

the turnaround idler adjacent to the VPR-1 supply reel.

Because of the high wrap angle (153° average), a rotating idler was dictated. However, we have discussed the effects of rotating idlers, which can induce speed perturbations due to eccentricity or bearing vibration. In this application, ultra-precision ball bearings (AFBMA—Anti-Friction Bearing Manufacturers Assn.—Class 7) were tried in a 3/4-in-diameter idler without success.

The final design, shown in Fig. 10, resulted in a very small diameter shaft running in precision bronze bushings sized to  $\pm 0.0001$ -in (2.54- $\mu\text{m}$ ) bore tolerance. The diameter of the idler was made as large as possible to reduce the once-around frequency, and the final turning is done "on the shaft" to minimize eccentricity; maximum total-indicated runout (TIR) equals 0.0004 in (10.2  $\mu\text{m}$ ). With this design, flutter was reduced by a 3:1 factor over the ball-bearing idler.

## Conclusion

The underlying aim of this paper is to acquaint the reader with the degree of precision and sophistication required in tape handling on helical-scan VTRs, above and beyond the obvious problems of tape-to-drum interface and helical alignment. Careful attention to the details illustrated here have helped to improve the reliability of these formats, increasing their popularity among today's demanding videotape users.

# Standards & Recommended Practices

## Approved American National Standards

On 17 July 1978, the American National Standards Institute approved two standards that are revisions of existing documents: PH22.56-1978, Nomenclature for Motion-Picture Film Used in Studios and Processing Laboratories (revision of PH22.56-1971); and PH22.182-1978, Dimensions for Photographic Sound Record on 8-mm Type S (Super 8) Motion-Picture Prints (revision of PH22.182-1972).

Inasmuch as compliance with American National Standards is purely voluntary, the standards will become truly effective when broad publicity is given to their existence. ANSI and SMPTE would appreciate any personal influence to promote the use of these standards where such action is appropriate.

Copies of the standards may be obtained for a nominal fee from the American National Standards Institute, 1430 Broadway, New York, NY 10018. — *Alex E. Alden, Manager of Engineering Services.*

## Ad Hoc Group to Study Lighting Equipment Accessories

The Society, working with the cooperation of the Professional Motion Picture Equipment Association (PMPEA), is forming an ad hoc study group under the SMPTE Standards Committee to review the potential need for standardization of motion-picture and television lighting equipment accessories.

The scope of the committee will be to examine the compatibility of lighting fixtures with respect to mounting hardware as lighting diffusion densities and diameters.

Interested parties are invited to attend the organizational meeting which will be held during the 120th SMPTE Conference on Thursday, 2 November 1978, 4:00 p.m., at the Americana Hotel, New York City, in the Loire Meeting Rooms Four and Five.

Inquiries should be directed to the Committee for Studio Lighting Accessory Standardization, c/o Ed Phillips, Matthews Studio Equipment, 2405 Empire Avenue, Burbank, California 91504.

## E.B.U. Definition of Field One in the Eight-Field Sequence of the PAL Signal

*This statement was drawn up by E.B.U. Sub-group G2 (Television Tape-Recording) and approved by the E.B.U. Technical Committee in April 1978.*

A complete repetition period of the synchronising signals of the PAL video signal consists of a sequence of eight fields. At the moment only a four-field sequence is defined.

E.B.U. Sub-group G2 is studying the problems of this eight-field repetition structure for video tape-recording and editing with an objective of formulating a complete set of proposals covering all the related aspects of this problem. A tutorial article will appear shortly in the *E.B.U. Review*.

In the meantime, for the sake of clear communication, the successive fields of one repetition period of a PAL video signal shall be numbered by adopting the following definition of field one of the eight successive fields:

At the half-amplitude point of the leading edge of the line synchronising pulse of line 1 of field 1, the phase of the extrapolated  $E'_u$  component\* of the video burst may accept the following values:

$$-90^\circ < \phi_{E'_u} \leq 90^\circ$$

\* Note: The  $E'_u$  component of the video burst is defined in C.C.I.R. Report No. 624 (XIIIth Plenary Assembly, Geneva, 1974, Vol. XI, p. 41, Fig. 4).

# American National Standard nomenclature for motion-picture film used in studios and processing laboratories

Approved July 17, 1978

Secretariat: Society of Motion Picture and Television Engineers

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## 1. General

**1.1 Motion Picture.** A series of images presented in rapid succession with objects presented in successive positions either unchanged or changed and producing, because of the persistence of vision, the optical effect of a continuous picture.

**1.2 Motion-Picture Film.** A thin flexible strip of plastic, complying with a dimensional standard as defined herein, whose use is specific to the process of manufacturing a motion picture.

**NOTE:** Motion-picture film, perforated or unperforated, is usually described by a name relating to or designating that part of the system for which it was designed, i.e., the terms color negative, release positive, separation master positive, sound recording, electronic video recording, etc.

**1.2.1 Raw Stock.** Raw stock is film which has not been exposed or processed.

**1.2.2 Film Base.** Film base is the plastic material upon which a photographic emulsion or other material may be coated.

**NOTE:** All film base manufactured in the United States for motion-picture use since 1952 has been safety base.

**1.2.2.1 Safety Base.** Safety base is the slow-burning film support used for motion-picture films which complies with American National Standard Specifications for Motion-Picture Safety Film, PH22.31-1967 (R1973).

**1.3 Magnetic Sound Film.** Magnetic sound film is a film base having film perforations along one or both edges and bearing a magnetic coating, either completely across the film or in stripes, the coating being capable of accepting and reproducing sound records.

**NOTE:** Unperforated materials usually are referred to as magnetic tape.

**1.4 Perforations.** Perforations are the regularly and accurately spaced holes that are punched throughout the length of motion-picture film. These holes are engaged by the teeth of various sprockets and pins by which the film is transported and positioned as it travels through cameras, processing machines, projectors and other film-handling machinery.

**1.4.1 Perforation Pitch.** The perforation pitch is the distance from the bottom edge of one perforation to the bottom edge of the next perforation, measured along the length of the film.

**NOTE:** Perforations are being identified currently by two-letter designations such as BH (Bell & Howell), KS (Kodak Standard), DH (Dobray-Howell) or CS (Cinema-Scope). A numeral, such as 1866, designates the pitch in ten thousandths of an inch. A designation, 1R, 2R, etc., used with films having 16-mm, regular 8 or super 8 perforations, refers to the number of rows of perforations across the narrow dimension of the film. The recommended designators for 8-mm films are "8-mm Type S" for super 8 film and "8-mm Type R" for regular 8 film.

**1.4.2 35-mm Perforation, BH-1866.** The 35-mm negative perforation has sharp corners, curved sides, a nominal width of 0.110 in (2.79 mm) and a height of 0.073 in (1.85 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated BH, PH22.93-1974).

**NOTE:** This perforation and pitch are used for negative and some special-purpose 35-mm films.

**1.4.3 35-mm Perforation, BH-1870.** The 35-mm negative perforation has sharp corners, curved sides, a nominal width of 0.110 in (2.79 mm) and a height of 0.073 in (1.85 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated BH, PH22.93-1974).

**NOTE:** This perforation and pitch are normally used for films for special effects such as background plates. (See 3.1.4.)

**1.4.4 35-mm Perforation, KS-1866.** The 35-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1866 in (4.740 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated KS, PH22.139-1974).

**NOTE:** This perforation and pitch are used largely for 35-mm photographic sound recording purposes and for 65-mm camera negative film.

**1.4.5 35-mm Perforations, KS-1870.** The 35-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated KS, PH22.139-1974).

**1.4.6 35-mm Perforation, DH-1870.** This perforation is rectangular in shape with a height of 0.073 in (1.85 mm), a width of 0.110 in (2.79 mm), a fillet in each corner with a radius of 0.013 in (0.33 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film, DH-1870, PH22.1-1975).

**1.4.7 35-mm Perforation, CS-1870.** This perforation is rectangular in shape with a height of 0.073 in (1.85 mm), a width of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.013 in (0.33 mm) and a pitch of 0.1870 in (4.750 mm) (American National Standard Dimensions for 35-mm Motion-Picture Film, CS-1870, PH22.102-1974). The outer edge of this perforation is at a different distance from the edge of the film than the other 35-mm film perforations listed above.

**NOTE:** This perforation is used on 35-mm release prints having four magnetic sound stripes; one on each side of the perforations.

**1.4.8 65-mm Motion-Picture Film, KS-1866.** The 65-mm negative perforation is rectangular in

shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1866 in (4.740 mm) (American National Standard Dimensions for 65-mm Motion-Picture Film Perforated KS, PH22.145-1975).

**NOTE:** The perforation for this film is the same as for 35-mm motion-picture film, KS-1866, but the margin and lateral distance between perforations are different.

**1.4.9 65-mm Motion-Picture Film, KS-1870.** This 65-mm negative perforation is the same as for 65-mm motion-picture film, KS-1866, except for the perforation pitch (American National Standard Dimensions for 65-mm Motion-Picture Film Perforated KS, PH22.145-1975).

**1.4.10 70-mm Motion-Picture Film Perforated 65-mm, KS-1870.** The 70-mm positive perforation is rectangular in shape with a width of 0.110 in (2.79 mm), a height of 0.078 in (1.98 mm), a fillet in each corner with a radius of 0.020 in (0.51 mm) and a pitch of 0.1870 in (4.750 mm). This film is intended to be printed from 65-mm motion-picture film, KS-1866, or from an optically enlarged 35-mm anamorphic negative image. The additional margin width is designed to accommodate magnetic sound records (American National Standard Dimensions for 70-mm Motion-Picture Film Perforated 65-mm, KS-1870, PH22.119-1975).

**NOTE:** This 70-mm film perforated 65-mm, is used for motion pictures. It should be distinguished from two other types of perforated 70-mm film which are used for still pictures. These are described in American National Standard Dimensions for Unperforated and Perforated Photographic Film in Rolls, Including Leaders and Trailers, for Aerial and Related Uses, PH1.10-1976.

**1.4.11 16-mm Perforation.** The 16-mm perforation is rectangular in shape with a height of 0.050 in (1.27 mm), a width of 0.072 in (1.83 mm) and a fillet in each corner with a radius of 0.010 in (0.25 mm). It is used on the following films:

**1.4.11.1 35-mm Motion-Picture Film Perforated 32-mm, 2R-2994.** This is a 35-mm film with 16-mm perforations so arranged that if 1 1/2 mm are slit from each edge of the film and the film were slit down the middle, two 16-mm films would result, each having one row of perforations. The perforation pitch, 0.2994 in (7.605 mm), is normally used for negative film and some special-purpose films (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 32-mm, 2R, PH22.73-1974).

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**1.4.11.2** 35-mm Motion-Picture Film Perforated 32-mm, 2R-3000. This is a 35-mm film with 16-mm perforations so arranged that when 1½ mm are slit from each edge of the film and the film is slit down the middle, two 16-mm films result, each with one row of perforations. The perforation pitch specified is normally used for positive film and some special-purpose films (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 32-mm, 2R, PH22.73-1974).

**1.4.11.3** 35-mm Motion-Picture Film Perforated 16-mm, 3R-2994 (1-3-0). This is a 35-mm film with 16-mm perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 16-mm, 3R (1-3-0), PH22.171-1974). The principal use of this film stock is as an intermediate film in the production of prints by the double-rank printing system.

NOTE: Numerals (e.g., 1-3-0) are added to the title of some standards to specify how the rows of perforations are placed on the film. The perforation rows are numbered starting at the reference edge. The reference edge is the edge nearest to that row of perforations which is retained in one of the 16-mm strips that may be generated by appropriate slitting of the parent 35-mm film. A row of perforations which is discarded is always given the number 0.

**1.4.11.4** 35-mm Motion-Picture Film Perforated 16-mm, 3R-3000 (1-3-0). This is a 35-mm film with 16-mm perforations so arranged that if 3 mm are slit from the selvage edge of the film and the film were slit down the middle, two 16-mm films would result, each having one row of perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 16-mm, 3R (1-3-0), PH22.171-1974). The perforation pitch, 0.3000 in (7.620 mm), is normally used for positive film.

**1.4.11.5** 16-mm Motion-Picture Film, 1R-2994. This film is 16 mm in width, perforated along one edge only (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 1R, PH22.109-1974). This perforation pitch is normally used on camera film.

NOTE: The formats referred to as "super 16" as well as regular 16 may be exposed on this film (American National Standard Dimensions of 16-mm Motion-Picture Camera Aperture Image, PH22.7-1976).

**1.4.11.6** 16-mm Motion-Picture Film, 1R-3000. This film is 16 mm in width, perforated along one edge only (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 1R, PH22.109-1974). This perforation pitch is normally used on sound positive film.

**1.4.11.7** 16-mm Motion-Picture Film, 2R-2994. This film is 16 mm in width, perforated along both edges (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 2R, PH22.110-1974). This perforation pitch is normally used on both black-and-white and color camera films.

**1.4.11.8** 16-mm Motion-Picture Film, 2R-3000. This film is 16 mm in width, perforated along both edges (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 2R, PH22.110-1974). This perforation pitch is normally used on silent positive film.

**1.4.12** 8-mm Type R (Regular 8) Perforation. The 8-mm Type R (regular 8) perforation is rectangular in shape with a height of 0.050 in (1.27 mm), a width of 0.072 in (1.83 mm) and a fillet in each corner with a radius of 0.010 in (0.25 mm). This perforation is identical to the 16-mm perforation described in 1.4.11 above but for 8-mm use has a pitch of 0.1500 or 0.1497 in (3.810 or 3.802 mm). It is used on the following films:

**1.4.12.1** 35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 5R-1500. This is a 35-mm film with 8-mm perforations so arranged that if 3 mm are slit from the selvage edge (identified by circular holes between perforations) and the film slit three times more, four 8-mm Type R (regular 8) films would result, each having one row of perforations. The perforation pitch specified is normally used for positive film.

**1.4.12.2** 35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1497. This is a 35-mm film with 8-mm Type R (regular 8) perforations along each edge. The perforation pitch (0.1497 in or 3.802 mm) is normally used for negative film and some special purpose films which usually remain unslit.

perforations on each edge of the film (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated Super 8, (1-4), PH22.168-1973). The principal use of this film is as an intermediate film in the production of prints by contact printing methods.

**1.4.13.4** 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1667 (1-4). This is a 16-mm film with 8-mm Type S (super 8) perforations on each edge of the film so arranged that when the film is slit down the middle, two 8-mm Type S (super 8) films result, each having one row of perforations (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated Super 8, (1-4), PH22.168-1973). The perforation pitch (0.1667 in or 4.234 mm) is normally used for positive films.

**1.4.13.5** 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-3). (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), (1-3), PH22.151-1975). The principal use of this film stock is as an intermediate film in the production of prints by the double-rank printing system.

**1.4.13.6** 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1667 (1-3). This is a film 16 mm in width which when slit down the middle results in two 8-mm Type S (super 8) films (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), (1-3), PH22.151-1975). The principal use of this film stock is for the production of prints by the double-rank printing system.

**1.4.13.7** 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R-1664. (American National Standard Dimensions for 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R, PH22.149-1975). This film is generally used as a camera negative.

**1.4.13.8** 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R-1667. This film is 8 mm in width with a single row of 8-mm Type S (super 8) perforations (American National Standard Dimensions for 8-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 1R, PH22.149-1975). The principal use of this film stock is for camera original film of the reversal type.

**1.4.12.3** 35-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 4R-1500. This is a 35-mm film with 8-mm perforations so arranged that when 1½ mm are slit from each edge and the film slit down the middle, two 16-mm films result which, when slit down the middle, produce four 8-mm Type R (regular 8) films, each having one row of perforations. The perforation pitch (0.1500 in or 3.810 mm) is normally used for positive film.

**1.4.12.4** 16-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1500. This is a film 16 mm in width which when slit down the middle results in two 8-mm Type R (regular 8) films, each having one row of perforations (American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 8-mm Type R (Regular 8), 2R-1500, PH22.17-1974).

**1.4.13** 8-mm Type S (Super 8) Perforation. The 8-mm Type S (super 8) perforation is rectangular in shape, with a height of 0.045 in (1.14 mm), a width of 0.036 in (0.91 mm) and a fillet in each corner with a radius of 0.005 in (0.13 mm). It is used in the following films:

**1.4.13.1** 35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-0). This is a 35-mm film with 8-mm Type S (super 8) perforations on each edge (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-0), PH22.169-1974). This film is normally used for preprint material.

**1.4.13.2** 35-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 5R-1667 (1-3-5-8). This is a 35-mm film with 8-mm Type S (super 8) perforations so arranged that when 0.030 in (0.76 mm) is slit from one edge and 0.091 in (2.31 mm) is slit from the factory-marked selvage (discard) edge of the film and slit three more times, four 8-mm Type S (super 8) films would result, each having one row of perforations (American National Standard Dimensions for 35-mm Motion-Picture Film Perforated Super 8, 5R-1667 (1-3-5-8), PH22.165-1973). The perforation pitch (0.1667 in or 4.234 mm) is normally used for positive films.

**1.4.13.3** 16-mm Motion-Picture Film Perforated 8-mm Type S (Super 8), 2R-1664 (1-4). This is a 16-mm film with 8-mm Type S (super 8)

**1.5.4 Direct Reversal Film.** A direct reversal film is one which, processed in a developer and fixing bath, produces an image having a scale of brightness values directly corresponding to that of the original exposure. In this case, reversal is due to the emulsion rather than to the use of a chemical reversal process subsequent to exposure.

**1.6 Image (Photographic).** An image is any photographically obtained likeness in a processed photosensitive material.

**1.6.1 Latent Image.** A latent image is the invisible image registered on a photographic emulsion due to the reaction produced in the emulsion by exposure to radiant energy.

NOTE: This image becomes visible after development.

**1.6.2 Picture Image.** A picture image is a photographically obtained likeness of any object on photographic material.

**1.6.3 Sound Image.** A sound image is a photographically obtained sound record.

**1.6.4 Negative Image.** A negative image is a photographic image in which the brightness scale is approximately inverted with respect to the brightness scale of the original subject. In color negatives, the hue scale is usually, but not necessarily, complementary to the hue scale of the original subject and the brightness scale is inverted.

**1.6.5 Positive Image.** A positive image is a photographic replica in which the tones of the gray scale or color values of the originally photographed subject are represented in their natural order.

**1.6.6 Black-and-White Image.** A black-and-white image is an image produced on a black-and-white film.

**1.6.7 Color Image.** A color image is an image produced on a color film.

**1.6.8 Anamorphic Image.** An anamorphic image is an image which has been produced by an optical system having different horizontal and vertical magnifications.

NOTE: Equal horizontal and vertical magnification is assumed unless the term anamorphic is applied specifically.

**1.4.13.9 35-mm Motion-Picture Film Perforated 35-mm and 8-mm Type S (Super 8), KS 2R-1866/SB 3R-1664.** This is a 35-mm film with 35-mm perforations down each edge and three rows of 8-mm Type S (super 8) perforations arranged to produce three like 8-mm Type S (super 8) images. This film, with 35-mm pitch (0.1866 in or 4.740 mm) and 8-mm Type S (super 8) pitch (0.1664 in or 4.227 mm) is normally used as pre-print material for the following film:

**1.4.13.10 35-mm Motion-Picture Film Perforated 35-mm and 8-mm Type S (Super 8), KS 2R-1870/SB 3R-1667.** This is a 35-mm film with 35-mm perforations down each edge and three rows of 8-mm Type S (super 8) perforations arranged so that when 0.218 in (5.54 mm) is slit from each edge and the remaining film slit twice more, three 8-mm Type S (super 8) films would result, each having one row of perforations. The result, each having one row of perforations. The 35-mm pitch (0.1870 in or 4.750 mm) and the 8-mm Type S (super 8) pitch (0.1667 in or 4.234 mm) are normally used for positive film.

**1.5 Photographic Emulsion.** A photographic emulsion consists of dispersions of light-sensitive materials in a colloidal medium, usually gelatin, carried as a thin layer on a film base.

NOTE: Photographic materials are usually designated as negative or positive types according to their light sensitivity (speed), or usage; negative emulsions, in general, being more sensitive than positive emulsions.

**1.5.1 Black-and-White Film.** Black-and-white film carries an emulsion in which, after processing, brightness values of a scene are reproduced only in tones of the gray scale.

NOTE: Color prints may also be made on black-and-white film by such methods as iron toning, color development or imbibition (dye transfer).

**1.5.2 Color Film.** Color film carries one or more emulsions in which, after processing, brightness values of a scene are reproduced in terms of color scales.

**1.5.3 Reversal Film.** A reversal film is one which, after chemical reversal processing, produces an image having a scale of brightness values directly corresponding to that of the original exposure. Chemical reversal includes first development, bleaching and redevelopment.

**1.10 Processing.** Processing is the generic term applied to the total operation necessary to produce a permanent visible image on exposed film.

**1.10.1 Development.** Development is that part of processing which makes visible the latent image of an exposed photographic emulsion.

**1.10.2 Fixing (Fixation).** Fixing (Fixation) is that part of processing which removes the residual sensitive silver salts from a developed film to render the developed image permanent.

NOTE: During the process of fixation, films are customarily treated to preserve and harden the developed image. Adequate washing or neutralizing treatment is necessary following fixation for image permanence.

**1.10.3 Bleaching.** Bleaching is that part of processing which converts a developed silver image into a soluble silver salt.

**1.11 Printing.** Printing is the operation of exposing raw stock by using the processed image of another film as the light modulator.

**1.11.1 Contact Printing.** Contact printing is that method of printing in which the raw stock is held in intimate contact with the film bearing the image to be copied. This printing is normally emulsion to emulsion.

**1.11.1.1 Step Contact Printing.** Step contact printing is that method of contact printing in which the film being copied and the raw stock are advanced intermittently frame by frame, being exposed to the printer light only when stationary.

**1.11.1.2 Continuous Contact Printing.** Continuous contact printing is that method of contact printing by which the light-modulating film and the raw stock move at the same constant speed past the printing aperture.

**1.11.2 Projection Printing (Optical Printing).** Projection printing (Optical printing) is printing by projecting the image to be copied through an optical system onto the raw stock.

NOTE: The printed image with respect to the projected image may be identical, an enlargement or a reduction, or an anamorphic image; or additional anamorphosis may be added or removed.

**1.7 Aspect Ratio.** Aspect ratio is the ratio of width to height of a projected picture image.

NOTE: This is the more common usage, although the term is also applied to photographic images and to camera, printer and projector apertures.

**1.8 Synchronism.** Synchronism is the relation between the picture and sound with respect either to the physical location on the film or films or to the time at which corresponding picture and sound are seen and heard.

**1.8.1 Projection Synchronism.** Projection synchronism is the time relation between picture and corresponding sound in a projection print.

NOTE: The sound record on a projection print is, in most cases, in advance of the corresponding picture. The displacement is specified in picture frames in the following American National Standards:

Sound Record	Standard
70-mm Magnetic*	PH22.185-1974
35-mm Photographic	PH22.40-1978
35-mm Magnetic*	PH22.137-1974
16-mm Photographic	PH22.41-1975
16-mm Magnetic	PH22.112-1977
Regular 8 Magnetic	PH22.135-1975
Super 8 Photographic	PH22.182-1978
Super 8 Magnetic	PH22.164-1975

\*In this case, the sound is behind the corresponding picture.

**1.8.2 Editorial Synchronism.** Editorial synchronism is the relationship between the picture and sound film during the editorial process.

NOTE: During the editorial process, the sound record and corresponding picture, whether on the same or separate films, are kept in alignment and not offset as for projection. Many composite release negatives are supplied in editorial synchronism.

**1.8.3 Camera Synchronism.** Camera synchronism is the relation between picture and sound record in a composite camera original.

NOTE: Camera synchronism is generally not the same as editorial synchronism. In 16-mm single systems, the two are normally in projection synchronism but this is not the case for most 35-mm single systems (i.e., where picture and sound are recorded on the same film).

**1.9 Exposure.** Exposure is the process of subjecting a photographic film to suitable intensity of radiant energy for a given time in such manner that it may produce a latent image on an emulsion.

NOTE: Exposure = intensity  $\times$  time.

**1.11.2.1 Step Projection Printing.** Step projection printing is that method of optical printing in which the film being copied and the raw stock are advanced intermittently frame by frame, being exposed to the printer light only when stationary.

**1.11.2.2 Continuous Projection Printing.** Continuous projection printing is that method of optical printing in which the light-modulating film and the raw stock move at a continuous rate at each end of the optical system. The film rate will be the same in 1:1 printing and will differ in reduction or enlargement processes.

**1.11.3 A and B Printing.** A and B printing is a method of making composite images, such as fades, dissolves or effects, in a release printer without requiring a duplicating process.

**NOTE:** The name comes from the fact that the films are edited into two separate rolls called A and B rolls. The sequences of pictures originally in one roll are in synchronization with the opaque leader in the other roll. When the two are printed in a separate operation onto a single roll of raw stock, an opportunity is afforded for the introduction of effects and for eliminating visible splices on the screen.

**1.11.4 Double-Rank Printing.** Double-rank printing is a method of producing prints on a wide film, two at a time, oriented so that both run in the same direction on the parent film before slitting.

**1.12 Projection.** Projection is the presentation of an enlarged image of the film on a screen for visual review. In addition the sound may be reproduced for aural review.

**1.13 Production.** Production is the general term used to describe the processes involved in making all the original material that is the basis for the finished motion picture.

**1.14 Editorial Process.** Editorial process is the term used to describe the combining, cutting, editing and other preparation of material obtained from the original material to make the finished motion picture.

**1.15 Re-recording.** Re-recording is the electrical process of transferring sound records from one or more films, magnetic tapes or discs to other films, tapes or discs.

**NOTE:** Re-recording may be used to combine different sound records into a single record to adjust the frequency-response characteristic or to adjust the relative levels between different scenes and sequences.

**1.16 Release.** Release is a generic term used to designate films used for or intended for general distribution and exhibition.

**1.16.1 Release Negative.** A release negative is a complete negative prepared specifically for printing release prints.

**NOTE:** A release negative may consist of separate picture and sound negatives and may be in either projection or editorial synchronism, depending upon the film printing technique to be employed in making release prints.

**1.16.2 Release Print.** A release print is a print made for general distribution and exhibition. It may be on films of 8, 16, 35 or 70 mm width. Some release prints are composed of two or more 35-mm-width films which are projected simultaneously in lateral alignment.

## 2. Picture Negative Film, Black-and-White and Color

**2.1 Picture Negative.** A picture negative is any processed film that possesses a negative picture image of the subject or film image to which it was exposed. This term is sometimes erroneously used to refer to the raw film before processing, either with or without exposure.

**2.1.1 Original Picture Negative.** The original picture negative is the negative film that is exposed in a camera and processed to produce a negative image of the original subject.

**2.1.2 Background Plate Negative.** A background plate negative is a picture negative which is used for printing background plates.

**2.1.3 Picture Library Negative.** A picture library negative is a picture negative that is usually held in a film library for use in reproducing scenes which would otherwise have to be made as original material for each production.

**2.1.4 Title Negative.** A title negative is a negative that is exposed to a title card or to both a title card and background.

**3.1.3 Picture Library Print.** A picture library print is a picture print made from a picture library negative.

**3.1.4 Background Plate (Background Print Film).** A background plate (background print film) is a picture print made specifically for use in projection background or similar process work, and is a print of a background plate negative.

**3.1.5 Picture Master Positive.** A picture master positive is a print usually made on a special film, for the purpose of producing picture duplicate negatives.

**3.1.5.1 35-mm Separation Positive.** A 35-mm separation positive is a black-and-white film with a positive image of the red, green or blue image component of a color negative. It is usually made by printing through suitable filters from a color negative onto a panchromatic black-and-white film.

**3.1.5.2 35-mm Protection Master Positive.** A 35-mm protection master positive film is a positive film made from the final cut and edited black-and-white or color release negative. In case of damage to the release negative, a duplicate negative could be made from this protection master positive. In the case of color, this protection master positive may be a set of three black-and-white separation master positives or a color master positive.

**3.1.5.3 35-mm Panchromatic Master Positive.** A 35-mm panchromatic master positive is a black-and-white print made on a panchromatic film from a color negative for the purpose of making a black-and-white duplicate negative.

**3.2 Composite Print.** A composite print is a positive film having both picture and corresponding sound on the same film, which may be in editorial or projection synchronism.

**3.2.1 Composite Daily Print.** A composite daily print is made from an original composite negative or original sound and picture negatives, and is used for checking photography, sound quality, action, etc. It is in projection synchronism.

**3.2.2 First Trial Composite Print.** The first trial composite is the first composite print made from the picture and sound-release negatives for the purpose of checking and correcting picture and sound quality, negative cutting and assembly, etc. It is in projection synchronism.

**2.1.5 Picture Duplicate Negative.** A picture duplicate ("dupe") negative is a picture negative made from black-and-white, color or separation master positive films or directly from a picture negative by a reversal process (see 1.5.3 Reversal Film).

**NOTE:** It may be used for making additional prints or it may be cut and edited to form a part of the picture release negative.

**2.1.5.1 Internegative.** An internegative film is a negative derived directly from a reversal original film.

**NOTE:** All other duplicating negatives derived from other than reversal film are known as duplicate negatives regardless of the generation.

**2.1.6 Picture Release Negative.** A picture release negative is a cut and edited picture negative used for printing the picture portion of release prints.

**NOTE:** It may consist of intercut original picture negatives, picture dupe negatives, etc., depending upon the choice of available material or the intended use of the release print.

**2.1.7 Foreign-Picture Release Negative.** A foreign-picture release negative is a picture release negative prepared specifically for printing foreign-version release prints.

**NOTE:** It is almost invariably a duplicate negative.

**2.1.8 16-mm-Picture Release Negative.** A 16-mm-picture release negative is a picture release negative on 16-mm film prepared specifically for printing 16-mm release prints.

## 3. Picture Positive Film, Black-and-White and Color

**3.1 Picture Print.** A picture print is a processed film that possesses a positive picture image of the subject or film image to which it was exposed.

**3.1.1 Picture Daily Print.** A picture daily print is the first picture print made from the original picture negative for use in checking photographic quality, camera technique, actions, etc.

**3.1.2 Picture Work Print.** A picture work print is a positive print which usually consists of intercut picture daily prints, picture library prints, prints of dissolves, montages, titles, etc., and has synchronism constantly maintained with the corresponding sound work print.

**3.2.3 Second, Third, Etc., Trial Composite Print.** The second, third, etc., trial composite print is similar to the first trial composite print, but has successive corrections incorporated as a result of viewing the previous trial composite prints.

**3.2.4 Final Trial Composite.** A final trial composite is a composite print, approved for release, in which all corrections found necessary in previous trial composite prints have been incorporated.

**NOTE:** The final trial composite may be any one of the various trial composite prints, depending upon the type and extent of corrections required.

**3.2.5 Composite Master Positive.** A composite master positive is a composite print usually made for the purpose of producing composite or picture and sound duplicate negatives which would be used for printing release prints.

**NOTE:** It is usually made on duplicating positive film and may be in either editorial or projection synchronism.

**3.2.6 Foreign-Version Release Print.** A foreign-version release print is a composite print in projection synchronism with dialogue made specifically for the particular language involved.

**NOTE:** Sometimes superimposed titles in a different language are used on the print. A superimposed title consists of printed words (usually transparent) overlaying the picture image.

**3.2.7 Foreign-Version Trial Composite Prints.** Foreign-version trial composite prints are similar to trial composite prints made during release, except that they are made for checking the release of the particular language version involved.

## 4. Reversal Film, Black-and-White and Color

**4.1 Reversal Original.** A reversal original is the film that is originally exposed in a camera or recorder and is processed by reversal to produce a positive image.

**NOTE:** The positive image obtained by the reversal process is not the same as a print from a negative. When viewed by projection on an opaque screen, the emulsion side of the print from a negative must face the light source and the emulsion side of a reversal original must face the lens in order for the screen image to have the same lateral orientation as the original scene.

**4.1.1 Composite Reversal Original.** A composite reversal original is a reversal original which has both picture and corresponding sound on the same film.

**4.1.2 Reversal Duplicate Negative.** A reversal duplicate negative is reversal-type film that has been exposed to a negative film image, usually an original picture negative, and developed by the reversal process.

**4.2 Reversal Print.** A reversal print is a reversal-type film that has been exposed to a positive film image, usually a reversal original film, and developed by the reversal process.

**4.2.1 Reversal Master Print, 16-mm.** A reversal master print is a 16-mm reversal print made specifically for use in producing other prints.

**NOTE:** It is sometimes referred to as a first-generation duplicate; prints from it are referred to as second-generation duplicates.

**4.2.2 Reduction Reversal Print, 16-mm.** A reduction reversal print is a reversal print made on 16-mm reversal film from a 35-mm positive by reduction printing and development by the reversal process.

## 5. Photographic Sound

**NOTE:** All definitions in this section are understood to be "photographic" unless the term "magnetic" is used. The term "photographic" replaced the term "optical" because the latter describes the method of reproduction and not the sound record itself.

**5.1 Photographic Sound.** Photographic sound is a sound record in the form of a photographic image.

**5.2 Sound Negative.** A sound negative is any film that, after exposure and subsequent processing, produces a negative sound record on the film. This sound record requires the printing and processing of a second film in order to obtain a reasonably faithful reproduction of the original sound, by the conventional scanning system. The negative image may be obtained by direct recording, by exposure through a positive sound image or by the reversal process from another sound negative.

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reasonably faithful reproduction of the original sound on 16-mm reproduction equipment. It may be re-recorded from a print of the 35-mm sound release negative or from the 35-mm re-recording print.

**5.2.7.2 Special Sound Release Negative, Foreign Release in English.** The special sound release negative for use in English version for foreign release is re-recorded from the re-recording print, except that the dialogue track is modified to remove American colloquialisms.

**5.2.7.3 Special Sound Release Negative, Foreign-Language Version.** The special sound release negative for use in foreign-language version release is usually re-recorded using all the re-recording tracks, except the dialogue track, for which is substituted a special synchronized dialogue track in the foreign language for which the release is being made.

**5.2.8 Sound Release Dupe Negative.** A sound release dupe negative is a duplicate negative of the sound record prepared specifically for printing the sound track of release prints.

**5.3 Sound Print.** A sound print is a positive sound record that provides a reasonably faithful reproduction of the original sound when running through the conventional scanning system. It is any positive obtained by printing from a sound negative or direct positive recording or, by the reversal process, from another sound positive.

**5.3.1 Sound Daily Print.** A sound daily print is the first sound print made from the original sound negative for checking sound quality, technique, etc.

**5.3.2 Sound Work Print.** A sound work print is a sound print that usually consists of intercut sound daily prints, but may also include other sound tracks of sound effects or music, or both, on the same or separate films, with synchronism constantly maintained with the corresponding picture work print.

**5.3.3 Sound-Effects Print.** A sound-effects print is a sound print made from a sound-effects negative, or from another sound-effects print by reversal processing.

**5.3.4 Music Print.** A music print is a sound print made from a music negative.

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**5.2.1 Original Sound Negative.** The original sound negative is the sound negative that is exposed in a film recorder and, after processing, yields a negative sound image on the film.

**5.2.2 Sound-Effects Negative.** A sound-effects negative is a sound negative upon which sound effects have been recorded. It is ordinarily held in library stock.

**5.2.3 Music Negative.** A music negative is a sound negative upon which music has been recorded. It is usually an original sound negative but may be a library negative.

**5.2.4 Sound Cut Negative.** A sound cut negative is a sound negative that is composed of sections of original sound negatives spliced in sequence.

**NOTE:** The sound cut negative is generally in exact conformity with the sound work print and produces a single sequentially spliced negative. The print of the sound cut negative provides all, or portions of, the re-recording print.

**5.2.5 Re-recorded Negative.** A re-recorded negative is a sound negative which is exposed by re-recording and, when processed, yields a negative sound record image on the film.

**5.2.6 Sound Release Negative.** A sound release negative is a photographic sound negative in the form required for the final printing operation onto the release print raw stock.

**NOTE:** The sound release negative may consist of re-recorded negatives, intercut original sound negatives, duplicate negatives of sound records, etc., depending upon the choice of available material or the intended use of the print.

**5.2.7 Special Sound Release Negative.** A special sound release negative is a sound release negative made for the purpose of obtaining a sound record which has characteristics other than those obtained from the sound release negative.

**NOTE:** Three common forms of special sound release negatives are those listed under 5.2.7.1, 5.2.7.2 and 5.2.7.3.

**5.2.7.1 Special Sound Release Negative for Use in 16-mm Release of 35-mm Preprint Material.** The special sound release negative for 16-mm release of 35-mm original material is a photographic sound negative, either 35- or 16-mm, recorded with specific characteristics for

**5.3.5 Re-recording Print.** A re-recording print is a sound print prepared specifically for use in re-recording to produce a re-recorded negative.

NOTE: A re-recording print may be a print from a sound cut negative, a specially intercut print, or a combination of both. It usually consists of several sound records on separate films that include dialogue, sound effects, music, or any other required material. The term is used interchangeably to designate the entire group of associated films or any individual film that is part of the group.

**5.3.6 Re-recorded Print.** A re-recorded print is a sound print from a re-recorded sound track negative.

**5.3.7 Sound Check Print.** A sound check print is a sound print made from the sound release negative for the purpose of checking negative cutting, printing lights, sound quality, etc.

NOTE: When a sound check print is required, it is usually made prior to the first trial composite print.

**5.3.8 Sound Master Positive.** A sound master positive is a sound print on special film stock that is usually made from a sound release negative for the purpose of producing duplicate negatives of the sound record for release printing.

#### 5.4 Composite Print

[3.2 Composite Print. A composite print is a positive film having both picture and corresponding sound on the same film, which may be in editorial or projection synchronism.]

#### 5.4.1 Composite Daily Print

[3.2.1 Composite Daily Print. A composite daily print is made from an original composite negative or original sound and picture negatives, and is used for checking photography, sound quality, action, etc. It is in projection synchronism.]

### 6. Magnetic Sound

#### 6.1 Magnetic Sound Film

[1.3 Magnetic Sound Film. Magnetic sound film is a film base having film perforations along one or both edges and bearing a magnetic coating, either completely across the film or in stripes, the coating capable of accepting and reproducing sound records. Note: Unperforated materials usually are referred to as magnetic tape.]

**6.2 Full-Coat Magnetic Film.** Full-coat magnetic film has the magnetic-coating compound applied across the film from edge to edge.

NOTE: The sound record may be photographic, magnetic or both.

**7.1.2 Domestic Release Print.** A domestic release print is a release print intended for distribution within the country where the print was manufactured and having dialogue in the language of that country. It may be a composite print or have a magnetic sound record or records on a separate film.

#### 7.1.3 Foreign-Version Release Print.

[3.2.6 Foreign-Version Release Print. A foreign-version release print is a composite print in projection synchronism with dialogue made specifically for the particular language involved. Note: Sometimes superimposed titles in a different language are used on the print. A superimposed title consists of printed words (usually transparent) overlaying the picture image.]

**7.2 Anamorphic Release Print.** An anamorphic release print is a release print in which the pic-

ture image is compressed laterally, requiring a deanamorphosing lens on the projector to cause objects in the projected picture to have correct proportions.

**7.3 Wide-Screen Release Print.** A wide-screen release print is a print which has no anamorphosis but, when projected, produces a screen image having an aspect ratio greater than 1.33:1.

NOTE: Some prints are made from negatives exposed in a camera aperture having an aspect ratio of 1.33:1, but which have been composed for projection to yield a projected picture having an aspect ratio greater than 1.33:1. A wide screen print may also be obtained from an anamorphic negative by deanamorphosing in the printing process.

**7.4 Magoptical Release Print.** A magoptical release print is a composite release print which has both magnetic and photographic (optical) sound records.

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daily	3.1.1
image	1.6
sound	5.1
background	3.1.4
internegative	2.1.5.1
music	5.2.3
picture	2.1
duplicate	2.1.5
library	2.1.3
original	2.1.1
release	2.1.6
foreign-picture	2.1.7
16-mm	2.1.8
release	1.16.1
reversal duplicate	3.1.4
composite	3.2
daily	3.2.1
final trial	3.2.4
first trial	3.2.2
foreign-version trial	3.2.7
master positive	3.2.5
second, third, etc., trial	3.2.3
picture	3.1
background	3.1.4
daily	3.1.1
image	1.6
sound	5.1
background	3.1.4
internegative	2.1.5.1
music	5.2.3
picture	2.1
duplicate	2.1.5
library	2.1.3
original	2.1.1
release	2.1.6
foreign-picture	2.1.7
16-mm	2.1.8
release	1.16.1
reversal duplicate	3.1.4
composite	3.2
daily	3.2.1
final trial	3.2.4
first trial	3.2.2
foreign-version trial	3.2.7
master positive	3.2.5
second, third, etc., trial	3.2.3
picture	3.1
background	3.1.4
daily	3.1.1

# American National Standard dimensions for photographic sound record on 8-mm type S (super 8) motion-picture prints

Approved July 17, 1978

Secretariat: Society of Motion Picture and Television Engineers

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## 1. Scope

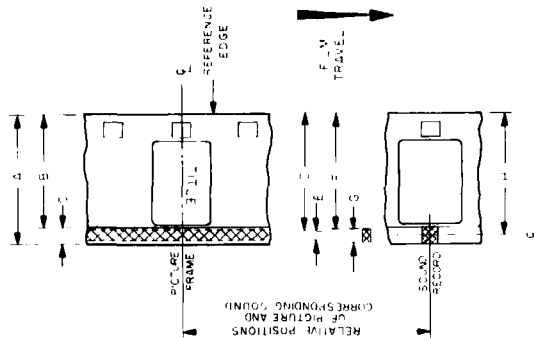
- 1.1 This standard specifies the lateral location and dimensions of the photographic sound record on 8-mm Type S (super 8) motion-picture prints (See Appendix).
- 1.2 This standard also specifies the width of the scanned area and its location with respect to the corresponding picture frame as the specification of the picture-sound displacement.

## 2. Sound Record

The lateral location and dimensions of the photographic sound record shall be as given in the figure and table.

## 3. Picture-Sound Displacement

The photographic sound record on the film shall precede the center of the corresponding picture by a distance of 22 frames = 1/2 frame.



Dimensions	Inches	Millimeters*
A Film Width	0.314 ref	7.98 ref
B	0.283 ± 0.001	7.19 ± 0.03
C	0.030 min	0.75 min
D	0.288 ± 0.001	7.32 ± 0.03
E	0.020 max	0.50 max
F	0.285 ± 0.001	7.25 ± 0.03
G	0.025 ± 0.001	0.66 ± 0.03
H	0.298 ± 0.001	7.57 ± 0.03

\*Millimeter dimensions deviate from standard conversions to reflect practices in countries using the metric system.

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NOTE 1: The density in the area between the printed photographic sound record and the printed photographic picture record should be equal to the sound record print density. Occasionally, some clear area adjacent to the sound track may be observed. This is not objectionable so long as it does not encroach on the minimum tolerances for the printed area. Usually, the area between the printed photographic sound record and the edge of the film will be maximum density.

NOTE 2: To prevent clear septum areas when the film is slit larger than its normal width of 0.314 in (7.98 mm), it may be necessary to have a printed width (Dimension C) more critical uses, the slit width tolerance should be ± 0.001 in (0.03 mm).

NOTE 3: It is anticipated that the printed width, Dimension C, will be utilized in the production of variable-density sound records.

NOTE 4: The dimensions and specifications do not provide for anticipated projector weave allowance and the tolerances should not be mutually exclusive.

## Appendix

(The Appendix is not a part of this American National Standard, but is included for information purposes only.)

The slit width (Dimension A) of super 8 film containing a photographic sound record must be held to tighter tolerances than are necessary for other uses. For these