SMPTE RECOMMENDED PRACTICE

RP 144-1991
Revision of RP 144-1987

Basic System and Transport Geometry Parameters for 1/2-in Type L Format

1 Scope

This practice specifies the tape speed, scanner parameters, tape tension, and test conditions for achieving the record dimensions specified in ANSI/SMPTE 229M-1991. The parameters are for reference purposes only and should not be interpreted as the only method available to attain the specifications in ANSI/SMPTE 230M-1991.

2 Definitions

2.1 scanner: A mechanical assembly containing a drum, rotating pole tips, and tape-guiding elements used to record and reproduce video tape recordings. (See figure 1A.)

2.2 drum: A cylindrical column around which the tape is at least partially wrapped in order to form the head-to-tape interface of a video tape recording system.

2.3 upper drum: That part of the drum which does not contact the reference edge of the tape. (See figure 1B.)

2.4 lower drum: The part of the drum which contacts the reference edge of the tape and provides tape guiding.

2.5 effective drum diameter: A value of drum diameter which, when used in theoretical calculations, will correspond to the actual video recording produced. The effective value is equal to or greater than the actual drum diameter.

2.6 helix angle: The angle formed between the path of the rotating pole tips and the tape reference edge-guiding system.

2.7 basic dimension: A fundamental dimension to which no tolerance is applicable.

2.8 track angle: The angle of the video record with respect to the reference edge of the tape.

2.9 center span tension: A calculated value of the tape tension at a point midway between the tape entrance and exit guides of the scanner in a video tape recording system.

2.10 wrap angle: The angle at the center of the drum rotation subtended by the lines of contact between the drum and the reference edge of the tape.

2.11 lead signal overlap: That portion of the helical record which is required to provide a duplicate (overlap) recording.

3 General specifications

3.1 Dimensions in this practice are given in the metric system.

3.2 Tests and measurements conducted on the recorder to measure the parameters specified in this practice should be conducted under the following conditions:

Temperature for drum diameter	20°C ± 0.5°C
Temperature for all other tests	20°C ± 1.0°C
Relative humidity	(50 ± 2)%
Barometric pressure	86 kPa to 106 kPa
Conditioning time before testing	24 hours

4 Tape speed

The tape speed shall be 118.582 mm/s, basic.

Approved August 6, 1990

FIGURE 1A
TOP VIEW

FIGURE 1B
DRUM SHOWING
TAPE WRAP

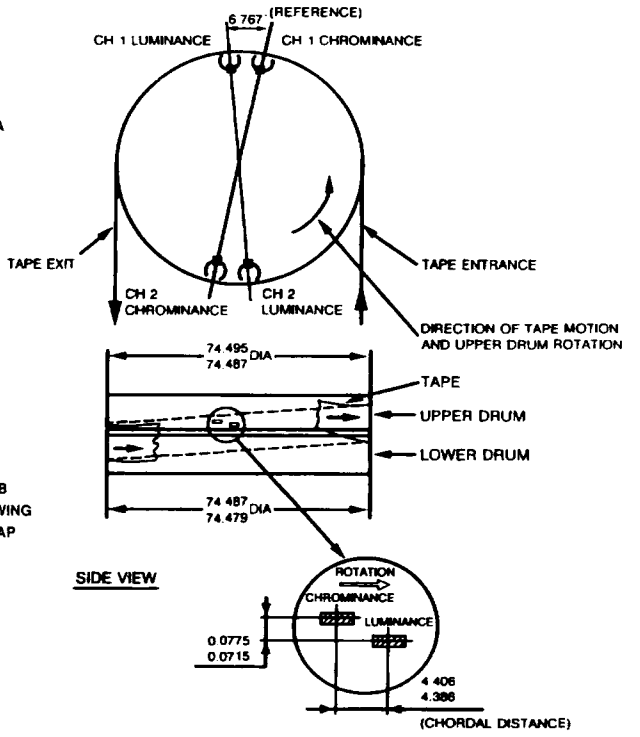

Figure 1 – Chrominance and luminance pole tips

5 Representative scanner parameters

5.1 Drum diameter and structure

The effective drum diameter, tape tension, helix angle, and tape speed taken together completely determine the track angle. Different methods of design and/or minor variations in drum diameter and tape tension will produce equivalent recordings for interchange purposes.

5.1.1 Actual upper drum diameter

The actual upper drum diameter shall be 74.487 mm + 0.008 mm – 0.000 mm.

5.1.2 Actual lower drum diameter

The actual lower drum diameter shall be 74.487 mm + 0.000 mm – 0.008 mm.

5.1.3 Upper drum section

The upper drum section shall rotate together with the video head tips.

5.1.4 Center span tension

The center span tension shall be 0.46 N ± 0.05 N.

5.1.5 Helix angle

The helix angle formed by the scanner and all associated tape guides shall be 4.6° ± 0.003°.

5.2 Scanner pole tips

Four circumferential pole tips shall be located as shown in figure 1.

5.2.1 Pole tip projection

Each pole tip shall project radially 0.040 mm + 0.010 mm – 0.025 mm above the outer surface of the upper drum.

5.2.2 Luminance pole tips

Two pole tips circumferentially spaced at 180° ± 0.003° shall be produced for recording the luminance signal.

5.2.3 Chrominance pole tips

Each luminance pole tip shall have an associated pole tip for recording the time-associated chrominance signal, and when applicable, the AFM audio signals. Chrominance pole tips shall be located at a chordal distance of 4.396 mm ± 0.010 mm in a counter-rotational direction from the associated luminance pole tips, and are axially displaced from the associated luminance pole tips by 0.0745 ± 0.0030 mm in a direction away from the reference edge of the tape. (See figure 1B.)

5.2.4 Channel identification

Suitable means, such as a pulse generator producing one pulse per drum revolution, shall be provided to permit identification of the luminance/chrominance-recording pole-tip pair which records field 1. This pair is identified as channel 1 and the remaining pair as channel 2.

Annex A (informative)
Bibliography

ANSI/SMPTE 229M-1991, Television Analog Recording — 1/2-in Type L — Records

ANSI/SMPTE 230M-1991, Television Analog Recording — 1/2-in Type L — Electrical Parameters, Control Code and Tracking Control

SMPTE 238M, Television Analog Recording — 1/2-in Type L — Tape and Cassettes

SMPTE RECOMMENDED PRACTICE

RP 19-1991
Revision of RP 19-1987

Specifications for 8-mm Type R Registration Test Film

1 Scope

1.1 This practice specifies the subject material and the dimensions and location of the subject material for an 8-mm type R test film of high accuracy to assist the user in achieving several quantitative visual tests. (See annex A.1.)

1.2 The film can be used to test motion-picture projectors and printers.

2 Normative references

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

ANSI/SMPTE 231-1989, Motion-Picture Film (8-mm Type R) — Camera Aperture Image and Usage

ANSI/SMPTE 234-1987, Motion-Picture Film (8-mm Type R) — Projectable Image Area

ANSI/SMPTE 239-1989, Motion-Picture Film (16-mm) — Perforated 8-mm Type R, 2R

3 Dimensions

The dimensions and location of the target areas shall be as specified in the figures. The patterns in figures 3 and 4 appear in the five circular areas of the test pattern shown in figures 1 and 2.

4 Description

4.1 The test film shall be produced as a camera original film photographed on high-contrast, high-definition, positive-type motion-picture stock made in accordance with ANSI/SMPTE 239-1989.

4.2 The diffuse density of the background area shall be 1.80 ± 0.10.

4.3 The camera and projector image areas shall be in accordance with ANSI/SMPTE 231-1989 and ANSI/SMPTE 234-1987.

4.4 The resolution targets shall be photographed in a magnification which results in the concentric rings reading in lines per millimeter on the film (20, 30, 40, 50, and 60). The rosette in the center shall indicate a measurement from 60 to 240 lines per millimeter. (See annex A.6.)

NOTE – A test film made in accordance with this practice is available from the Society of Motion Picture and Television Engineers.

Approved October 9, 1991

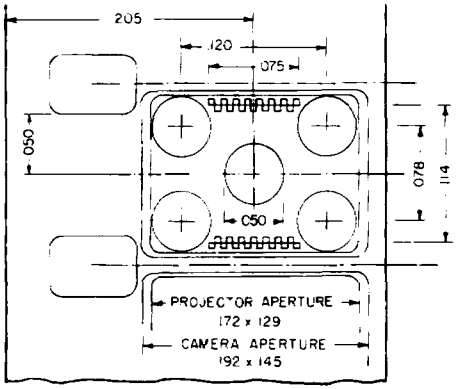

Figure 1 – Test pattern dimensions

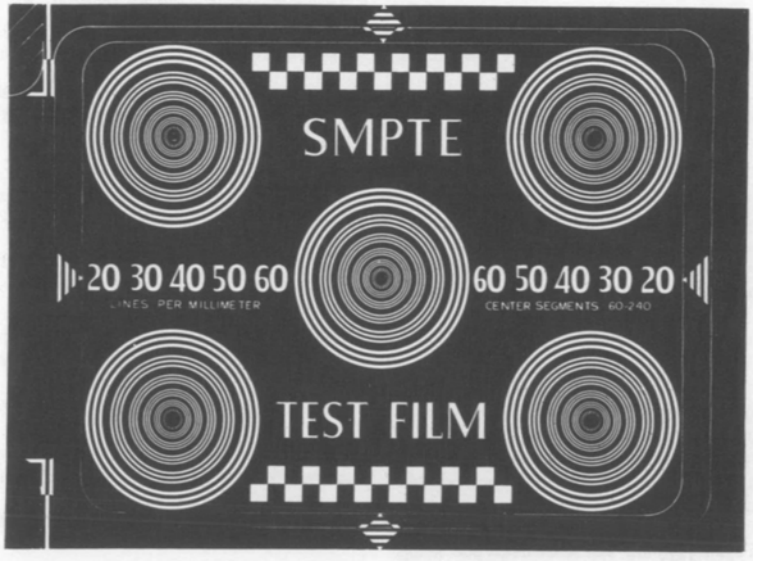

Figure 2 – Reproduction of test pattern

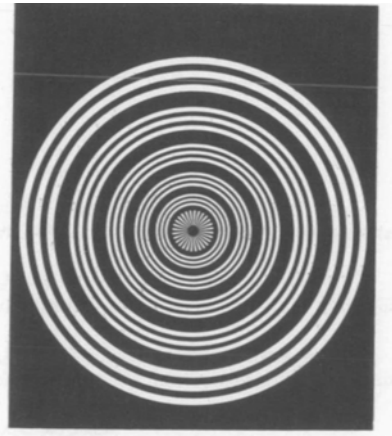

Figure 3 – Enlargement of target area

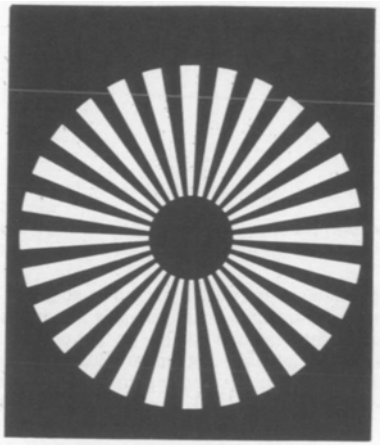

Figure 4 – Enlargement of rosette

Annex A (informative)
Additional data

A.1 Visual tests

The following quantitative visual tests can be performed:

Tests	Projector	Printer		
		Contact		Optical
		Continuous	Step	Step
Steadiness (jump and weave)	X	X*	X	X
Aperture alignment	X	X	X	X
Double-exposure alignment		X	X	X
Shutter adjustment (travel ghost)	X			X
Framing accommodation	X			X
Focus	X			X
Resolution	X	X	X	X
Field flatness	X	X	X	X

*The perforation pitch of the test film is not optimum for continuous contact printers and its value for this purpose may be limited.

A.2 Magnification

If the image of the test film target is projected to 30 in × 40 in (762 mm × 1016 mm), it will be enlarged 230 times.

A.3 Jump and weave

The triangular areas in the centers of the vertical and horizontal framelines can be used to measure jump and weave and aperture misalignment. Each line in these areas is 0.001 in (0.03 mm) wide. The lines are spaced 0.001 in (0.03 mm) apart.

A.4 Aperture centering and size

The inner rectangle represents the nominal projectable area.

A.5 Travel ghost

The white blocks are 0.005 in (0.13 mm) square and will quickly indicate travel ghost caused by incorrect shutter adjustment. They also provide a quick check on the ability to frame above and below center position. Travel ghost is a blurring effect seen on the screen and evidenced by vertical tails or light streaks added to the projected images of the more transparent areas on the test film. It is caused by the projector shutter being out of synchronism with the intermittent mechanism. If the ghost is above the blocks, the shutter

closes late; if the ghost is below the blocks, the shutter opens early.

A.6 Resolution

Resolving power in lines per millimeter can be read directly from the test target to the limit permitted by the film stock used. Resolution targets are spaced one in the center and one in each of the four corners. The outside diameter of the target on the film is 0.050 in (1.27 mm) and will fill the area covered by an average microscope using a 10X objective. (See 4.4.)

A.7 Field flatness

Side-to-side out-of-focus is determined from the difference in softness of the sides. Quantitative differences can be determined from resolution charts. Circle charts at the middle of the field permit quick focus adjustment and detection of in- and out-of-focus effects.

A.8 Striping

The user may apply magnetic record and balance stripes to this film by post-process means. If this is done, the dimensions of the film image should be checked to determine if change has been produced by the striping process. It is anticipated that striping will not affect significantly the performance of the test film. However, the user is cautioned that the proximity of the film image to the limiting aperture may be altered due to striping thickness. Also, the frictional characteristics of the test film may be changed, which could affect film transport in the user's apparatus.

SMPTE RECOMMENDED PRACTICE

RP 20-1991
Revision of RP 20-1987

Specifications for 16-mm Registration Test Film

1 Scope

1.1 This practice specifies the subject material and the dimensions and location of the subject material for a 16-mm test film of high accuracy to assist the user in achieving several quantitative visual tests. (See annex A.1.)

1.2 The film can be used to test motion-picture projectors and printers.

2 Normative references

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

ANSI/SMPTE 7-1988, Motion-Picture Film (16-mm) — Camera Aperture Image and Usage

ANSI/SMPTE 110-1986, Motion-Picture Film (16-mm) — Perforated 2R

ANSI/SMPTE 233-1987, Motion-Picture Film (16-mm) — Projectable Image Area

3 Dimensions

The dimensions and location of the target areas shall be as specified in the figures. The patterns in figures 3 and 4 appear in the nine circular areas of the test pattern shown in figures 1 and 2.

4 Description

4.1 The test film shall be produced as a camera original film photographed on high-contrast, high-definition, positive-type motion-picture stock made in accordance with ANSI/SMPTE 110-1986.

4.2 The diffuse density of the background area shall be 1.80 ± 0.10.

4.3 The camera and projector image areas shall be in accordance with ANSI/SMPTE 7-1988 and ANSI/SMPTE 233-1987.

4.4 The resolution targets shall be photographed in a magnification which results in the concentric rings reading in lines per millimeter on the film (20, 30, 40, 50, and 60). The rosette in the center shall indicate a measurement from 60 to 240 lines per millimeter. (See annex A.6.)

NOTE – A test film made in accordance with this practice is available from the Society of Motion Picture and Television Engineers.

Approved October 9, 1991

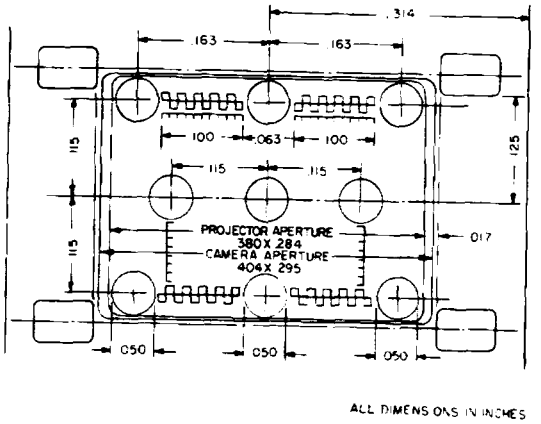

Figure 1 – Test pattern dimensions

Figure 2 – Reproduction of test pattern

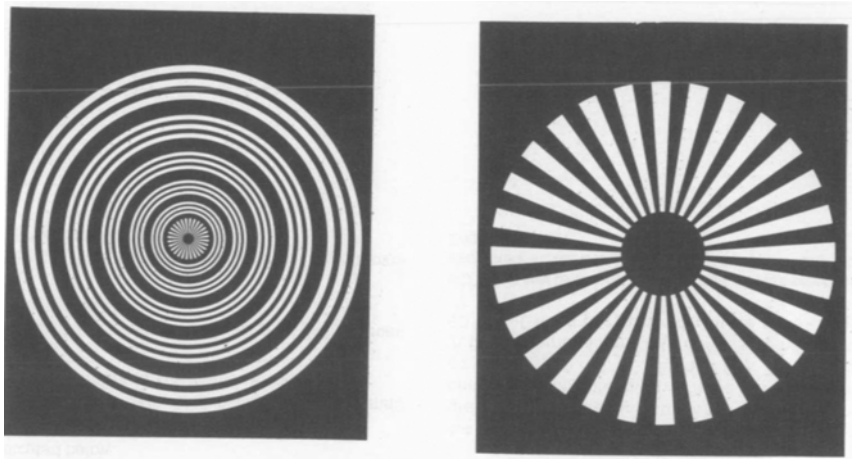

Figure 3 – Enlargement of target area

Figure 4 – Enlargement of rosette

Annex A (informative)
Additional data

A.1 Visual tests

The following quantitative visual tests can be performed:

Tests	Projector	Printer		
		Contact		Optical
		Continuous	Step	Step
Steadiness (jump and weave)	X	X*	X	X
Aperture alignment	X	X	X	X
Double-exposure alignment		X	X	X
Shutter adjustment (travel ghost)	X			X
Framing accommodation	X			X
Focus	X			X
Resolution	X	X	X	X
Field flatness	X	X	X	X

*The perforation pitch of the test film is not optimum for continuous contact printers and its value for this purpose may be limited.

A.2 Magnification

If the image of the test film target is projected to 30 in × 40 in (762 mm × 1016 mm), it will be enlarged 100 times.

A.3 Jump and weave

The triangular areas in the centers of the vertical and horizontal framelines can be used to measure jump and weave and aperture misalignment. Each line in these areas is 0.001 in (0.03 mm) wide. The lines are spaced 0.001 in (0.03 mm) apart.

A.4 Aperture centering and size

The inner rectangle represents the nominal projectable area. The horizontal and vertical scales have least divisions of 0.001 in (0.03 mm). They provide useful information when film is double-exposed in a printer to check registration.

A.5 Travel ghost

The white blocks are 0.010 in (0.25 mm) square and will quickly indicate travel ghost caused by incorrect shutter adjustment. They also provide a quick check on the ability to frame above and below center position. Travel ghost is a blurring effect seen on the screen and evidenced by vertical tails or light streaks added to the projected images of the more transparent areas on the test film. It is caused by the

projector shutter being out of synchronism with the intermittent mechanism. If the ghost is above the blocks, the shutter closes late; if the ghost is below the blocks, the shutter opens early.

A.6 Resolution

Resolving power in lines per millimeter can be read directly from the test target to the limit permitted by the film stock used. Resolution targets are spaced one in the center, four equidistant from the center, and one in each of the four corners. The outside diameter of the target on the film is 0.050 in (1.27 mm) and will fill the area covered by an average microscope using a 10X objective. (See 4.4.)

A.7 Field flatness

Side-to-side out-of-focus is determined from the difference in softness of the sides. Quantitative differences can be determined from resolution charts. Circle charts at the middle of the field permit quick focus adjustment and detection of in- and out-of-focus effects.

A.8 Striping

The user may apply magnetic record and balance stripes to this film by post-process means. If this is done, the dimensions of the film image should be checked to determine if change has been produced by the striping process. It is anticipated that striping will not significantly affect the performance of the test film. However, the user is cautioned that the proximity of the film image to the limiting aperture may be altered due to striping thickness. Also, the frictional characteristics of the test film may be changed, which could affect film transport in the user's apparatus.

SMPTE RECOMMENDED PRACTICE

RP 32-1991
Revision of RP 32-1987

Specifications for 8-mm Type S Test Film for Projectors and Printers

1 Scope

This practice specifies the content and dimensions of an 8-mm type S test film useful in checking the performance of motion-picture projectors and printers. Its use is described in annex A.

2 Normative references

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

ANSI/SMPTE 154-1988, Motion-Picture Film (8-mm Type S) — Projectable Image Area and Projector Usage

ANSI/SMPTE 157-1988, Motion-Picture Film (8-mm Type S) — Camera Aperture Image and Usage

ANSI/SMPTE 168-1991, Motion-Picture Film (16-mm) — Perforated 8-mm Type S, (1-4)

3 Dimensions

3.1 The dimensions and location of the target areas shall be as specified in figures 1 and 2. These values apply when the film is conditioned and measured at 70°F (21°C), 50% relative humidity.

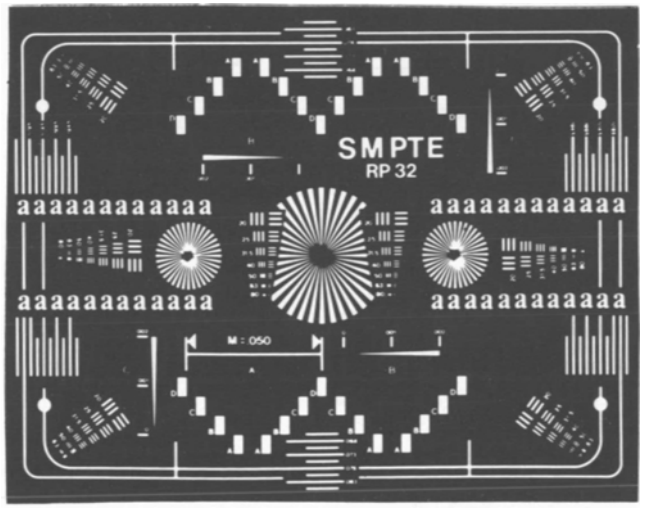

Figure 1 – Reproduction of test pattern

Approved October 9, 1991

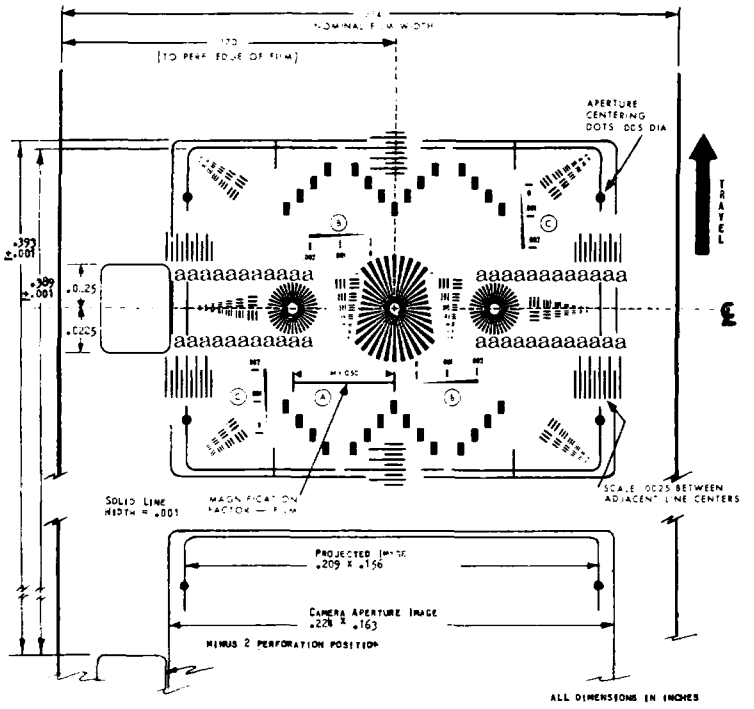

Figure 2 – Test pattern dimensions

3.2 The general tolerance for all dimensions shall be ± 0.0005 in (0.013 mm), unless otherwise specified.

3.3 The minus–2 perforation position used for dimensional reference is two perforations following the perforation adjacent to the image.

4 Description

4.1 The test film shall be produced as a camera original on high-contrast, high-definition motion-picture film, cut and perforated in accordance with ANSI/SMPTE 168-1991. It shall be processed to yield a dye image.

4.2 The camera and projector image areas shown on the test film shall meet the requirements for the minimum camera aperture image and the nominal projected image in accordance with ANSI/SMPTE 157-1988 and ANSI/SMPTE 154-1988.

4.3 The target shall be photographed at a magnification which results in dimension M at Ⓐ of 0.050 in (1.27 mm) on the film. When this is done, the solid lines have a width of 0.001 in (0.03 mm) ± 5%.

4.4 The vertical and horizontal frame-to-frame placement of the target on the film should be consistent to ensure its usefulness for steadiness measurements. When its placement is measured according to 3.1 above, the frame-to-frame variability of the placement of the image shall be within ± 0.002 in (0.005 mm) vertically and horizontally.

NOTE – A test film made in accordance with this practice is available from the Society of Motion Picture and Television Engineers.

Annex A (informative)
Additional data

A.1 Visual tests

The following quantitative visual tests can be performed:

Tests	Projector	Printer		
		Contact		Optical
		Continuous	Step	Step
Steadiness (jump and weave)	X	X*	X	X
Aperture alignment	X	X	X	X
Double-exposure alignment		X	X	X
Shutter adjustment (travel ghost)	X			X
Framing accommodation	X			X
Focus	X			X
Resolution	X	X	X	X
Field flatness	X	X	X	X

*The perforation pitch of the test film is not optimum for continuous contact printers and its value for this purpose may be limited.

A.2 Magnification

If the image of the test film target is projected to 30 in x 40 in (762 mm x 1016 mm), it will be enlarged 192 times.

A.3 Steadiness

Wedges for measurement of vertical steadiness B and horizontal steadiness C taper from 0 to 0.002 in (0.05 mm) wide, with an intermediate position of 0.001 in (0.03 mm). The outer sides of the B wedges and the inner sides of the C wedges are parallel to the horizontal and vertical sides of the frame respectively.

A.4 Aperture centering and size

The inner rectangle represents the nominal projectable area and the center of the large pie is located at midpoints horizontally and vertically. The groups of short lines along the border indicate distances from the center of the aperture and are spaced at intervals of 0.0025 in (0.064 mm). Circular dots near the corners are 0.005 in (0.13 mm) in diameter and can be used for rapid aperture-centering checks. If some portion of all dots is visible, centering would be within 0.0025 in.

A.5 Travel ghost

The A, B, C, and D blocks are used to determine travel ghost. Travel ghost is a blurring effect seen on the screen and evidenced by vertical tails or light streaks added to the projected images of the more transparent areas on the test film. It is caused by the projector shutter being out of synchronism with the intermittent mechanism. If the ghost is above the blocks, the shutter closes late; if the ghost is below the blocks, the shutter opens early.

A.6 Framing accommodation

The longer lines of the group of lines at the top and bottom of the vertical aperture centerline are 0.005 in (0.13 mm) apart. By centering the aperture and framing above and below, the range of framing is determined. The height of each travel ghost block is 0.007 in (0.18 mm). This permits the extent of framing to be measured beyond the limits of the dimensional lines.

A.7 Resolution

Resolving power in lines per millimeter can be read directly from the test target to the limit permitted by the film stock used. The ratio of line spacings of adjacent resolution patterns is equal to 10 1/10 (i.e., the logarithm to the base 10 of the ratio of adjacent line spacings is 0.10).

A.8 Field flatness

Side-to-side out-of-focus is determined from the difference in softness of the a's at the sides. Quantitative differences can be determined from resolution charts. Pie charts at the middle of the field permit quick focus adjustment and detection of in- and out-of-focus effects.

A.9 Striping

The user may apply magnetic record and balance stripes to this film by post-process means. If this is done, the dimensions of the film image should be checked to determine if change has been produced by the striping process. It is anticipated that striping will not significantly affect the performance of the test film. However, the user is cautioned that the proximity of the film image to the limiting aperture may be altered due to striping thickness. Also, the frictional characteristics of the test film may be changed, which could affect film transport in the user's apparatus.

PROPOSED SMPTE STANDARD

SMPTE 109
Revision and Consolidation of
ANSI/SMPTE 109-1986
and
ANSI/SMPTE 110-1986

Motion-Picture Film (16-mm) — Perforated 1R and 2R

1 Scope

This standard specifies the cutting and perforating dimensions for 16-mm motion-picture film with perforations along one or both edges and a perforation pitch of either 0.2994 in or 0.3000 in (7.605 mm or 7.620 mm) for the following two categories:

a) 16-mm motion-picture films;

b) manufacturer-designated 16-mm professional motion-picture camera films with tighter tolerances.

2 Normative reference

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

ANSI/SMPTE 223M-1991, Motion-Picture Film — Safety Film

3 Dimensions

3.1 The dimensions and tolerances shall be as given in table 1 and in the accompanying figures 1, 2, and 3.

3.2 The dimensions pertain to a safety film as defined in ANSI/SMPTE 223M-1991.

3.3 The dimensions apply at the time of cutting and perforating for film adjusted to a temperature of 23°C ± 1°C (nominally converted to 73°F ± 1°F) and a relative humidity of (50 ± 2)%. The manufacturer may indicate other nominal temperature and humidity conditions under which the dimensions apply.

NOTE – The title of this standard was established by the application of a nomenclature system developed for all film dimension standards: Each title provides an indication of the film width, a code designation for the perforation shape (BH, KS, DH, or CS), or the number of rows of perforations (1R, 2R, etc.), depending upon which is the significant factor, or the perforation pitch without the decimal point.

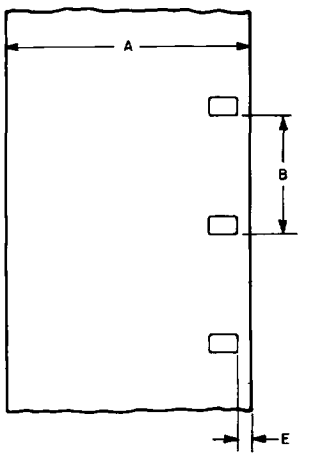

Figure 1 – 16-mm film perforated 1R

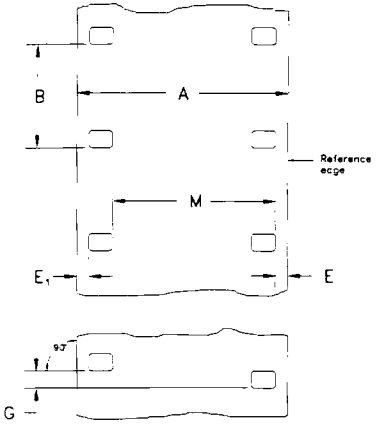

Figure 2 – 16-mm film perforated 2R

Table 1 – Dimensions

Dimensions	All films		Designated professional camera films (only dimensions which differ from all films are shown)		
	Inches	Millimeters[1]	Inches	Millimeters[1]	Notes
A[2]	0.628 ± 0.001	15.950 ± 0.025			
B[3]	0.3000 ± 0.0004	7.620 ± 0.010			5,6
B'[3]	0.2994 ± 0.0004	7.605 ± 0.010			5,6
C	0.0720 ± 0.0004	1.830 ± 0.010			5
D	0.0500 ± 0.0004	1.270 ± 0.010			5
E	0.0355 ± 0.0020	0.900 ± 0.050	0.0355 ± 0.0010	0.900 ± 0.025	5,6
E_1	0.0355 ± 0.0020	0.900 ± 0.050			
G	0.001 max	0.025 max	0.0004 max	0.010 max	
L[3,4]	30.00 ± 0.03	762.0 ± 0.8			
L'[3,4]	29.94 ± 0.03	760.5 ± 0.8			
M	0.485 ± 0.001	12.32 ± 0.03			
R	0.010 ± 0.001	0.25 ± 0.03			

NOTES (applicable to all 16-mm films) –

1 The metric dimensions are chosen to reflect the practice in those countries which use the metric system primarily.

2 The metric conversion of dimension A is purposely chosen and shown to three decimal places to prevent the maximum width dimension from exceeding 16 mm.

3 Dimensions B and L apply to long perforation pitch; dimensions B' and L' apply to short perforation pitch.

4 Dimensions L and L' represent the length of any 100 consecutive perforation intervals.

NOTES (applicable only to films designated by the manufacturer for professional camera use) –

5 The range of values measured in any 50 consecutive perforations shall not exceed 0.0004 in (0.010 mm) for dimensions B, B', C, and D, and 0.0008 in (0.020 mm) for dimension E (see A.3).

6 The difference in the dimensional value of B or B' between any consecutive perforation intervals shall not exceed 0.0002 in (0.005 mm). Between consecutive perforations, the difference in the dimensional value of E shall not exceed 0.0004 in (0.010 mm) (see A.3).

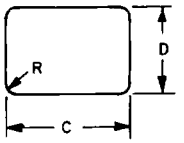

Figure 3 – Perforation for 16-mm film 1R and 2R

Annex A (informative)
General Information

A.1 The user is reminded that, as a plastic, film can change dimensions temporarily due to moisture or temperature, or permanently due to solvent loss or strain effect.

A.2 Film for positive use has a longitudinal pitch 0.2% longer than its companion negative. Shrinkage of the negative during processing and aging prior to printing will generally not exceed 0.2%. Thus, the negative stock is expected to be 0.3% ± 0.1% shorter than the positive. This difference will minimize slippage between the two on the 12-in (305-mm) circumference sprocket of the printer, assuming a film thickness of 0.0055 in to 0.0065 in (0.140 mm to 0.165 mm).

A.3 The uniformity of pitch, hole size, and margin (Dimensions B, C, D, and E) is an important variable affecting steadiness. Variations in these dimensions, from roll to roll, are of little significance compared to variations from one perforation to the next within any small group of consecutive perforations. As an example, the uniformity of the margin is uniquely critical for optical printing.

PROPOSED SMPTE STANDARD

for Motion-Picture Film (8-mm Type R)—

Projectable Image Area and Projector Usage

SMPTE 234
Revision and Consolidation of
ANSI/SMPTE 232M-1987
and
ANSI/SMPTE 234-1987

1 Scope

1.1 This standard specifies the maximum dimensions of the film image area intended for projection from an 8-mm type R motion-picture film, and the placement of this area relative to the perforations and the reference edge of the film.

1.2 This standard also specifies the position of the emulsion, the rate of projection, and the orientation of the image area for 8-mm type R motion-picture film as used in a motion-picture projector.

2 Normative reference

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

ANSI/SMPTE 239-1989, Motion-Picture Film (16-mm)—Perforated 8-mm Type R, 2R

3 Dimensions

3.1 The dimensions shall be as given in figure 1 and table 1.

3.2 The angle between the horizontal edges of the image area and the reference edge of the film shall be 90° ± ½°.

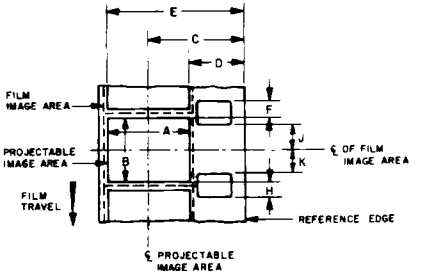

Figure 1 – Projectable image area on film as seen looking through the film towards the lens

Table 1 – Dimensions

Dimensions	Inches	Millimeters
A	0.172 nom	4.37 nom
B	0.130 max	3.30 max
C*	0.205 ref	5.21 ref
D	0.117 min	2.97 min
E	0.293 max	7.44 max
F = H	within 0.014	within 0.36
J = K	nominally equal	nominally equal

* See A.1.

4 Relationship to other standards

4.1 This standard may be used as the basis for establishing picture areas from original photography for final viewing because it presents a description of the picture area on the projection print that is usable for the indicated purposes of

the print which is of primary importance because the projection print is the most commonly interchanged item.

4.2 ANSI/SMPTE 231-1989 defines the image area for other important phases of motion-picture operations, and it is consistent with this standard under currently acceptable commercial practice.

5 Emulsion position

Most 8-mm films are projected with the emulsion toward the screen. There are, however, some systems which produce prints that are projected with the base toward the screen.

6 Rate of projection

The normal rate of projection shall be 18 frames per second for silent film and 24 frames per second for sound film.

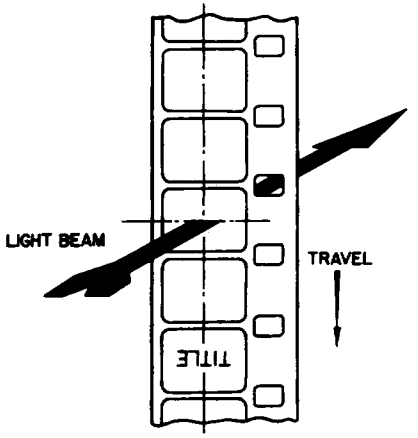

Figure 2 – Film as seen from projector light source looking toward lens

NOTES

1 Camera and printer apertures. The actual image on the film is significantly larger than the maximum area intended for projection, so that in placement of the images throughout the sequence of the films the tolerance is not restrictive of commercial practice. Upper limits have been established through consideration of good practice in avoiding frame overlap, encroachment upon areas reserved for audio records, flare from perforation edges, etc. Lower limits are similarly related to the avoidance of image effects at a defined edge, tolerances in film position, etc.

2 Projector aperture. Dimensions B, D, and E define the maximum image area on the film that is available for projection. They do not define the opening in the aperture plate of a projector. The size of this opening may differ from dimensions A and B, for example, because of the physical separation necessary between the aperture plate and the film to avoid scratching the film, the slant of the marginal rays accepted by the projection lens, etc.

3 Actual projected area. It is recognized that, in many cases, the actual film image area that is projected may be smaller than the projectable maximum and, in some cases, may be nonrectangular (for example, an irregular four-sided figure bound by either straight or curved lines). Such departures may result from equipment considerations such as slight inconsistencies among lenses, screen sizes, etc.; from geometric limitations such as the screen surface being at an angle other than 90° from the projection axis, or being nonplanar, or both; and from aesthetic considerations such as pictorial composition within more restrictive image limits. In the absence of specific instructions to the contrary, it is intended that the actual projected film image area be the largest appropriately-shaped figure that can be inscribed within the specified dimensions.

When the picture outline on the screen is defined by the projector aperture, it is customary to round the corners of the projected film area. A maximum corner radius of 0.010 in (0.25 mm) at the film plane is recommended.

4 Film perforations. Film intended for projection with this image area is normally perforated as specified in ANSI/SMPTE 231-1989.

Annex A (informative)
General Information

A.1 The centerlines of the image area are given for convenience in interpreting the standard, facilitating such applications as the optical design of equipment, and assisting in the understanding of suitable mechanical embodiments related to the projectable image areas. Note that the centerline of the projectable image area is displaced from the centerline of the film by 0.048 in (1.22 mm) nominal.

A.2 Because of the increased intensity of illumination available in modern 8-mm projection systems, the industry has found it desirable to extend the flicker threshold by choosing as high a projection rate (and, therefore, as high a flicker frequency) as practicable. A projection rate of 18 frames per second and a corresponding flicker frequency of 54 cycles per second (obtained with a three-blade shutter) has been found by experience to be an acceptable compromise.

Annex B (informative)
Bibliography

ANSI/SMPTE 231-1989, Motion-Picture Film (8-mm Type R) — Camera Aperture Image and Usage

PROPOSED SMPTE STANDARD

for Motion-Picture Film —

35- and 16-mm Magnetic Audio Records — Recorded Characteristics

SMPTE 208M

Revision, Redesignation and Consolidation of ANSI PH22.208M-1984 and ANSI/SMPTE 213M-1984

1 Scope

This standard specifies the recorded characteristics of magnetic records on 35-mm motion-picture film intended for reproduction at 24 frames per second, and on 16-mm motion-picture film intended for reproduction at 24 frames per second. (See notes 1 and 2.)

2 Recorded characteristics

With a constant-amplitude sine-wave signal applied to the input of the recording system, the nominal characteristic of the short circuit magnetic flux versus frequency shall decrease with increasing frequency proportionately to the impedance of a parallel combination of a capacitance and a resistance having the time constant τ = 35 µs for 35-mm motion-picture film, and the time constant τ = 70 µs for 16-mm motion-picture film. (See note 3.)

The characteristics defined above are represented by the following equation:

$$L_\Phi = L_0 - 10 \log_{10} \left(1 + (2\pi\tau)^2 f^2 \right) \text{ dB}$$

where L_Φ is the recorded relative short circuit magnetic flux level in decibels, f is the frequency in hertz, τ is the time constant described above, and L_0 is a constant calculated to make L_Φ = 0 at the reference frequency of 1 kHz for 35-mm motion-picture film, and to make L_Φ = 0 at the reference frequency of 400 Hz for 16-mm motion-picture film:

	for 35-mm film	for 16-mm film
L_0 =	0.20511	0.13238

Approximate numerical values for each curve are given in table 1.

Table 1 – Recorded characteristics

Frequency Hz	Relative level, dB	
	35-mm film 35 µs	16-mm film 70 µs
20	0.20	
31.5	0.20	0.13
40	0.20	0.13
50	0.20	0.13
63	0.20	0.13
80	0.20	0.13
100	0.20	0.12
125	0.20	0.12
160	0.20	0.11
200	0.20	0.10
250	0.19	0.08
315	0.18	0.05
400	0.17	0.00
500	0.15	–0.07
630	0.12	–0.19
800	0.07	–0.37
1000	0.00	–0.64
1250	–0.11	–1.01
1600	–0.30	–1.61
2000	–0.56	–2.36
2500	–0.94	–3.31
3150	–1.50	–4.52
4000	–2.28	–5.99
5000	–3.24	–7.53
6300	–4.45	–9.25
8000	–5.92	–11.13
10000	–7.46	–12.95
12500	–9.12	–14.81
14000	–10.00	–15.77
16000	–11.06	–16.90
20000	–12.88	

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3 Tolerances

Magnetic audio records on motion-picture film shall be recorded to the characteristics specified in clause 2 with the tolerances shown in figure 1 for 35-mm magnetic audio records, and with the tolerances shown in figure 2 for 16-mm magnetic audio records.

NOTES

1 The film velocity of 35-mm film is also commonly stated as 18 inches per second or 457 millimeters per second, and historically stated as 90 feet or 27 meters per minute.

2 The film velocity of 16-mm film is also commonly stated as 7.2 inches per second or 183 millimeters per second, and historically stated as 36 feet or 11 meters per minute.

3 The time constant is only a convenience in defining the desired response curve and is never intended as a recommended electrical circuit.

4 This standard has substantially the same technical content as that of ISO 1188:1984 and ISO 1189:1986.

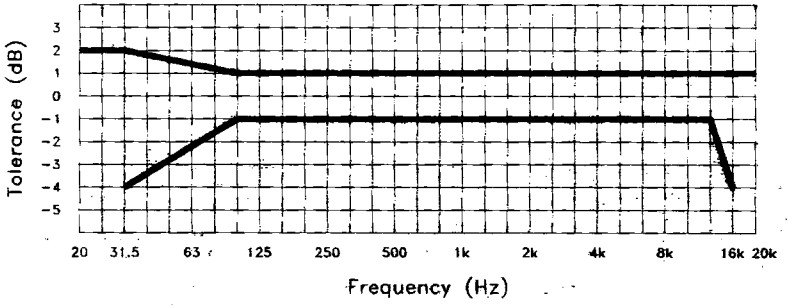

Figure 1 – Tolerance on 35-mm recorded records

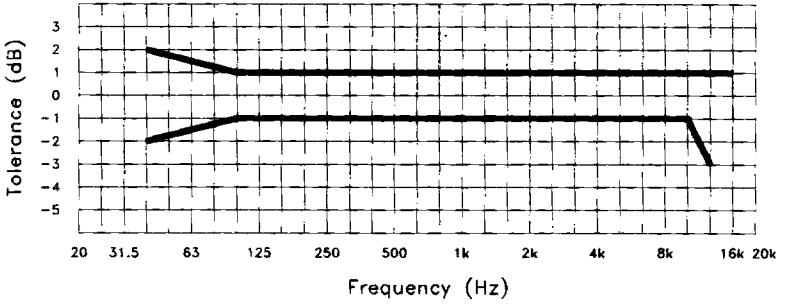

Figure 2 – Tolerance on 16-mm recorded records

Annex A (informative) Bibliography

ISO 1188:1984, Cinematography — Recorded Characteristic for Magnetic Sound on Full-Coat 16 mm Motion-Picture Film — Specifications

ISO 1189:1986, Cinematography — Recorded Characteristic for Magnetic Sound Records on 35 mm Motion-Picture Film Excluding Striped Release Prints — Specifications