Approved SMPTE Recommended Practices

In May 1968, the Society's Board of Governors approved two Recommended Practices which are printed here for your information. Copies of these documents and all SMPTE Recommended Practices may be acquired from Society Headquarters upon request.

SMPTE Recommended Practice Tape Vacuum Guide Radius and Position for 2-Inch Quadruplex Video Magnetic Tape Recording, RP11-1968, is actually a reaffirmation of the previous issue modified editorially to conform with other similar documents.

SMPTE Recommended Practice Specifications for Operational Alignment Test Pattern for Television, RP27.1-1968, was developed by the Television Committee as the first of a series of precision patterns. A subcommittee report describing this work was published in the December 1967 SMPTE *Journal*.

Draft USA Standards

Four draft USA Standards are published here for a trial period and public review. Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters before September 30, 1968. The proposals have also been submitted to USA Standards Committee PH22. Consequently, all comments received through *Journal* publication will be reviewed prior to the conclusion of action by the PH22 Committee.

PH22.23, Dimensions for Projection Reels for 8mm Motion-Picture Film, is a substantial revision of the 1956 issue and should be examined carefully by all concerned. It should be noted that the proposal has been expanded to include the 1200-ft capacity reels.

The other three proposals are new standards prepared by the 16 and 8mm Committee: PH22.173, Dimensions for Double 8mm Motion-Picture Camera Spools (100-Ft Capacity); PH22.-174, Dimensions for 16mm Daylight-Loading Motion-Picture Camera Spools (50- to 400-Ft Capacity); and PH22.175, Dimensions for Projection Lamps, Four-Pin, Prefocus, Base-Down Type. — *A.E.A.*

SMPTE RECOMMENDED PRACTICE — **RP 27.1-1968**

Specifications for Operational Alignment Test Pattern for Television

1. *Scope*

This recommended practice describes the format, dimensions and optical densities for a test pattern transparency to be used as an operational alignment tool for television systems.

2. *Purpose*

The purpose of this practice is to provide a simplified test pattern to facilitate day-to-day operational checks and adjustments of focus, resolution response, mid-band streaking, astigmatism, field uniformity, scanning size, linearity, and interlace in live and film television systems.

3. *Description*

3.1 Pattern. A reproduction of the test pattern is shown in Fig. 1.

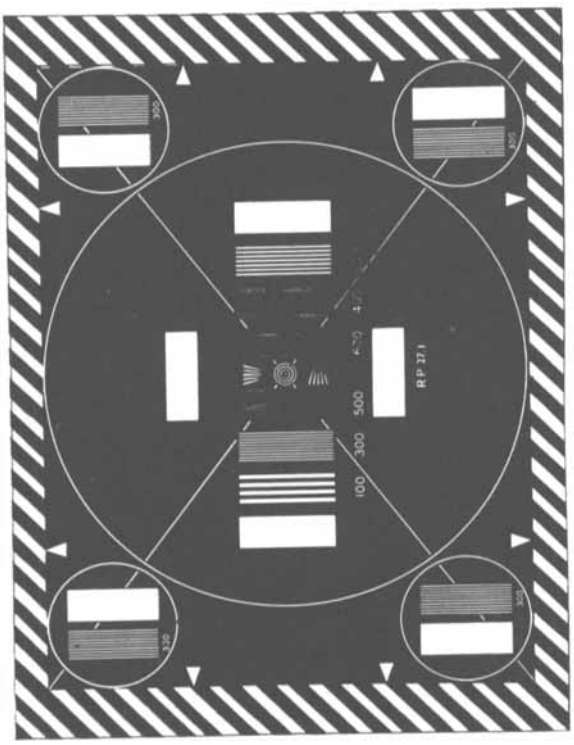


Fig. 1—Reproduction of Test Pattern

Approved May 1968

3.2 Background Density. The background of the test pattern is black to minimize interference when evaluating the television waveform display. (See 5.2.)

3.3 Reference White Bars. White bars of equal size are located on each side, above and below the central spatial frequency bursts and in each of the four corners. The bars are provided to establish a reference white level and to evaluate the white signal uniformity of the system. The two bars located above and below the central spatial frequency bursts are also used to evaluate mid-band streaking.

3.4 Spatial Frequency Bursts. All spatial frequency bursts are calibrated in television lines per picture height and are located in the central portion of the test pattern and at each of the four corners. The central bursts are arranged with the highest line numbers nearest the center of the pattern where optical and electrical performance is maximum. The spatial frequency bursts located in each of the four corners are horizontally positioned so that they do not overlap each other when viewed on a waveform monitor triggered at a horizontal rate.

3.5 Electrical Alignment. A bull's-eye pattern is located at the center of the test pattern to facilitate pickup tube beam alignment.

3.6 Horizontal and Vertical Wedges. Horizontal and vertical wedges are located near the center of the test pattern to facilitate beam alignment for minimum astigmatism. The horizontal wedge can also be used to check scanning interlace.

3.7 Circles and Diagonal Lines. Circles and diagonal lines are provided to check system geometry. They are dark gray to minimize interference when evaluating the television waveform display. (See 5.4.)

3.8 Boundary Arrows and Black-and-White Border. The eight boundary arrows and black-and-white border provide a check on system centering, scanning size, and equipment clamp performance. (See 5.3.)

3.9 Pattern Identification. The identification number of this document shall appear on the slide in the area specified in Fig. 2.

3.10 Manufacturer's Identification. Identification of the manufacturer shall appear on the slide mount outside the pattern area.

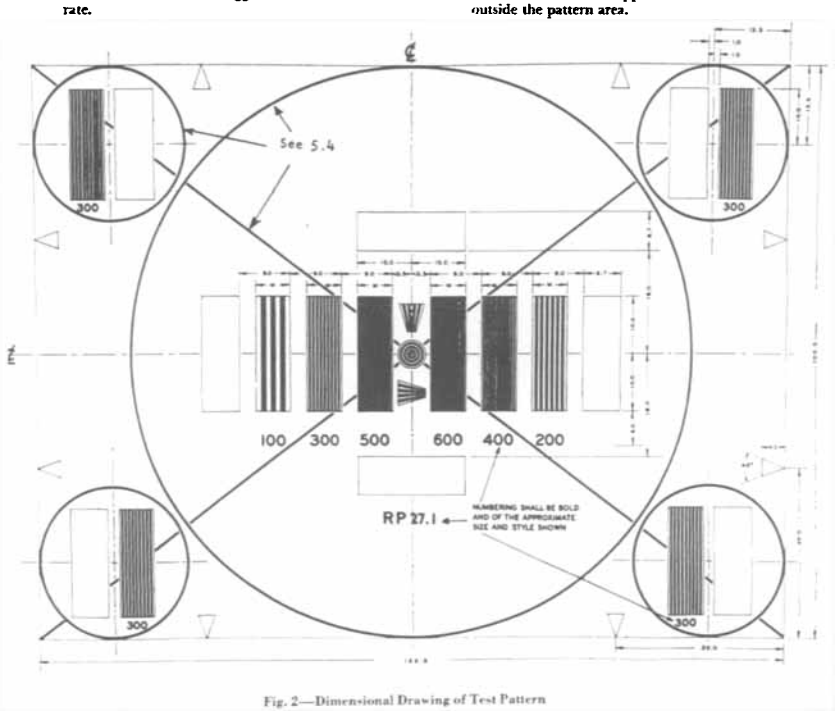


Fig. 2—Dimensional Drawing of Test Pattern

4. *Format*

4.1 The dimensions of the test pattern shall be as shown in Figs. 2 and 3. All dimensions are in percentage of picture height. One hundred percent picture height is equal to the outside diameter of the largest circle. No dimensions, dimension lines, or centerlines are to appear on the final product.

4.2 Image Size. The size of the area inside the black-and-white border, as indicated by the eight boundary arrows, shall be as follows:

4.2.1. 2x2 in. test slides and 8x10 in. test transparencies shall have Category 1 dimensions, as specified in USA Standard Dimensions and Optical Specifications of Test Slides and Transparencies for Television, PH22.144-1965.

4.2.2. 35mm test films shall have dimensions in accordance with Section 3.3 of USA Standard Dimensions for Television Image Area on 35mm Motion-Picture Film, PH22.95-1963. 16mm test films shall have dimensions in accordance with Section 3.3 of USA Standard Dimensions for Television Image Area on 16mm Motion-Picture Film, PH22.96-1963.

4.3 Black-and-White Border. Height and width dimensions of the black-and-white border for 2x2 in. slides and 8x10 in. transparencies are specified in USA Standard Dimensions and Optical Specifications of Test Slides and Transparencies for Television. PH22.144-1965.

For 35mm and 16mm motion-picture films, the black-and-white border shall extend to the dimension of the negative image as specified in USA Standard Dimensions of 35mm Motion-Picture Camera Aperture Images (Style A), PH22.59-1966, and USA Standard Dimensions of 16mm Motion-Picture Camera Aperture Image, PH22.7-1964.

4.4 Corner Circles. Each of the four corner circles shall be located so that its outside diameter is tangent to the perimeter of the pattern in its respective corner.

4.5 Diagonal Lines. Diagonal lines shall be drawn between opposing corners as shown in Fig. 2 and shall not intersect any of the pattern elements.

4.6 Line Widths. Line widths for the circumference of the five circles and the diagonal lines shall be 0.50 ± 0.05 percent.

4.7 Spatial Frequency Burst. Each spatial frequency burst width "W" is nominally equal to 6 percent of picture height plus one additional half cycle of white to provide a burst pattern which starts and ends with a white half cycle. The ratio of the width of the black half cycle to the width of the white half cycle shall be 1.00 ± 0.05. A tabulation of the nominal dimensions in terms of picture height is listed in Table I.

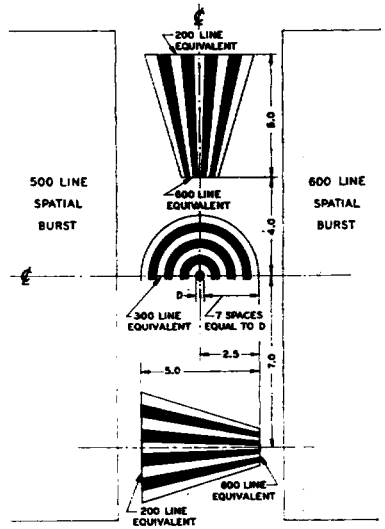


Fig. 3—Enlargement of Central Portion of Fig. 2

Line Number	Line Width in Percent of Picture Height	Burst Width "W" in Percent of Picture Height
100	1.00	7.00
200	0.50	6.50
300	0.33	6.33
400	0.25	6.25
500	0.20	6.20
600	0.17	6.17

5. *Optical Densities*

5.1 Optical Densities. All densities shall be as specified in SMPTE Recommended Practice RP 7, Density and Contrast Range of Black-and-White Films and Slides for Television. (See Note.)

5.2 Background. The background shall be in accordance with the maximum diffuse density specification of RP 7.

5.3 Reference White Bars and Boundary Arrows. The eight reference white bars and boundary arrows shall be in accordance with the minimum diffuse density specification of RP 7.

5.4 Circles, Diagonal Lines and Lettering. Circles, diagonal lines and lettering shall have a density of 0.5 ± 0.05 less than the background density specified in 5.2 above.

5.5 Spatial Frequency Bursts, Wedges, Bull's-eye, and Black-and-White Border shall have a black density in accordance with the maximum diffuse density and a white density in accordance with the minimum diffuse density specification of RP 7.

Note: Since the test pattern does not include any glint or specular highlights, there should be no information less than the minimum diffuse highlight density, as specified in RP 7. Similarly, since the test pattern does not include any small lowlight areas, there should be no information more than the maximum diffuse lowlight density, as specified in RP 7

SMPTE RECOMMENDED PRACTICE — RP 11–1968

Tape Vacuum Guide Radius and Position for 2-In. Quadruplex Video Magnetic Tape Recording

1. *Scope*

This recommended practice specifies the tape vacuum guide radius and position for recording video records on 2-in. quadruplex magnetic tape.

2. *Mechanical Dimensions*

2.1 The radius of the tape vacuum guide shall be 1.0334, +0.0000, —0.0005 in. (26.248, +0.000, —0.013mm).

2.2 The position of the vacuum guide shall be set so that the eccentricity of its center of curvature with respect to the axis of rotation of the video heads is as indicated in the table. The eccentricity shall be such that the extension of a line joining the center of curvature of the vacuum guide and the axis of rotation of the heads intersects the tape at the midpoint of its width. The center of curvature of the vacuum guide shall lie between the axis of rotation of the heads and the vacuum guide.

Vacuum Guide Radius		Eccentricity	
Inches	Millimeters	Inches	Millimeters
1.0334	26.248	0.0000	0.000
1.0333	26.246	0.0001	0.003
1.0332	26.243	0.0002	0.005
1.0331	26.241	0.0003	0.008
1.0330	26.238	0.0004	0.010
1.0329	26.236	0.0005	0.013

Note: These dimensions are based on a nominal tape thickness of 0.0014 in. (0.036mm) and a radius of rotation of the magnetic head pole tips of 1.0329 in. min. to 1.0356 in. max.

Appendix

(This Appendix is not a part of SMPTE Recommended Practice RP 11, Tape Vacuum Guide Radius and Position for 2-In. Quadruplex Video Magnetic Tape Recording, but is included to facilitate its use.)

Achievement of tape reproducing interchangeability requires, among other things, that means be provided to accommodate variations of (a) the radius of rotation of the magnetic head pole tips, (b) the radius of the vacuum guide and (c) tape thickness. These effects are compensated by the stretching of the tape into a slot cavity in the vacuum guide by virtue of the radius of rotation of the magnetic head pole tips projecting beyond the unstretched oxide surface of the tape as held in the vacuum guide. Over the limits normally encountered, the stretching provides automatic compensation if the vacuum guide is positioned to give the minimum geometric distortion in the reproduced picture.

Revision of
RP 11–1962
Approved May 1968

Draft USA Standard Dimensions for

Projection Reels for 8mm Motion-Picture Film

PH22.23

Revision of PH22.23-1958

1. Scope

This standard specifies the dimensions for 8mm motion-picture reels used for projection having film capacities of 50, 100, 200, 400, 600, 800, and 1,200 ft.

2. Dimensions

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

2.2 The dimensions apply regardless of the material used for construction. (See Note 3.)

2.3 Dimensions C and K apply from the core to the periphery of the reel except for the area of Dimension J. All points of the outside surface of the flanges, including the rim, lettering, lugs, and all other protrusions, shall fall between planes as defined by Dimension K. If spring fingers are used to engage the edges of the film, Dimension C shall be measured with the fingers fully expanded.

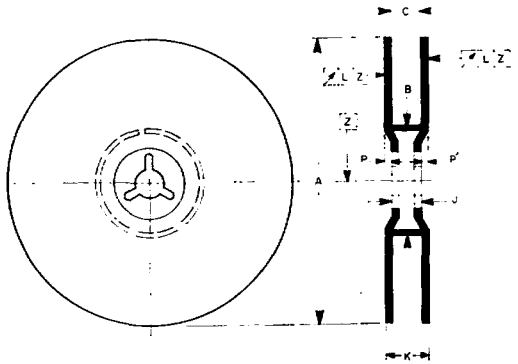
2.4 Dimension A applies to both flanges.

2.5 Dimension J shall apply within a circle of 1.0 in. (25mm) diameter or larger, centered on the spindle hole axis.

2.6 Dimension L in Table 1 is the total indicator reading on the flanges of the reel at any distance from the reel axis (datum line Z), measured through a complete revolution of the reel. The reel is to be rotated about its axis while being held against a 1 in.-(25mm) diameter circular reference support or flange of a horizontal spindle. An exception is made and the restricted runout does not apply over the small zone of transition from Dimension J to Dimension K.

2.7 The surface of the core and the periphery of the flanges shall be concentric with the spindle holes to within 0.020 in. (0.51mm) total indicator reading.

2.8 For reels of increasing radius or capacity, progressively smaller tolerances for Dimension D are specified in Table 2. This is done because the potential for greater runout and the masses involved increase with diameter, and larger reels require more precise and positive alignment on the spindle.



ENLARGED VIEW OF SPINDLE HOLE AREA

Table 1

Nominal Reel Capacity Feet	Meters	Dimensions	Inches Min	Inches Max	Millimeters Min	Millimeters Max
50	15	A	2.91	2.95	74.0	75.0
		B	1.25	1.30	31.7	33.0
		L		0.04		1.0
100	30	A	3.90	3.94	99.1	100.1
		B	1.77	1.81	45.0	46.0
		L		0.04		1.0
200	60	A	5.00	5.04	127.0	128.0
		B	1.77	2.00	45.0	50.8
		L		0.06		1.5
400	120	A	7.00	7.09	177.8	180.1
		B	2.36	2.50	59.9	63.5
		L		0.08		2.0
600*	180	A	9.25	9.31	235.0	236.5
		B	4.85	4.91	123.2	124.7
		L		0.10		2.5
800*	240	A	10.47	10.55	265.9	268.0
		B	4.85	4.91	123.2	124.7
		L		0.12		3.0
1,200*	360	A	12.23	12.27	310.6	311.7
		B	4.85	4.91	123.2	124.7
		L		0.12		3.0

*See Appendix A5.

2.9 Dimensions P and P′ have been established to ensure symmetry of the recessed area represented by Dimension J. They apply only when Dimension K exceeds Dimension J. They should be measured at the point of departure of Dimension J to the larger Dimension K so that the difference between Dimension P and Dimension P′ shall not exceed 0.020 in. (0.51mm).

Table 2

Dimensions	Inches	Millimeters
C	0.33 $^{+0.06}_{-0.00}$	8.4 $^{+1.5}_{-0.0}$
D (100 ft or less)	0.316 $^{+0.010}_{-0.000}$	8.03 $^{+0.25}_{-0.00}$
(200 ft)	0.316 $^{+0.004}_{-0.000}$	8.03 $^{+0.10}_{-0.00}$
(400 ft or more)	0.316 $^{+0.003}_{-0.000}$	8.03 $^{+0.08}_{-0.00}$
E	0.312 ± 0.005	7.92 ± 0.13
F	0.06 $^{+0.01}_{-0.00}$	1.5 $^{+0.3}_{-0.0}$
J	0.490 $^{+0.00}_{-0.06}$	12.45 $^{+0.0}_{-1.5}$
K	0.56 max	14.2 max
R	Maximum is ½ value used for Dimension F	

NOTE 1: For future construction, it is preferred that the flanges of the reel shall have three radial driving slots spaced approximately 120° and conforming to Dimensions E and F, and that the drive slots of each flange shall be aligned. If properly aligned, the reel will fit on a test spindle (gauge) of 0.314-in. (7.98mm) diameter with a radial spindle drive key having a length from the spindle shoulder greater than the width of the reel, Dimension J; a thickness of 0.058 in. (1.47mm) and a height, measured as a radius from the spindle axis, of 0.27 in. (6.9mm). Existing reels with drive slots in only one flange are recognized temporarily.

NOTE 2: Provision should be made for securing the end of the film so that the reel accepts the full width of the film, and that the film will be freely released at the end of its run. If film attachment is provided by a slot in the core, a suitable cutout in the core may be included to allow free access to the film end and to provide for attachment of a film end retention clip or plug when the reel is used on automatic rewind equipment.

NOTE 3: The dimensions were determined for reels made from a dimensionally-stable material such as metal. If the reel or reel hub is made of plastic or other dimensionally-unstable material, the spindle hole diameter, Dimension D, should be adjusted so that at least the minimum dimension (0.316 in., 8.03mm) is maintained throughout the normal use range of temperature and relative humidity.

NOTE 4: The International Organization for Standardization has established the minimum diameter of the spindle hole, Dimension D, as 0.317 in. to ensure satisfactory fit on internationally available 8mm projector spindles, and to provide for compatibility of the minimum spindle hole diameter for 8mm, 16mm, and 35mm camera and projector spools and reels. It is, therefore, recommended that USA manufacturers direct future production to the 0.317 in. minimum in order to facilitate USA acceptance of the international standard when submitted for approval.

NOTE 5: The spindle hole may be a sleeve or there may be an air space between the spindle holes in the flanges, depending upon the type of construction. Because of this, the means of retaining the reel on the projector spindle should be outboard of the reel, as defined by Dimension J.

Appendix

(This Appendix is not a part of this Draft USA Standard, but is included to facilitate its use.)

A1. Although the standard specifies three drive slots on each flange, only one is normally used to drive the reel. Three slots are specified to facilitate easy loading of the reel on the drive spindle.

A2. As noted, a spindle shoulder of 1.0 in. (25mm) in diameter is required for the measurement of lateral runout. The wobble of the reel on the projector will be less if a shoulder of this diameter is also incorporated on the projector spindle and provision made to fit the reel tightly to this shoulder. It is expected that projector manufacturers will incorporate a spindle shoulder of at least 0.50 in. (12.7mm) in diameter.

A3. This standard applies to reels used for projection which are considered to be interchangeable on all types of projection equipment. Take-up reels, which may be considered an integral part of the manufacturer's projection equipment, may deviate from the dimensions in this standard. For example, it may be desirable to taper the flanges from the core to the periphery or to provide for special film attachment mechanisms.

A4. The nominal reel capacity stipulated in Table 1 is based on a total film thickness (including any magnetic striping or winding allowance) not exceeding 0.0065 in. (0.165mm).

A5. Reels of 600-, 800-, and 1,200-ft capacity are not in common use at this time. Specifications are provided so that a standard will be available should these reels come into use.

Draft USA Standard Dimensions for

Double 8mm Motion-Picture Camera Spools (100-Ft Capacity)

PH22.173

1. Scope

The dimensions shown in this standard are for double 8mm motion-picture film spools with a nominal capacity of 100 ft. These spools are used in cameras of the type in which each roll of film is passed through the camera twice for exposure in accordance with USA Standard Specifications for Camera Usage of Double Width 8mm Motion-Picture Film, Perforated Two Edges, PH22.21-1964. The spindle holes in the spool are shown with splines which are intended to assist in assuring correct orientation of the spool in the camera.

2. Dimensions

2.1 The dimensions shall be as given in the figures and table.

2.2 If rivet heads or other fastening devices extend beyond the outer surfaces of the flanges, they shall lie at a larger diameter than the minimum K diameter and within the boundaries defined by other portions of the Volume of Rotation Diagram.

2.3 Dimension H_2 is the space between the flanges inside the core, but outside the D diameter zone.

2.4 Dimension H_3 applies within a diameter of 0.38 in. (9.7mm) centered on the spindle hole of each flange.

2.5 Dimension J represents the thickness of the spool within the K diameter area, which is centered on the spindle hole axis of each flange.

2.6 A reference plane of rotation for each flange is defined by a plane perpendicular to the axis of the spindle and coincident with the surface of a flat, 0.615-in. (15.62mm) diameter support, which is in contact with the flange and centered on the spindle hole axis of the flange.

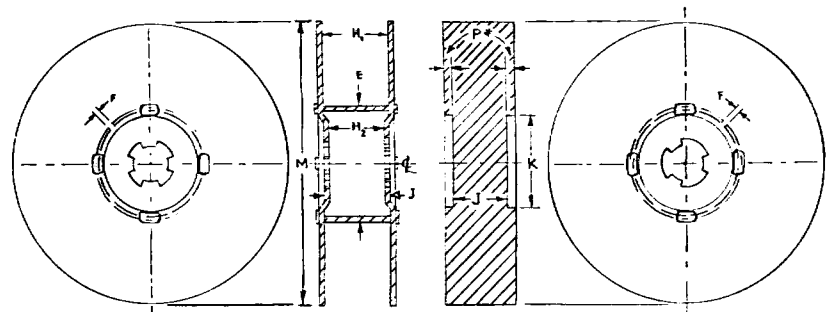
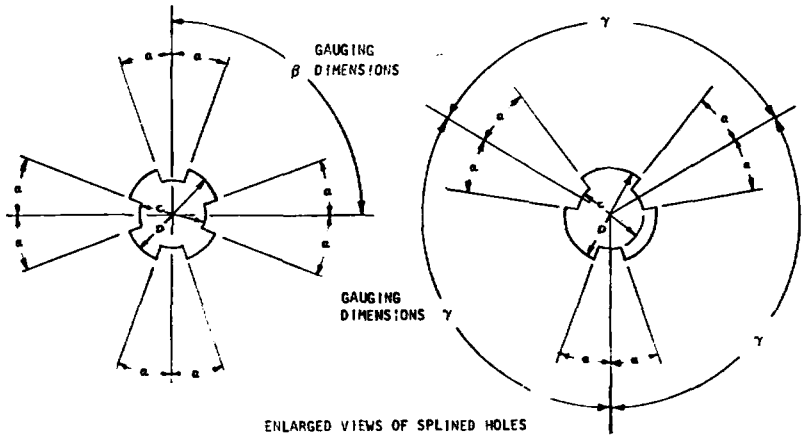
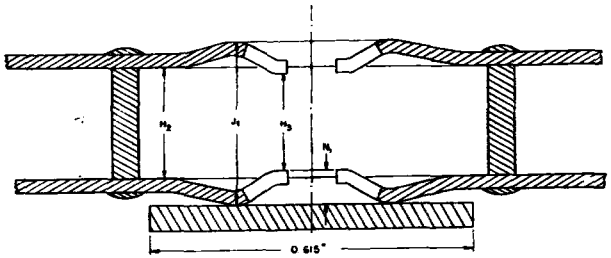


Fig. 1



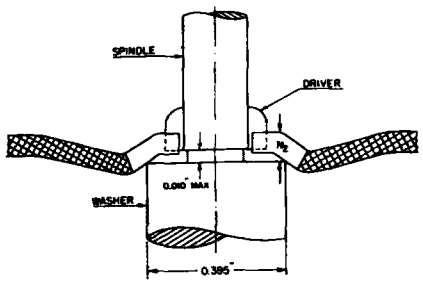
ENLARGED VIEWS OF SPLINED HOLES

Fig. 2



ENLARGED SECTION FOR DIMENSION H_1

Fig. 3



SPINDLE AND SPOOL RELATIONSHIPS

Fig. 4

Dimensions	Inches	Millimeters
C	0.287 $^{+0.008}_{-0.000}$	7.29 $^{+0.20}_{-0.00}$
D	0.384 min	9.75 min
E (See 2.9)	0.750 ± 0.015	19.05 ± 0.38
F	0.035 ± 0.020	0.89 ± 0.51
H_1	0.632 $^{+0.014}_{-0.000}$	16.05 $^{+0.35}_{-0.00}$
H_2	0.630 min	16.00 min
H_3	0.622 min	15.80 min
J	0.73 $^{+0.00}_{-0.02}$	18.5 $^{+0.0}_{-0.5}$
K	0.615 min	15.62 min
M	3.62 $^{+0.00}_{-0.04}$	91.9 $^{+0.0}_{-1.0}$
N_1	0.038 min	0.97 min
N_2	0.025 min	0.64 min
P (See 2.6)	0.030 max	0.76 max
	Degrees	
α	20 +0 —1	
β	90	
γ	120	

Dimension P is the distance measured outwardly from the reference plane* of rotation to the farthest plane of rotation described by any point on the flange outside the K diameter zone when the spool is rotated on an accurate, tight-fitting spindle. This includes rivets or other fastening devices, variations in flange thickness, flatness, and lateral runout of the flanges.

Selection of a value for Dimension P is dependent upon the thickness of the material used for the flanges. According to the flange material thickness, (1) the K diameter area may be depressed (with P greater than zero), or (2) the outside surfaces of the flanges may be flat from the spindle hole area to the periphery (with P equal to zero), or (3) in the case of flanges made of very thin material, the K diameter area may be raised rather than recessed (effectively, P less than zero).

2.7 The maximum effective thickness of spools (including all the characteristics mentioned in 2.6) outside the K diameter area has not been stated because it is a function of a spool's specific J value between the 0.615-in. (15.62mm) diameter reference zones on each flange. The largest overall effective thickness, however, will be J max + 2 × P max = 0.77 in. (19.5mm).

2.8 The eccentricity of the core with respect to the spindle hole axis should not exceed a total radius variation (total indicator reading) of 0.03 in. (0.8mm).

2.9 A dimension of 1.26 ± 0.02 in. (32.0 ± 0.5mm) should be considered for the diameter of the core. All future design should be directed toward this dimension to aid in the design of metering devices.

2.10 When thin material is used for flanges, Appendixes A3 and A4 should be taken into account.

2.11 Dimension F (Fig. 1) specifies the width of the slot in the core for attaching the end of the film.

NOTE 1: When the loaded camera is viewed from the side, with the lens to the left, and the bottom of the housing downward (regardless of whether or not the spool-loading mechanism is visible from that side), both the supply and the take-up spools rotate in a clockwise direction.

NOTE 2: Flanges should be opaque and their surfaces should have low reflectance characteristics.

*Note that the reference plane from which P is measured is not necessarily coincident with all points within the K diameter zone but only must be coincident with those which are in contact with the reference support which has a diameter smaller than K.

Appendix

(This Appendix is not a part of this Draft USA Standard, but is included to facilitate its use.)

A1. It is expected that every spool manufacturer will hold H_1 within the narrowest limits that his design and manufacturing process permits.

A2. Camera spindles should allow for a radius of not more than 0.015 in. (0.38mm) at each corner of each tongue.

A3. Figures 3 and 4 represent special examples of how the needs of certain dimensions critical to proper performance in some cameras can be met by appropriate shaping or embossing of the spool stock if spools are made of a thin-gage material (much less than 0.040 in.). For a number of years, the effective thickness of the 4-splined webs which engage most camera drivers, Dimension N_1, was the stock thickness, nominally 0.040 in. (1.02mm). Recently, spools have been made from thinner materials which required embossing to maintain Dimension J in order to enable the splines to engage the camera drivers, some of which have a clearance approaching 0.025 in. (0.64mm). Dimension N_1 is normally measured to a flat support having a diameter of 0.615 in. (15.62mm). Many cameras have spool support washers with diameters considerably less than 0.615 in. (15.62mm). In order to assure proper operation with such cameras, the dimension from the inside of the 4-splined flange to the plane of a flat support 0.395 in. (10.03mm) in diameter centered on the spindle hole axis of the flange, Dimension N_2 (Fig. 4), shall be at least 0.025 in. (0.64mm).

The enlarged section for Dimension N_1 (Fig. 3) illustrates one method of shaping the splines in the 4-splined flange so they will engage the camera driving spindle when the flange thickness is less than 0.025 in. (0.64mm).

A4. Camera spindles engaging the 4-splined flange of the spool should not have a gap greater than 0.010 in. (0.25mm) between the bottom of the spindle driving spline and the top of the spindle shoulder or washer that supports the spool.

It is recommended that, in newly designed cameras, the diameter of the supporting spindle shoulder or washer be not less than 0.500 in. (12.70mm) and no greater than 0.615 in. (15.62mm).

A5. To facilitate the distinction between a roll of film which has been exposed along only the first side (one-half width) and a roll of film which has not been exposed at all or has been exposed along both the first and second sides (both one-half widths), it is recommended that the flanges of spools be marked prominently as follows:

	Raw Stock Spools Numeral	*Camera Accessory Spools* Numeral and/or Phrase
Flange with 4-splined spindle hole	1	2 No Phrase (or numeral) necessary if phrase shown below is included on other flange.
Flange with 3-splined spindle hole	2	1 Phrase or equivalent as follows: Film on this spool is half exposed.

Attention is called to the fact that if a camera accessory spool wound with the first exposure run of film is removed from the camera, identification of the film exposure status is more obvious if the spool has been marked with a phrase instead of (or in addition to) numerals. Some camera accessory spools have identical 4-splined holes in each flange. (Supply spindles of such cameras have one small lug or none.) Both flanges of such accessory spools should be marked with the phrase suggested above. To ensure proper orientation for the second exposure in this case, in addition to the phrase, it is helpful to have the numeral 1 on one flange and the numeral 2 on the other.

A6. Neither this document nor USA Standard PH22.21-1964 restrict the perforation type of double-perforated 8mm film that can be supplied with the spools. Generally, these spools are used only with conventional 8mm motion-picture films, i.e., those cut and perforated 16mm 2R-1500. Double super 8 motion-picture films (16mm 2R-1664 or 1667) are usually supplied on 16mm camera spools having square spindle holes aligned as specified in Draft USA Standard Dimensions for 16mm Daylight-Loading Motion-Picture Camera Spools (50- to 400-Ft Capacity), PH22.174.

Draft USA Standard Dimensions for

16mm Daylight-Loading Motion-Picture Camera Spools (50- to 400-Ft Capacity)

PH22.174

1. Scope

1.1 This standard specifies the dimensions for 16mm daylight-loading motion-picture camera spools having capacities from 50- to 400-ft of film.

1.2 This standard further specifies the configuration of the positioning of the spindle holes in the two flanges. These shall be identified as Styles 1, 2, and 3 (See Fig. 2).

2. Dimensions

The dimensions shall be as specified in Figures 1 and 2 and Tables 1 and 2.

3. Spindle Hole Alignment

In Styles 2 and 3, the alignment of the sides of the squares in the two flanges shall be such that a test bar 0.316 in. (8.03mm) square may be passed completely through the spool. The corner keyways in the two flanges of Style 2 shall be aligned with each other.

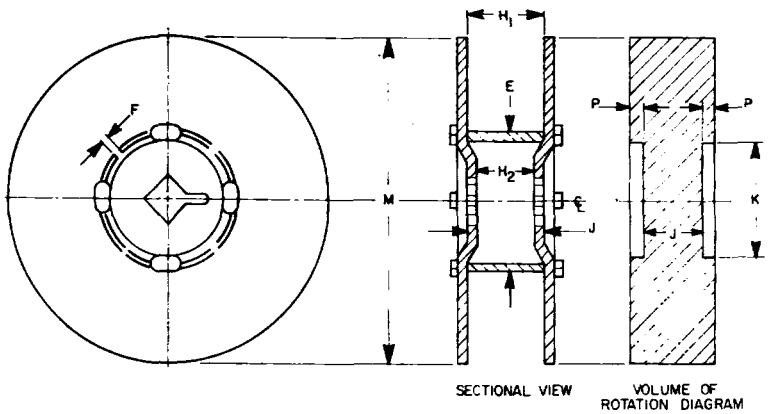


Fig. 1

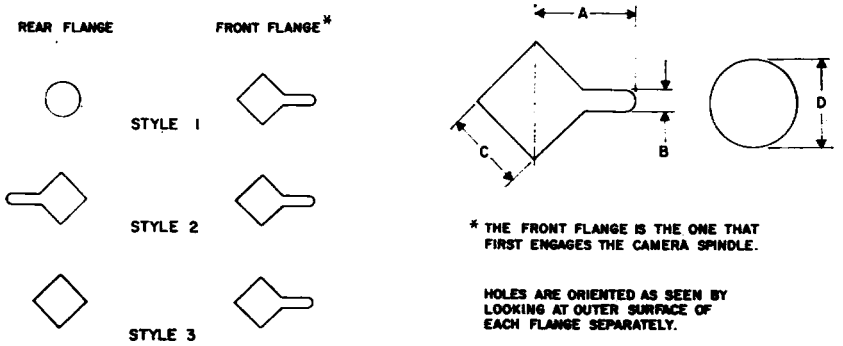


Fig. 2

Table 1

Nominal Spool Capacity

Dimensions	Feet	Meters	Inches	Millimeters
E	50	15	1.26 ± 0.02	32.0 ± 0.5
	100	30	1.26 ± 0.02	32.0 ± 0.5
	200	60	1.26 ± 0.02	32.0 ± 0.5
	400	120	2.12 ± 0.02	53.8 ± 0.5
K	50	15	1.00 min	25.4 min
	100	30	1.00 min	25.4 min
	200	60	1.00 min	25.4 min
	400	120	1.5 min	38 min
M	50	15	2.81 +0.00 −0.04	71.4 +0.0 −1.0
	100	30	3.62 +0.00 −0.04	91.9 +0.0 −1.0
	200	60	4.96 +0.00 −0.04	126.0 +0.0 −1.0
	400	120	6.65 +0.00 −0.04	169.0 +0.0 −1.0

Table 2

Dimensions Common to Spools in Table 1

	Dimensions	Inches	Millimeters
A	Keyway depth	0.30 +0.04 −0.00	7.6 +1.0 −0.0
B	Keyway width	0.12 +0.02 −0.00	3.0 +0.5 −0.0
C	Side of square spindle hole	0.317 +0.006 −0.000	8.05 +0.15 −0.00
D	Spindle hole diameter	0.317 +0.006 −0.000	8.05 +0.15 −0.00
F	Film slot (See 4.1)	0.03 +0.03 −0.00	0.8 +0.08 −0.00
H_1	At periphery	0.632 +0.014 −0.000	16.05 +0.36 −0.00
H_2	Distance between flanges at spindle holes	0.630 min	16.00 min
J	Overall thickness at spindle holes	0.73 +0.00 −0.02	18.5 +0.0 −0.5
P	(See Note 6)	0.020 max	0.51 max

4. Specifications

4.1 Dimension F represents a slot in the spool core for attaching film. Its sides shall be straight, parallel, and 0.028 to 0.059 in. (0.71 to 1.50mm) apart. It is permissible for the slot sides to diverge in the center portion of the slot. Any divergence shall not be greater than one half the width of the slot.

4.2 Dimension J is the thickness of the spool within the K diameter zone, which is centered on the spindle hole axis of each flange.

4.3 The eccentricity of the core with respect to the spindle hole axis shall not exceed a total radius variation (total indicator reading) of 0.030 in. (0.76mm) for all spool sizes.

NOTE 1: The metric values in the tables of dimensions are converted from the inch values in accordance with conversion principles outlined in USA Standard Practice for Inch-Millimeter Conversion for Industrial Use, B48.1-1933 (Reaffirmed 1947).

NOTE 2: The Style 2 configuration of spindle holes is recommended as the preferred standard for future design.

NOTE 3: Flanges shall be opaque and their inner surfaces shall have a low-reflectance characteristic.

NOTE 4: If the spool or spool hub is made from plastic or other dimensionally-unstable material, spindle hole Dimensions C and D shall be adjusted so that at least the minimum dimension is maintained throughout the normal use range of temperature and humidity.

NOTE 5: Rivet heads or other fastening devices, which extend beyond the outer surface of the flange, shall lie outside the K diameter zone but within the boundaries defined by the Volume of Rotation Diagram.

NOTE 6: A reference plane of rotation for each flange is defined by a plane perpendicular to the axis of the spindle and coincident with the surface of a flat 0.590 in. (14.99mm) diameter support in contact with flange and centered on the spindle hole axis of the flange. Dimension P is the distance measured outwardly from this reference plane of rotation to the farthest plane of rotation generated by any point on the flange outside the K diameter zone when the spool is rotated on an accurate, tight-fitting spindle.

NOTE 7: The maximum effective thickness of spools (including all the characteristics mentioned in NOTE 6) outside the K diameter zone has not been stated because it is a function of a spool's specific J value between the 0.590 in. (14.99mm) diameter reference zones on each flange. The largest such overall effective thickness, however, will be J max + 2P max = 0.770 in. (19.56mm).

NOTE 8: There may be other cutouts or holes in the hub area of the flanges within the limits of Dimension K, provided the spool remains nominally in dynamic balance.

Draft USA Standard Dimensions for

Projection Lamps
Four-Pin Prefocus Base-Down Type

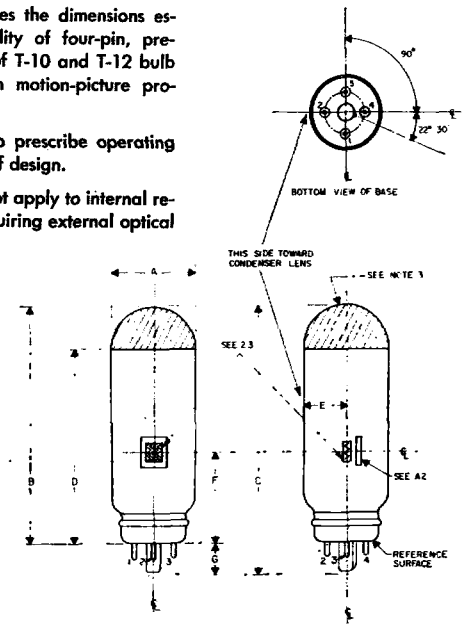
PH22.175

1. Scope

1.1 This standard specifies the dimensions essential to interchangeability of four-pin, prefocus, base-down lamps of T-10 and T-12 bulb sizes in 16mm and 8mm motion-picture projectors.

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

1.3 This standard does not apply to internal reflector-type lamps not requiring external optical systems.



Dimensions*	Inches T-10	Inches T-12	Millimeters T-10	Millimeters T-12
A	1.294 max	1.546 max	32.87 max	39.27 max
B	3.475 max	4.150 max	88.26 max	105.41 max
C	4.000 max	4.625 max	101.60 max	117.48 max
D	2.675 min	3.000 min	67.94 min	76.20 min
E	0.715 max	0.830 max	18.16 max	21.08 max
F	1.562 nom		39.67 nom	
G	0.545 nom		13.84 nom	

*Angular dimensions are nominal.

NOT APPROVED

2. Dimensions

2.1 Base and pin dimensions shall be as specified in USA Standard Dimensional Characteristics of 4-Pin Prefocus Base (IEC Designations: G17q-7 and GX17q-7), C81.57-1966.

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

2.3 The light source shall be centered on base axis within 0.030 in. (0.76mm) in both front and side views.

3. Operating Position

Pin 2 is usually positioned toward the condenser lens.

NOTE 1: Dimension E defines the maximum excursion of any point on the bulb surfaces from the base axis. Therefore, the lamp chimney, the mirror, the condensing lenses and their respective mounts must be so located as to ensure adequate clearance between these parts and the bulb surface.

NOTE 2: Incandescent projection lamps are usually identified by a three-letter code, as specified in USA Standard Method for the Designation of Photo Lamps, C78.370-1963.

NOTE 3: Dimension D applies to those projection lamps having opaque end coatings. However, there are exceptions, the specifications of which are supplied by the equipment manufacturer.

Appendix

(This Appendix is not a part of this Draft USA Standard, but is included to facilitate its use.)

A1. Lamps designed for operation at voltages above 100 volts are usually prefocused with respect to Pins 1 and 3. Electrical contact is usually made through Pins 1 and 4. Pins 2 and 3 are not necessarily electrically isolated from Pins 1 and 4.

A2. Some lamp types, commonly called internal reflector lamps, incorporate a mirror inside the bulb in close proximity to the filament, thus eliminating the need for an external mirror. Such internal mirrors are slightly larger than the filament area and replace only the external reflector of conventional optical systems.

A3. The terms "T-10" and "T-12" define the general shape and nominal diameter of the bulb. The letter "T" is an abbreviation for tubular; the numbers relate to the nominal diameter in eighths of an inch; e.g., T-10 is a tubular bulb 10/8 in. (1¼ in.) in diameter.

A4. There are two types of the four-pin prefocus base in current use. One has three bosses spaced at approximately 120° intervals; the other has a raised ring around the base shell. Both variations are usually interchangeable.