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SMPTE RECOMMENDED PRACTICE

RP 195-2004
Revision of RP 195-1998

Use of the Reference Mark in Manufacturer-Printed Latent Image Key Numbers for Unambiguous Film Frame Identification

1 Scope

This practice specifies the procedure for unambiguously identifying film frames which have been exposed on film stock carrying latent-image key numbers of an incompatible repetition rate.

Particular examples are the identification of 35-mm 3-perforation frames on stock conforming to SMPTE 254, and the identification of 65-mm 15-perf frames on stock conforming to ANSI/SMPTE 270. The procedure is quite general and may be extended to other frame sizes on other film stocks.

This practice also specifies a standard notation for film positions identified according to this practice. The standard notation is used in relevant SMPTE practices for film-to-tape transfer and negative conforming.

2 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 listed below.

ANSI/SMPTE 270-1994, Motion-Picture Film (65-mm) — Manufacturer-Printed, Latent Image Identification Information

SMPTE 12M-1999, Television, Audio and Film — Time and Control Code

SMPTE 254-2002, Motion-Picture Film (35-mm) — Manufacturer-Printed, Latent Image Identification Information

SMPTE 258M-2004, Television — Transfer of Edition Decision Lists

SMPTE 313-1999, Motion-Picture Film (65-mm) — Manufacturer-Printed, Latent Image Identification Information — 120 Perforation Repeat

SMPTE RP 194-2004, Film Negative Cutter's Conform List

SMPTE RP 197-2003, Film-to-Video Transfer List

3 Definitions and glossary

3.1 Terms defined by SMPTE 254 and ANSI/SMPTE 270

3.1.1 key number: A number, sometimes referred to as an edge number or footage number, that is printed with ink or exposed onto film at the time of manufacture. The numbers are placed at regular intervals, typically

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one foot. This practice is concerned only with key numbers which are exposed onto the film at the time of manufacture, so-called latent image key numbers.

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

3.1.3 mid-foot key number: The primary key numbers occur at the repetition rate and define the start of each foot. Mid-foot key numbers are additional numbers which appear at regular intervals between the primary key numbers. They are distinguished from the primary key numbers by additional perforation counts. Mid-foot key numbers do include a reference mark, but it is not used to provide any reference information in this practice.

3.1.4 reference mark: A mark, usually a dot, which is included in the latent image of the key number and which is aligned to a perforation on the film.

3.2 Term defined by SMPTE RP 197

3.2.1 edge number period: An informational directive in the film transfer list which states both the key number repetition rate and the frame repetition rate for each roll.

3.3 Terms defined by this practice

3.3.1 film feet edge number: The string of characters which defines a single film frame, including the perf offset, and is both human and machine readable. This practice defines the format of a film feet edge number which includes a perf offset. The syntactic definition of a film feet edge number is given in this practice.

3.3.2 frameline: The junction between two exposed film images on the film.

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

3.3.4 perf offset: The count of the number of perforations from the frameline to the reference mark (the count includes the perforation adjacent to the reference mark). This practice specifies the procedure for determining the perf offset on any given exposed film format.

4 Use of a reference mark

4.1 General principles and method

SMPTE 254 and ANSI/SMPTE 270 provide for the inclusion of a reference mark within the manufacturer-printed latent image identification information. The alignment of the frameline at the start of a film foot is illustrated in figure 1, for the perfect case of 4-perforation film frames exactly aligned on stock conforming to SMPTE 254, and in figure 2 for the more general case of the same images and stock, and in figure 3 for the case of 65-mm 5-perforation images on stock conforming to ANSI/SMPTE 270.

Note that in all figures, the film is shown as it would appear on a cutting table, with emulsion towards the viewer and heads to the right. Frame numbers are shown oriented as if they were part of the original image.

To identify film frames unambiguously, this practice defines the perf offset as the count of the number of perforations from the frameline to the reference mark at the start of the foot. As defined in clause 5, the notation for the film frame pointed to in figure 2 would be: XX 99 1234 5678+00 P2.

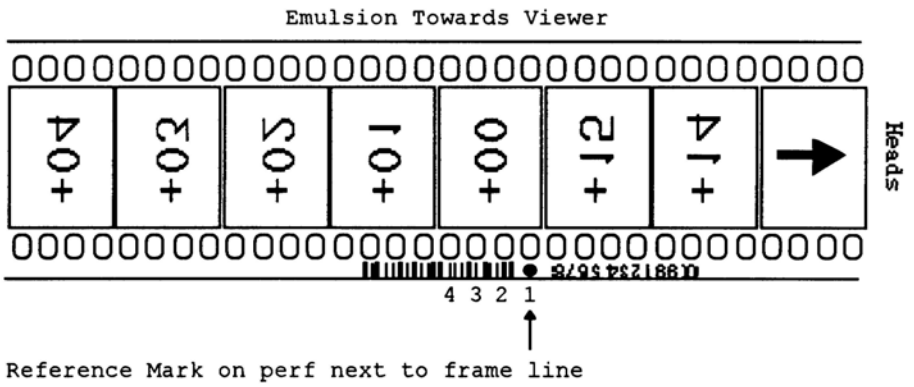

Figure 1 – 35-mm 4-perforation perfect case

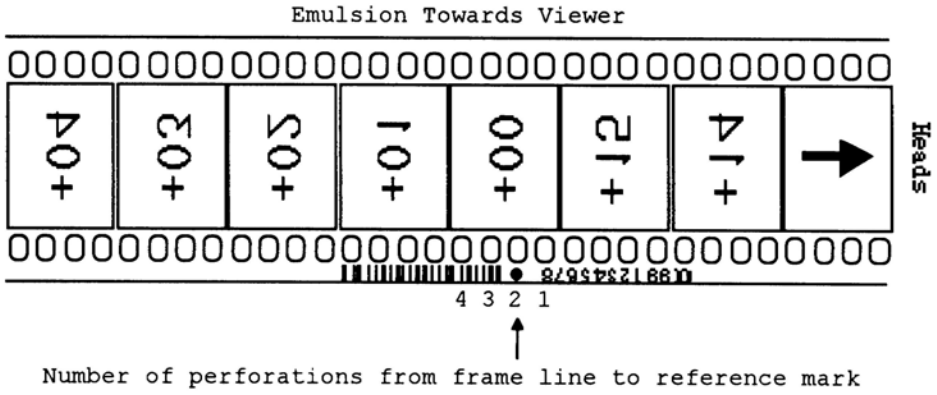

Figure 2 – 35-mm 4-perforation general case

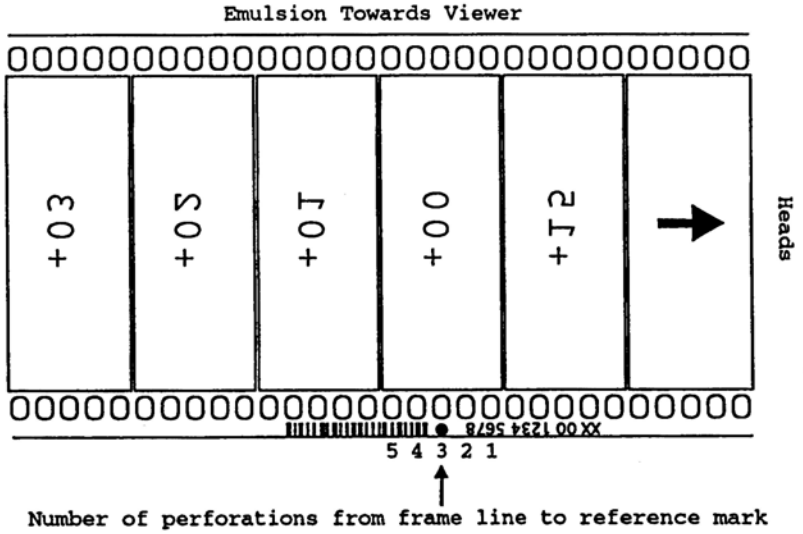

Figure 3 – 65-mm 5-perforation general case

4.2 35-mm 3-perforation images

In the case of 35-mm 4-perforation images, there is no ambiguity as to the film frame, so it is not necessary to use this notation. However, in the case of 35-mm 3-perforation images, ambiguity may exist, as shown in figures 4, 5, and 6 for three consecutive feet of film. The ambiguity arises because key numbers conforming to SMPTE 254 have a repetition rate of 64 perforations, and 64 is not evenly divisible by 3.

In numbering the frames of 35-mm 3-perforations, by convention, the first foot and second foot each include 21 frames, numbered +00 through +20, and the third foot includes 22 frames, numbered +00 through +21. However, the key numbers by themselves give no information to determine which is the first foot, second foot, and so on. Without such information, it is not possible to calculate the duration of a film clip, since it is not known whether the clip spans film feet containing 21 or 22 frames.

This practice defines the first foot as the foot in which the reference mark appears at the first perforation after the frameline at the start of the foot, as shown in figure 4.

The perf offset of the frame at the start of a foot is the count of the number of perforations from the frameline to the reference mark. For any frame within a foot, the perf offset is the perf offset of the next key number towards the head of the film clip.

Note that if the film has been exposed "tails out," so that the sequence of key numbers decreases from head to tail of a clip, the perf offset is still obtained from the key number towards the head, which in this case is one greater than the key number of the foot in which the frame appears.

4.3 65-mm 15-perforation images on ANSI/SMPTE 270 stock (80-perf key number)

In the case of 65-mm 15-perforation images on ANSI/SMPTE 270 stock (which has a key number repetition rate of 80 perfs), ambiguity may exist, as shown in figures 7, 8, and 9 for three consecutive feet of film. The ambiguity arises because key numbers conforming to ANSI/SMPTE 270 have a repetition rate of 80 perforations, and 80 is not evenly divisible by 15.

Note that this ambiguity does not arise for 65-mm 15-perforation images on film stock with 120-perforation key number repetition rate.

In numbering the frames of 65-mm 15-perforation on film stock with 80 perf key number repetition rate, by convention, the first foot and second foot each include 5 frames, numbered +00 through +04, and the third foot includes 6 frames, numbered +00 through +05. However, the key numbers by themselves give no information to determine which is the first foot, second foot, and so on. Without such information, it is not possible to calculate the duration of a film clip, since it is not known whether the clip spans film feet containing 5 or 6 frames.

In the case of 65-mm 15-perforation on ANSI/SMPTE 270 stock (80 perforation), this practice defines the first foot as the foot in which the reference mark appears within the first 5 perforations from the frameline.

4.4 Other combinations of key number and frame repetition rate

In the general case of key number repetition rate K and frame repetition rate R, this practice defines the first foot as the foot in which the reference mark appears within the first K-modulo-R perforations.

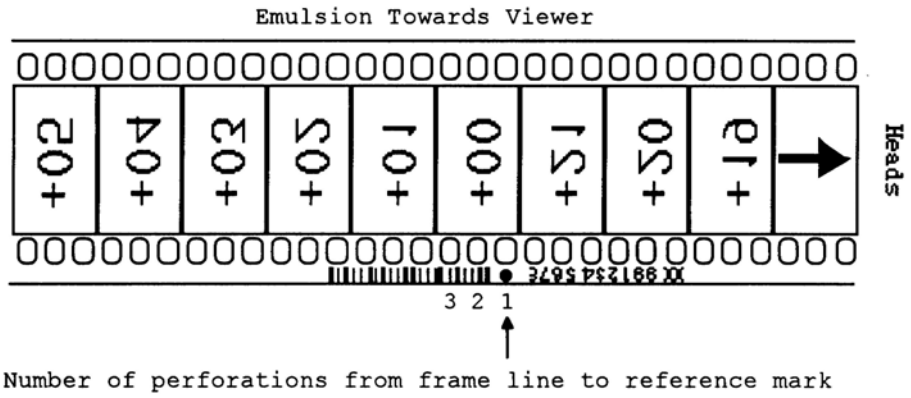

Figure 4 – 35-mm 3-perforation general case – First foot

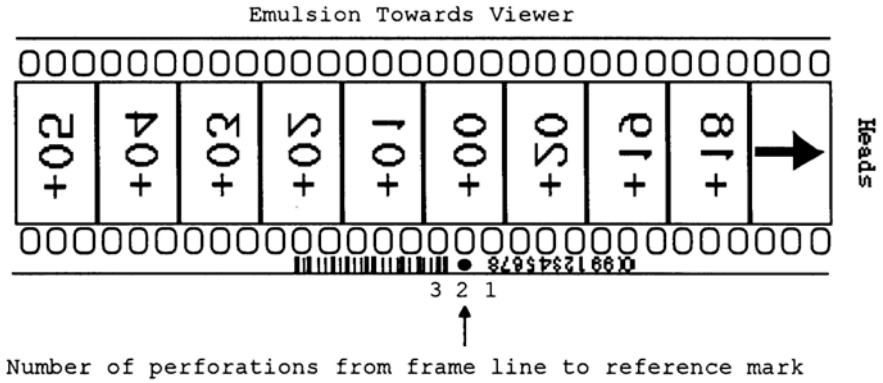

Figure 5 – 35-mm 3-perforation general case – Second foot

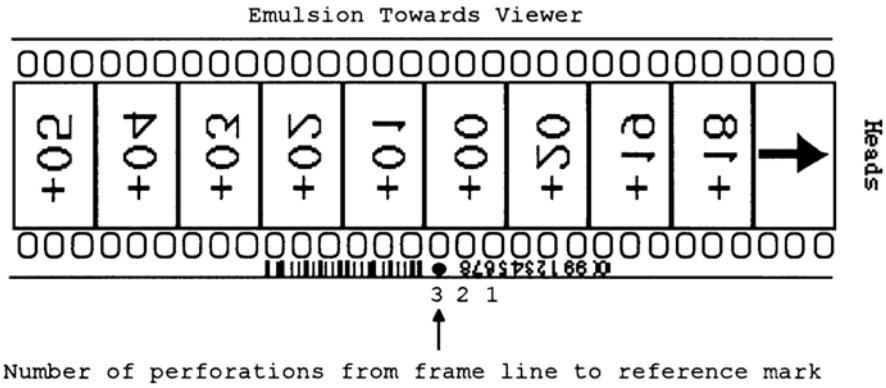

Figure 6 – 35-mm 3-perforation general case – Third foot

5 Film feet edge number notation

When a film frame has been identified by the procedures described above, resulting in a value for that frame's perf offset, and it is required to identify that frame in a film transfer list or other list (such as a negative cutter's conform list), the notation used shall be that of a film feet edge number, defined as follows:

FILM_FEET_EDGE_NUMBER:
FILM_FEET_BAR_NUMBER
| FILM_FEET_LHR_NUMBER

FILM_FEET_BAR_NUMBER:
$\{DIGIT\}_4$ SEPARATOR KEY_NUM PLUS_MINUS FILM_FRAME [PERF_SPEC]

FILM_FEET_LHR_NUMBER:
$\{ALPHA\}_2$ SEPARATOR KEY_NUM PLUS_MINUS FILM_FRAME [PERF_SPEC]

KEY_NUM: $\{DIGIT\}_2$ SEPARATOR $\{DIGIT\}_4$ SEPARATOR KEY_FEET

KEY_FEET: $\{DIGIT\}_4$

PLUS_MINUS: "+" | "-"

FILM_FRAME: $\{DIGIT\}_2$

PERF_SPEC: [SEPARATOR] "P" $\{DIGIT\}_{1..2}$

5.1 Syntax

The syntax above uses modified Backus-Naur form (BNF), as described in SMPTE 258M.

5.2 Example

According to this notation, the fifth frame of the foot of 35-mm 3-perforation with key number XA 43 4247 1932, which is also the first foot of the 3-foot sequence, would be: XA 43 4247 1932+04 P1.

5.3 Semantics and notes

This notation is used when a perf offset is known. The perf offset is recorded in the PERF_SPEC specifier. The PERF_SPEC specifier is mandatory for film formats where a perf offset is required. The SMPTE RP 197 film transfer list (FTL) allows for FILM_FEET_EDGE_NUMBERs for film formats which have no need of a perf offset; these formats do not include a PERF_SPEC specifier.

Note that this syntax of FILM_FEET_EDGE_NUMBER does not include alternate ink number and latent character formats; these alternatives are defined within the FTL. The definition given here also allows for positive and negative frame offsets from start of foot - however, negative offsets are disallowed in the FTL and are constrained within the SMPTE RP 194 negative cutter's conform list.

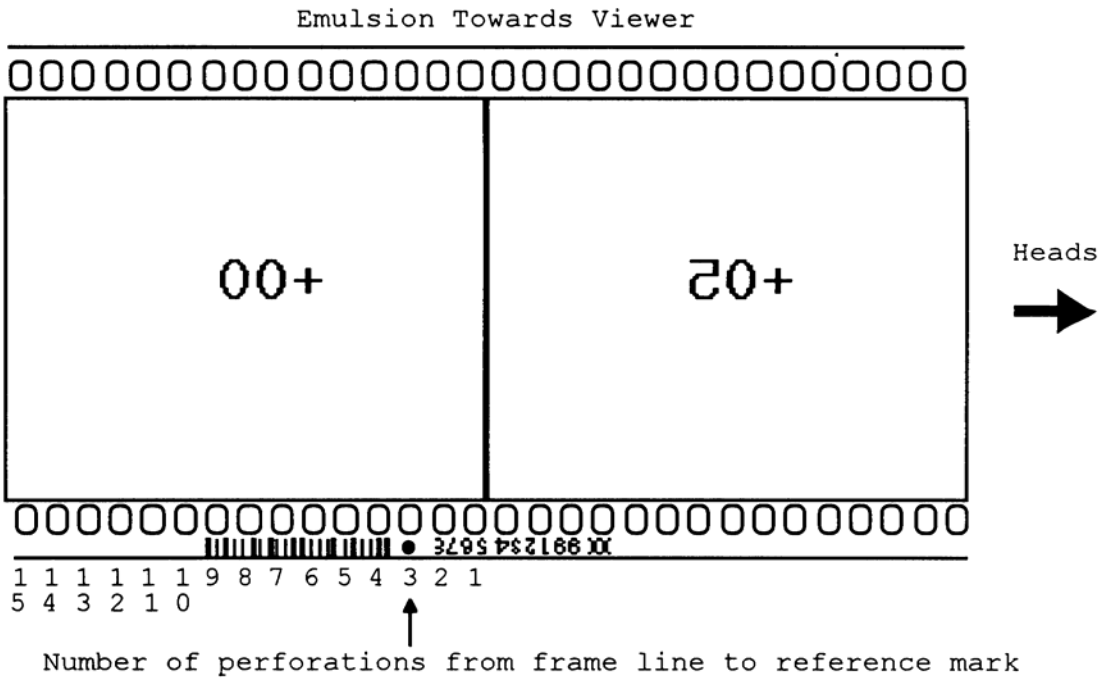

Figure 7 – 65-mm 15-perforation general case - First foot

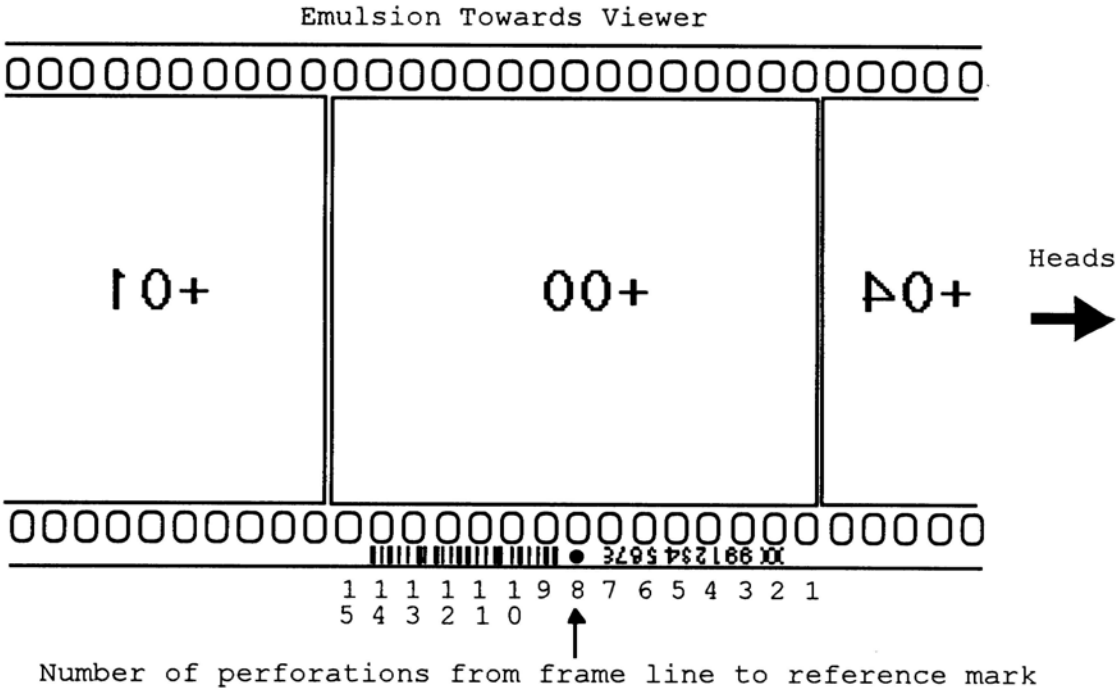

Figure 8 – 65-mm 15-perforation general case -- Second foot

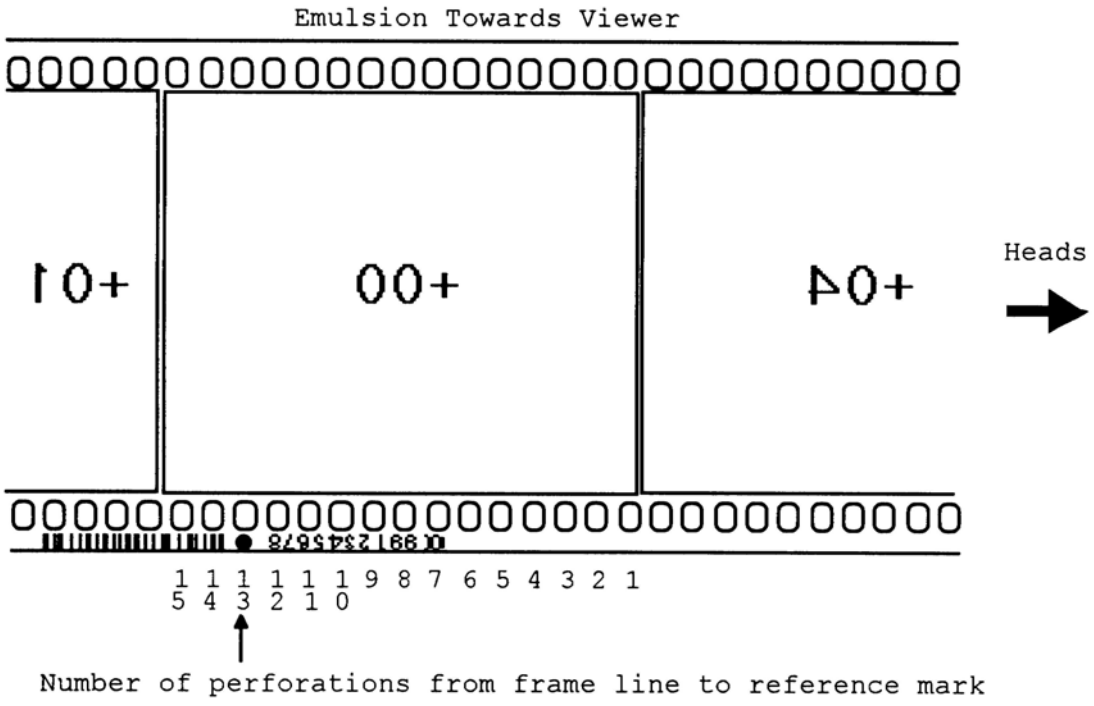

Figure 9 – 65-mm 15-perforation general case – Third foot