standards and recommended practices

Approved SMPTE Recommended Practices

In June 1969, the Society's Board of Governors appproved SMPTE Recommended Practice Video Alignment Signal Specifications for Quadruplex Video Magnetic Tape Recording, RP 10-1969, which is printed here for your information. This Recommended Practice is basically a reaffirmation of the earlier issue. As a number of editorial modifications have been included, the users of this test tape should review the new document carefully.

In July 1969, the Society's Board of Governors approved two additional SMPTE Recommended Practices, also printed here. SMPTE Recommended Practice Specifications for a Super 8 Test Film for Projectors and Printers, RP 32-1969, was approved. A film in accordance with this practice is available through Society Headquarters.

SMPTE Recommended Practice Color Temperature for Color Television Studio Monitors, RP 37-1969, was developed by the Television Committee as part of an extensive program intended to facilitate a more uniform color presentation of television programming.

Copies of these documents and all SMPTE Recommended Practices may be acquired from Society Headquarters upon request.

Proposed SMPTE Recommended Practices

Two Proposed Recommended Practices are published here for a trial period and public review. Proposed Recommended Practice RP 27.2, Specifications for Operational Registration Test Pattern for Multiple-Channel Television Cameras, and Proposed Recommended Practice RP 38.1, Specifications for Deflection Linearity Test Pattern for Television, were developed by the Television Committee as part of a series of precision patterns. A subcommittee report describing this work was published in the December 1967 SMPTE Journal.

Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters prior to October 30, 1969. If no adverse criticism is received by this date, the Proposed Recommended Practices will be submitted to the SMPTE Board of Governors for final approval.

SMPTE RECOMMENDED PRACTICE — RP 10-1969

Video Alignment Signal Specifications for Quadruplex Video Magnetic Tape Recording

1. *Scope*

1.1 This recommended practice specifies the video signals to be recorded on a magnetic video tape for use in evaluating and adjusting the performance of video tape recording and reproducing equipment on a routine operational basis.

1.2 Specifically, the recorded signals provide the means for checking the following characteristics or adjustments:

(a) video head quadrature
(b) tape vacuum guide position
(c) video levels
(d) video amplitude versus frequency response
(e) video low-frequency tilt
(f) video amplitude linearity
(g) relative noise banding
(h) r.f. carrier deviation frequencies

2. *Recorded Signal Characteristics*

2.1 The video signals shall be recorded so that they will occupy sequential bands from top to bottom in the reproduced picture. Each band shall correspond to the single traverse of one video head tip in a 2-in. quadruplex recording system. For the purpose of identification, these bands shall be designated as one through sixteen. The first band after that containing the vertical synchronizing pulse interval shall be designated as band one. (Band one will contain fewer active lines than the other bands because it contains a portion of vertical blanking.) The active picture portion of the horizontal scan shall be divided into eleven equal sections. For the purpose of identification, these sections are designated as zero through ten. Information shall be recorded as follows:

Information	*Bands*
2.1.1 A stairstep signal consisting of a ten-step linear gray scale extending from blanking level to 100 IRE units respectively, as shown in Fig. 1.	1 through 4
2.1.2 A stairstep signal consisting of a five-step linear gray scale extending from black level to 50 IRE units respectively, as shown in Fig. 2.	5 through 8
2.1.3 A series of five sine-wave bursts, as shown in Fig. 2, and described as follows: The time sequence of the burst frequencies shall be 4.2, 3.6, 3.0, 2.0 and 1.5 MHz. The axis of the multiburst shall be at 50 IRE units, and the peak-to-peak amplitude shall be 40 IRE units. Each burst duration will be at least 75 percent of the section width.	5 through 8
2.1.4 A window signal at reference white level (100 IRE units) three sections wide and six bands high to be positioned horizontally in sections six, seven and eight, as shown in Fig. 3, and vertically between the centers of the ninth and fifteenth bands. The remaining section shall be at blanking level (0 IRE units).	9 through 15
2.1.5 Vertical synchronizing pulse interval and a portion of vertical blanking.	Band 16 Only
2.1.6 Sine-squared T pulses of 0.125 microsecond width (measured at half level) and 50 IRE units in height at horizontal positions corresponding to the center of each of the first six sections. The base level of each sine-squared pulse shall be as follows: (a) Bands 1 through 8, the same as the accompanying stairstep section level, as shown in Figs. 1 and 2. (b) Bands 9 through 15, at blanking level, as shown in Fig. 3.	1 through 15

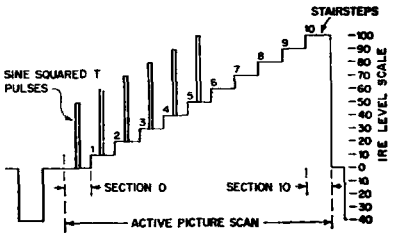

Fig. 1. Bands 1 through 4.

2.2 The waveform of the composite signal shall appear as shown in Fig. 4.

2.3 All synchronizing waveforms and signal amplitudes shall conform to EIA Standard RS-170, Electrical Performance Standards—Monochrome Television Studio Facilities, and Sections 73.682 and 73.687 of the FCC Rules and Regulations dated February 1, 1967.

2.4 All video signals shall be within ± 1 IRE unit of specified amplitudes.

2.5 Rise and decay time of the stairstep signal shall not exceed 0.003 H (0.3 percent of the horizontal scanning period). The leading and trailing edges of the window signal shall correspond approximately in shape and rise time to the sine-squared pulses specified in paragraph 2.1.6, such as may result from the use of the same pulse shaping network for both sine-squared pulse and window signals.

2.6 Overshoot of the stairstep signal shall not exceed 5 percent of the amplitude of transition. An exception is the trailing edge of stairstep (leading edge of horizontal blanking) which is limited to 2 percent in accordance with EIA Standard RS-170.

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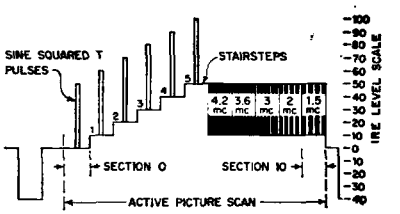

Fig. 2. Bands 5 through 8.

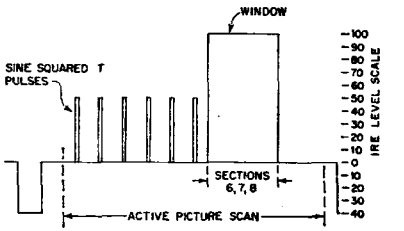

Fig. 3. Bands 9 through 15.

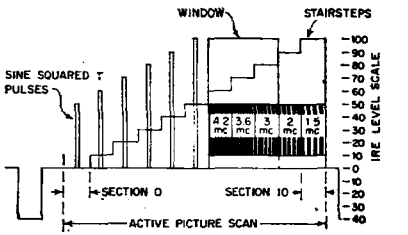

Fig. 4. Composite waveform. Waveforms shown at the line rate.

2.7 Multiburst frequencies shall conform with specified values within 1 percent. Total harmonic distortion content of the multiburst frequencies shall not exceed 2 percent.

2.8 In the event that a color burst is included, it shall conform to Section 2.3.

Note: In paragraph 2.1.6, an 0.125 μs sine-squared T pulse is specified. During the next year, it is intended to review this specification. An alternative would be specification of a 2T pulse for measurement of reproducer transient response characteristics. The T pulse now specified is useful for evaluation of head quadrature and vacuum guide position only.

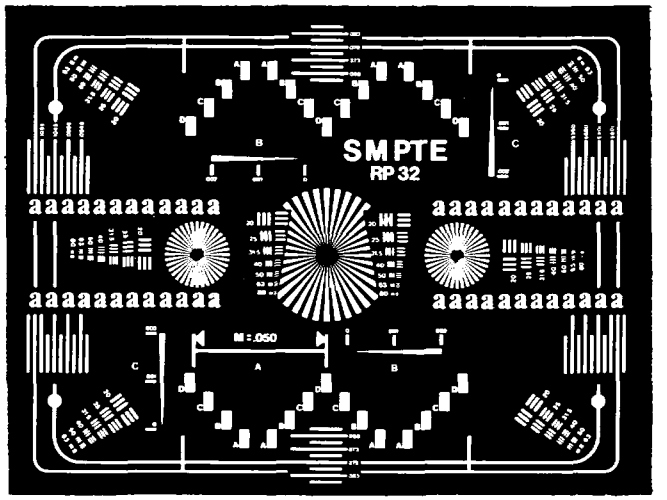

Fig. 1

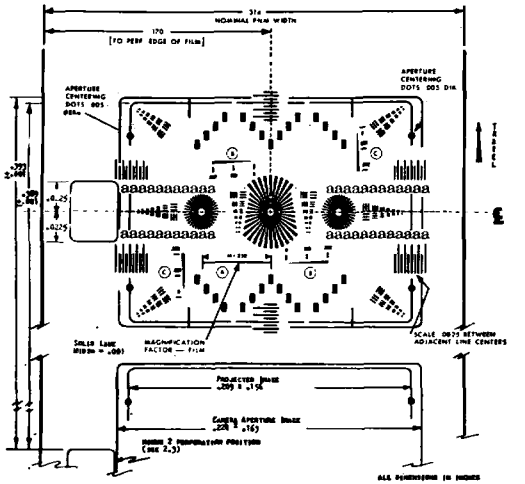

Fig. 2

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SMPTE RECOMMENDED PRACTICE — RP 32-1969

Specifications for a Super 8 Test Film for Projectors and Printers

1. *Scope*

This recommended practice specifies the content and dimensions of a super 8 test film useful in checking the performance of motion-picture projectors and printers. Its use is described in the Appendix.

2. *Dimensions*

2.1 The dimensions and location of the target areas shall be as specified in Figs. 1 and 2. These values apply when the film is conditioned and measured at 70°F, 50 percent relative humidity.

2.2 The general tolerance for all dimensions shall be ± 0.0005 in., unless otherwise specified.

2.3 The minus 2 perforation position used for dimensional reference is two perforations above the perforation adjacent to the image when the film is viewed with the travel downward, the normal position for projection.

3. *Description*

3.1 The test film shall be produced as a camera original on high-contrast, high-definition motion-picture film, cut and perforated in accordance with Draft USA Standard Dimensions for 16mm Motion-Picture Film, Perforated Super 8, 2R-1667 (1-1). PH22.167. It shall be processed to yield a dye image.

3.2 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 USA Standard Dimensions of Camera Aperture Image on Super 8 Motion-Picture Film, PH22.157-1967, and Draft USA Standard Dimensions of Projectable Image Area on Super 8 Motion-Picture Film, PH22.154.

3.3 The target shall be photographed at a magnification which results in Dimension M at Ⓐ of 0.050 in. on the film. When this is done the solid lines have a width of 0.001 inch ± 5 percent.

3.4 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 2.1 above, the frame-to-frame variability of the placement of the image shall be within ± 0.0002 in. vertically and horizontally.

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Appendix

(This Appendix is not a part of this SMPTE Recommended Practice, but is included to facilitate its use.)

A1. 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.

A2. Magnification. If the image of the test film target is projected to 30 x 40 in., it will be enlarged 192 times.

A3. Steadiness. Wedges for measurement of vertical steadiness (B) and horizontal steadiness (C) taper from 0 to 0.002 in. wide, with an intermediate position of 0.001 in. 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.

A4. 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. Circular dots near the corners are 0.005 in. 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.

A5. 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.

A6. Framing Accommodation. The longer lines of the group of lines at the top and bottom of the vertical aperture centerline are 0.005 in. 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. This permits the extent of framing to be measured beyond the limits of the dimensioned lines.

A7. 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 $10\sqrt{10}$ (i.e., the log 10 of the ratio of adjacent line spacings is 0.10.)

A8. 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.

A9. 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.

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

SMPTE RECOMMENDED PRACTICE — RP 37-1969

Color Temperature for Color Television Studio Monitors

1. *Scope*

This recommended practice specifies the chromaticity for color television studio monitors.

2. *Specifications*

The white reference for color television studio monitors shall be Illuminant D_{6500}, as specified by the International Commission on Illumination (CIE).

Appendix

(This Appendix is not a part of this SMPTE Recommended Practice, but is included to facilitate its use.)

Illuminant D_{6500} is the new International Daylight Standard prescribed by the International Commission on Illumination. The standard illuminant is definable on the CIE chromaticity diagram and is reproducible. However, in adjusting the white balance of shadowmask CRT color monitors, there are situations wherein a suitable comparator is required.

Approved July 1969

PROPOSED

SMPTE RECOMMENDED PRACTICE — RP 27.2

Specifications for Operational Registration Test Pattern for Multiple-Channel Television Cameras

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 multiple-channel cameras used in color television systems.

2. *Purpose*

The purpose of this practice is to specify a test pattern designed to provide a television picture signal suitable for aligning, adjusting and checking multiple-channel color cameras for combined optical, mechanical, and electrical registration.

3. *Description*

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

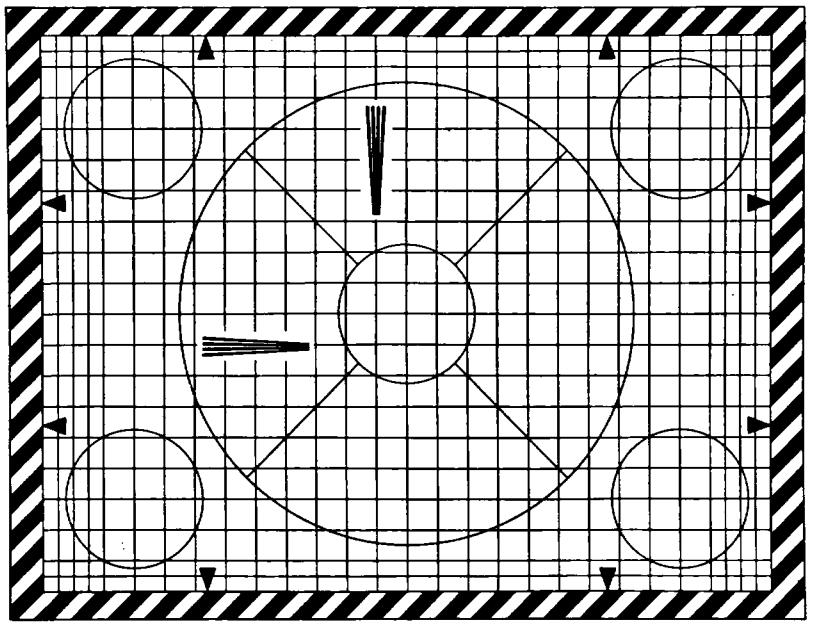

Fig. 1—Reproduction of Test Pattern

3.2 Background Density. The background is white. (See 5.2.)

3.3 Grid. The horizontal and vertical black lines of the grid produce a uniformly-spaced grid dividing the picture area into 18 squares vertically and 24 squares horizontally. Half dimensions near the edges of the pattern aid registration where it is most difficult.

3.4 Circles and Diagonals. Circles and diagonal black lines are provided to center the pattern on the camera tubes and check alignment.

3.5 Resolution Wedges. Vertical and horizontal wedges are provided for checking optical and electrical focus and to aid registration.

3.6 Boundary Arrows and Black-and-White Border. The arrows and border define the edge of the test pattern area.

3.7 Pattern Identification. The identification number of this document shall appear on the pattern in the area indicated in Fig. 2.

4. *Format*

4.1 Dimensions. The dimensions of the test pattern shall be as shown in Figs. 2 and 3. All dimensions are in percentages of picture height. 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 The 2x2 in. test slides and 8x10 in. transparencies shall have Category 1 dimensions, as specified in USA Standard Dimensions and Optical Specifications of Test Slides and Tranparencies for Television, PH22.144-1965.

4.2.2 The 35mm test film 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.

4.2.3 The 16mm test film 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.

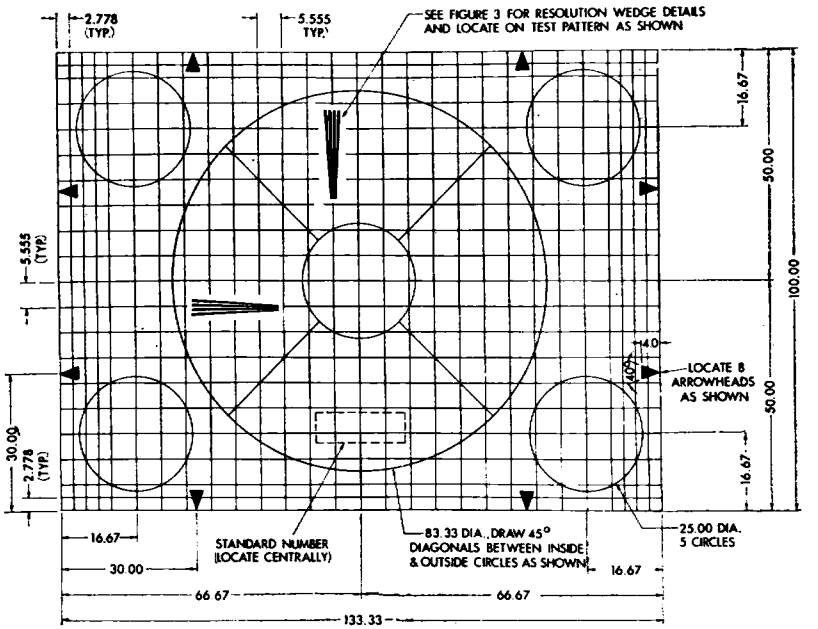

Fig. 2—Dimensional Drawing of Test Pattern

4.3 Black-and-White Border. The dimensions of the black-and-white border shall be as follows:

4.3.1 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.

4.3.2 For 35mm motion-picture films, the black-and-white border shall extend to the dimensions of the negative image, as specified by Style A in USA Standard Dimensions of 35mm Motion-Picture Camera Aperture Image, PH22.59-1966.

4.3.3 For 16mm motion-picture films, the black-and-white border shall extend to the dimensions of the negative image, as specified in USA Standard Dimensions of 16mm Motion-Picture Camera Aperture Image, PH22.7-1964.

4.4 Line Widths. The width of the grid lines, the circles, and the diagonals shall be 0.167 ± 0.011 percent.

4.5 Resolution Wedges. The resolution portion of the pattern is shown in detail in Fig. 3. The tolerance of the nominal dimensions of the lines of the wedge shall be ± 0.011 percent.

5. *Optical Densities*

5.1 Optical Densities. All densities shall be as specified in SMPTE Recommended Practice on Density and Contrast Range of Black-and-White Films and Slides for Television, RP 7-1962.

5.2 Background. The white background shall have a density of 0.3 to 0.4 but not less than 0.3, as specified in Section 2.1 of SMPTE Recommended Practice RP 7 for highlight areas.

5.3 Grid lines, circles, diagonals, arrows, and lettering shall have a density of 1.9 to 2.0, as specified in Section 2.2 of SMPTE Recommended Practice RP 7 for lowlight areas.

5.4 Resolution Wedges and Black-and-White Border. The resolution wedges and black-and-white border shall have a black density of 1.9 to 2.0, as specified for lowlight areas in Section 2.2 of SMPTE Recommended Practice RP 7, and a white density of 0.3 to 0.4 but not less than 0.3, as specified in Section 2.1 of RP 7 for highlight areas.

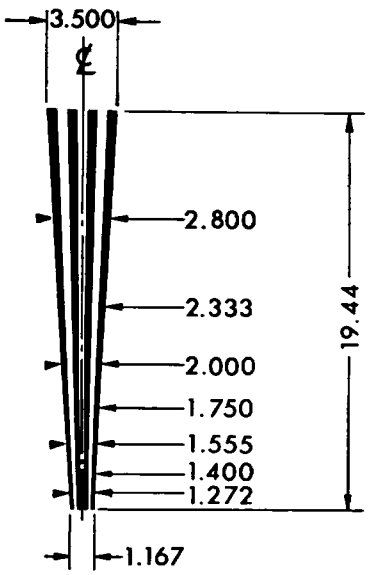

Fig. 3—Wedge Detail of Test Pattern

PROPOSED

SMPTE RECOMMENDED PRACTICE

RP 38.1

Specifications for Deflection Linearity Test Pattern for Television

1. *Scope*

This recommended practice describes the format, dimensions, and optical densities for a test pattern transparency to be used in the measurement of geometric distortion of television systems.

2. *Purpose*

The purpose of this practice is to specify a test pattern which, when used in conjunction with an appropriate electronically-generated grating signal, will facilitate the adjustment of deflection linearity and the measurement of geometric distortion of television cameras and picture display devices.

3. *Description*

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

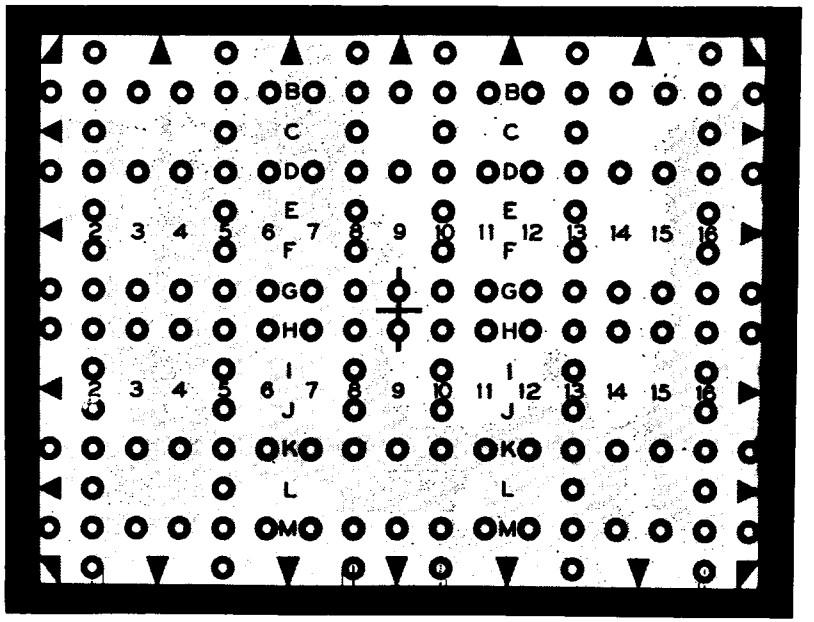

Fig. 1—Reproduction of Test Pattern

3.2 Background Density. The background density is a uniform gray. (See 5.1.)

3.3 Black Rings. Black rings, having an inner radius of one percent of picture height and an outer radius of two percent of picture height, are uniformly spaced and arranged to overlay an electronically-generated grating pattern.

3.4 Number of Rings. There are 148 rings arranged in a grid of 17 vertical columns and 14 horizontal rows. Numbers appear from left to right indicating columns 2 through 16 and letters from top to bottom, B through M, indicating rows 2 through 13.

3.5 Centering. A black cross is located in the center of the test pattern.

3.6 Boundary Arrows and Border. Black arrows and a black border define the scanned area of the test pattern.

3.7 Electronically-Generated Grating Pattern. The test pattern is designed to produce a video signal which will overlay an electronically-generated test signal producing 20 equally-spaced pulses per line scan period, 17 of which appear after normal signal blanking, and 15 equally-spaced pulses of 1-line duration per field period, 14 of which appear during picture time. Ideally, the center of the rings will coincide with intersections of the grating pattern on an overlay display.

3.8 Pattern Identification. The identification number of this document shall appear on the pattern in the area indicated in Fig. 2.

4. *Format*

4.1 Dimensions. The dimensions of the test pattern shall be as shown in Fig. 2. All dimensions are in percentages of picture height. 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 border, as indicated by the boundary arrows, shall be as follows:

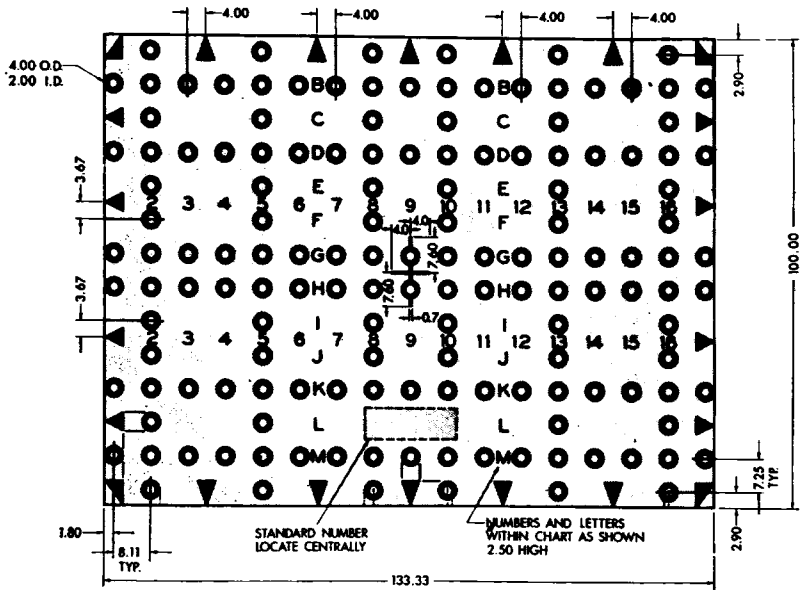

Fig. 2—Dimensional Drawing of Test Pattern

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

4.2.2 The 35mm test film 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.

4.2.3 The 16mm test film 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 Border. The dimensions of the black border of the test pattern shall be as follows:

4.3.1 Height and width dimensions of the black 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.

4.3.2 For 35mm motion-picture films, the black border shall extend to the dimensions of the negative image, as specified by Style A in USA Standard Dimensions of 35mm Motion-Picture Camera Aperture Image, PH22.59-1966.

4.3.3 For 16mm motion-picture films, the black border shall extend to the dimensions of the negative image, as specified in USA Standard Dimensions of 16mm Motion-Picture Camera Aperture Image, PH22.7-1964.

5. *Optical Densities*

5.1 Background Density. The background shall have a diffuse density of 0.6 ± 0.2.

5.2 Pattern Density. The arrows, rings, centering cross, and lettering shall have a maximum diffuse density range as specified in SMPTE Recommended Practice on Density and Contrast Range of Black-and-White Films and Slides for Television, RP 7-1962.

5.3 Border Density. The black border shall have a maximum diffuse density as specified in SMPTE Recommended Practice RP 7-1962.

Note: The following document is listed for reference only:

USA Standard Methods of Measurement of Aspect Ratio and Geometric Distortion of Television Cameras and Picture Monitors, C16.23-1954 (Reaffirmed 1961).