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Standards & Recommended Practices

Proposed American National Standards

Proposed revisions of two American National Standards are published here for a trial period and public review: C98.6, Dimensions of Video, Audio and Tracking Control Records on 2-in Video Magnetic Tape Quadruplex Recorded at 15 and 7.5 in/s; and PH22.166, Specifications for 8-mm Type S Sound and Silent Motion-Picture Film Camera Cartridge Notches for Exposure Control and Stock Identification.

C98.6 reflects a change in the video track width for 7.5 in/s tape from 0.0045 to 0.0055 in to 0.0050 to 0.0060 in to allow newer systems to take advantage of the increased track width and permit older systems to have the same track range formerly specified. The revision of PH22.166 incorporates specifications for sound as well as silent cartridges.

Comments should be addressed to Alex E. Alden, Manager of Engineering Services, at Society Headquarters before 1 January 1980. The proposals have been submitted to the appropriate American National Standards Committee. All comments received through *Journal* publication will be reviewed prior to conclusion of committee action. — *Alex E. Alden, Manager of Engineering Services*

Proposed American National Standard

Dimensions of Video, Audio and Tracking Control Records on 2-in Video Magnetic Tape Quadruplex Recorded at 15 and 7.5 in/s

C98.6

Revision of C98.6-1973

1. Scope

This standard specifies both the locations for the edges of the video, audio and tracking control records, and the mechanical separation of the simultaneously-recorded information of the video and audio records, as recorded on 2-in quadruplex video magnetic tape.

2. Definitions

2.1 Transverse: Pertaining to dimensions or motions perpendicular to the tape travel.

2.2 Longitudinal: Pertaining to dimensions or motions parallel to the tape travel.

2.3 Downstream: Pertaining to locations on the tape longitudinally displaced from a given reference point, in the direction of tape travel.

2.4 Upstream: Pertaining to locations on the tape longitudinally displaced from a given reference point, in a direction opposite to tape travel.

2.5 Reference Edge: On a video tape containing quadruplex-recorded information, that longitudinal tape edge nearest the tracking control record.

2.6 Trailing Edge, Video Track: The upstream edge of the video track.

2.7 Transverse Reference Line: A line perpendicular to the reference edge and passing through a video track trailing edge at its lowest end (point T) as in Fig. 1.

3. General

3.1 References. The transverse reference line and reference edge shall be the references for all dimensions in this standard.

3.2 Measurement Conditions. The dimensions specified in this standard are measured with no transverse or longitudinal tension applied to the tape. (See Appendix A4.)

3.3 Magnetic Coating. With the direction of tape travel as shown in all figures in this standard, the magnetic coating is on the surface facing the observer.

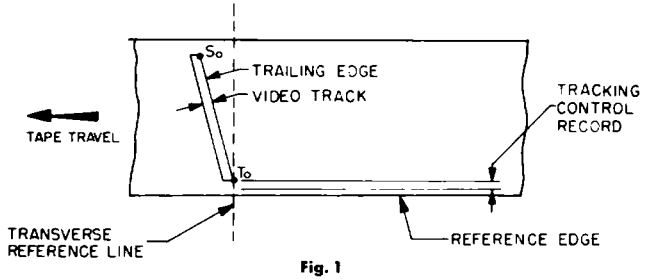

Fig. 1
Definitions

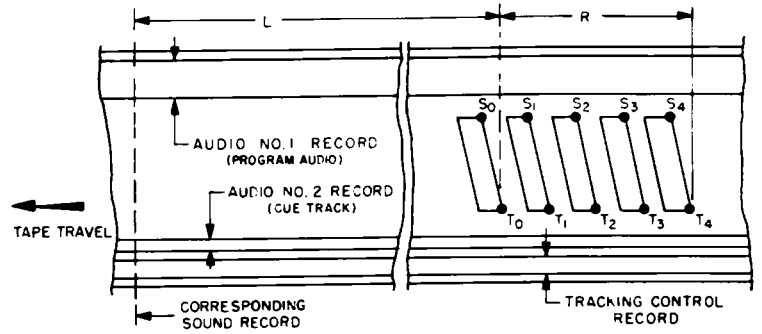

Fig. 2
Longitudinal Dimensions

4. Longitudinal Dimensions

4.1 Average Video Track Pitch. For a tape recorded at 15 in/s (381 mm/s), the longitudinal distance, R, from a transverse reference line to a point, T., four tracks away (See Fig. 2), shall be greater than 0.062438 in (1.58593 mm) and less than 0.062562 in (1.58907 mm). (An acceptable method for obtaining the accuracy required by the above dimensions is to measure the span occupied by 3072 tracks, which should be greater than 47.952 in (1217.98 mm) and less than 48.048 in (1220.42 mm).) See Apoendixes A2 and A3.

For a tape recorded at 7.5 in/s (190.5 mm/s), the longitudinal distance from a transverse reference line to a point, T., four tracks away shall be greater than 0.031219 in (0.79296 mm) and less than 0.031281 in (0.79454 mm). (An acceptable method for obtaining the accuracy required by the above dimensions is to measure the span occupied by 3072 tracks, which should be greater than 23.976 in (608.99 mm) and less than 24.024 in (610.21 mm).) See Appendixes A2 and A3.

4.2 Video Track Spacing. The longitudinal distance from any transverse reference line to Points T , T , and T shall be R/4, R/2, and 3R/4, respectively, with a tolerance of ± 0.00015 in (0.0038 mm), where R is the average video track pitch as determined in Section 4.1 for the tape being measured (See Fig. 2). (The tolerances indicated cannot be readily measured on a pre-recorded tape by methods presently available. At the present state of the art, these dimensions are controlled by the head wheel manufacturer's ability to achieve coplanarity of the recording pole tips.) See Appendixes A2 and A3.

4.3 Video Track Curvature and Angle. The trailing edge of any video track shall fall between two parallel lines spaced apart by 0.001 in (0.03 mm).

For a tape recorded at 15 in/s, the two parallel lines shall make, with the reference edge, a positive angle no greater than 90° 36′ and no less than 90° 30′, when positioned so as to enclose the entire length of the video track trailing edge.

For a tape recorded at 7.5 in/s, the two parallel lines shall make, with the reference edge, a positive angle no greater than 90° 19′ 30″ and no less than 90° 13′ 30″, when positioned so as to enclose the entire length of the video track trailing edge.

4.4 Video Track Width. For a tape recorded at 15 in/s, the longitudinal width of any video track shall lie between 0.0095 in (0.241 mm) and 0.0105 in (0.267 mm), measured at any and all points along its transverse direction. For a tape recorded at 7.5 in/s, the video track width shall lie between 0.0050 in (0.127 mm) and 0.0060 in (0.152 mm).

4.5 Audio Record Displacement. Audio or other information which is time-coincident with video information recorded at a point, T, of any video track shall be recorded in Audio Record No. 1 (Program Audio) or Audio Record No. 2 (Cue Track), at a distance, L, downstream from that point, T, where L shall be at least 9.200 in (233.68 mm) and no more than 9.300 in (236.22 mm).

5. Transverse Dimensions

The transverse dimensions shall be as specified in Fig. 3 and the table.

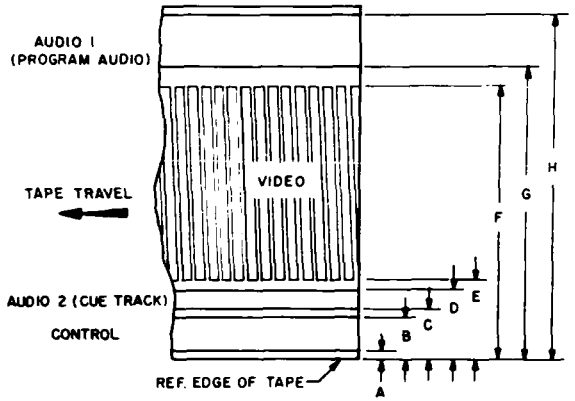

Fig. 3
Tranverse Dimensions

Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.000	0.004	0.00	0.10
B	0.040	0.049	1.02	1.24
C	0.058	0.062	1.47	1.57
D	0.078	0.085	1.98	2.16
E	0.087	0.094	2.21	2.39
F	1.902	1.914	48.31	48.62
G	1.921	1.930	48.79	49.02
H	1.988	1.996	50.50	50.70

Appendix

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

A1. A magnetic record is that area in which magnetization conveying the intended signal exists. A common technique for measurement of record locations and dimensions is the use of carbonyl iron to make them visible.

A2. Since all recorded tapes exhibit wow and flutter to some degree, the span of measured tracks should be long enough to average out variations in video track pitch arising from wow or flutter. If other measuring methods are employed, appropriate averaging must be included in the measurement.

A3. The track pattern specified by Sections 4.1 and 4.2 results when the tape speed in inches per second and the head wheel rotational rate in revolutions per second are in the ratio of 0.0625:1 for 15 in/s recording practice, and in the ratio of 0.03125:1 for 7.5 in/s recording practice. Since both the head wheel rotational speed and the capstan metering rate are locked to the television frame rate, the speed of the tape will vary with the television frame rate. This speed variation will not alter the pattern placed on the tape. Replay rate of any recording, as well as the replay rate of the information contained in the record, will be determined solely by the reference frequency to which the replay capstan and head wheel are synchronized.

Primary causes of departures from the video track pitch specified by Section 4.1 are incorrect capstan diameter, capstan slippage, or incorrect longitudinal tape stretch.

The tolerances specified in Section 4.1 reflect the magnitude of allowable changes in the ratio of tape speed to head wheel rotational speed. Variations in excess of those specified will not only result in improper video track pitch but will also result in an incorrectly placed control track on tapes recorded on machines having the control track head displaced from the plane of rotation of the video pole tips by approximately 0.7 in (18 mm), as is common practice in present-day transports. (See SMPTE Recommended Practice RP 16-1977, Specifications of Tracking Control Record for 2-in Quadruplex Video Magnetic Tape Recordings, for a description of the tracking control record.)

A4. Although, with sufficient care, measurements of track dimensions may be made with no transverse or longitudinal tension applied to the tape, tape-handling problems during measurements may be lessened by making two sets of measurements at two different longitudinal tensions and extrapolating data thus obtained to the zero-tension condition.

Proposed American National Standard

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

PH22.166

Revision of
PH22.166-1977

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 it applies regardless of feature size (RFS) of the locating slot (see Appendix A3).

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*

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 Fig. 4).

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.

*Assignment of specific combinations of notches can be made according to the manufacturer's needs by application to the Manager, Technical Services, National Association of Photographic Manufacturers, Inc., 600 Mamaroneck Ave., Harrison, New York 10528.

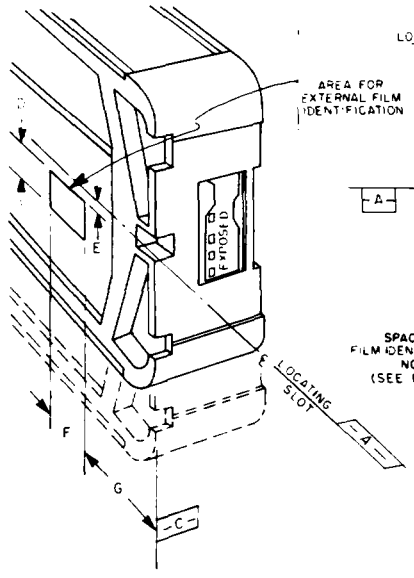

Fig. 1
External Visual Film Identification Area

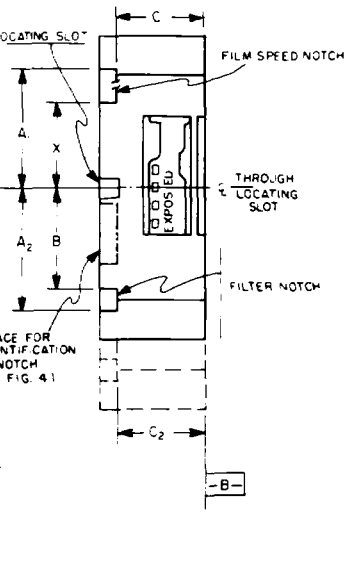

Fig. 2
Film Speed and Filter Notches

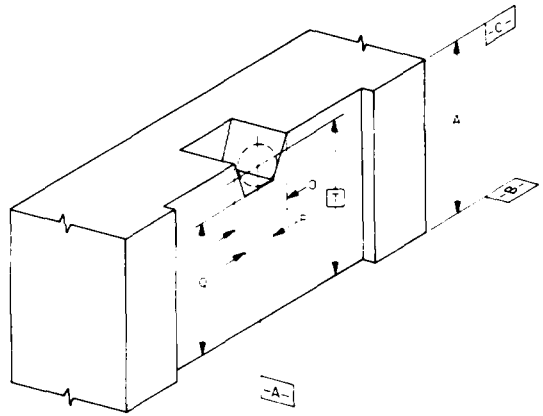

Fig. 3
Camera Locating Slot

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 Appendix A3.

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).

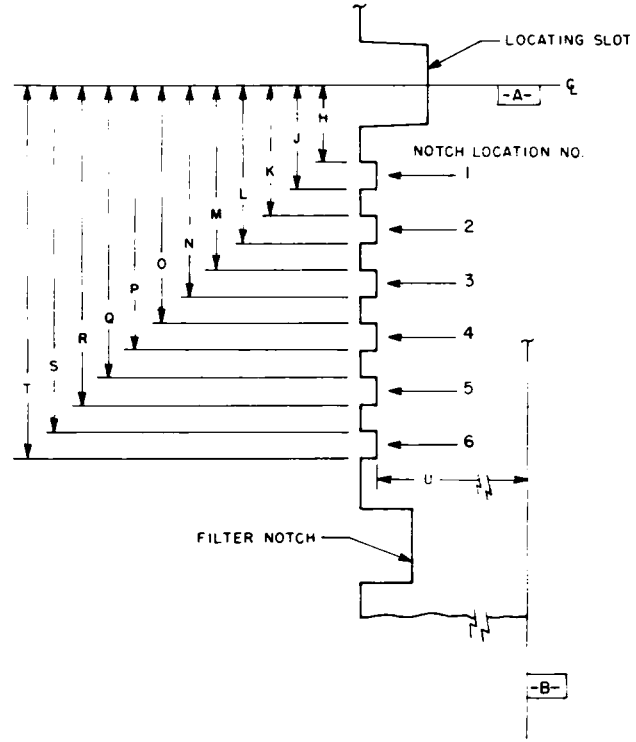

Fig. 4
Film Identification Notch Locations

Table 3

Dimensions	Inches Minimum	Inches Maximum	Millimeters Minimum	Millimeters 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						NOTCH COMBINATION CODE NUMBER	LOCATION NUMBER					
	1	2	3	4	5	6		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							

NOTE 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.

NOTE 2: The space available for notch-sensing devices is specified in American National Standard Specifications for Super 8 Motion-Picture Film Camera Cartridge and Cartridge-Camera Fit, PH22.159.1-1968 (R1973), and Proposed American National Standard Specifications for 8-mm Type S (Super 8) Model 1 Sound Motion-Picture Film Camera Cartridge, Cartridge-Camera Interface and Take-Up Core Drive, PH22.197.

NOTE 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.

NOTE 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 Fig. 1).

NOTE 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.

NOTE 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.

NOTE 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 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.

Appendix

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

A1. ASA film speeds for reversal color camera-original motion-picture film are in accordance with American National Standard Method for Determining Speed of 16 mm, 8 mm and Super 8 Reversal Color Camera Films Intended for Direct Projection in Motion-Picture Photography, PH22.146-1973.

A2. In order to clarify the system of speed notching specified in this standard, examples are provided below and in the table 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 on 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 (⅔ 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. The 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 I, 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 a 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 where it senses the filter notch. Then, if the camera exposure-control 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. The 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 have to be adjusted to provide proper exposure for a film with a film speed rating of 25 (differing 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 (⅔ of a lens stop less exposure).

Situation 2. If tungsten-light pictures are made, there would be no light-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.

A3. To provide a consistent method of measurement, it is recommended that a cartridge gauging fixture be used which incorporates datum surfaces, a locating pin, and means of exerting locating forces on appropriate surfaces of the cartridge.

SUMMARY OF APPENDIX

Case	Example	Situation	Exposure System Ind*	Exposure System TTL†	Film Color Balance Tungsten	Film Color Balance Daylight	Film Speed Tungsten 40	Film Speed Daylight 25	Exposure Light Tungsten	Exposure Light Daylight	Camera Speed Setting	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