PROPOSED SMPTE STANDARD

SMPTE 301

for Motion-Picture Film —

Theater Projection Leader, Trailer and Cue Marks

1 Scope

This standard specifies the make-up or assembly of leaders and cue marks for 70-, 35-, and 16-mm motion-picture release prints for use in motion-picture theaters and screening rooms.

2 Normative reference

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

SMPTE RP 65-1995, Motion-Picture Enlargement/Reduction Ratios

3 Reduction ratio

The reduction ratio in the production of the head and foot leaders from 35-mm motion-picture film to 16-mm motion-picture film shall be in accordance with SMPTE RP 65.

4 General specifications

4.1 Orientation and dimensions of letters and numerals in this standard are with respect to 35-mm motion-picture film and are modified proportionally for 70-mm and 16-mm prints in accordance with SMPTE RP 65.

4.2 Information appearing in the leader which is printed lengthwise (in the direction of film travel) shall read from left to right when viewed from the projection lens towards the projector light source with the head end of the film at the right. Information appearing in the leader which is printed upright shall read normally when the reel is uppermost and the head of the film hangs down ready for threading (see figures 1 and 5 for orientation of information).

4.3 All frames in the head leader and trailer leader identification sections (see 5.3 and 7.3) and in frames 1 through 171 of the head leader synchronizing section (see 5.4) shall be masked to the nominal anamorphic projection aperture (0.825 in [20.96 mm] × 0.690 in [17.53 mm]) with clear framelines nominally the height of anamorphic projection aperture framelines (0.061 in [1.55 mm]). Frames 172 through 218 of the head leader synchronizing section and frames 1 through 87 of the trailer leader runout section shall be masked to the nominal anamorphic camera aperture (0.864 in [21.95 mm] × 0.732 in [18.59 mm]) with clear framelines nominally the height of anamorphic camera aperture framelines (0.016 in [0.41 mm]).

4.4 Since many types of film may be used for leaders, exact neutral densities have not been specified. For the purpose of this standard, the following approximate neutral densities are referred to:

– clear (neutral density less than 0.35);

– black (neutral density greater than 1.95).

5 Head leader (see figure 1)

5.1 Protective section

The protective section of the leader shall consist of a minimum of 8 linear feet (2.44 m) of transparent or raw stock. When the protective leader has been reduced to a length of 6 linear feet (1.83 m), it shall be restored to its original length. Logos, trademarks, part titles, or other extraneous materials, if absolutely necessary, should be placed in this section.

5.2 Splicing frame

A single frame with the upright words "SPLICE HERE" and an arrow pointing to the frameline between this frame and frame 1 of the identification section to indicate where the protective section joins the identification section. The letters should be at least 1/8 in (3.2 mm) high.

5.3 Identification section

The identification section of the leader shall be 43 frames in length. The identification section of the head leader, when viewed as specified in 4.2, shall be made up as follows:

Frame 1 – Black.

Frame 2 – The word "BEG" with letters 7/16 in (11.1 mm) high printed upright in the center of the frame, clear on black background.

Frame 3 – Black.

Frame 4 – The word "of" with letters 3/32 in (2.4 mm) high printed lengthwise in the center of the frame, clear on black background.

Frame 5 – Black.

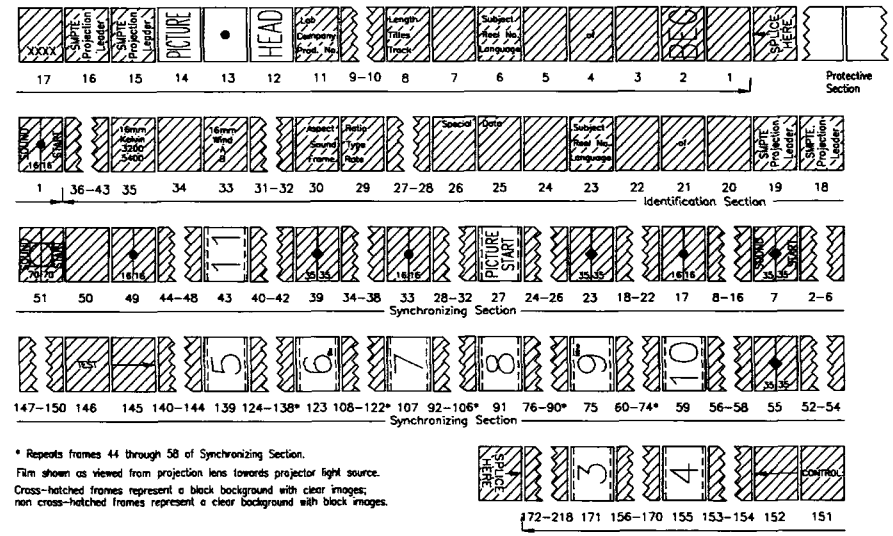

Figure 1 – Head leader

Frame 6 – The words "Subject," "Reel No.," and "Language" with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background.

Frame 7 – Black.

Frame 8 – The words "Length," "Titles," and "Track" with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background.

Frames 9-10 – Black.

Frame 11 – The words "Lab," "Company," and "Prod No." with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background.

Frame 12 – The word "HEAD" nominally 3/8 in (9.5 mm) high printed upright in the center of the frame, black letters on clear background.

Frame 13 – A 1/8-in (3.2-mm) diameter block dot in the center of the frame on clear background.

Frame 14 – The word "PICTURE" nominally 3/8 in (9.5 mm) high printed upright in the center of the frame, black letters on clear background.

Frames 15-16 – Two frames in which the words "SMPTE Projection Leader" are printed upright in clear letters on a black background. Letters shall not be less than 1/8 in (3.2 mm) high.

Frame 17 – Four letter "X"s, printed in a lengthwise line adjacent to 35-mm analog photographic audio record, approximately 5/16 in (7.9 mm) from the 35-mm camera aperture centerline toward 35-mm analog photographic audio record. Letters shall be 1/8 in (3.2 mm) high and 1/8 in wide, clear on black background.

Frames 18-19 – Same as frames 15-16.

Frames 20-23 – Same as frames 3-6.

Frame 24 – Black.

Frames 25-26 – The words "Special Data" with letters 3/32 in (2.4 mm) high printed lengthwise along the edge of the frame opposite the sound track area, clear on black background, starting in the 26th frame.

Frames 27-28 – Black.

Frames 29-30 – The words "Aspect Ratio," "Sound Type," and "Frame Rate" with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background, starting in the 30th frame and in three separate lengthwise lines.

Frames 31-32 – Black.

Frame 33 – The words "16-mm," "Wind," "A," and "B" with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background.

Frame 34 – Black.

Frame 35 – The words "16-mm," "Kelvin," "3200," and "5400" with letters 3/32 in (2.4 mm) high printed lengthwise, clear on black background.

Frames 36-43 – Black.

5.4 Synchronizing section

The synchronizing section of the leader shall be 218 frames in length.

5.4.1 The words and numerals indicating 16-frame units in the synchronizing section shall have the vertical dimension of the 1.85:1 projection aperture (0.446 in [11.3 mm]). The orientation of the words and numerals shall be upright. These frames (27, 43, 59, 75, 91, 107, 123, 139, 155, and 171) shall have dashed lines to indicate the 1.37:1 projection aperture height (0.600 in [15.25 mm]).

5.4.2 The synchronizing section, when viewed as specified in 4.2, shall be made up as follows:

Frame 1 – The 16-mm sound indication; the numeral "16" printed lengthwise in clear letters on a black background on both sides of a clear horizontal line with a clear dot of 1/8 in (3.2 mm) diameter in the center of the frame (as shown in figure 2). The line shall extend to the edges of the frame. This frame is repeated every 16 frames to frame 129 (see note).

Frames 2-6 – Black.

Frame 7 – The 35-mm sound indication; the numeral "35" printed lengthwise in clear letters on a black background on both sides of a clear horizontal line with a clear diamond at least 3/16 x 3/16 in (4.76 mm) in the center of the frame (as shown in figure 3).

The line shall extend to the edges of the frame. This frame is repeated every 16 frames to frame 135 (see note).

Frames 8-16 – Black.

Frame 17 – Same as frame 1.

Frames 18-22 – Black.

Frame 23 – Same as frame 7.

Frames 24-26 – Black.

Frame 27 – The words "PICTURE START" printed upright in black on a clear background. The letters shall be 3/16 in (4.8 mm) high. The total vertical dimensions of the words shall be as described in 5.4.1. Visual countdown begins with this frame.

Frames 28-32 – Black.

Frame 33 – Same as frame 1.

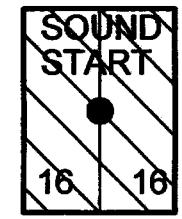

Figure 2 – 16-mm sound start identification frame

Frames 34-38 – Black.

Frame 39 – Same as frame 7.

Frames 40-42 – Black.

Frame 43 – The numeral "11" printed upright in black on a clear background, dimensions as described in 5.4.1.

Frames 44-48 – Black.

Frame 49 – Same as frame 1.

Frame 50 – Black.

Frame 51 – The 70-mm sound indication; the numeral "70" printed lengthwise in clear letters on a black background on both sides of a clear horizontal line with a clear circle of 3/8 in (9.5 mm) diameter within a clear square 3/8 in x 3/8 in (9.5 mm) in the center of the frame (as shown in figure 4). This frame is repeated every 16 frames to frame 131 (see note).

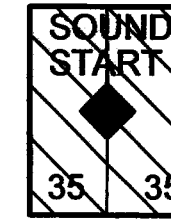

Figure 3 – 35-mm sound start identification frame

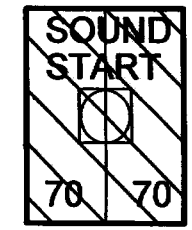

Figure 4 – 70-mm sound start identification frame

Frames 52-54 – Black.

Frame 55 – Same as frame 7.

Frames 56-58 – Black.

Frame 59 – The numeral "10" printed upright in black on a clear background; dimensions as described in 5.4.1.

Frames 60-139 – Continuation of the sequence described from frame 44 to frame 59, inclusive, with the 16-frame units counting down. The numeral "9" shall be superscripted with the word "Nine." The numeral "6" shall be superscripted with the word "Six."

Frames 140-144 – Black.

Frames 145-152 – Eight frames labeled with clear arrows in frames 145 and 152 and the words "Control Test" printed lengthwise in clear letters on a black background to indicate the position in the leader where one to eight frames may be removed and a similar number of control frames spliced in.

Frames 153-154 – Black.

Frame 155 – The numeral "4" printed upright in black on a clear background; dimensions as described in 5.4.1.

Frames 156-170 – Black.

Frame 171 – The numeral "3" printed in black on a clear background; dimensions as described in 5.4.1.

Frames 172-218 – Black.

NOTE – Frames 1, 7, and 51 only shall also contain the words "SOUND START" printed lengthwise in clear letters 1/8 in (3.2 mm) high (see figures 2, 3, and 4).

5.5 Splicing frame

One additional frame shall follow with the inverted upright words "SPLICE HERE" as shown in figure 1, and an arrow pointing to a clear frameline between frame 218 and this frame to indicate where the synchronizing section joins the picture section. The letters should be at least 1/8 in (3.2 mm) high.

6 Picture section (see figure 5)

6.1 Picture

It is recommended that picture action start and finish on fades wherever possible. Otherwise, significant audio should be kept at least 80 frames from the start and finish of the picture.

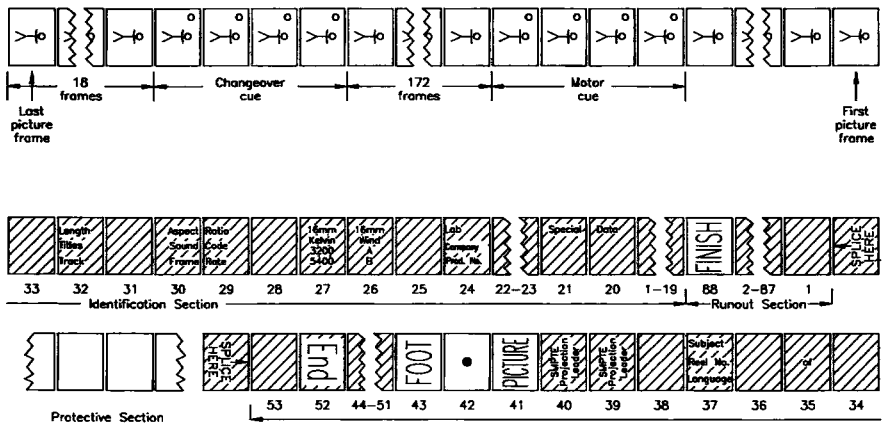

Figure 5 – Picture and trailer leader

6.2 Motor cue

The motor cue shall consist of black circles or clear circles, printed from a negative which has had four consecutive frames marked as shown in figures 6, 7, and 8 for 16-mm, 35-mm, and 70-mm films, respectively. The position and dimensions of this mark shall be as given in table 1. Following the four frames containing the motor cue, there shall be 172 frames to the beginning of the changeover cue.

6.3 Changeover cue

The changeover cue shall consist of four frames containing circles of the same dimensions and position on the frame as those in the motor cue. Following the four frames of the changeover cue, there shall be 18 frames to the beginning of the runout section of the trailer.

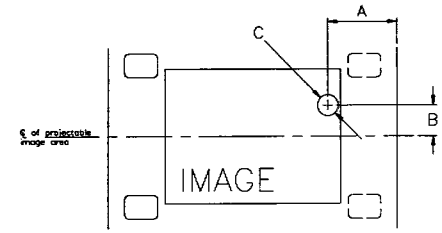

Figure 6 – 16-mm cue marks

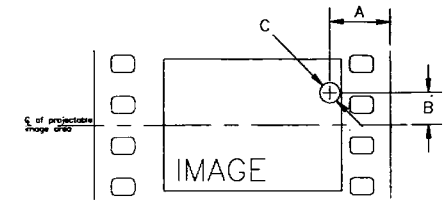

Figure 7 – 35-mm cue marks

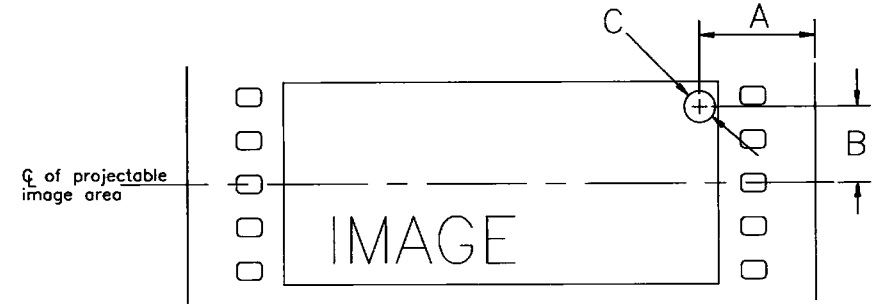

Figure 8 – 70-mm cue marks

Table 1 – Position and dimensions of cue marks

Dimensions		16-mm film		35-mm film		70-mm film	
		in	mm	in	mm	in	mm
A	Center of cue mark to edge of film	0.149	3.78	0.281	7.14	0.500	12.70
B	Center of cue mark to horizontal centerline of projectable image area	0.068	1.73	0.148	3.76	0.327	8.31
C	Diameter of cue mark	0.043	1.09	0.094	2.39	0.136	3.45

7 Trailer (foot) leader (see figure 5)

7.1 Splicing frame

A single frame with the upright words "SPLICE HERE" and an arrow pointing to the clear frameline shall precede frame 1 of the runout section to indicate where the runout section joins the picture section. The letters should be at least 1/8 in (3.2 mm) high.

7.2 Runout section

The runout section of the trailer shall consist of 88 frames, the first 87 of which are to be black with framelines as described in 4.3. Frame 48 shall have an asterisk on the horizontal centerline adjacent to the sound track area. Frame 88 shall have the printed word "FINISH" nominally 3/8 in (9.5 mm) high in upright black letters on clear background.

7.3 Identification section

The identification section of the trailer shall consist of 53 frames.

7.3.1 The identification section shall be made up as follows:

Frames 1-19 – Black.

Frames 20-21 – Similar to frames 25-26 of the head leader identification section.

Frames 22-23 – Black.

Frame 24 – Similar to frames 11 of the head leader identification section.

Frame 25 – Black.

Frame 26 – Similar to frame 33 of the head leader identification section.

Frame 27 – Similar to frame 35 of the head leader identification section.

Frame 28 – Black.

Frames 29-30 – Similar to frames 29-30 of the head leader identification section.

Frame 31 – Black.

Frame 32 – Similar to frame 8 of the head leader identification section.

Frames 33-34 – Black.

Frame 35 – Similar to frame 4 of the head leader identification section.

Frame 36 – Black.

Frame 37 – Similar to frame 6 of the head leader identification section.

Frame 38 – Black.

Frames 39-40 – Similar to frames 15-16 of the head leader identification section.

Frame 41 – Similar to frame 14 of the head leader identification section.

Frame 42 – Dot similar to that in frame 13 of the head leader identification section.

Frame 43 – Similar to frame 12 of the head leader identification section, except the printed word shall be "Foot."

Frames 44-51 – Black.

Frame 52 – The printed word "End" with letters 7/16 in (11.1 mm) high in the center of the frame in the inverted upright position, as shown in figure 5, clear on black background.

Frame 53 – Black.

7.3.2 One additional frame with the inverted upright words "SPLICE HERE" as shown in figure 5, and an arrow pointing to a clear frameline between this frame and frame 53 to indicate where the protective section joins the trailer. The letters should be at least 1/8 in (3.2 mm) high.

7.4 Protective section

The protective section of the trailer shall consist of a minimum of 8 linear feet (2.44 m) of transparent or raw stock. When the protective leader has been reduced to a length of 6 linear feet (1.83 m), it shall be restored to its original length. Logos, trademarks, part titles, or other extraneous materials, if absolutely necessary, should be placed in this section.

Annex A (informative)
Extraneous material

Logos, trademarks, part titles, or other extraneous materials, if absolutely necessary, can be used to replace an equivalent number of frames in frames 36 to 43 of the head leader identification section or in frames 44 to 51 of the trailer leader identification section. The preferred placement area for these materials is in the protective section.

PROPOSED SMPTE RECOMMENDED PRACTICE

RP 160
Revision of RP 160-1991

Three-Channel Parallel Analog Component High-Definition Video Interface

1 Scope

1.1 This practice defines the physical characteristics of an interface using three parallel channels for the interconnection of equipment operating with analog component HDTV signals. For ANSI/SMPTE 240M, the signals carried across this interface have a scanning structure of 1125 lines, 60.00 fields per second, 16:9 aspect ratio, and 2:1 interlace. This interface is also appropriate for HDTV signals having other scanning structures.

1.2 The intended uses of this interface are:

– to interconnect the elements of parallel analog HDTV video subsystems which use the same component sets within larger component islands or plants. Component HDTV editing and post-production suites are examples of such subsystems;

– to interconnect equipment into complete, self-contained HDTV analog component systems of relatively small size.

1.3 This practice applies to signals carried on the connectors described in 7.1 and may not apply to component signals carried on other types of connectors. The practice also defines the preferred component video signals across the interface, including their waveform structure and levels.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this practice. At the time of publication, the edition indicated was 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 standard indicated below.

ANSI/SMPTE 240M-1995, Television — Signal Parameters — 1125-Line High-Definition Production Systems

3 Video signals

The signals carried across this interface may be those of either of two signal sets: a color set comprising E_R', E_G', and E_B' signals, or a color-difference set comprising E_Y', E_{PB}', and E_{PR}' signals. Definitions of the signal sets may be found in ANSI/SMPTE 240M and other relevant standards. Figures 1 and 2 illustrate the waveform structure, synchronizing signal, and video levels for these two component sets.

4 Impedance

Equipment using this interface shall have nominal 75-ohm input and output impedances.

5 Clamping and signal dc content

The clamp period shown in figures 1 and 2 may be used as a dc level clamp reference point. If an ac coupled system is employed, the average dc level of any signal specified herein shall not exceed ± 1 volt.

6 Component timing

The three component video signals (E_G', E_B', E_R') or (E_Y', E_{PB}', E_{PR}') should be simultaneous in real time.

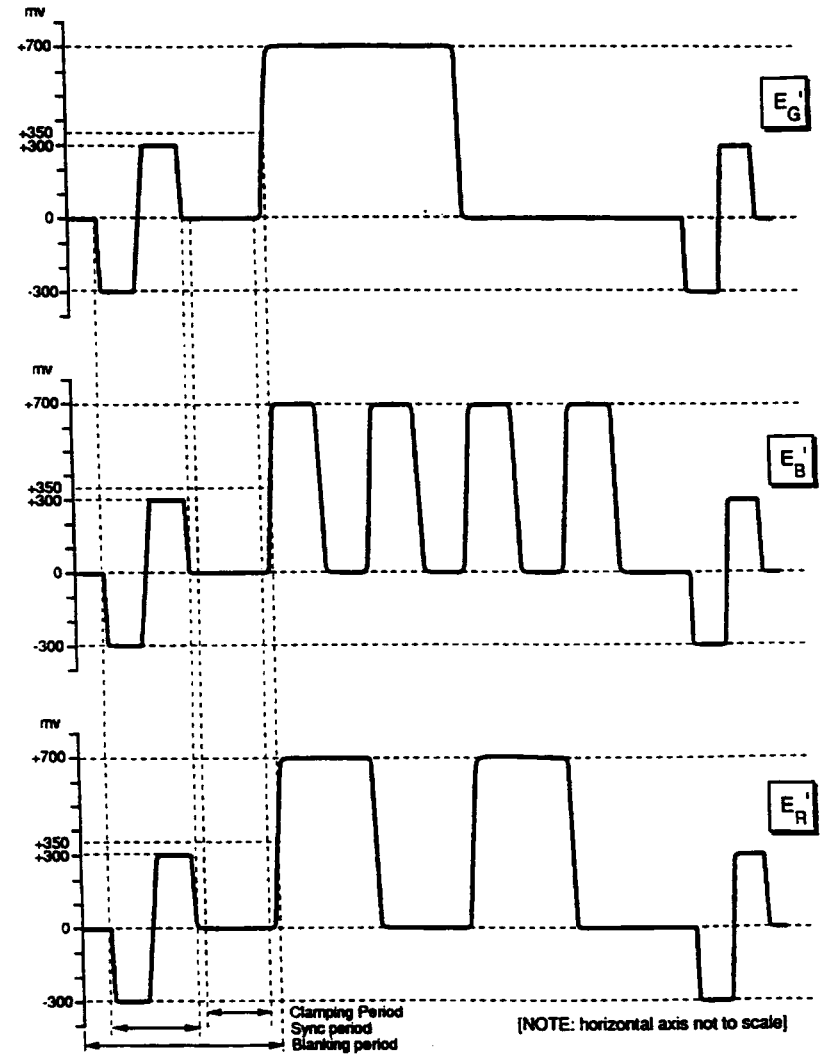

Figure 1 – Waveform structure and levels of E_G', E_B', E_R' signals for 100% color bars

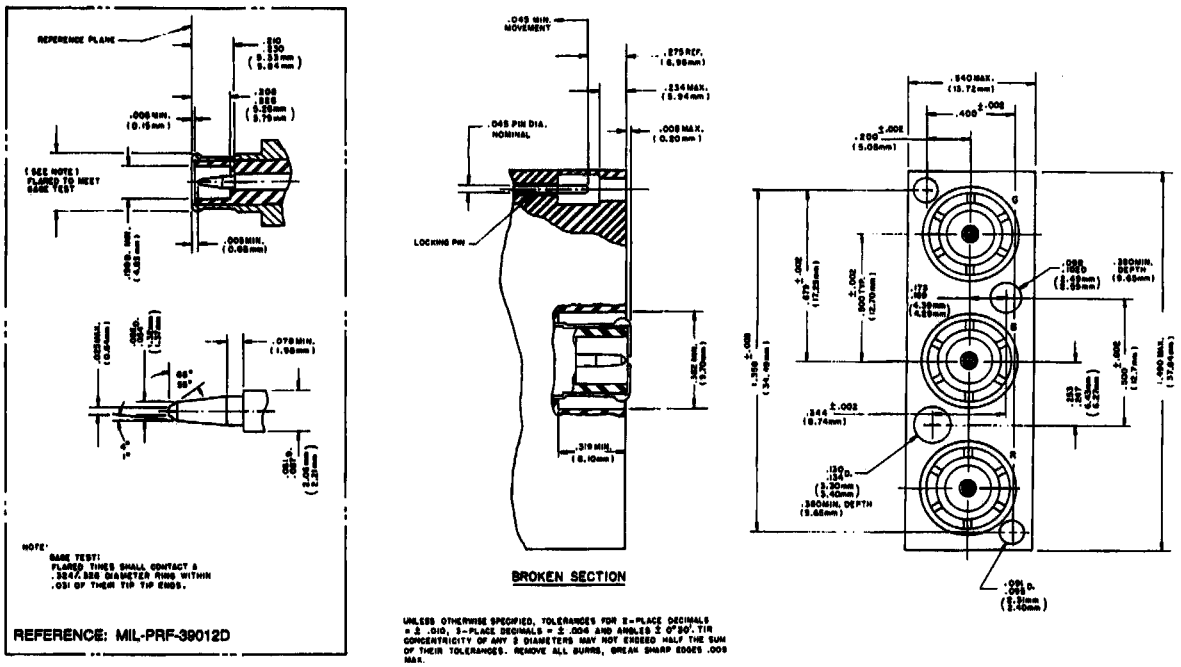

Figure 3 – Plug interface

RP 160

RP 160

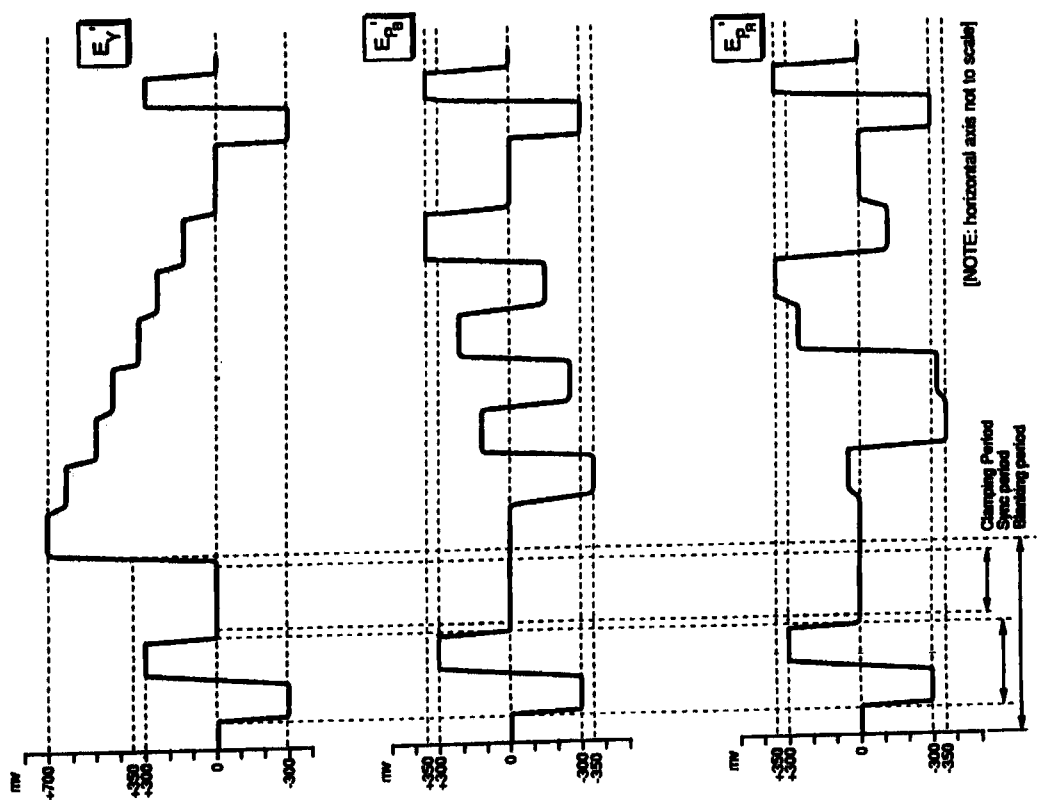

Figure 2 – Waveform structure and levels of EY', EPB' and EPR' signals for 100% color bars

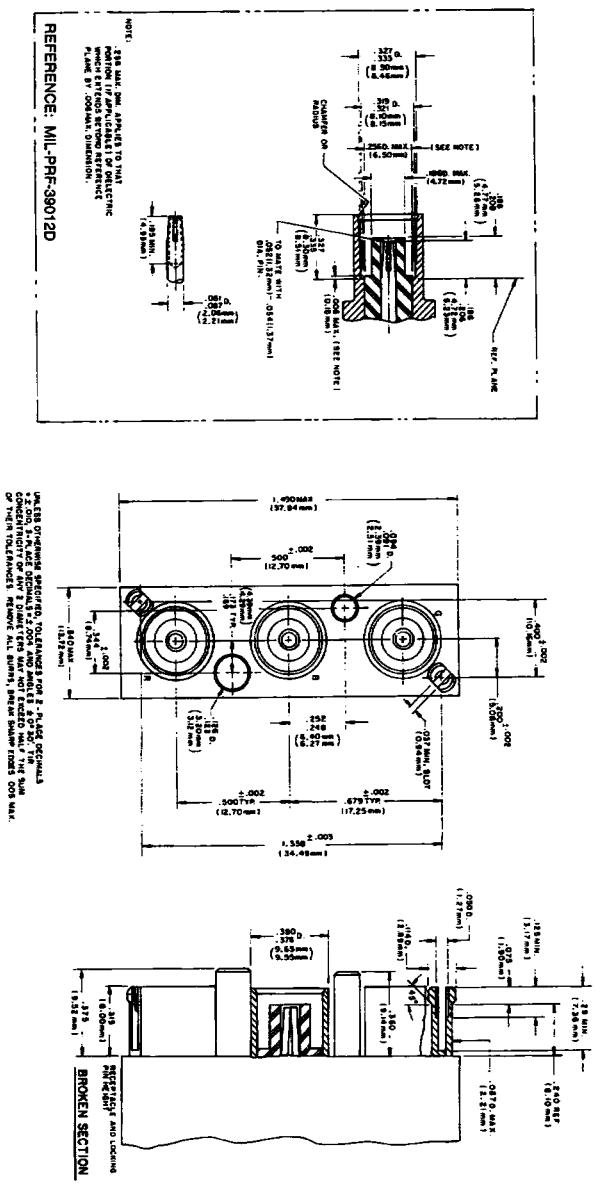

Figure 4 – Socket interface

7 Connector and cable

Two different connector implementations are permissible under this practice. The preferred implementation incorporates a single multiconductor cable and keyed connector arrangement carrying all three parallel signals. The secondary implementation utilizes three separate cables with BNC connectors carrying the three parallel signals. This clause describes the preferred implementation.

7.1 Connector

The connector consists of three BNC inserts mounted in a rectangular housing. Latching is accomplished by two latch posts and receptacles, internal to the connector. Additional posts are utilized for polarizing and reinforcing purposes.

This practice defines the dimensions and tolerances necessary to permit the interchange of plug and socket connectors that contain the three BNC inserts.

The plug interface is described in figure 3, and the socket interface in figure 4. The BNC pin and socket are derived from MIL-PRF-39012D and are described in figures 3 and 4.

Individual insert positions in each mating connector shall be marked with G, B, and R, respectively, as shown in figures 3 and 4. These position identifications correspond to the cable coding.

7.2 Cable

The recommended cable consists of three individual, insulated, coded, coaxial cables, all housed in a nonmetallic jacket.

7.2.1 Cable selection considerations

HDTV component sets as specified, for example, in ANSI/SMPTE 240M, are wideband signals. In choosing the coaxial cable to implement this interface, the user should take account of the following:

– 30-MHz bandwidth for each video component signal;

– Differential timing between each of the three coaxial cables (this refers specifically to the tolerance in cable transit time);

– Crosstalk among the three coaxial cables;

– A cable with nominal impedance of 75 ohms is recommended;

– Return loss of the cable.

7.2.2 Cable color coding

Each individual coax within this cable shall be uniquely coded to identify the signal to be carried upon it. The coding shall be:

Coax coding	Signal carried
Color green or letter G	E_G' or E_Y'
Color blue or letter B	E_B' or E_{PB}'
Color red or letter R	E_R' or E_{PR}'

Annex A (informative)
Bibliography

SMPTE 253, Television – Three-Channel RGB Analog Video Interface

MIL-PRF-39012D, General Specification for Coaxial, Radio Frequency Connectors

PROPOSED SMPTE RECOMMENDED PRACTICE

RP 196

Transmission of LTC and VITC Data as HANC Packets in Serial Digital Television Interfaces

1 Scope

This practice describes a transmission format for the transporting of linear time code (LTC) and vertical interval time code (VITC) over the SMPTE serial digital interface (ANSI/SMPTE 259M). The data packets will be transmitted in the horizontal ancillary data space (HANC). Mapping of data is for 10-bit interfaces only.

2 Ancillary data format

2.1 Ancillary data structure is shown in figure 1. Ancillary data packets carrying LTC or VITC data conform to type 2 (ANSI/SMPTE 291M) for ancillary data transmission.

2.1.1 One ancillary data block per frame shall represent LTC, if present.

2.1.2 One ancillary data block per field shall represent VITC, if present.

2.1.3 The data ID (DID) for transmission of time and control code shall be set to 164_h.

2.1.4 The secondary data ID (SDID) shall indicate if the time code user data words are derived from LTC or VITC. The values shall be set as follows:

LTC = 64_h
VITC = $7F_h$

2.1.5 The data count (DC) word shall be set to (see ANSI/SMPTE 291M):

LTC = 8
VITC = 9

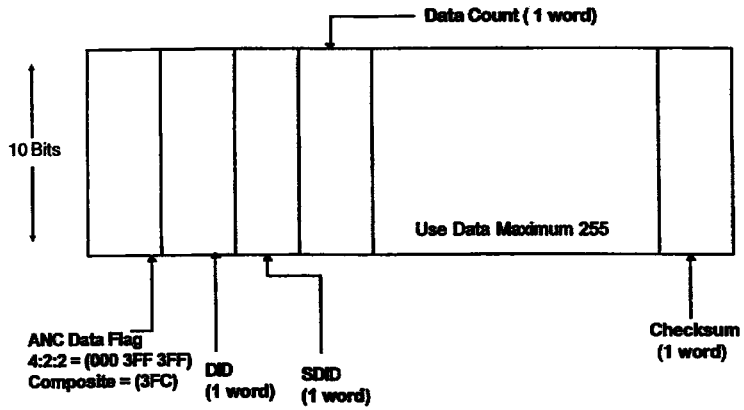

Figure 1 – Ancillary data structure

2.1.6 Tables 1a and 1b show mapping of the time and control data defined in ANSI/SMPTE 12M into user data words of the ancillary data space.

2.1.7 VITC bit mapping maps the time and binary group data as defined in ANSI/SMPTE 12M into words 0–7. Word 8 conveys VITC line selection, validity, and line-duplication information.

2.1.7.1 For VITC line allocation, word 8 b0–b5 is derived from table 2. Field identification is shown by "phase/field" bit (for 525/60 LTC, bit number 27; for 625/50 LTC, bit number 59) and is defined as 0 = field 1 and 1 = field 2, derived from ANSI/SMPTE 12M.

2.1.7.2 When the line-duplication flag, bit 6 of word 8, is set to one, it signifies that the VITC word carried in the data block shall be inserted on the selected line number when converted to the analog domain and be repeated two lines later.

Table 1a – LTC mapping

Word No.	0	1	2	3	4	5	6	7
b0 LSB	0	16	32	48	4	20	36	52
b1	1	17	33	49	5	21	37	53
b2	2	18	34	50	6	22	38	54
b3	3	19	35	51	7	23	39	55
b4	8	24	40	56	12	28	44	60
b5	9	25	41	57	13	29	45	61
b6	10	26	42	58	14	30	46	62
b7	11	27	43	59	15	31	47	63
b8	P	P	P	P	P	P	P	P
	—	—	—	—	—	—	—	—
b9 MSB	b8	b8	b8	b8	b8	b8	b8	b8

NOTE – b0-b7 correspond to the LTC bit numbers defined in ANSI/SMPTE 12M.

Table 1b – VITC mapping

Word No.	0	1	2	3	4	5	6	7	8
b0 LSB	2	22	42	62	6	26	46	66	VITC line select LSB
b1	3	23	43	63	7	27	47	67	VITC line select
b2	4	24	44	64	8	28	48	68	VITC line select
b3	5	25	45	65	9	29	49	69	VITC line select
b4	12	32	52	72	16	36	56	76	VITC line select
b5	13	33	53	73	17	37	57	77	VITC line select MSB
b6	14	34	54	74	18	38	58	78	VITC line duplication +2 (see 2.1.7.2)
b7	15	35	55	75	19	39	59	79	Validity flag
b8	P	P	P	P	P	P	P	P	P
	—	—	—	—	—	—	—	—	—
b9 MSB	b8	b8	b8	b8	b8	b8	b8	b8	b8

NOTE – b0-b7 correspond to the VITC bit numbers defined in ANSI/SMPTE 12M.

Table 2 – VITC line allocation

VITC line select b0 - b5	525/60		625/50	
	Field 1	Field 2	Field 1	Field 2
0	Line 10	273	Line 6	319
1	11	274	7	320
2	12	275	8	321
3	13	276	9	322
4	14	277	10	323
5	15	278	11	324
6	16	279	12	325
7	17	280	13	326
8	18	281	14	327
9	19	282	15	328
10	20	283	16	329
11	21	284	17	330
12	22	285	18	331
13	23	286	19	332
14	24		20	333
15	25		21	334
16	26		22	335

2.1.7.3 Word 8 b7, assigned to a validity play when set to "1," shall indicate that a reading error of sync bits or CRCC has occurred at the input interface.

3 Transmission of horizontal ancillary (HANC) time code packets

3.1 Transmission of HANC time code packets shall be at least once per frame for LTC data words, and once per field for VITC data words.

3.2 Within the television frame/field, the LTC and VITC data words shall be transmitted between lines 10-20 for 525-line systems and 6-22 for 625-line systems.

Annex A (informative)
Bibliography

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