, or any arbitrary hexadecimal values.

5.2 Film Data Block

The film data block contains the key number information from the film, as well as information specifying the film format and pulldown of the transferred frame.

The time bits of the film data block are used to store the pulldown flags, film manufacturer, film gauge, emulsion type, and part of the film prefix. The user bits contain the remainder of the film prefix, the film feet, the film frame offset, and the feet frame count.

Film manufacturer and type IDs are encoded as a hexadecimal nibble. Film emulsion, prefix, and footage are encoded as a pair of packed BCD digits. Frame count is encoded as a binary number. The remainder of the information is bitmap encoded as shown in Tables 1 to 5.

<u>Name</u>	<u>Contents</u>
Pulldown	A bitmapped nibble comprised of three pulldown flags plus the video field flag. The three pulldown flags, PD1, PD2, and PD3, encode the pulldown of the film frame with respect to the video (see tables 2 to 5). The field flag FLD encodes video field information required to make the pulldown complete (0 is encoded for field 1, 1 is encoded for field 2).
Film manufacturer and type ID	A hexadecimal nibble which describes the manufacturer and the type of film being used (see Table 1).
Film emulsion type	A packed BCD digit pair containing the film emulsion type corresponding to the encoded values recovered from the machine-readable bar code (and not the letter codes on the human-readable part of the edge number). When ink numbers are used, the film emulsion type contains the decimal ASCII values of the letter suffix in the ink number prefix. If no letter suffix is used, the decimal ASCII for a space (32) shall be encoded.
Film prefix	Six BCD digits containing the film prefix.
Film feet	Four BCD digits containing the film feet.
Feet frame count	Two bits (FFC2 and FFC1) containing the feet frame count (see Table 1).
Film frame offset	Six bits containing the film frame offset.

5.2.1 Film manufacturer and type ID

See Table 1.