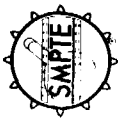


B-Chain Electro-Acoustical Response for Preparing Magnetic Masters for Transfer to 16-mm or 35/32-mm Monaural Photographic Film



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indoor theaters, generally considered to consist of an A- and a B-chain.

3.2 Pre-emphasized Audio Track: An audio record, either magnetic or photographic, which is intended for playback over normally de-emphasized playback systems.

3.3 A-Chain (Transducer System): That part of a motion-picture audio system shown in Fig. 1, extending from the transducer to the input terminals of the main fader.

3.4 B-Chain (Final Chain): That part of a motion-picture sound reproduction system shown in Fig. 1, commencing from the input terminals of the main fader and terminating at any position in the listening area of the room or auditorium at which sound pressure measurements are taken.

3.5 Electro-Acoustical Response: The electro-acoustical response of the final chain is the sound-pressure level expressed, in decibels with respect to an arbitrary reference pressure over a given frequency range measured at a given position in the listening area when wide-band pink noise is applied to the input terminals of the main fader.

3.6 Wide-Band Pink Noise: A continuous spectrum noise having constant energy per constant percentage bandwidth and Gaussian probability distribution.

1. **Scope**
This guideline specifies the electro-acoustical frequency response characteristic of the monitor system when making magnetic masters intended for transfer to 16-mm photographic negative tracks.

2. **Referenced American National Standards**
This guideline is intended for use in conjunction with the following American National Standards:

ANSI S1.11-1986, Specifications for Octave-Band and Fractional Octave-Band Analog and Digital Filters

ANSI S1.13-1971 (R1986), Methods for the Measurement of Sound Pressure Levels

ANSI PH22-202M-1981, Motion Picture Film Indoor Theaters

ANSI SMPTE 214M-1981, Motion Picture Film (35-mm)—Photographic Audio Reproduction Characteristic

3. **Definitions**
3.1 **Complete Sound Reproduction System:** Represented diagrammatically in Fig. 1 and used in studio dubbing theaters, laboratory review rooms, and

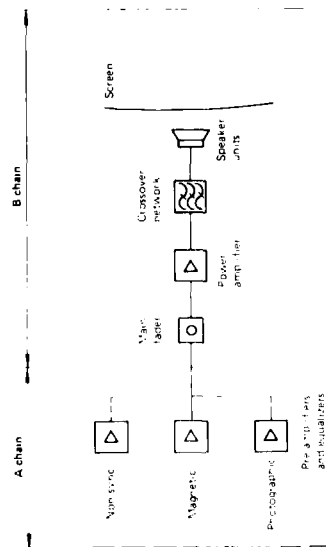


Fig. 1
Complete Theoretical Sound Reproducing System

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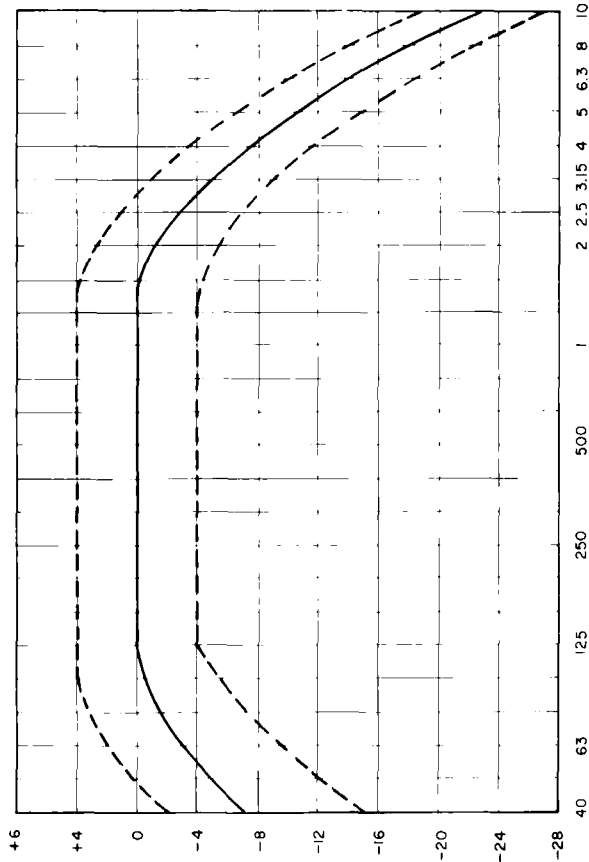


Fig. 2
A - B Chain Characteristic

tion of instantaneous values, having a bandwidth exceeding the frequency range of interest (typically extending from 31.5 Hz to 12.5 kHz).

1. **Method of Measurement**

1.1 The electro-acoustical response shall be measured by generating wide-band pink noise on the monitor at a level of 85 dBC, slow reading. Measure the acoustical output with a calibrated microphone intended for use in the diffuse field together with an audio-frequency real-time spectrum analyzer, covering the spectrum in 1/3-octave bands.

1.2 The electro-acoustical response shall be an average of the response measured according to 4.1 at an adequate number of locations in the room where monitoring occurs.

5. **Characteristics**

5.1 For record monitoring, where magnetic masters are being prepared with pre-emphasis for making photographic negatives, both the photographic A-chain and the B-chain de-emphasis in the monitoring chain are required as shown in Table 2 and Fig. 2.

5.2 Because of the room gain reverberation component and high frequency attenuation in air (proportional to the signal path length), the measured frequency response should have a slightly elevated high-frequency response in a small dubbing theater. Table 1 gives approximate correction factors which should be added numerically to the characteristic curve in Table 2 and Fig. 2.

Table 1
Approximate Correction Factors for Auditorium Size, db

Frequency	Number of Seats*					
	10	30	150	500	1000	2000
2000	0	0	0	0	0	0
4000	1.5	1.0	0.5	0	-0.5	-1.0
8000	3.0	2.0	1.0	0	-1.0	-2.0

*Note that for conversion to room volume in cubic feet, a figure of 190 ft³/seat, the average of many U.S. theaters, may be used.

Table 2
A + B Chain Electro-Acoustical Response (db)

Frequency	Pre-Emphasized Audio Track	Tolerance	
		+	-
40	-7.0	5	8
63	-8.0	5	7
125	0	4	4
250	0	4	4
500	0	4	4
1000	0	4	4
2000	-1.0	4	4
2500	-3.0	4	4
3150	-5.0	4	4
4000	-7.5	4	4
5000	-10.5	4	4
6300	-14.0	4	4
7100	-16.0	4	4
8000	-18.0	4	4
9000	-20.5	4	4
10000	-23.0	4	4

Appendix

This Appendix is not part of the SMPTE Engineering Guideline, but is included for information only.

This guideline is not intended to provide a standard for the playback characteristics of the photographic track, due to the fact that 16-mm film is used in such varied facilities. Such screenings are in classrooms where the internal speaker of the projector is used and the sound track has to compete with the projector noise; in churches where the acoustics are often a compromise; in television receivers where the speaker in the TV set has its limitations; or in small screening theaters. It has been found in practice that when using the standard Academy monitor characteristic (as described in this guideline) for preparing master and masters for photographic tracks, a good quality track

is obtained for virtually all screening situations. 16-mm projectors generally have manual tone controls which may be adjusted according to the acoustical conditions of the screening. Under good screening conditions, a center positioning of the tone controls will produce a good-sounding track.

It is recommended that a 6- or 7-KHz low-pass filter and a 70-Hz high-pass filter be inserted during the transfer from magnetic film to 16-mm photographic negative to reduce the effects of cross-modulation distortion.

Cinematography — Leaders and run-out trailers for 35 mm and 16 mm release prints — Specifications

1 Scope and field of application

This International Standard specifies the essential features of leaders, change-over cue marks and run-out trailers for 35 mm and 16 mm release prints for cinema use.

It also specifies the essential information to be placed on the leader and run-out trailer, and the specific frame spacing of this information in relation to the beginning and end of the picture section.

2 Leader (see figure 1)

2.1 Sections of the leader

The leader shall consist of

- a) a protective section,
- b) an identification section, and
- c) a synchronizing section.

2.2 Protective section

The protective section shall consist of any raw stock or film with no image and shall be not less than 2.4 m (8 ft) long for 35 mm film and 1 m (3 ft) long for 16 mm film, but not less than the circumference of the wound roll.

2.3 Identification section

The identification section shall have the following information photographically printed or indelibly marked on it:

- a) title of film;
- b) identification number of the reel;
- c) a word to indicate beginning, boldly printed in one frame;
- d) aspect ratio for presentation, and whether non-anamorphic or anamorphic;
- e) type of sound; where non-standard photographic sound tracks are used, any special characteristics of recording shall be indicated;
- f) the language of the version of the photographic sound record, printed in the sound track area.

2.4 Synchronizing section

2.4.1 Length

The synchronizing section shall be 218 frames in length.

2.4.2 Sound track area

The area for the sound track in the synchronizing section shall be opaque except for the sound photographic record which corresponds to the first picture images.

2.4.3 Picture gate

Frame 192 shall be transparent and contain in bold black letters the word or mark appropriate to the country of use to indicate "PICTURE GATE".

NOTE — This frame is intended for threading, and the projector must be run down to a later point which is chosen depending on the acceleration characteristics of the projector.

2.4.4 Time lapse numerals

Commencing from the "picture gate" (frame 192), there shall be a series of six frames at intervals of 24 frames (frames 168, 144, 120, 96, 72 and 48), containing, respectively, the numerals 7, 6, 5, 4, 3 and 2. The frames shall be neutral grey and the numerals shall be boldly printed in black.

NOTE — The duration of the synchronizing section is specified as 8 s, a longer section, as may be required, is acceptable.

2.4.5 Sound head symbols

Related to the "picture gate" (frame 192), these shall be included as follows:

- 16 mm photographic sound:
 - 26 frames in advance of "picture gate" (frame 218);
 - 16 mm magnetic sound:
 - 28 frames in advance of "picture gate" (frame 220);
 - 35 mm photographic sound:
 - 20 frames in advance of "picture gate" (frame 212);

NOTE — While picture and sound are correctly synchronized with a displacement of 21 ± 12 frames on the film, normal playback of motion pictures occurs in theatres where the relatively slow speed of sound means that the audio should precede the picture at the

screen if subjectively correct synchronism is to be achieved in the middle of the theatre. An average seat location has been determined to be approximately 15 m from the screen, representing a displacement of one frame. For this reason, this International Standard, intended to assist in the threading of film in reproducers, defines the position of sound synchronization marks as being displaced 20 frames from the picture, i.e. 21 frames minus 1 frame.

35 mm magnetic sound:

28 frames behind "picture gate" (frame 164).

2.4.5.1 Details of sound head frames

The sound head frames shall be opaque with a central horizontal transparent line. Above the line there shall appear a transparent number "35" or "16", appropriate to the gauge of film, and below the line there shall appear a transparent letter "P" or "M", appropriate to the type of sound track (photographic or magnetic).

2.4.5.2 Repeat of sound head frames

The sound head frames may be repeated in relation to the time lapse numerals 7, 6 and 5, at the same relative positions as are stated in 2.4.5.

2.4.6 Black lead picture section

Following the time lapse numeral 2, there shall be black frames to the commencement of the picture section. An additional frame shall be added to the synchronizing section with an arrow indicating the splice line to ensure correct splicing of picture and leader. The frames marked "SPICE HERE" are not to be included in the picture of the release print.

2.4.6.1 Frame 8

A single transparent dot shall be located as specified in 3.2. The dot is used to determine that the last eight frames of the leader have been retained when leaders have been removed and replaced.

3 Change-over cues (see figure 1)

3.1 Cue marks

The picture section shall include a "motor" cue and also a "change-over" cue in the position shown in figure 2. These two marks may differ in shape.

3.2 Location of cue marks

The cue marks shall be placed on the film so as to appear in the top right-hand corner of the screen when the film is projected at any aspect ratio up to 1:1.85 for non-anamorphic images and 1:2.35 for anamorphic images (see figure 2).

3.3 Visual duration of cue marks

The "motor" cue marks and the "change-over" cue marks shall each be of four frames duration.

3.4 Spacing of cue marks

There shall be 168 frames between the last frame of the "motor" cue marks and the first frame of the "change-over" cue marks, and 24 frames between the last frame of the "change-over" cue marks and the end of the picture section.

4 Run-out trailer (see figure 1)

4.1 Sections of the run-out trailer

- a) a run-out section,
- b) an identification section, and
- c) a protective section.

4.2 Run-out section

The run-out section shall comprise not less than 48 black frames. An additional frame shall be added ahead of the run-out section with an arrow indicating the splice line to ensure correct splicing of picture and trailer. The frames marked "SPICE HERE" are not to be included in the picture of the release print.

4.3 Identification section

The identification section may be of any convenient length, and shall have the following information photographically printed or indelibly marked on it:

- a) title of film;
- b) identification number of the reel;
- c) in one frame, boldly printed, the word appropriate to the country of use to indicate "END" ("FIN").

4.4 Protective section

The protective section shall consist of any raw stock or film with no image and shall be not less than 2.4 m (8 ft) long for 35 mm film and 1 m (3 ft) long for 16 mm film, but not less than the circumference of the wound roll.

5 Optical density

The clear (transparent) portions of the leader and trailer shall have a minimum neutral density of 0.35.

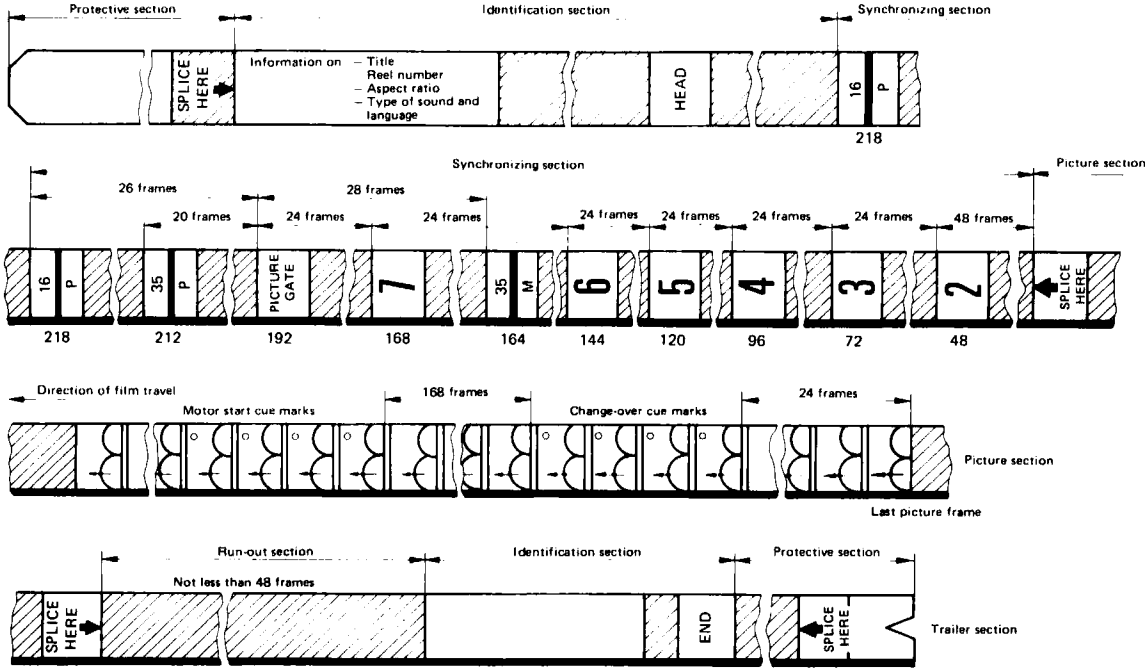


Figure 1 - Leader, cue marks and run-out trailer

Annex

(This annex does not form part of the standard.)

In applying the characteristics and specifications given in this International Standard to the design of a specific leader and trailer, it should be recognized that these features are expressed as minima and without the embellishment sometimes desired in practice.

Therefore, it is recognized that modifications may be made to accommodate national practices or specific applications without damaging the standardized characteristics.

Examples of permissible modifications might be: the incorporation of a sweeping hand, moving wedge or other features to provide for the interpretation of time change; or the inclusion of additional frames which may be needed to accommodate national or other engineering practices, or requirements such as increasing the minimum synchronizing section duration to 10 s.

The user is cautioned, however, that no changes should be made to the standard that will delete any of the features which would affect its intended function.

Table 1 — For non-anamorphic prints

Dimension	mm	in
A	3,8	0,150
B	2,4	0,094
C	7,1	0,280

Table 2 — For anamorphic prints

Dimension	mm	in
A	6,1	0,240
B	2,4	0,094
C	9,7	0,382

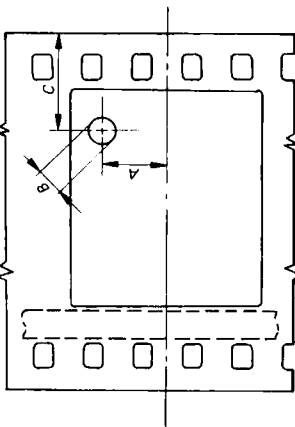


Image as seen on the screen

Figure 2 — Position of cue marks