

standards and recommended practices

Approved American National Standards

On 25 November 1974, the American National Standards Institute approved three standards: PH22.185-1974, Position, Dimensions and Reproducing Speed of Six Magnetic Sound Records on 70-mm Motion-Picture Release Prints; PH22.186-1974, Position, Dimensions and Reproducing Speed of Six 100-Mil Magnetic Sound Records on 35-mm Motion-Picture Film; and PH22.187-1974, Dimensions for Projection Lamps, Condenser-Reflector, Four-Pin, Prefocus-Base.

Inasmuch as compliance with American National Standards is purely voluntary, these 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 these standards may be obtained for a nominal fee from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

Draft American National Standards

Three Draft American National Standards are published here for a trial period and public review.

PH22.11, Draft American National Standard Dimensions for 16-mm Motion-Picture Projection Reels (200- to 2300-Ft Capacity), reflects a number of dimensional changes, which should be examined carefully by those concerned with 16-mm reels.

PH22.40, Draft American National Standard Position, Dimensions and Reproducing Speed of Photographic Sound Records on 35-mm Motion-Picture Release Prints, is substantially a reaffirmation of the technical content of the earlier issue, but has been modified editorially to conform to similar standards. The revision retains the 21-frame picture-sound displacement on the film, which has been the standard displacement for release prints from the beginning, and is in agreement with international stan-

dards. This should not be confused with the established practice by motion-picture laboratories of advancing the sound record in relation to the picture by 20 frames. The extra frame is added during the dubbing operation to place the sound sync at a point approximately 50 ft from the screen, which is the distance at which the dubbing is done and also the center of an average theater. The practice is based on the fact that projectors are designed to thread film in such a manner as to result in a 20-frame displacement of the picture-sound relationship. Without the extra frame, the sound is in sync at the screen and out-of-sync in the rest of the theater.

In checking current operations, it appears that the practice of adding the extra frame is not being followed. This results in poor sound synchronization in all but very small and outdoor theaters where the speakers are fairly close to the viewers. Those responsible for the preparation of preprint materials are urged to consider this point and re-establish the practice as specified in the standard.

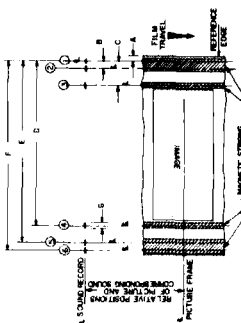
PH22.55, Draft American National Standard Specifications for Leaders and Cue Marks for 35- and 16-mm Sound Motion-Picture Release Prints, has been modified by specifying that the leader frames be printed so as to result in neutral grays and inclusion of the positioning of footage numbers, given in the original Academy Leader, for the benefit of theater projectionists. There are still many questions which need to be resolved in order to make the leader truly universal, i.e., equally applicable to theater and television usage. These studies are continuing and further necessary modifications will be added at a later time.

Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters before 1 April 1975. The proposals have been submitted to American National Standards Committee PH22. Consequently, all comments received through *Journal* publication will be reviewed prior to conclusion of action by that committee. — Alex E. Alden, *Staff Engineer*

ANSI PH22.185-1974 American National Standard position, dimensions and reproducing speed of six magnetic sound records on 70-mm motion-picture release prints

Approved November 25, 1974
Secretariat: Society of Motion Picture and Television Engineers

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Dimensions	Inches	Millimeters
A	0.052 ± 0.002	1.32 ± 0.05
B	0.110 ± 0.002	2.79 ± 0.05
C	0.316 ± 0.002	8.03 ± 0.05
D	2.328 ± 0.002	59.13 ± 0.05
E	2.534 ± 0.002	64.36 ± 0.05
F	2.644 ± 0.002	67.16 ± 0.05
G	0.060 ± 0.004	1.52 ± 0.10

1. Scope

- 1.1 This standard specifies the position, dimensions, reproducing speed, identity and use of the six magnetic sound records on 70-mm motion-picture release prints.
- 1.2 The standard also specifies the longitudinal picture-sound displacement on the film.

2. Sound Records

- 2.1 The lateral location and width of the six magnetic sound records shall be as specified in the figure and table.

- 2.1.1 The records shall be referred to by number, as shown in the figure, with record No. 1 nearest the reference edge. The left and right channel apply to a listener facing the screen. Record No. 1 shall be used for the left loudspeaker channel. Record No. 2 shall be used for the left center loudspeaker channel. Record No. 3 shall be used for the center loudspeaker channel. Record No. 4 shall be used for the right center loudspeaker channel. Record No. 5 shall be used for the right loudspeaker channel. Record No. 6 shall be used for the surround or auditorium loudspeakers.

- 2.2 The recording shall be made so that the azimuth of the record is at an angle of $90 \pm 5^\circ$ to the reference edge of the film.

- 2.3 With the direction of film travel as shown in the figure, the magnetic striping shall be on the surface of the film facing the projector lens.

- 2.4 The sound records shall be recorded in such a manner that they can be reproduced properly by reproducing heads whose gaps are positioned along a common plane or in line.

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3. Reproducing Speed

The recording shall be made so that the sound records will reproduce properly at 120 perforations per second (approximately 112 feet [34 meters] per minute or 22.4 inches [57 centimeters] per second) which is 24 frames (5 perforations each) per second.

4. Picture-Sound Displacement

The magnetic sound records on the film shall lag behind the center of the corresponding picture by a distance of 23 frames \pm 1/2 frame (see Appendix A5).

Appendix

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

A1. Record Width

The width of the recorded area must be measured with great care as it enters directly into the calculation of flux per unit width.

When the recording head gap is narrower than the width of the coating or stripe, as is normal for all motion-picture test films, there is a measurement complication involving both the uncertainties in seeing the track and in determining the recording fringing.

If the recording head gap is available, the track width is best measured directly by measuring the gap width and adding to this dimension twice the thickness of the test record magnetic coating. This correction will usually be 0.0003 to 0.0006 inch (0.008 to 0.015 mm).

If the recording head gap is unknown, the recorded record may be made visible by the use of a carbonyl iron suspension. Care should be taken to apply the minimum quantity that makes the recording visible, so that the developed image is not wider than the actual recorded area.

A2. Reproducing Head Gap Width

If precision measurements or calibrations are to be made on sound records made in accordance with this standard, reproducing head gaps of the same width dimension or wider than the recorded track must be used to take into account edge effects or fringing.

A3. Erase Heads

Erasing head gaps used to erase the records specified in this standard should be substantially wider than the record specified.

A4. Reference Standards

Motion-picture prints conforming to this standard are usually made on film made in accordance with American National Standard Dimensions for 70 mm Motion-Picture Film, Perforated 65 mm, KS-1870, PH22.119-1967, and projected in accordance with American National Standard Dimensions of Projectable Image Area on 70 mm Motion-Picture Film, PH22.152-1969.

A5. Picture-Sound Displacement

As a working procedure, the accuracy of picture-sound displacement in a projection print is frequently judged by screening in a review room. It is important that the standard thread-path in this review room projector be set accurately to the value specified in this standard plus 1 frame for every 50 feet (15 meters) separating the loudspeaker from the observer. Otherwise, nonstandard prints may be produced.

A6. Striping Position

The outer edge of the magnetic striping ideally should be 0.007 inch (0.18 mm) from the edge of the film.

American National Standard position, dimensions and reproducing speed of six 100-mil magnetic sound records on 35-mm motion-picture film

Approved November 25, 1974

Secretariat: Society of Motion Picture and Television Engineers

1. Scope

This standard specifies the position, dimensions, reproducing speed and identity of the six nominal 0.100-in (2.54 mm) magnetic sound records on 35-mm motion-picture film.

2. Sound Records

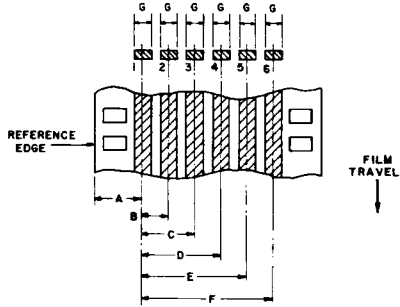
2.1 The lateral location and width of the six magnetic sound records shall be as specified in the figure and table.

2.1.1 The records shall be referred to by number, as shown in the figure, with record No. 1 nearest the reference edge.

2.2 The recording shall be made so that the azimuth of the record is at an angle of 90 \pm 5' to the reference edge of the film.

2.3 With the direction of travel as shown in the figure, the magnetic coating is on the upper surface of the film.

2.4 The sound records shall be recorded in such a manner that they can be reproduced properly by reproducing heads whose gaps are positioned along a common plane or in line.



Dimensions	Inches	Millimeters
A	0.289 \pm 0.002	7.34 \pm 0.05
B	0.160 \pm 0.002	4.06 \pm 0.05
C	0.320 \pm 0.002	8.13 \pm 0.05
D	0.480 \pm 0.002	12.19 \pm 0.05
E	0.640 \pm 0.002	16.26 \pm 0.05
F	0.800 \pm 0.002	20.32 \pm 0.05
G	0.100 \pm 0.002	2.54 \pm 0.05

3. Reproducing Speed

The recording shall be made so that the sound records will reproduce properly at 96 perforations per second (approximately 90 feet [27 meters] per minute or 18 inches [46 centimeters] per second) which is 24 frames per second.

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Appendix

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

A1. Record Width

The width of the recorded area must be measured with great care as it enters directly into the calculation of flux per unit width.

When the recording head gap is narrower than the width of the coating or stripe, as is normal for all motion-picture test films, there is a measurement complication involving both the uncertainties in seeing the track and in determining the recording fringing.

If the recording head gap is available, the track width is best measured directly by measuring the gap width and adding to this dimension twice the thickness of the test record magnetic coating. This correction will usually be 0.0003 to 0.0006 inch (0.008 to 0.015 mm).

If the recording head gap is unknown, the recorded record may be made visible by the use of a carbonyl iron suspension. Care should be taken to apply the minimum quantity that makes the recording visible, so that the developed image is not wider than the actual recorded area.

A2. Reproducing Head Gap Width

If precision measurements or calibrations are to be made on sound records made in accordance with this standard, reproducing head gaps of the same width dimension or wider than the recorded track must be used to take into account edge effects or fringing.

A3. Erase Heads

Erasing head gaps used to erase the records specified in this standard should be substantially wider than the record specified.

A4. Reference Standard

The film base used for the sound records conforming to this standard is usually made in accordance with American National Standard Dimensions for 35 mm Motion-Picture Film Perforated KS, PH22.139-1974.

A5. Picture-Sound Synchronization

The film is used for sound records only. Any accompanying picture is on a separate photographic film. When sound records are intended to be used in synchronization with pictorial material found on a separate film, the picture-sound relationship should be in accordance with SMPTE Recommended Practice RP 25-1968, Sound and Picture Synchronization on Motion-Picture Film Relative to the Universal Leader for Magnetic and Photographic Tracks.

A6. Magnetic Coating

The dimensions of the magnetic coating are not specified, but it is assumed to be wide enough to permit the placement of the sound records in accordance with this standard.

American National Standard dimensions for projection lamps, con- denser-reflector, four-pin, prefocus-base

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Secretariat: Society of Motion Picture and Television Engineers

Page 1 of 3 pages

1. Scope

1.1 This standard specifies the dimensions essential to interchangeability of condenser-reflector, four-pin, prefocus lamps of T-12, TB-12, T-14 and TB-14 bulb sizes in 8 mm motion-picture projectors.

1.2 It is not the intent to prescribe operating characteristics or details of design.

2. Dimensions

2.1 Base and pin dimensions shall be as specified in American National Standard Specifications for Four-Pin Prefocus Base, C81.57-1973.

2.2 Lamp dimensions shall be as specified in the figure and table.

2.3 Dimension J, maximum bulb excursion, specifies that no portion of the bulb wall shall extend toward the aperture more than J from a plane through the base axis and perpendicular to the optical axis.

2.4 Dimension E specifies bulb excursion limits at certain potential lamp housing interference points in the projector. Measurements are made in Plane X, parallel to and 2.437 in (61.90 mm [Dimension H]) above the base seating plane.

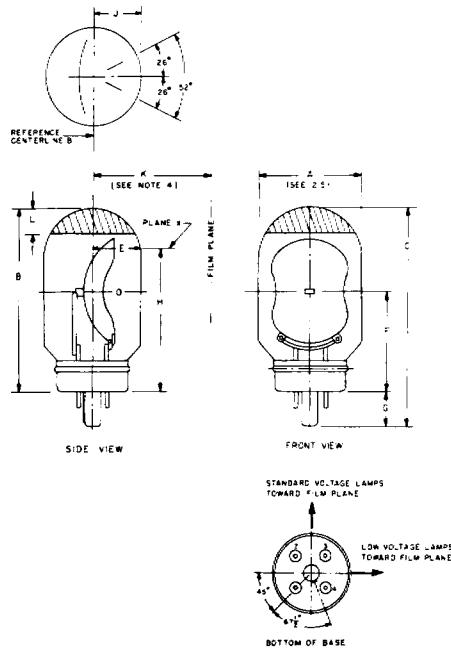
The critical zone in Plane X is an included angle of 52° located as shown in the top view of the lamp. The apex of the 52° angle is located at the intersection of the base axis, Plane X, and Reference Centerline B.

No portion of the bulb wall within the critical 52° angle located in Plane X shall extend more than E from Reference Centerline B.

2.5 Dimension A, maximum bulb diameter, is defined as the diameter of a cylinder coaxial with the axis of the lamp base into which the lamp must fit. (See Note 3.)

2.6 If an opaque top is used, it shall not extend more than 0.630 in (16 mm) from the top of the bulb. (See Note 2.)

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3. Operating Position

3.1 Lamps designed for operation up to 50 volts are prefocused with respect to Pins 2 and 4. (See Appendix A1.)

3.2 Lamps designed for operation in the 100-135 volt range are prefocused with respect to Pins 1 and 3. (See Appendix A2.)

4. Group Types

4.1 The variations of reflector-type lamps used in 8 mm applications may be divided into three general groups:

Group I—T-12 and TB-12 (nominal 1½ in [38 mm] diameter) bulb and a 1.750 in (44.45 mm) focal distance.

Group II and IIa—T-12 and TB-12 (nominal 1½ in [38 mm] diameter) bulb and a 2.250 in (57.15 mm) focal distance.

Group III—T-14 and TB-14 (nominal 1¾ in [44 mm] diameter) bulb and a 1.750 in (44.45 mm) focal distance.

NOTE 1: Incandescent projection lamps are usually identified by a three-letter code, as specified in American National Standard Method for the Designation of Photo Lamps, C78.370-1963 (R1969).

NOTE 2: The dimension in Section 2.6 applies to those projection lamps having opaque end coatings. However, there are exceptions, the specifications of which are supplied by the equipment manufacturers.

NOTE 3: Bulb size is defined by the cylinder of Diameter A together with excursion limits in specific areas, as defined by Dimensions E and J. It is possible, therefore, that the bulb shape may be other than T (for tubular or cylindrical), such as the TB (tubular with a bulged, formed face) bulb used for some lamps.

Projector parts, such as the chimney, baffle plates, and aperture must be so located as to ensure adequate clearance between these parts and the bulb surface.

NOTE 4: Focal distance is the recommended dimension from the axis of the lamp base to the film plane. It is not necessarily the focal length of the internal condensing reflector.

Appendix

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

A1. In those lamps designed for operation up to 50 volts, electrical contact is made through Pins 1 and 2. Pins 3 and 4 are not always electrically isolated from Pin 1 or 2 or both.

A2. In those lamps designed for operation in the 100-135 volt range, electrical contact is made through Pins 1 and 4. Pins 2 and 3 are not always electrically isolated from Pin 1 or 4 or both.

A3. The terms "T-12" and "TB-12" define the general shape and nominal diameter of the bulb. The letter "T" is an abbreviation for tubular, "TB" for tubular with a

bulged, formed face. The numbers relate to the nominal diameter in eighths of an inch; e.g., T-12 is a tubular bulb 12/8 inch (38 mm) in diameter.

A4. Both metallic and dichroic internal integral reflectors are used with all groups of projection lamps. Although dichroic reflector lamps of equal wattage can generally be used in place of metallic reflector lamps, the reverse is not true due to the infrared energy reflection and transmission characteristics differences. Metallic reflector lamps should not be substituted for dichroic reflector projection lamp types. Film and equipment damage may result.

Dimensions	Groups	Inches	Millimeters
A (See 2.5)	I, II, IIa*	1.875 max	47.62 max
	III	2.140 max	54.36 max
B	I, II	3.037 max	77.14 max
	IIa*	2.663 max	67.64 max
	III	2.850 max	72.39 max
C	I, II	3.562 max	90.47 max
	IIa*	3.188 max	80.98 max
	III	3.375 max	85.72 max
E (See 2.4)	All	0.800 max	20.32 max
F	All	1.562 nom	39.67 nom
G	All	0.535 ref	13.59 ref
H	All	2.437 ref	61.90 ref
J (See 2.3)	I, II, IIa*	0.825 max	20.96 max
	III	0.950 max	24.13 max
K (See Note 4)	I, III	1.750 nom	44.45 nom
	II, IIa*	2.250 nom	57.15 nom
L (See Note 2)		0.630 max	16.00 max

*Group IIa lamps are designed primarily for horizontal operation.

Draft American National Standard

Dimensions for 16-mm Motion-Picture Projection Reels (200- to 2300-Ft Capacity)

PH22.11

Revision of
PH22.11-1966

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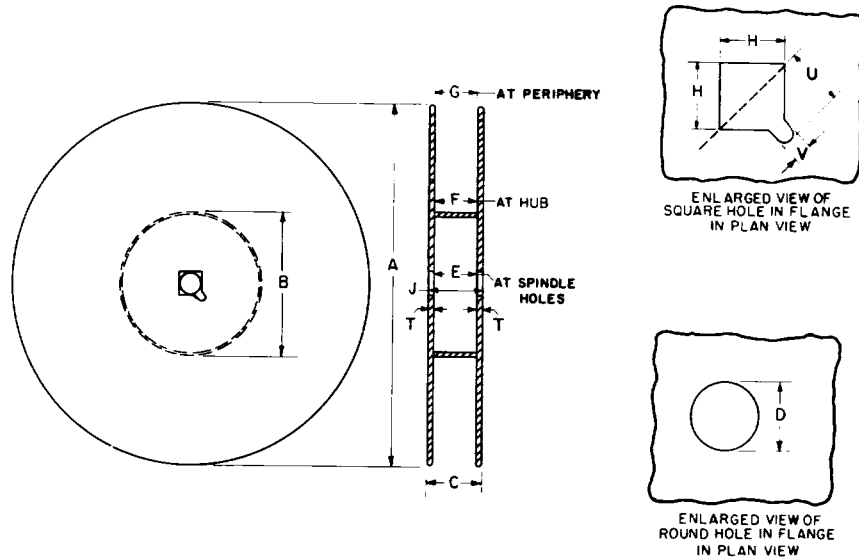
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1. Scope

This standard specifies the dimensions for 16-mm motion-picture projection reels having capacities from 200 to 2300 ft (60 to 700 m) of film inclusive.

2. Dimensions

The dimensions shall be as specified in the figure and tables.



Plan View and Cross Section of Reel

Nominal Capacity	Dimension A		Dimension B		Lateral Runout	
	Inches	Millimeters	Inches	Millimeters		
200 ft (60 m)	5.031 -0.000 +0.031	127.79 -0.00 +0.79	1.750 -0.250 +0.075	44.45 -6.35 +1.90	0.057 max	1.45 max
400 ft (120 m)	7.000 -0.000 +0.031	177.80 -0.00 +0.79	2.500 -0.000 +0.075	63.50 -0.00 +1.90	0.080 max	2.03 max
600 ft (180 m)	9.225 -0.000 +0.010	234.32 -0.00 +0.25	4.875 -0.000 +0.250	123.82 -0.00 +6.35	0.080 max	2.03 max
800 ft (240 m)	10.500 -0.000 +0.031	266.70 -0.00 +0.79	4.875 -0.000 +0.375	123.82 -0.00 +9.52	0.120 max	3.05 max
1200 ft (370 m)	12.250 -0.000 +0.125	311.15 -0.00 +3.18	4.875 -0.000 +0.250	123.82 -0.00 +6.35	0.140 max	3.56 max
1600 ft (490 m)	14.000 -0.000 +0.275	355.60 -0.00 +6.98	4.875 -0.000 +0.250	123.82 -0.00 +6.35	0.160 max	4.06 max
2000 ft (610 m)	15.000 -0.000 +0.031	381.00 -0.00 +0.79	4.875 -0.000 +0.250	123.82 -0.00 +6.35	0.171 max	4.34 max
2300 ft (700 m)	14.975 -0.000 +0.025	380.36 -0.00 +0.64	3.550 -0.000 +0.015	90.17 -0.00 +0.38	0.175 max	4.44 max

Table 2

Dimensions		Inches	Millimeters
C	Total thickness (including flared, rolled or beveled edges, if any)	0.962 max	24.43 max
D	Spindle hole diameter	0.319 -0.000 +0.003	8.10 -0.00 +0.08
E	Distance between flanges at spindle holes	0.660 ± 0.015	16.76 ± 0.38
F	At hub	0.660 ± 0.010	16.76 ± 0.25
G	At periphery	0.660 -0.075 +0.000	16.76 ± 1.90 -0.00
H	Side of square spindle hole	0.319 -0.000 +0.003	8.10 -0.00 +0.08
J	Overall thickness at spindle holes	0.790 max	20.07 max
T	Flange thickness (adjacent to spindle holes)	0.105 max 0.027 min	2.67 max 0.69 min
U	Keyway depth	0.330 +0.000 -0.020	8.38 -0.00 -0.51
V	Keyway width	0.125 -0.005 +0.000	3.18 -0.13 -0.00
Flange and hub eccentricity		0.031 max	0.79 max

NOTES:

1. The metric values in the tables of dimensions are converted from the inch values in accordance with conversion principles outlined in American National Standard Metric Practice Guide, Z210.1-1973.

2. The outer surfaces of the flanges shall be flat out to a diameter of at least 1.250 in (31.75 mm). Dimension J is the thickness of the reel over the area described by this diameter.

3. Rivets or other fastening members shall not extend beyond the outside surfaces of the flanges more than 0.03 in (0.8 mm) and shall not extend beyond the overall thickness indicated by Dimension C.

4. Except at embossings, rolled edges and rounded corners, the limits shown shall not be exceeded at the periphery of the flanges, nor at any other distance from the center of the reel.

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PH22.11

5. If spring fingers are used to engage the edges of the film, Dimension F shall be measured between the fingers when they are pressed outward to the limit of their operating range.

6. Eccentricity of the flanges and hub with respect to the spindle hole axis shall not exceed the total variation shown in Table 2.

7. A good projection reel must meet certain minimal physical strength requirements, particularly with respect to the flanges. A reel that meets this standard must pass the following test for flange rigidity:

Make three posts that are placed 120° apart and constructed so they support a short length of the rim of the reel for a distance of 0.12 in (3.0 mm) radially. Apply a load of 1/2 pound (2.2 N) over a central area not greater than 1.25 in (31.8 mm) in diameter. Measure the vertical location of this area with a dial indicator. Add 1 pound (4.4 N) and measure again. Repeat the process on the other flange. The additional deflection caused by the 1-pound load over that given by the 1/2-pound load should be less than 0.035 in (0.89 mm).

8. Lateral runout shall be measured with respect to the common axis established by the round and square holes.

Appendix

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

A1. For regular projection, a reel with a round hole in one flange is generally preferred. When this hole is present, the projectionist can tell at a glance whether or not the film needs rewinding. Furthermore, this type of reel helps the projectionist place the film correctly on the projector and thread it so that the picture is properly oriented with respect to the right and left sides.

It is common practice to use reels with square holes on both flanges. In such a case, the alignment of the square holes must be such that a test bar 0.316 in (8.02 mm) in diameter shall pass completely through the reel.

However, if both flanges have square holes, they and the opening in the corner should be aligned so that the reel will fit on a square spindle and rewinds with a long key. Such reels may not be suitable for use on some projector spindles. This is true if the spindle has a shoulder that a flange must touch in order to supply lateral positioning for the reel.

A2. Nominal values for Dimensions E, F and G were chosen to provide lateral clearance for the film, which has a maximum width of 0.630 in (16.00 mm). However, a channel of the indicated width is narrow enough so that the film cannot wander laterally too much as it is wound. If the channel is too wide, it is likely to cause loose winding of the film with resultant excessively large rolls.

At the hub, the tolerances applied to Dimension F are least because it is possible to control the separation fairly easily in that zone. At the region near the holes for the spindles, these tolerances are somewhat larger to allow

for slight buckling of the flanges between the hub and the holes. At the periphery, the tolerances are still greater because it is difficult to maintain the distance with accuracy.

A3. The opening in the corner of the square hole, to which Dimensions U and V apply, is provided to fit the spindles of 35-mm rewinds, which are used in some laboratories.

A4. Minimum and maximum values for Dimension T, the thickness of the flanges, were chosen to permit the use of various materials.

A5. The outside diameter of the flanges was made as large as permitted by past practice in the design of projectors, containers for reels, rewinds and similar equipment. This was done so that the values of B could be made as great as possible. As a result, there is less variation throughout the projection of a roll in the tension to which the film is subjected by the take-up mechanism. This is especially true if a constant-torque device is used.

A6. Film tension in a projector should be kept low to avoid perforation damage. In order to maintain low tension, it is necessary to keep the quotient B/A (core diameter B divided by flange diameter A) as large as possible. Rather widely separated limits for hub diameter are allowed in the values given in the tables in some cases. They are not intended to be manufacturing tolerances, only to describe currently available reels that give satisfactory performance. In the design of new large reels, it is recommended that the paper listed as Reference 2 below be consulted.

REFERENCES:

1. VILBRANDT, C. N. The projection life of 16mm film. *Journal of the Society of Motion Picture Engineers*, vol 48, June 1947, pp 521-542.

2. CHANDLER, J. S. Projecting 16mm film with large reels. *Journal of the Society of Motion Picture and Television Engineers*, vol 65, May 1956, pp 320-327.

Draft American National Standard Position, Dimensions and Reproducing Speed of Photographic Sound Records on 35-mm Motion-Picture Release Prints

PH22.40

Revision of
PH22.40-1967

Page 1 of 2 pages

1. Scope

1.1 This standard specifies the position, dimensions and reproducing speed of variable-area and variable-density photographic sound records on 35-mm motion-picture release prints.

1.2 This standard also specifies the longitudinal picture-sound displacement.

2. Sound Record

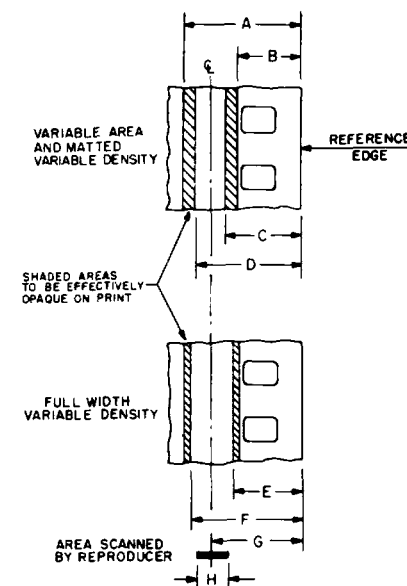
The dimensions and location of the sound records shall be as specified in the figure and table.

3. Longitudinal Picture-Sound Displacement

The sound record on the film shall be displaced longitudinally from the center of the corresponding picture by a distance of 21 frames \pm 1/2 frame in the direction of film travel during normal projection.

4. Reproducing Speed

The recordings shall be made so that the sound records will reproduce properly at 96 perforations per second (approximately 90 feet [27.4 meters] per minute or 18 inches [45.7 centimeters] per second) which is 24 frames per second.



Dimensions	Inches		Millimeters	
A	0.308	nom	7.82	nom
B	0.192	nom	4.88	nom
C	0.205	± 0.001	5.21	± 0.03
D	0.281	± 0.001	7.14	± 0.03
E	0.193	± 0.004 $- 0.000$	4.90	± 0.10 $- 0.00$
F	0.293	± 0.004 $- 0.000$	7.44	± 0.10 $- 0.00$
G	0.244	± 0.001	6.20	± 0.03
H	0.084	± 0.001	2.13	± 0.03

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NOTE 1: Motion-picture prints conforming to this standard are usually projected in accordance with American National Standard 35-mm Photographic Sound Motion-Picture Film, Usage in Projector, PH22.3-1961 (R1973).

NOTE 2: Motion-picture prints conforming to this standard are usually made on film made in accordance with long-pitch dimensions specified in American National Standard Dimensions for 35-mm Motion-Picture Film Perforated KS, PH22.139-1974.

NOTE 3: Dimensions A and B, describing the printed area of the sound record, are established by American National Standard Dimensions of Exposed Areas for Picture and Photographic Sound on 35-mm Motion-Picture Prints Made on Continuous Contact Printers, PH22.111-1965 (R1969), and are shown in the table as nominal values for reference only.

Appendix

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

In the average theater, it is necessary to emit the sound pulses before the corresponding picture frame is positioned in the aperture. Since sound travels approximately 1100 ft per second or about 50 ft per frame during the normal projection rate of 24 frames per second, the projectionist can place the sound and picture in synchronization in the theater where he wishes by varying the length of the threading path in the projector.

For example, if the positioning of frame 21 at the scanning point brings the corresponding picture and sound to the screen and the speaker at the same instant, then positioning frame 20 at the scanning point would give synchronism at about 50 ft from the screen.

Draft American National Standard Specifications for Leaders and Cue Marks for 35- and 16-mm Sound Motion-Picture Release Prints

PH22.55

Revision of
PH22.55-1966

Page 1 of 7 pages

1. Scope

This standard specifies the make-up or assembly of leaders and cue marks for 35- and 16-mm sound motion-picture release prints for use in both motion-picture theaters and television studios.

2. Reduction Ratio

The reduction ratio in the production of the head and foot leaders from 35-mm motion-picture film shall be in accordance with American National Standard 16-Millimeter Positive Aperture Dimensions and Image Size for Positive Prints Made from 35-Millimeter Negatives, PH22.46-1946 (R1969).

3. Orientation of Words and Numerals

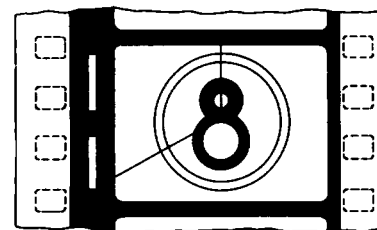
3.1 Orientation and dimensions of letters and numerals in this standard are with respect to 35-mm motion-picture film and are modified proportionally for 16-mm prints in accordance with Section 2.

3.2 The third, fourth and fifth frames of the identification sections containing the title of the film and reel number shall be printed in white letters on a black background so that they can be read normally when the reel is uppermost and the leading end or head of the film hangs down ready for threading.

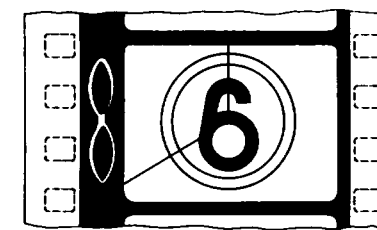
3.3 The words "Type of Sound," "Aspect Ratio," "Picture Title," "Company," "Series," "Reel No.," "Prod. No.," and "Play Date" shall be printed lengthwise with the film in white letters on a black background.

3.4 A footage count-down number is placed in the sound track area of the Synchronizing Section (4.3) in Frames 27, 43, 59, 75, 91 and 107. The number shall fill a space no less than $\frac{3}{4}$ of frame height and be bold white figures on a black background so that it is read normally as in Sec. 3.2 (see Fig. 1).

3.5 In sections where information is to be printed lengthwise with the film, light framelines shall be included and all such printing must be placed within the outlined areas so that it can be read on 16-mm reduction prints.



FOOTAGE NUMBER 8 IN FRAME 43



FOOTAGE NUMBER 6 IN FRAME 91

Figure 1
Footage Numbers in Sound Track Area

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3.6 In the trailer (foot leader), the title of the film and the reel number shall be printed so that they appear inverted when the remainder of the reel is uppermost and the film hangs downward.

4. Head Leader (See Figure 2)

4.1 Protective Section. The protective section of the 35-mm leader shall consist of 8 feet (2.44 m) of transparent or raw stock; for 16-mm leader, 3.25 feet (99 cm). When the protective leader has been reduced to a length of 6 feet (1.83 m) for 35-mm film or 2.5 feet (76 cm) for 16-mm film, it is to be restored to its original length.

The last frame of this section contains the words "Splice Here" and an arrow pointing to the frameline between this frame and Frame 1 of the identification section. The letters should be at least 0.125 inch (3.18 mm) high.

4.2 Identification Section. The identification section of the leader shall be 42 frames in length. The frames may be of the 4 x 3 format or of a reduced height.

4.2.1 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:

- White (low neutral density of 0.35)
- Gray (medium neutral density of 0.65)
- Black (high neutral density of 1.95)

4.2.2 The identification section, when viewed as specified in 3.2, shall be made up as follows:

Frames 1-2—Black.

Frame 3—The printed word "Subject" with letters 1/8 inch (1.6 mm) high at top of frame in upright position, white on black background (4 x 3 format).

Frame 4—The printed word "Length" at top left side of frame and the printed word "Roll" at center of frame on left side. Lettering to be comparable to that in Frame 3 (4 x 3 format).

Frame 5—The printed words "Reel No." at top left side of frame and printed word "Color" at center of frame on left side. Lettering, read upright, to be comparable to that in Frame 3. At bottom of frame printed word "Picture" 1/8 inch (3.2 mm) high.

Frames 6-10—Five frames of black with white

framelines on which the words "Aspect Ratio" and "Type of Sound" are plainly printed lengthwise with the film in 1/8 inch (3.2 mm) high white letters. Each group of words starting in the 10th frame and in two separate lengthwise lines reading through base of film from left to right with head end of film at right.

Frame 10—Four letter Os vertically in line and opposite the sound track area approximately 5/16 inch (7.9 mm) from the 35-mm camera aperture centerline opposite the sound area. Letters to be 1/8 inch (3.2 mm) high and 1/8 inch wide, white on black background (4 x 3 format).

Frame 11—The printed word "Head" not less than 3/8 inch (9.5 mm) high in inverted black letters on white background.

Frame 12—A 1/8-inch (3.2 mm) diameter black dot in center of 4 x 3 format. White background with narrow black framelines.

Frame 13—The printed word "Picture" not less than 3/8 inch (9.5 mm) high in inverted black letters on white background.

Frames 14-15—Two frames in which the words "SMPT Universal Leader" shall be printed. Letters to be not less than 1/8 inch (3.2 mm) high. Inverted white letters on a black background (4 x 3 format).

Frame 16—Four letter Xs vertically in line adjacent to sound track area approximately 5/16 inch (7.9 mm) from the 35-mm camera aperture centerline toward sound area. Letters to be 1/8 inch (3.2 mm) high and 1/8 inch wide, white in black background (4 x 3 format).

Frames 17-18—Same as Frames 14-15.

Frames 19-26—Eight frames of black with white framelines on which the words "Reel No.," "Prod. No.," and "Play Date" are printed lengthwise with the film in 1/8 inch (3.2 mm) high white letters in Frame 20. In Frame 26, on three lines lengthwise, reading left to right through film base with head of leader to right, the words "Picture," "Company" and "Series," using the same format as that in Frame 20.

Frames 27-42—Sixteen frames of part titles are to be inserted here. In each frame (1) the reel number (Arabic numeral not less than 1/4 of frame height) and (2) the picture title shall be printed in black letters on a white background. If part titles are not available, these frames should be black with narrow framelines.

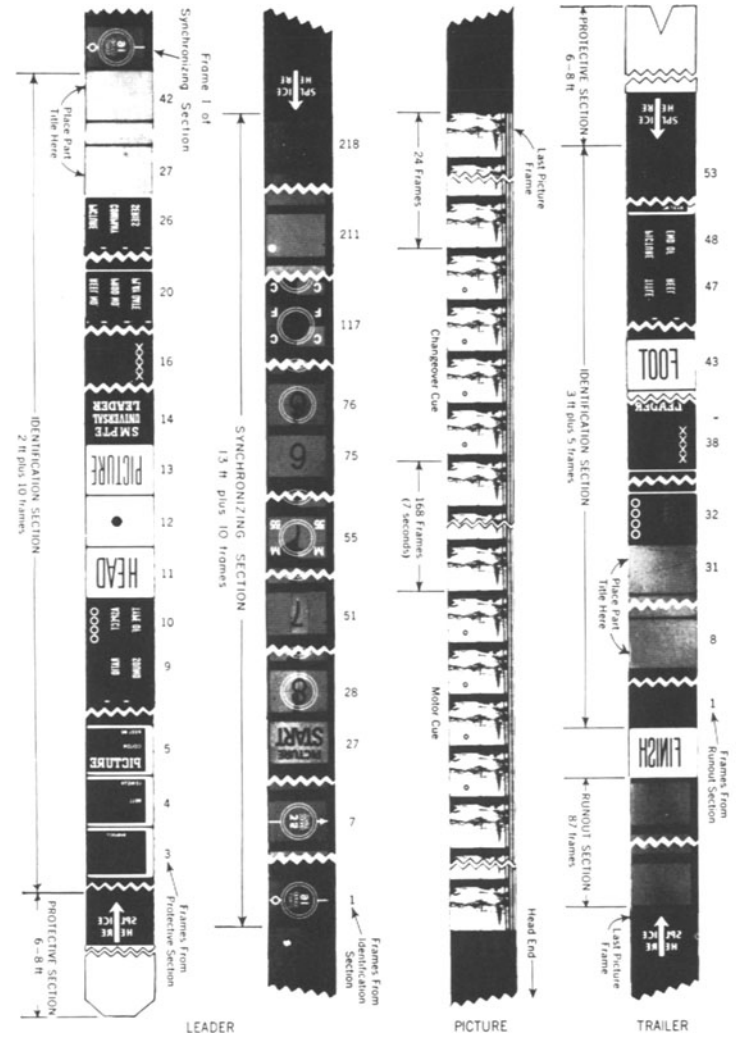


Figure 2 Figure shows 35-mm film with sound track on right edge as seen from the light source in the projector. The sound track is on the left edge of 16-mm film.

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

4.3.1 The cross hairlines shall be black and the two large concentric circles used throughout the visual count-down section shall be white. Seconds count-down numerals shall project right side up.

4.3.2 The synchronizing section, when viewed as specified in 3.2, shall be made up as follows:

Frame 1—The 16-mm sound start indication shall be printed in white letters on a neutral gray background as shown in Fig. 3.

Frames 2-6—Five frames of neutral gray.

Frame 7—The 35-mm sound start indication shall be printed in white letters on a neutral gray background as shown in Fig. 4.

Frames 8-26—Nineteen frames of neutral gray.

Frame 27—The words "Picture Start" shall be printed in black on a white background, the letters in the word "Picture" to be not less than 1/8 inch (3.2 mm) high and in "Start" not less than 1/4 inch (6.4 mm) high. Visual count-down begins with this frame.

The footage number "12" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 28—The visual count-down continues with the figure "8" in black within a circle of white on an overall neutral gray background with a 15-degree wedge of darker neutral gray on the right of top center, as projected. In each succeeding frame, the wedge increases in 15-degree steps, moving clockwise when projected (see Fig. 5).

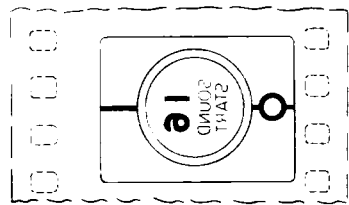


Figure 3
16-mm Sound Start Identification Frame

Frame 43—The footage number "11" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 50—All background, except for a 15-degree wedge at the top left center, is of neutral gray.

Frame 51—The numeral changes to "7" in black on a white background.

Frame 52—The wedge again appears.

Frame 55—On each side of the "7," there shall be letters 1/8 inch (3.2 mm) high, white on a neutral gray background, "M" and "35" vertically to indicate 35-mm magnetic sound start (see Fig. 6).

Frames 56-117—The sequence of numerals marking the seconds of film running time at 24 frames per second continues to Frame 117.

Frame 59—The footage number "10" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 75—The footage number "9" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 91—The footage number "8" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frame 107—The footage number "7" shall be printed in the sound track area (see Sec. 3.4 and Fig. 1).

Frames 117-122—The moving wedge and numeral appear on Frames 141-146 but with the addition of the Gothic letters "C" and "F" on the left- and right-hand side of the circle, respectively, to indicate the position in the leader where one to six frames may be removed and a similar number of control frames spliced in.

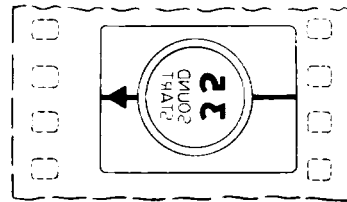


Figure 4
35-mm Sound Start Identification Frame

Frames 123-170—The sequence of numerals and moving wedge marking the seconds of film running time continues through Frame 170.

Frame 171—The numeral "2" in black on a white background appears ending the visual count-down.

Frames 172-210—Thirty-nine frames of black density.

Frame 211—A single white dot shall be located as specified in 5.2.

Frames 212-218—Seven frames of black density.

4.3.3 One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between Frame 218 and this frame. The letters should be at least 1/8 inch (3.2 mm) high.

5. Picture Section (See Figure 2)

5.1 Picture. It is recommended that picture action start and finish on fades wherever possible. Otherwise, significant sound should be kept at least five feet (1.52 m) for 35-mm prints and two feet (61 cm) for 16-mm prints from the start and finish of the picture.

5.2 Motor Cue. The motor cue shall consist of a black circular dot with a white outline or a white circular dot with a black outline, printed from a 35-mm negative which has had four consecutive frames punched with a die 0.094 inch (2.39 mm) in diameter. The position of this cue mark for release prints with aspect ratios up to 1.85:1 shall be as shown in Fig. 7. The position of the cue mark for release prints with aspect ratios from 2.35:1 to 2:1 shall be as shown in Fig. 8.

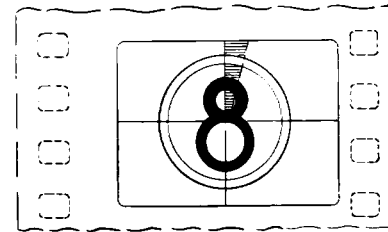


Figure 5
Example of Visual Count-down

Following the four frames containing the motor cue, there shall be 168 frames, or seven seconds running time, to the beginning of the changeover cue.

5.3 Changeover Cue. The changeover cue shall consist of four frames containing circular dots 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 24 frames, or one second running time, to the beginning of the runout section of the trailer.

6. Trailer (Foot Leader) (See Figure 2)

6.1 Additional Frame. One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between the picture section and the trailer. The letters should be at least 1/8 inch (3.2 mm) high.

6.2 Runout Section. The runout section of the trailer shall consist of 88 frames, 87 of which are to be black. Frame 88 shall have the printed word "Finish" not less than 3/8 inch (9.5 mm) high in upright black letters on white background.

6.3 Identification Section. The identification section of the trailer shall consist of 53 frames.

6.3.1 The identification section shall be made up as follows:

Frames 1-7—Seven frames of black without framelines.

Frames 8-31—Twenty-four frames of part titles are to be inserted here. In each frame (1) the end of reel, (2) the reel number (Arabic numeral not less than 1/4 of frame height), and (3) the picture title shall be printed in black let-

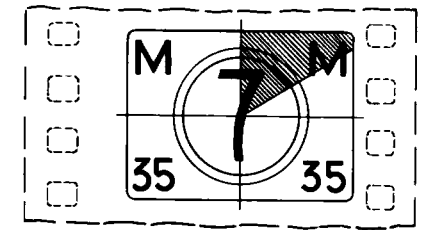


Figure 6
35-mm Magnetic Sound Start

ters on a white background. If part titles are not available, these frames shall be blank of medium neutral density with narrow framelines.

Frame 32—Four letter Os vertically in line and opposite the sound track area approximately $\frac{5}{16}$ inch (7.9 mm) from the 35-mm camera aperture centerline opposite the sound area. Letters to be $\frac{1}{8}$ inch (3.2 mm) high and $\frac{1}{8}$ inch wide, white on black background (4 x 3 format).

Frames 33-37—Five black frames with light framelines for reproduction of information written on the negative.

Frame 38—Black with four Xs adjacent to the sound track, similar to Frame 16 of the head leader identification section.

Frames 39-40—Similar to Frames 14-15 of head leader identification section with words "SMPTE Universal Leader," except that the words are upright.

Frame 41—Similar to Frame 13 of head leader identification section, except that the word "Picture" is upright (not inverted).

Frame 42—Dot similar to that in Frame 12 of head leader identification section.

Frame 43—Similar to Frame 11 of head leader identification section, except printed word is "Foot" which is upright (not inverted).

Frames 44-48—Five blank frames of black with light framelines upon which the words (1) "Picture Title" and (2) "End of Reel" are printed lengthwise with the film in $\frac{1}{8}$ inch (3.2 mm) high white letters on black background.

Frames 49-51—Three frames identical to Frames 5, 4 and 3, respectively, of head leader identification section, except that the letters are inverted.

Frames 52-53—Two black frames.

6.3.2 One additional frame follows with the words "Splice Here" and an arrow pointing to the frameline between this frame and Frame 53 to indicate where the protective section joins the trailer.

6.4 Protective Section. The protective section of the trailer shall consist of 8 feet (2.44 m) of transparent or raw stock for 35-mm prints and 3.25 feet (99 cm) for 16-mm prints.

Note: The Society of Motion Picture and Television Engineers makes available leaders in accordance with this standard. Supplied on master positive motion-picture stock in 16-mm and 35-mm sizes, intended for reproduction as negatives, they are identified as SMPTE Universal Leaders.

Appendix

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

A1. The difference between projection rates of 24 and 25 frames per second is negligible in the normal usage of the leader.

A2. Logos, trademarks or other extraneous material, if absolutely necessary, should be inserted in the leader prior to the 16-mm sound start cue or just preceding Frame 32 of the trailer identification section or both.

A3. The outside diameter of the larger white circle, referred to in Sec. 4.3.1, indicates the height of the television safe action area specified in SMPTE Recommended Practice RP27.3-1972, Specifications for Safe Action and Safe Title Areas Test Pattern for Television Systems.

A4. The outside diameter of the smaller white circle, referred to in Sec. 4.3.1, is equivalent to the height of a projector aperture having an aspect ratio of 1.85:1.

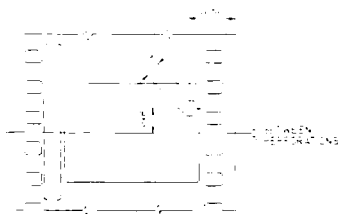


Figure 7
Position of Cue Marks for
Nonanamorphic Release Prints
Image as seen on the Screen



Figure 8
Position of Cue Marks for
Anamorphic Release Prints
Image as seen on the Screen