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SMPTE RECOMMENDED PRACTICE

Implementation of 24P, 25P and 30P Segmented Frames for 1920 × 1080 Production Format



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1 Scope

This practice defines the changes to SMPTE 274M to implement various 1920 × 1080 progressive systems

in their segmented frame format: 24sF, 25sF, and 30sF. Only the changes to the appropriate clauses of SMPTE 274M are contained herein. The same clause, table, and figure numbering system, as used in SMPTE 274M, is employed in this practice.

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.

Same as in SMPTE 274M.

ITU-R BT.709-4, Parameter Values for the HDTV Standards for Production and International Programme Exchange

3 General

Same as in SMPTE 274M.

Additions to table 1 – Scanning systems

	System nomenclature	Samples per active line (S/AL)	Active lines per frame	Frame rate (Hz)	Scanning format	Interface sampling frequency fs (MHz)	Samples per total line (S/TL)	Total lines per frame
12	1920 × 1080/30 (sF)	1920	1080	30	Progressive (sF)	74.25	2200	1125
13	1920 × 1080/29.97 (sF)	1920	1080	$\frac{30}{1.001}$	Progressive (sF)	$\frac{74.25}{1.001}$	2200	1125
14	1920 × 1080/25 (sF)	1920	1080	25	Progressive (sF)	74.25	2640	1125
15	1920 × 1080/24 (sF)	1920	1080	24	Progressive (sF)	74.25	2750	1125
16	1920 × 1080/23.98 (sF)	1920	1080	$\frac{24}{1.001}$	Progressive (sF)	$\frac{74.25}{1.001}$	2750	1125

4 Scanning

4.6 A segmented frame system shall scan a frame as a first field then as a second field, in which the scan lines of each field have twice the vertical spatial sampling pitch of the frame. Scanning lines in the second field shall be displaced vertically by the vertical sampling pitch, but the scanning time shall be the same temporally as that of scanning lines in the first field.

The first field shall convey 540 active picture lines, starting with the top picture line of the frame. The second field shall convey 540 active picture lines, ending with the bottom picture line of the frame.

5 System colorimetry

SAME as in SMPTE 274M.

6 Raster structure

NOTE ON INTERLACED AND SEGMENTED FRAME VERSIONS – All of the scanning systems defined in this practice and in SMPTE 274M use a total of 1125 lines per picture. In an analog-only system, this would normally imply that the interlaced versions would divide this total into two equal-length fields of 562½ lines each. However, because a digital interface must also be supported, only whole numbers of lines in each field are allowed, in order to permit unambiguous identification of lines by the digital timing reference sequences (see clause 8). Therefore, the interlaced and segmented frame versions define integer, and hence unequal, numbers of lines (563 and 562) in each of the two fields comprising one frame. Analog vertical sync sequences, however, must remain equally spaced in time and are therefore not fully aligned to the fields as defined for the digital interface. This results in the analog vertical sync for the second digital field beginning one half-line before the end of the first digital field.

6.1 For details of vertical timing, see figures 1 and 2.

6.4 According to this practice, in a segmented frame system, the assignment of lines within a frame shall be the same as that of an interlaced system. More specifically, the assignment of each even line of a progressive system shall correspond to lines 1 through 562 of a segmented frame system, and each odd line of a

progressive system shall correspond to lines 563 through 1125 of a segmented frame system. In general, the relationship of line N of a progressive system and line M of a segmented frame system shall be shown as follows:

Line number of a progressive system:	N	2, 4., 6, ..., 1124	1,3,5, ..., 1125
Line number of a segmented frame system:	M	$M = N/2$	$M = (N+1125)/2$

For this reason, it is clear that the top active line of the progressive system, line 42, corresponds to the top active line of the segmented frame system, line 21. Also, according to the same relation above, line 1 of the progressive system corresponds to line 583 of the segmented frame system and line 2 of the progressive system corresponds to line 1 of the segmented frame system.

NOTE – Clause 6.4 applies to 30, 29.97, 25, 24, and 23.98 systems only (systems 12 through 16 of table 1).

6.5 Ancillary signals may be conveyed in a progressive system during lines 7 through 41 inclusive, and in an interlaced and segmented frame system during lines 7 through 20 inclusive and lines 569 through 583 inclusive. The portion within each of these lines that may be used for ancillary data is defined in 9.3. Ancillary signals shall not convey picture information although they may be employed to convey other related or unrelated signals, coded similarly to picture information. Further specification of ancillary signals is outside the scope of this practice.

6.10 The center of the picture shall be located at the center of the clean aperture (and of the production aperture), midway between sample number 959 and 960, and midway between lines 581 and 582 in a progressive system, and midway between lines 291 and 853 in an interlaced and segmented frame system.

7 Digital representation

7.3 R'G'B' signals and Y' signals shall have bandwidth nominally 60 MHz for systems 1, 2, and 3 in table 1 and 30 MHz for systems 4 through 16 in table 1. C'B C'R signals shall have bandwidth nominally half that of the associated Y' signal.