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SMPTE STANDARD

SMPTE 166-2004
Revision of
SMPTE 166-1999

for Motion-Picture Film (8-mm Type S) — Exposure Control and Stock Identification — Sound and Silent Camera Cartridge Notches

1 Scope

1.1 This standard specifies the dimensions and location of 8-mm type S sound and silent motion-picture film camera cartridge notches intended to preset exposure devices automatically with respect to the film speed and color-balancing filter.

1.2 This standard also specifies the dimensions and location of cartridge notches intended for identification of the motion-picture film inside the cartridge.

2 Dimensions

2.1 The dimensions of the cartridge notches shall be as specified in the figures and tables.

2.2 The datum planes used for dimensioning are mutually perpendicular.

2.3 Datum features B, C, and A are primary, secondary, and tertiary, respectively.

2.3.1 Datum plane A is coincident with the center of a circle located by basic dimension T. The circle is in contact with edges of the locating slot defined by dimensions A, O, P, and Q. The diameter of this circle is such that is applies regardless of feature size (RFS) of the locating slot (see annex A.3).

2.3.2 Datum feature B is the unnotched, unlabelled surface of the cartridge.

2.3.3 Datum feature C is the front seating surface of the cartridge.

2.4 Dimension U applies to all film identification notch locations.

3 Assignment code*

*Assignment of specific combinations of notches can be made according to the manufacturer's needs by application to the Director, Standards and Technology, Photographic and Imaging Manufacturers Association, 550 Mamaroneck Ave., Harrison, NY 10528-1612.

3.1 The film identification notch location positions are numbered 1 through 6 from the locating slot so that combinations of notches can be assigned (see figure 4).

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3.2 The 63 possible film identification notch combinations have been systematically arranged and identified with a notch combination code number, as shown in table 4.

3.3 Assignment of a code for use with either 50-ft (15-m) silent or sound 8-mm type S cartridges shall imply permission to utilize the same identification notch code for the same film offered in the alternate cartridge.

NOTES

1 The dimensions for the filter notch apply if the cartridge is loaded with film balanced for tungsten-light exposure and for some special cases with black-and-white film, as specified in note 6. This area is not notched if the cartridge is loaded with color film for daylight exposure and usually is not notched for black-and-white film.

2 The space available for notch-sensing devices is specified in SMPTE 159.1 and SMPTE 197.

3 The dimensions in table 3 permit the removal of material between adjacent identification notch positions, and between the number six identification notch position and the filter notch when adjacent notch positions are used. When material is retained, caution should be exercised to ensure that it is of sufficient strength to withstand normal handling without breakage.

4 If film data, such as film name and length of film load, are to be provided on the cartridge, they should be within the area shown by dimensions D, E, F, and G to provide for visual film identification in the camera (see figure 1).

5 Many general-purpose black-and-white reversal films can be processed satisfactorily in a universal process. Notch combination code number 1, therefore, has been reserved for such general-purpose black-and-white reversal films.

6 To ensure proper identification of film products whose production volume or market life does not warrant the assignment of a film identification notch, the absence of a notch in the area specified will require the film product to be identified by its label.

7 The film speed notch is used to set the exposure of an automatic camera with the daylight film speed. When the cartridge is loaded with film balanced for tungsten light, the tungsten light values are those at which the films are rated by the manufacturer. The effective speeds to daylight illumination for which the camera will expose these films (unless instructed otherwise) are based on the premise that a typical tungsten-light balanced color camera original film will have a speed two-thirds of a lens stop less when exposed through an appropriate filter to daylight illumination than it has when exposed unfiltered to tungsten light. The filter notch established by dimensions A_2 and B must, therefore, be used when the cartridge is loaded with color film balanced for tungsten illumination because this notch activates the camera to position a tungsten-to-daylight illumination correcting filter in the exposing light path. Black-and-white films are usually notched according to their daylight speed; however, a manufacturer may choose to speed notch a black-and-white film according to its speed to tungsten light, depending upon the intended use of the film. If this is done, the film would be exposed to daylight illumination through a tungsten-to-daylight correcting filter, as described above. A filter notch may also be used with black-and-white film if the manufacturer wishes to reduce the effective speed of a given film to daylight illumination by approximately two-thirds of a stop.

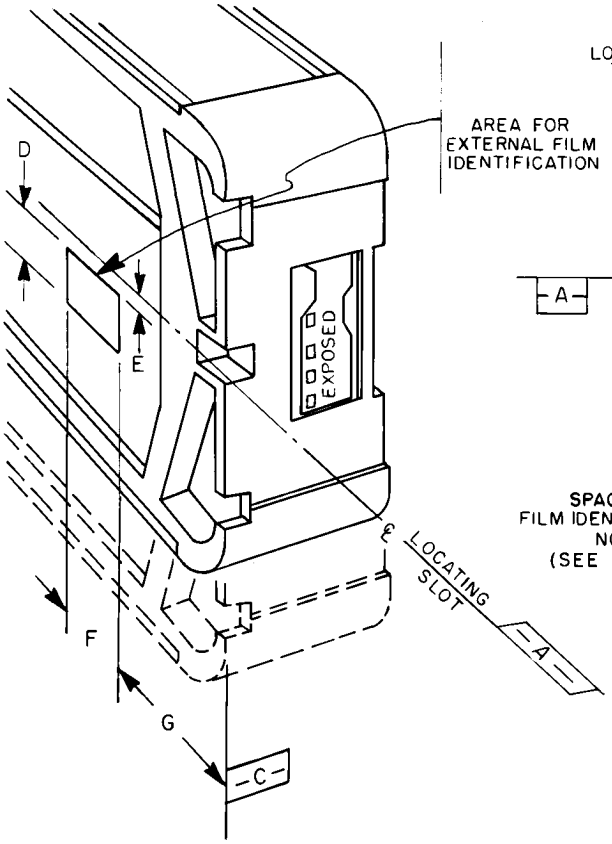

Figure 1 – External visual film identification area

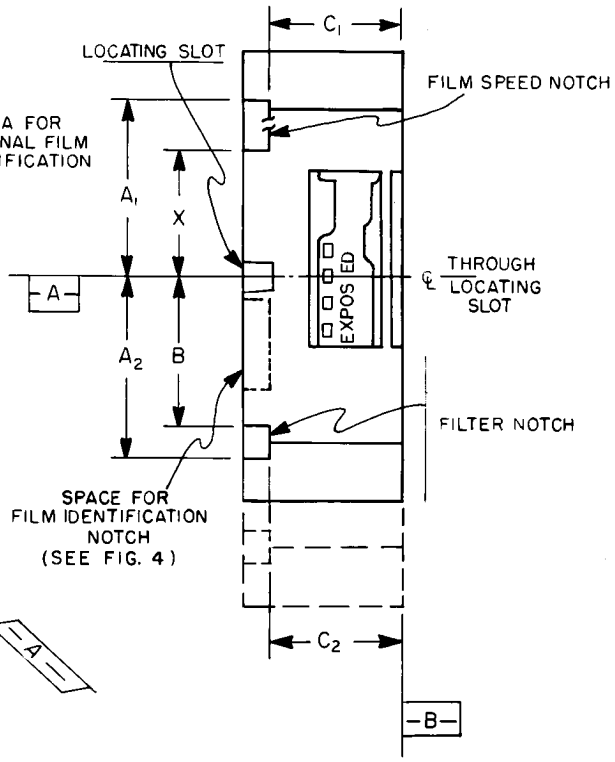

Figure 2 – Film speed and filter notches

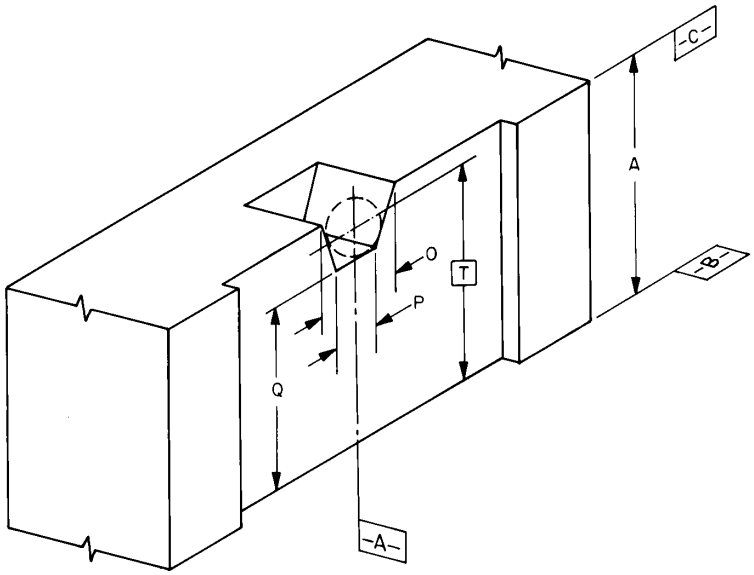

Figure 3 – Camera locating slot

Table 1 – Film speed and filter notch dimensions

Dimensions	Inches	Millimeters
A	0.962 ± 0.018	24.43 ± 0.46
A_1	1.100 ± 0.015	27.94 ± 0.38
A_2*	1.100 ± 0.015	27.94 ± 0.38
B*	0.913 ± 0.015	23.19 ± 0.38
C_1	0.800 ± 0.015	20.32 ± 0.38
C_2	0.800 ± 0.015	20.32 ± 0.38
D	0.250 ± 0.015	6.35 ± 0.38
E	0.052 ± 0.015	1.32 ± 0.38
F	0.563 ± 0.015	14.30 ± 0.38
G	1.062 ± 0.015	26.97 ± 0.38
O	0.154 ± 0.004	3.91 ± 0.10
P	0.142 ± 0.004	3.61 ± 0.10
Q	0.770 ± 0.010	19.56 ± 0.25
T	0.870 basic	22.10 basic

*See annex A.3.

Table 2 – Film speed notches

Daylight film speed (Cartridge has no filter notch)	Tungsten light film speed (Cartridge has a filter notch)	Dimension X*	
		Inches	Millimeters
10	16	1.000	25.40
16	25	0.900	22.86
25	40	0.800	20.32
40	64	0.700	17.78
64	100	0.600	15.24
100	160	0.500	12.70
160	250	0.400	10.16
250	400	0.300	7.62
400	640	0.200	5.08

*The tolerance for dimension X is ± 0.015 in (0.38 mm).

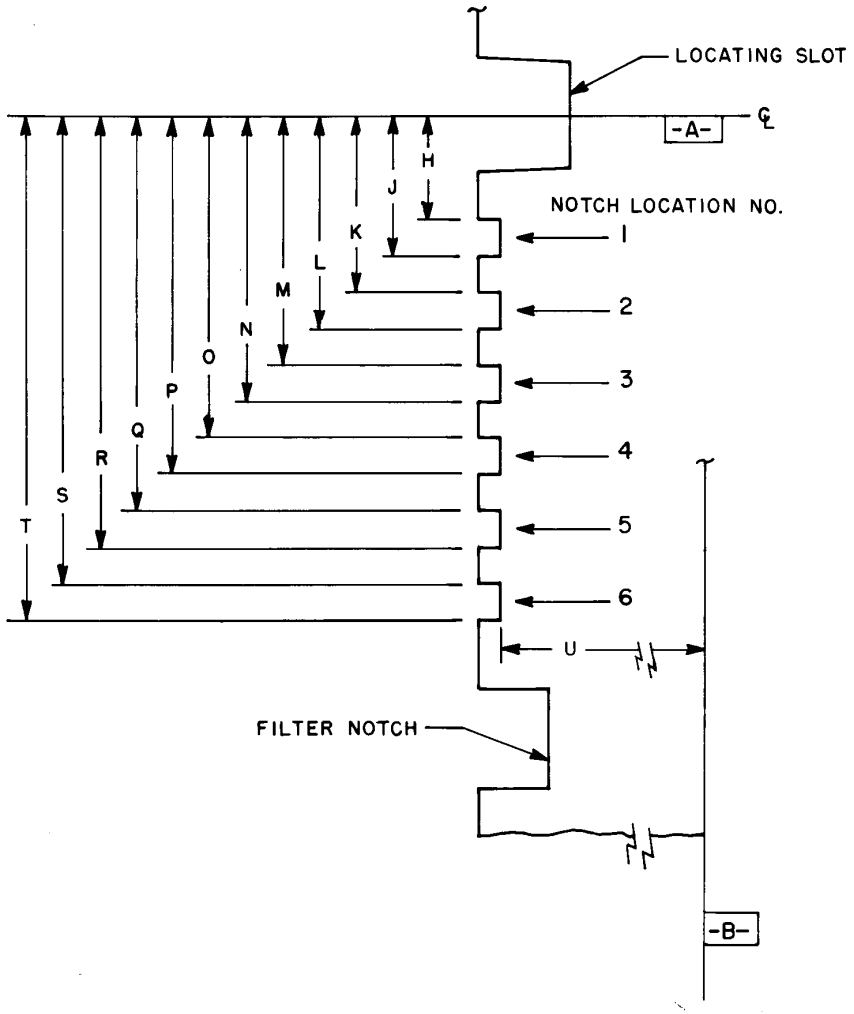

Figure 4 – Film identification notch locations

Table 3 – Identification notch specifications

Dimensions	Inches			Millimeters		
	Minimum		Maximum	Minimum		Maximum
H	0.150		0.170	3.81		4.32
J	0.220		0.256	5.59		6.50
K	0.256		0.292	6.50		7.42
L	0.342		0.378	8.69		9.60
M	0.378		0.414	9.60		10.52
N	0.464		0.500	11.79		12.70
O	0.500		0.536	12.70		13.61
P	0.586		0.622	14.88		15.80
Q	0.622		0.658	15.80		16.71
R	0.708		0.744	17.98		18.90
S	0.744		0.780	18.90		19.81
T	0.830		0.928	21.08		23.57
U	0.894	±	0.020	22.71	±	0.51

Table 4 – Film identification notch combinations

Notch combination code number	Location number 1	2	3	4	5	6	Notch combination code number	Location number 1	2	3	4	5	6
1	1						35	1		3		5	
2		2					36		2		4		6
3			3										
4				4			37	1		3			6
5					5								
6						6	38	1			4	5	
							39		2			5	6
7	1	2											
8		2	3				40	1			4		6
9			3	4									
10				4	5		41	1				5	6
11					5	6							
							42	1	2	3	4		
12	1		3				43		2	3	4	5	
13		2		4			44			3	4	5	6
14			3		5								
15				4		6	45	1	2	3		5	
							46		2	3	4		6
16	1			4									
17		2			5		47	1	2	3			6
18			3			6							
							48	1	2		4	5	
19	1				5		49		2	3		5	6
20		2				6							
							50	1	2		4		6
21	1					6	51	1	2			5	6
22	1	2	3				52	1		3	4	5	
23		2	3	4			53		2		4	5	6
24			3	4	5								
25				4	5	6	54	1		3	4		6
							55	1		3		5	6
26	1	2		4			56	1			4	5	6
27		2	3		5								
28			3	4		6	57	1	2	3	4	5	
							58		2	3	4	5	6
29	1	2			5								
30		2	3			6	59	1	2	3	4		6
							60	1	2	3		5	6
31	1	2				6	61	1	2		4	5	6
							62	1		3	4	5	6
32	1		3	4									
33		2		4	5		63	1	2	3	4	5	6
34			3		5	6							

Annex A (informative)
Additional data

A.1 ISO (ASA) film speeds for reversal color camera-original motion-picture film are in accordance with SMPTE 146M.

A.2 In order to clarify the system of speed notching specified in this standard, examples are provided below and in table A.1 describing picture-taking situations that will require a fully automatic camera to insert or remove a color-correcting filter, and to make adjustments to the camera exposure system in order to obtain theoretically correct exposure and color balance of the resulting pictures.

CASE I. Assume an automatic exposure camera, having its exposure-sensing device separate from the camera lens system, is used. The following will apply:

Example A. 8-mm type S film cartridge loaded with a color original film balanced for tungsten light with a film speed rating of 40. This cartridge will be notched with a filter notch and with a film speed notch dimensioned to allow the camera to sense that the appropriate exposure required is for film with an effective daylight film speed rating of 25 and a corresponding tungsten film speed rating of 40. (Effective speed is defined as the speed of a given photographic material used in conjunction with a filter and taken together as a system. The normal speed of a photographic product is defined as the speed it has when no filter is used during exposure. Effective speed ratings are useful because no filter factors or repeated exposure corrections are necessary when using such ratings.)

Situation 1. If daylight pictures are to be taken with this cartridge and camera, a color-correcting filter would be inserted into the lens axis by the camera when it senses the filter notch, and the camera exposure-sensing device would be adjusted to provide the appropriate exposure for an effective film speed rating of 25.

Situation 2. If tungsten-light pictures are taken, a means of removing the color-correcting filter inserted into the camera lens axis by the sensing of the filter notch would be required. Furthermore, the camera exposure-control system would have to be adjusted for a film speed of 40 (2/3 of a lens stop faster). These two adjustments could be accomplished when the color-correcting filter is removed from the lens axis automatically, when a lighting unit is attached to the camera, or manually by the operator.

Example B. 8-mm type S film cartridge loaded with a color film balanced for daylight or with black-and-white film having a film speed rating of 25. This cartridge would not include a filter notch, and the film speed notch would be dimensioned to allow the camera to sense that the appropriate exposure required is for a film with a film speed rating of 25.

Situation 1. Daylight pictures would be made without a color-correcting filter in the lens axis because there is no filter notch for the camera to sense. The camera exposure-sensing device would be adjusted to properly expose a film with a film speed rating of 25.

Situation 2. Tungsten-light pictures would be made without a color-correcting filter in the lens axis because there is no filter notch for the camera to sense. If, however, the operator actuates the mechanical means of removing the color correcting filter (which could be coupled to the lighting unit attachment, it would be necessary for the camera to distinguish this situation from that described in case II, example A, situation 2, and no change in the adjustment of the camera exposure-sensing device should be made (i.e., it should remain set for a film with a speed rating of 25).

CASE II. Assume a camera designed with its automatic exposure-sensing system behind the lens and obtaining its information from the lens axis by reflex or split-beam arrangement is used. Any light correction filter used in the lens axis would, therefore, be ahead of the film and the exposure-sensing device.

Example A. 8-mm type S film cartridge loaded with a color original film balanced for tungsten light with a film speed rating of 40. This cartridge will be notched with a filter notch and with a film speed notch dimensioned to allow the camera to sense that the appropriate exposure required is for film with an effective speed rating of 25.

Situation 1. Daylight pictures would be made with the color-correcting filter inserted into the lens axis by the camera when it senses the filter notch. Then, if the camera exposure-sensing device has a spectral sensitivity comparable to that of a tungsten-light balanced color film, the film speed rating adjustment for the exposure-sensing device should be corrected to properly expose a film with a film speed rating of 40 instead of the effective daylight rating of 25, as notched. This adjustment is necessary because the light-correcting filter is in front of the exposure-sensing device, and the effective film speed rating sensitivity of 25 is accomplished by the filter's spectral density.

Situation 2. When tungsten-light pictures are made, it will be necessary to remove mechanically the light-correcting filter actuated by the camera's sensing the cartridge filter notch without allowing any change in the film speed rating adjustment of the exposure-sensing device and maintaining a film speed rating of 40.

Example B. 8-mm type S film cartridge loaded with a color film balanced for daylight or with black-and-white film having a film speed rating of 25. This cartridge would not include a filter notch, and the film speed notch would be dimensioned to allow the camera to sense that the appropriate exposure required is for a film with a film speed rating of 25.

Situation 1. Daylight pictures would be made with no light-correcting filter in the lens axis because there is no filter notch for the camera to sense. However, the camera exposure-sensing device would be adjusted to provide proper exposure for a film with a film speed rating of 25 (different from that in case II, example A, situation 1). This could be accomplished because no filter notch is incorporated in the film cartridge, and the camera could sense the absence of this notch to properly adjust its exposure-sensing device (2/3 of a lens stop less exposure).

Situation 2. If tungsten-light pictures are made, there would be no color-correcting filter in the lens axis because there is no filter notch for the camera to sense, and the camera exposure-sensing device should be adjusted, as described in situation 1 above (for a film with a speed rating of 25).

Film speed ratings of 25 for daylight and 40 for tungsten illumination were selected for camera original color films used in the examples above. The same principles and color film speed rating relationships would apply if other film speed ratings had been selected.

A.3 To provide a consistent method of measurement, it is recommended that a cartridge gauging fixture be used which incorporates datum surfaces, a location pin, and means of exerting locating forces on appropriate surfaces of the cartridge.

Table A.1 – Summary of annex A

			Exposure system		Film color balance		Film speed		Exposure light		Camera speed setting	
Case	Example	Situation	Ind*	TTL†	Tungsten	Daylight	Tungsten (40)	Daylight (25)	Tungsten	Daylight		Filter
I	A	1	x		x		40	25 effective		x	25	in
I	A	2	x		x		40	25 effective	x		40	out
I	B	1	x			x		25		x	25	out
I	B	2	x			x		25	x		25	out
II	A	1		x	x		40	25 effective		x	40	in
II	A	2		x	x		40	25 effective	x		40	out
II	B	1		x		x		25		x	25	out
II	B	2		x		x		25	x		25	out

* Independent
† Through the lens

Annex B (informative)
Bibliography

SMPTE 146M-2001, Motion-Picture Film — 16- and 8-mm Reversal Color Camera Films — Determination of Speed

SMPTE 159.1-2001, Motion-Picture Film (8-mm Type S) — Model 1 Camera Cartridge — Cartridge-Camera Interface and Take-Up Core Drive

SMPTE 197-2003, Motion-Picture Film (8-mm Type S) — 50-Ft Model 1 Sound Camera Cartridge — Cartridge, Cartridge-Camera Interface and Take-Up Core