



Kodak

CINEMATOGRAPHER'S
FIELD GUIDE



Cinematographer's Field Guide

KODAK
MOTION
PICTURE
CAMERA
FILMS



Cinematographer's
Field Guide
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INTRODUCTION

This pocket-sized publication provides up-to-date and easy-to-use information about all KODAK Motion Picture Camera Films and several related subjects. We designed the book to help you choose and order the right films for your needs and to help you use the films most effectively. The guide is divided into five major sections for easy reference:

- Motion Picture Camera Films

- Filter Information

- Tips and Techniques

- Formats and Packaging

- Ordering Raw Stock

Brief but comprehensive descriptions of each black-and-white and color camera film appear in the section KODAK Motion Picture Camera Films. The section Filter Information contains charts for color conversion, neutral density, color balancing, filter factors, and color temperature. The section Tips and Techniques covers film storage and care, shooting for television, must-have items for your on-location ditty bag, survival tools, flashing techniques, force processing, a filmmaker's flowchart, and more. The section Formats and Packaging clears up any questions you might have concerning spec numbers, iden numbers, film can label terms and numbers, and packaging information. The last section, Ordering Raw Stock, tells you how to order film and lists names, addresses, and telephone numbers of Kodak people worldwide who can answer your questions about film and film orders.

This edition includes the newest KODAK VISION2 Color Negative Films, the highest quality camera films available from Kodak. VISION2 Films offer superior technology for image capture and seamlessly intercut with all KODAK Motion Picture Color Negative Films.

KODAK VISION2 Films are the first line of products specifically created for both traditional and digital post-production. Offering wider latitude, superior shadow and highlight detail, and excellent tone scale and flesh-to-neutral reproduction. VISION2 Films are also engineered to maintain neutrality through the full range of exposure, allowing you more flexibility from capture to post.

An edge-numbering system for KODAK Motion Picture Camera Films features both electronic- and operator-read characters. The digital numbers, called EASMAN KEYCODE Numbers, are in the form of a machine-readable barcode and a human-readable letter code. This feature provides the potential for automated film handling. All KODAK Motion Picture Color Negative and Black-and-White Camera Films have KEYCODE Numbers.

Note: The Kodak filter materials and other brand name products we describe in this publication, are available from photographic supply dealers. Equivalent materials can be used.

Need Another H-2?

This publication and many others are available at the Kodak website at www.kodak.com/go/motion, or visit www.kodak.com and choose Service and Support. You can purchase extra copies of Publication No. H-2 from the nearest Kodak company or distributor in your country. U.S. residents can order directly from Eastman Kodak Company by calling 1 (800) 233-1650. Please provide CAT No. 141 3871 when placing your order.

**Motion Picture
Camera Films**

KODAK MOTION PICTURE CAMERA FILMS

Introduction

This section provides pertinent information about all currently available KODAK Motion Picture Camera Films.

A quick reference chart of all the films is on page MPF-4. Page references for the individual film-information sheets as they appear in this guide are included at the right of the chart. The detailed descriptions for each film begin on page MPF-6 and include the following information:

- Film code number and film name
- Exposure indexes and filters
- General properties
- Trial exposure settings
- Illumination table and light-contrast suggestions
- Filter factors
- Reciprocity characteristics
- Handling
- Availability

Caution: Load and unload all camera spools in total darkness to prevent edge fog on the film.

H-1 Data Sheets Available

Detailed data sheets for all KODAK Motion Picture Camera Films are available at the Kodak website at www.kodak.com/go/motion, or visit www.kodak.com and choose Service and Support. In countries outside the U.S., contact one of the facilities listed in the back of this book. Be sure to include the name and code number for each film data sheet you request. (For example: KODAK VISION2 500T Color Negative Film 5218 [35 mm] and 7218 [16 mm], KODAK Publication No. H-1-5218.)

Technical Information

For technical information in the United States, call the Kodak Information Center (KIC), 9:00 a.m. to 7:00 p.m. Eastern time, Monday through Friday, at 1 (800) 242-2424. In Canada, call 1 (800) 465-6325, Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern time. Outside the United States and Canada, contact Kodak or a distributor in your country.

A Note on T-Stops and F-Stops

When discussing lens aperture size, cinematographers traditionally refer to t-stops while still photographers refer to f-stops. A t-stop is a measure of actual light transmission by the lens. An f-stop is the theoretical ratio of the lens' focal length to the diameter of its entrance pupil (approximately the aperture diaphragm size in a symmetrical lens). What relates the two is the lens' efficiency in transmitting light; if the lens could transmit all the light entering it, its t-stop and f-stop would be the same (ANSI PH 22.90-1987, *Aperture Calibration of Motion Picture Lenses, Method for Determining*, gives full details).

Color Temperature

The color quality of some light sources can be stated in *color temperature*; it's a measure that defines the color of a light source relative to the visual appearance and expressed in degrees Kelvin (K). There are at least two important points to consider when using color temperature values. *First*, color temperature refers only to the visual appearance of a light source and does not necessarily describe its photographic effect. Second, color temperature doesn't take the spectral distribution of a light source into account. Unless the light source has a continuous spectral distribution, its effective color temperature alone may not be reliable as a means of selecting a suitable correction filter. Foreexample, fluorescent lamps do not have the continuous smooth spectral-distribution curve that is characteristic of a tungsten-filament source.

It is possible for two or more light sources to be described as having the same color temperature, even though photographic results obtained with each may be quite different. Only a wavelength-by-wavelength comparison of film sensitivity and spectral output of a lamp can determine the exact filters required to balance the light-to-film response. KODAK Motion Picture Films have a photographic latitude that makes unusual filtration unnecessary, except for special visual effects. For most photography, filter recommendations in this publication are capable of producing excellent-quality pictures with the products described.

All light sources, whether daylight, tungsten, or fluorescent, emit energy at a precise color temperature at a given moment and may not remain consistent. Some factors that affect color temperature are sun angle, conditions of sky (clouds, dust, haze), age of lamps, voltage, reflectors, etc. Deviations from the expected light source color temperature will cause an overall color shift in the finished product. While this difference may be color corrected in printing, there could be some unforeseen mired shifts. The light source color temperature should be monitored with a color temperature meter and corrected as necessary at the source, camera, or both.

Only recommended conversion filters (e.g. daylight to artificial light) that are placed on the camera are listed in this publication. Since they may not be consistent with previous recommendations, use the current recommendations for exposures and testing. Light source filters (filters on lamps, arcs, etc.) are not listed because of the many varieties and color temperatures of the sources.

The manufacturers of these light sources should be contacted for filter recommendations. It is suggested that all filter recommendations be tested before actual shooting.

KODAK Motion Picture Camera Films

Film Name	Code No.			
	35 mm	16 mm	Super 8	
KODAK VISION2 Expression 500T	5229	7229	—	
KODAK VISION2 500T	5218	7218	7218	
KODAK VISION2 250D	5205	7205		
KODAK VISION2 200T	5217	7217	7217	
KODAK VISION2 100T	5212	7212	—	
KODAK VISION 500T	5279	7279	—	
KODAK VISION 320T	5277	7277	—	
KODAK VISION 250D	5246	7246	—	
KODAK VISION 200T	5274	7274	—	
EASTMAN EXR 50D	5245	7245	—	
EASTMAN EKTACHROME 100D	5285	7285	—	
EASTMAN PLUS-X	5231	7231	—	
EASTMAN DOUBLE-X	5222	7222	—	
KODAK PLUS-X	—	7265	7265	
KODAK TRI-X	—	7266	7266	

	Type	Exposure Index KODAK WRATTEN Gelatin Filter		See Page
		Daylight	Tungsten (3200 K)	
	Color Negative	320 with Filter No. 85	500	MPF-6
	Color Negative	320 with Filter No. 85	500	MPF-8
	Color Negative	250	64 with Filter No 80A	MPF-10
	Color Negative	125 with Filter No. 85	200	MPF-12
	Color Negative	64 with Filter No. 85	100	MPF-14
	Color Negative	320 with Filter No. 85	500	MPF-16
	Color Negative	200 with Filter No. 85	320	MPF-18
	Color Negative	250	64 with Filter No. 80A	MPF-20
	Color Negative	125 with Filter No. 85	200	MPF-22
	Color Negative	50	12 with Filter No. 80A	MPF-24
	Color Reversal	100	25 with Filter No. 80A	MPF-26
	B&W Negative	80	64	MPF-28
	B&W Negative	250	200	MPF-30
	B&W Reversal	100	80	MPF-32
	B&W Reversal	200	160	MPF-34

KODAK VISION2 Expression

500T Color Negative Film

5229 / 7229

Available in 35 mm and 16 mm
Tungsten EI 500

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	320
Tungsten 3200 K	None	500
Tungsten Photoflood 3400 K	None	500
Daylight 5500 K	85	320
Metal Halide H.M.I.	85	320
White-Flame Arcs	85B	200
Yellow-Flame Arcs	CC20Y	320
OPTIMA 32	None	500
VITALITE	No. 85	320
Fluorescent** Cool White	85 + CC10M	200
Fluorescent** Deluxe Cool White	85C + CC10R	320

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 320.

Process: ECN-2

General Properties: KODAK VISION2 Expression 500T Color Negative Film 5229 / 7229 is better than ever. With greatly reduced grain and superior shadow detail, this film offers a subdued range of contrast and color saturation for smooth skin tones. Giving you more flexibility in post and cleaner images from under-to-over-exposure.

The VISION2 Film family is the first line of products created specifically for both film and digital post-production. What's more, all VISION2 Films provide excellent tone scale and flesh-to-neutral reproduction. With superior shadow and highlight detail and very fine grain. VISION2 Films also maintain neutrality through the full range of exposure. So you can convey exactly the look you intended all the way from capture to post.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	5	10	20	40	80	160	320	640

Use this table for average subjects. When a subject includes only pastels, use at least ½ stop less exposure; dark colors require ½ stop more exposure.

Reciprocity Characteristics EI 500: No filter corrections or exposure adjustments for exposure times from 1/1000 of a second to 1/10 second. In the 1-second range, increase exposure 2/3 stop and use a KODAK WRATTEN Gelatin Filter CC10Y. In the 10 second range, increase exposure 1 stop and use a KODAK WRATTEN Gelatin Filter CC20Y.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION2 500T

Color Negative Film

5218 / 7218

Available in 35 mm, 65 mm, 16 mm, and
Super 8 mm
Tungsten EI 500

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	320
Tungsten 3200 K	None	500
Tungsten Photoflood 3400 K	None	500
Daylight 5500 K	85	320
Metal Halide H.M.I.	85	320
White-Flame Arcs	85B	200
Yellow-Flame Arcs	CC20Y	320
OPTIMA 32	None	500
VITALITE	85	320
Cool White**	85 + CC10M	200
Deluxe Cool White**	85C + CC10R	320

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 320.

Process: ECN-2

General Properties: KODAK VISION2 500T Color Negative Film 5218 / 7218 is the lowest grain 500T film available for clean, crisp images. Its toe speed is optimized to enhance shadow detail and neutrality. The curve shape is linear, which contributes to the overall neutrality and flesh-to-neutral tone reproduction. You'll appreciate its greater flexibility in film and digital post-production. VISION2 500T Film is the right choice when you require true, natural color over a wide range of exposures.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	5	10	20	40	80	160	320	640

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 500: No exposure or filter compensation is required for exposure times from 1/1000 to 1/10 second. If your exposure is in the 1-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10R. In the 10-second range, increase exposure 1 stop and use a KODAK WRATTEN Gelatin Filter CC10R.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number.

KODAK VISION2 250D

Color Negative Film

5205 / 7205

Available in 35 mm, 65 mm, and 16 mm,
Daylight EI 250

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82A	64
Tungsten 3200 K	82A	64
Tungsten Photoflood 3400 K	82A	64
Daylight 5500 K	None	250
Metal Halide H.M.I.	None	250
White-Flame Arcs	CC20Y + CC10C	160
Yellow-Flame Arcs	CC30Y + CC10C	160
OPTIMA 32	80A	64
VITALITE	None	250
Fluorescent** Cool White	CC20M	200
Fluorescent** Deluxe Cool White	82C	160

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC20M + CC10B with a trial exposure index of 125.

Process: ECN-2

General Properties: is an advanced, medium-speed film that delivers superior imaging in daylight, artificial daylight, and a variety of mixed lighting. Expect beautiful fleshtones, accurate color reproduction, and—thanks to its wider latitude—increased detail in shadow and highlight areas. Add seamless intercutting with other KODAK VISION2 Films and you have a versatile addition to your storytelling toolkit.

The VISION2 Film family is the first line of products created specifically for both film and digital postproduction. What's more, all VISION2 Films provide excellent tone scale and flesh-to-neutral reproduction. With superior shadow and highlight detail and very fine grain, VISION2 Films also maintain neutrality through the full range of exposures. So you can convey exactly the look you intended all the way from capture to post.

Illumination (Incident Light) Table for Tungsten Light (24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	10	20	40	80	160	320	640	1250

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 250: No exposure or filter compensation is required for exposure times from 1/1000 to 1/10 second. If your exposure is in the 1-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10Y. In the 10-second range, increase exposure 1 stop and use a KODAK WRATTEN Gelatin Filter CC10R.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number.

KODAK VISION2 200T

Color Negative Film

5217 / 7217

Available in 35 mm, 65 mm, 16 mm, and
Super 8 mm
Tungsten EI 200

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	125
Tungsten 3200 K	None	200
Tungsten Photoflood 3400 K	None	200
Daylight 5500 K	85	125
Metal Halide H.M.I.	85	125
White-Flame Arcs	85B	80
Yellow-Flame Arcs	CC20Y	125
OPTIMA 32	None	200
VITALITE	85	125
Fluorescent** Cool White	85 + CC10M	80
Fluorescent** Deluxe Cool White	85C + CC10R	125

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 125.

Process: ECN-2

General Properties: KODAK VISION2 200T Color Negative Film 5217 / 7217 is highly versatile and reliable, offering excellent image structure under a wide variety of lighting conditions. This film also enables you to shoot all scenes for digital compositing on the same stock. Giving you pristine edges and making VFX easier and more seamless than ever.

The VISION2 Film family is the first line of products created specifically for both film and digital post-production. VISION2 200T Film has excellent tone scale and flesh-to-neutral reproduction; superior shadow and highlight detail; and very fine grain. It maintains neutrality through the full range of exposure.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	5	10	20	40	80	160	320	640

Use this table for average subjects. When a subject includes only pastels, use at least ½ stop less exposure; dark colors require ½ stop more exposure.

Reciprocity Characteristics EI 500: No filter corrections exposure adjustments for exposure times from 1/1000 of a second to 1/10 second. In the 1-second range, increase exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10R. In the 10 second range, increase exposure 1 stop and use a KODAK WRATTEN Gelatin Filter CC10R.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION2 100T

Color Negative Film

5212/ 7212

Available in 35 mm, 65 mm, and 16 mm
Tungsten EI 100

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	64
Tungsten 3200 K	None	100
Tungsten Photoflood 3400 K	None	100
Daylight 5500 K	85	64
Metal Halide H.M.I.	85	64
White-Flame Arcs	85B	40
Yellow-Flame Arcs	85B CC20Y	64
OPTIMA 32	None	100
VITALITE	85	64
Fluorescent** Cool White	85 + CC10M	40
Fluorescent** Deluxe Cool White	85C + CC10R	64

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 64.

Process: ECN-2

General Properties: KODAK VISION2 100T Color Negative Film 5212 / 7212 is the sharpest color negative motion picture film. With excellent flexibility and extremely fine grain, VISION2 100T Film offers clean and crisp images. And 100T Film also includes superior VFX capabilities, so you can shoot all your scenes for digital compositing on the same stock.

The VISION2 Film family is the first line of products created specifically for both film and digital post-production. VISION2 100T Film has excellent tone scale and flesh-to-neutral reproduction; superior shadow and highlight detail; and very fine grain. It maintains neutrality through the full range of exposure.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	25	50	100	200	400	800	1600	3200

Use this table for average subjects. When a subject includes only pastels, use at least ½ stop less exposure; dark colors require ½ stop more exposure.

Reciprocity Characteristics EI 100: No filter corrections adjustments for exposure times from 1/1000 of a second to 1/10 second. In the 1-second range, increase exposure 2/3 stop and use a KODAK WRATTEN Gelatin Filter CC10R. In the 10 second range, increase exposure 1 stop and use a KODAK WRATTEN Gelatin Filter CC10R.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION 500T

Color Negative Film

5279 / 7279

Available in 35 mm, 65 mm, and 16 mm
Tungsten EI 500

Also available in 35 mm, 65 mm, and 16 mm ESTAR Base

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	320
Tungsten 3200 K	None	500
Tungsten Photoflood 3400 K	None	500
Daylight 5500 K	85	320
Metal Halide H.M.I.	85	320
White-Flame Arcs	85B	200
Yellow-Flame Arcs	CC20Y	320
OPTIMA 32	None	500
VITALITE	85	320
Fluorescent** Cool White	85 + CC10M	200
Fluorescent** Deluxe Cool White	85C + CC10R	320

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 320.

Process: ECN-2

General Properties: This normal-contrast KODAK VISION 500T Color Negative Film has traditional tone scale and flesh tone reproduction. It offers excellent latitude with rich blacks and clean whites, and delivers colorful images with fine grain and high sharpness. A robust, high-speed tungsten film that meets the needs of most low-light cinematography for telecine transfer or print release.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	5	10	20	40	80	160	320	640

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 500: No exposure or filter compensation is required for exposure times from 1/1000 to 1 second. If your exposure is in the 10-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10Y.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION 320T

Color Negative Film

5277 / 7277

Available in 35 mm and 16 mm
Tungsten EI 320

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	200
Tungsten 3200 K	None	320
Tungsten Photoflood 3400 K	None	320
Daylight 5500 K	85	200
Metal Halide H.M.I.	85	200
White-Flame Arcs	85B	125
OPTIMA 32	None	320
VITALITE	85	200
Fluorescent* Cool White	85 + CC10M	125
Fluorescent* Deluxe Cool White	85C + CC10R	200

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 200.

Process: ECN-2

General Properties: KODAK VISION 320T Color Negative Film. A tungsten-balanced film with fine grain structure and very high sharpness. It features lower overall contrast and an additional reduction in toe contrast, which provides a significant increase in underexposure latitude and shadow detail.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	8	16	32	64	125	250	500	1000

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 320: No exposure or filter compensation is required for exposure times from 1/1000 to 1 second. If your exposure is in the 10-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10Y.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION 250D

Color Negative Film

5246 / 7246

Available in 35 mm, 65 mm, and 16 mm
Daylight EI 250

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	80A	64
Tungsten 3200 K	80A	64
Tungsten Photoflood 3400 K	80A	64
Daylight 5500 K	None	250
Metal Halide H.M.I.	None	250
White-Flame Arcs	CC20Y + CC10C	160
OPTIMA 32	80A	64
VITALITE	None	250
Fluorescent* Cool White	CC20M	200
Fluorescent* Deluxe Cool White	82C	160

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC20M + CC10B with a trial exposure index of 125.

Process: ECN-2

General Properties: KODAK VISION 250D Color Negative Film. This daylight-balanced, medium-speed film offers outstanding performance in mixed lighting. It has exceptional sharpness, high speed, and fine grain—usually found only in slower speed stocks. Plus, it offers rich black shadows, clean white highlights, and excellent flesh-to-neutral reproduction that make it a popular choice for all flesh tones.

Illumination (Incident Light) Table for Daylight
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	10	20	40	80	160	320	640	1250

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 250: No exposure or filter compensation is required for exposure times from 1/1000 to 1 second. If your exposure is in the 10-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10Y.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK VISION 200T

Color Negative Film

5274 / 7274

Available in 35 mm, 65 mm, and 16 mm
Tungsten EI 200

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	82B	125
Tungsten 3200 K	None	200
Tungsten Photoflood 3400 K	None	200
Daylight 5500 K	85	125
Metal Halide H.M.I.	85	125
White-Flame Arcs	85B	125
OPTIMA 32	None	200
VITALITE	85	125
Fluorescent** Cool White	85 + CC10M	80
Fluorescent** Deluxe Cool White	85C + CC10R	125

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC40R with a trial exposure index of 125.

Process: ECN-2

General Properties: KODAK VISION 200T Color Negative Film. The remarkable sharpness and exceptionally fine grain of this tungsten-balanced film set it apart from other medium-speed products. It features all the color, contrast, and latitude filmmakers have come to expect from the family of KODAK Motion Picture Products.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	12.5	25	50	100	200	400	800	1600

Use this table for average subjects. When a subject includes only pastels, use at least $\frac{1}{2}$ stop less exposure; dark colors require $\frac{1}{2}$ stop more exposure.

Reciprocity Characteristics EI 200: No exposure or filter compensation is required for exposure times from 1/1000 to 1 second. If your exposure is in the 10-second range, increase your exposure $\frac{2}{3}$ stop and use a KODAK WRATTEN Gelatin Filter CC10Y.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

EASTMAN EXR 50D

Color Negative Film

5245 / 7245

Available in 35 mm, 65 mm, and 16 mm
Daylight EI 50

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Tungsten 3000 K	80A	12
Tungsten 3200 K	80A	12
Tungsten Photoflood 3400 K	80A	12
Daylight 5500 K	None	50
Metal Halide H.M.I.	None	50
Yellow-Flame Arcs	80C	25
White-Flame Arcs	CC20Y + CC10C	32
OPTIMA 32	80A	12
VITALITE	None	50
Fluorescent** Cool White	CC20M	40
Fluorescent** Deluxe Cool White	82C	32

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC20M + CC10B with a trial exposure index of 25.

Process: ECN-2

General Properties: When your assignment requires fine image structure and slow speed, EASTMAN EXR 50D Film is an excellent choice. With micro-fine grain, ultrasharp resolution, and underexposure latitude, it allows you to capture rich, natural colors and helps you pull out every last detail from any daylight exterior source.

Illumination (Incident Light) Table for Daylight
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11	f/16
Footcandles	50	100	200	400	800	1600	3200	6400

Reciprocity Characteristics EI 50: No exposure or filter compensation is required for exposure times from 1/1000 second to 1 second.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK EKTACHROME 100D

Color Reversal Film

5285

Available in 35 mm and 16 mm
Daylight EI 100

Exposure Indexes and Filters

Light Source	KODAK WRATTEN Gelatin Filters on camera*	Exposure Index (DIN)
Daylight 5500 K	None	100
Metal Halide H.M.I.	None	100
Tungsten 3000 K	80A	25
Tungsten 3200 K	80A	25
Tungsten Photoflood 3400 K	80A	25
White-Flame Arcs	CC20Y + CC10C	64
OPTIMA 32	80A	25
VITALITE	None	100
Fluorescent** Cool White	CC20M	80
Fluorescent** Deluxe Cool White	82C	64

*These are approximate corrections only. Make final corrections during printing.

**These are approximate filter requirements. When the lamp type is unknown, use a KODAK WRATTEN Gelatin Filter CC20M + CC10B filter with a trial exposure index of 50.

Process: E-6, cine machine

General Properties: KODAK EKTACHROME 100D Color Reversal Film. A true 100-speed color reversal motion picture film designed for daylight. Whether you are shooting ads, music videos, documentaries, television, or features, it delivers intensely saturated color, plus a neutral gray scale and accurate skin tones. All with sharpness you won't find in any other 100-speed film.

Illumination (Incident Light) Table for Daylight
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11
Footcandles	25	50	100	200	400	800	1600

Reciprocity Characteristics EI 100: No exposure or filter compensation is required for exposure times from 1/1000 to 1 second.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

EASTMAN PLUS-X

Negative Film

5231 / 7231

Available in 35 mm and 16 mm

Exposure Indexes: (For development to gamma of 0.65)

Daylight—80 Tungsten—64

Process: Black and white with KODAK Developer D-96. Force Processing: 1 stop (or more) with some loss in quality—check with your processing laboratory.

General Properties: EASTMAN PLUS-X Negative Film. Improved EASTMAN PLUS-X Negative Film is a medium speed, black-and-white camera negative film designed for general production use both outdoors and in the studio, and is widely used for making composite projection background scenes. Improvements include scratch-resistant backing and a process-surviving top layer, both of which allow better camera transport characteristics; reduced noise in the camera; improved raw stock keeping; and decreased risk of ferrotyping.

Illumination (Incident Light) Table for Tungsten Light
(24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11			
Footcandles	40	80	160	320	640	1280	2560			
KODAK	Filter Factors									
WRATTEN										
Filter No.	3	8	12	15	21	23A	8N5	25	29	96*
Daylight Filter Factor	1.5	2	2.5	3	3.5	5	5	8	25	8

*For use in bright sunlight to reduce the exposure without modifying color rendering or depth of field. This neutral-density filter in a density of 0.90 provides a reduction equivalent to 3 full stops.

Reciprocity Characteristics: No compensation is needed for exposure or filter adjustments for exposure times ranging from 1/1000 to 1/10 second. At 1 second, increase exposure by $\frac{1}{2}$ stop.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

EASTMAN DOUBLE-X

Negative Film

5222 / 7222

Available in 35 mm and 16 mm

Exposure Indexes: (For development to gamma of 0.65)

Daylight—250 Tungsten—200

Process: Black and white with KODAK Developer D-96.
Force Processing: 1 stop (or more) with some loss in quality—check with your processing laboratory.

General Properties: EASTMAN DOUBLE-X Negative Film. Improved EASTMAN DOUBLE-X Negative Film 5222/7222 is a high-speed, black-and-white camera negative film with excellent image-structure characteristics designed for general production use both outdoors and in the studio. Improvements include scratch-resistant backing and a process-surviving top layer, both of which allow better camera transport characteristics; reduced noise in the camera; improved raw stock keeping; and decreased risk of ferrotyping.

Illumination (Incident Light) Table for Tungsten Light
 (24 frames per second, 170° shutter opening)

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11
Footcandles	13	25	50	100	200	400	800

KODAK WRATTEN		Filter Factors							
Filter No.	3	8	12	15	21	23A	25	29	96*
Daylight Filter Factor	1.5	1.5	2.0	3.0	3.0	5	8	20	8

*For use in bright sunlight to reduce the exposure without modifying color rendering or depth of field. This neutral-density filter in a density of 0.90 provides a reduction equivalent to 3 full stops.

Reciprocity Characteristics: No exposure or filter compensation is required for exposure times from 1/10,000 to 1 second.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK PLUS-X Reversal Film 7265

Available in 16 mm and Super 8

Exposure Indexes*: (For recommended reversal processing)

Daylight—100 *Tungsten*—80

For negative processing ($\gamma = 0.65$) in a typical negative motion picture film developer, use the following exposure indexes:

Daylight—25 *Tungsten*—20

Process: This film should be processed with KODAK B&W Reversal Process Kit Chemicals or with solutions prepared according to the formulas presented in KODAK Publication No.H-24, Processing KODAK Motion Picture Films, Module 15, Processing Black-and-White Films.

Note: KODAK B&W Reversal First Developer and Replenisher (D-94A) and KODAK B&W Reversal Bleach and Replenisher (R-10) should be used with this film

General Properties: KODAK PLUS-X Reversal Film 7265 is a medium-speed, panchromatic black-and-white film suitable for general exterior photography. It has a high degree of sharpness, good contrast, and tonal gradation. It can also be used in interior photography with ample artificial illumination. When processed as a reversal film, the resulting positive can be used for projection or for duplication. Processed as a negative material by conventional methods, the film will yield satisfactory results, although a print will be necessary.

*When exposed in Super 8 cameras through a KODAK WRATTEN Gelatin Filter No. 85, the effective speed is reduced to 32 for daylight. In automatic cameras, due to the cartridge speed and filter notching system, the film will be exposed as follows:

Daylight (no filter) 50
Daylight (with filter) 25
Tungsten (without filter) 40

Illumination (Incident Light) Table for Tungsten Light

This table is based on EI-80 (tungsten) and reversal processing with a shutter speed of approximately 1/50 second, 24 frames per second (fps), and 180-degree shutter opening:

Lens Aperture	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8
Footcandles *	32	64	125	250	500	1000

*At 18 frames per second, use 3/4 of the foot-candles (fc) shown. When the film is used as a negative material, the values specified should be doubled.

KODAK WRATTEN	Filter Factors								
Filter No.	3	8	12	15	21	23A	25	29	96*
Daylight Filter Factor	1.5	2.0	2.0	2.5	3.0	5.0	10	40	8

*For use in bright sunlight to reduce the exposure without modifying color rendering or depth of field. This neutral-density filter in a density of 0.90 provides a reduction equivalent to 3 full stops.

Reciprocity Characteristics: No exposure or filter compensation is required for exposure times from 1/1,000 to 1 second.

At an exposure time of 1/10,000 second, increase exposure by 1/2 stop.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

KODAK TRI-X Reversal Film

7266

Available in 16 mm and Super 8

Exposure Indexes*: (For development to a gamma of 1.0)

Daylight—200 *Tungsten*—160

For negative processing (gamma = 0.65) in a typical negative motion picture film developer, use the following exposure indexes:

Daylight—100 *Tungsten*—80

Process: This film should be processed with KODAK B&W Reversal Process Kit Chemicals or with solutions prepared according to the formulas presented in KODAK Publication No.H-24, Processing KODAK Motion Picture Films, Module 15, Processing Black-and-White Films.

Note: KODAK B&W Reversal First Developer and Replenisher (D-94A) and KODAK B&W Reversal Bleach and Replenisher (R-10) should be used with this film.

General Properties: KODAK TRI-X Reversal Film 7266

A high-speed, panchromatic black-and-white film with an antihalation undercoat that makes it suitable for general interior photography with artificial light. It can also be used in daylight and is particularly useful for sports pictures taken at regular speed or slow motion in weak light (overcast sky or late in the day). This film is characterized by excellent tonal gradation and sharpness. When processed as a reversal film, the resulting positive can be used for projection or for duplication. Processed as a negative material by conventional methods, the film will yield satisfactory results, although a print will be necessary.

*Super 8 automatic cameras will expose the film at ASA 160 due to the ANSI standard cartridge notching system.

Illumination (Incident Light) Table for Tungsten Light (24 frames per second, 180° shutter opening)

Lens Aperture	<i>f/1.4</i>	<i>f/2</i>	<i>f/2.8</i>	<i>f/4</i>	<i>f/5.6</i>	<i>f/8</i>
Footcandles*	13	32	64	125	250	500

*At 18 frames per second, use 3/4 of the foot-candles (fc) shown. When the film is used as a negative material, the values specified should be doubled.

KODAK	Filter Factors								
WRATTEN									
Filter No.	3	8	12	15	21	23A	25	29	96*
Daylight									
Filter Factor	1.5	2.0	2.0	2.5	3.0	5.0	10	40	8

*For use in bright sunlight to reduce the exposure without modifying color rendering or depth of field. This neutral-density filter in a density of 0.90 provides a reduction equivalent to 3 full stops.

Reciprocity Characteristics: No exposure adjustment is required for exposure times from 1/1,000 to 1 second.

Handling: Total darkness

Available Roll Lengths: For information on film roll lengths, check Kodak's *Professional Motion Imaging Price Catalog*, or contact a Kodak sales representative in your country.

All rolls are identified with a product-code number and an internal product-code symbol.

Incident-Light Illumination (in footcandles)

(Frame rate: 24 frames/sec–approx1/50 sec)

NOTE: Data applies to both color and black-and-white films.

Exp Index (Daylight or Tungsten)	Lens Opening						
	f/1.4	f/2	f/2.8	f/4	f/5.6	f/8	f/11
12	200	400	800	1600	3200	6400	13000
16	160	320	640	1250	2500	5000	10000
20	125	250	500	1000	2000	4000	8000
25	100	200	400	800	1600	3200	6400
32	80	160	320	640	1250	2500	5000
40	64	125	250	500	1000	2000	4000
50	50	100	200	400	800	1600	3200
64	40	80	160	320	640	1250	2500
80	32	64	125	250	500	1000	2000
100	25	50	100	200	400	800	1600
125	20	40	80	160	320	640	1250
160	15	32	64	125	250	500	1000
200	12	25	50	100	200	400	800
250	10	20	40	80	160	320	640
320	8	15	32	64	125	250	500
400	6	12	25	50	100	200	400
500	5	10	20	40	80	160	320
640	4	8	15	32	64	125	250
800	3	6	12	25	50	100	200
1000	*	5	10	20	40	80	160
1250	*	4	8	15	32	64	125
1600	*	3	6	12	25	50	100
2000	*	*	5	10	20	40	80

*Less than 3 footcandles

FILTER INFORMATION

Introduction

Use the filter and color temperature charts in this section as a quick reference and general guide. The values are approximate; they offer good starting points for trial exposures in critical work. For less demanding work the recommendations may be adequate, but it is always best to run tests before shooting final footage. For photography with fluorescent lights, see the individual film's filter information in the section "KODAK Motion Picture Camera Films."

Types of Filters

Optical filters may be solid, liquid, or gaseous; only solid filters are discussed in this book. These consist mainly of colorants dissolved in a gelatin or in cellulose acetate. Each KODAK Filter, gelatin or acetate, is standardized for spectral transmittance and total transmittance by special instruments, which apply an optical form of limit gauge to these characteristics.

The dyes are obtained from a number of sources and many have been synthesized. Like other dyes, the dyes used in filters may, in time, change under certain conditions of heat and light. In this publication, we will address only *filters* for black-and-white films, color compensating, conversion, light balancing, and neutral density (No. 96).

Filters for Black-and-White Films

You can use a wide range of KODAK WRATTEN Gelatin Filters with black-and-white negative films for many purposes. They vary the contrast and tonal rendering of the subject in a photograph, either to correct to the normal visual appearance or to accentuate special features. The total photographic effect obtained with a particular filter depends on four main factors: its spectral absorption characteristics; the spectral sensitivity of the sensitized material; the color of the subject to be photographed; and the spectral quality of the illuminant.

Filter	Filter Factors* for KODAK Motion Picture Films			
	Negative Films		Reversal Films	
	PLUS-X	DOUBLE-X	PLUS-X	TRI-X
No. 3	1.5	1.5	1.5	1.5
No. 8 (K2)	2.0	1.5	2.0	2.0
No. 12 (Minus Blue)	2.5	2.0	2.0	2.0
No. 15 (G)	3.0	3.0	2.5	2.5
No. 21	3.5	3.0	3.0	3.0
No. 23A	5	5	5	5
No. 8N5	5	5	6	6
No. 25	8	8	10	10
No. 29	25	20	40	40
No. 96	8	8	8	8

*All filters absorb part of the incident radiation, so their use usually requires some increase in exposure over that required when no filter is used. The number of times by which an exposure must be increased for a given filter with a given material is called the *filter factor*, or multiplying factor.

Filter factors published for KODAK Products by Kodak are intended only as approximate guides.

Published filter factors apply strictly to the particular lighting conditions used in the laboratory where the factors were determined. For scientific applications, especially, the quality of light can vary widely so that it may be desirable to determine the filter factor for actual working conditions.

To determine a filter factor, choose a subject having a neutral-gray area, or place an 18-percent gray card or a photographic gray scale in the scene to be photographed. Make one exposure without a filter. With the filter set for the exposure, and beginning with the unfiltered exposure setting, make a series of exposures. Increase each in 1/2-stop increments through a 2- to 4-stop greater exposure (very dense filters may need more). After processing the negative, match densities of the unfiltered exposure with the filter series either visually or with a densitometer. Choose the filtered exposure that is closest to the unfiltered exposure. Some additional exposure adjustments may be necessary.

Below is a conversion table of filter factors to exposure increase in stops.

Filter Factor	+ Stops	Filter Factor	+ Stops	Filter Factor	+ Stops
1.25	$\frac{1}{2}$	4	2	12	$3\frac{2}{3}$
1.5	$\frac{2}{3}$	5	$2\frac{1}{3}$	40	$5\frac{1}{3}$
2	1	6	$2\frac{2}{3}$	100	$6\frac{2}{3}$
2.5	$1\frac{1}{2}$	8	3	1000	10
3	$1\frac{2}{3}$	10	$3\frac{1}{3}$	—	—

Each time a filter factor is doubled, increase the exposure by 1 stop. For example, a filter factor of 2 requires a 1-stop exposure increase. A filter factor of 4 requires a 2-stop exposure increase. Use this example for filter factors not listed in the above table.

Color Compensating Filters

Color compensating filters control light by attenuating the red, green, or blue part of the spectrum. While controlling one color, the filter transmits one or both of the other two colors. Thus, color compensating filters can make changes to the color balance of pictures recorded on color films, or compensate for deficiencies in the spectral quality of a light source. For optimum results, use the single recommended color compensating filter rather than combining filters (for example, CC20Y + CC20M = 20R, so using 20R only is preferable). KODAK WRATTEN Gelatin Filters / Color Compensating Filters have excellent optical quality and are suitable for image forming optical systems; such as a camera lens. For less critical work, use KODAK Color Printing Filters (acetate).

Conversion Filters for Color Films

These filters are intended for use whenever *significant* changes in the color temperature of the illumination are required (for example, daylight to artificial light). The filter may be positioned between the light source and other elements of the system or over the camera lens in conventional photographic recording.

Filter Color	Filter Number	Exposure Increase In Stops*	Conversion in Degrees K
Blue	80A	2	3200 to 5500
	80B	1 ² / ₃	3400 to 5500
	80C	1	3800 to 5500
	80D	¹ / ₃	4200 to 5500
Amber	85C	¹ / ₃	5500 to 3800
	85	² / ₃	5500 to 3400
	85N3	1 ² / ₃	5500 to 3400
	85N6	2 ² / ₃	5500 to 3400
	85N9	3 ² / ₃	5500 to 3400
	85B	² / ₃	5500 to 3200
	85BN3	1 ² / ₃	5500 to 3200
	85BN6	2 ² / ₃	5500 to 3200

*These values are approximate. Check critical work accurately, especially if you use more than one filter.

KODAK Light Balancing Filters

Lightbalancing filters enable the photographer to make *minor* adjustments in the color quality of illumination to obtain cooler (bluer) or warmer (yellower) color rendering. KODAK Light Balancing Filters are used in scenes where light sources exhibit color temperatures that are different from those a film is balanced for. When using a color temperature meter to determine the color temperature of prevailing light, use the table below, which for conversions of the prevailing temperature to either 3200 K or 3400 K.

Filter Color	Filter Number	Exposure Increase in Stops*	To Obtain 3200 K from:	To Obtain 3400 K from:
Bluish	82C + 82C	$1\frac{1}{3}$	2490 K	2610 K
	82C + 82B	$1\frac{1}{3}$	2570 K	2700 K
	82C + 82A	1	2650 K	2780 K
	82C + 82	1	2720 K	2870 K
	82C	$\frac{2}{3}$	2800 K	2950 K
	82B	$\frac{2}{3}$	2900 K	3060 K
	82A	$\frac{1}{3}$	3000 K	3180 K
	82	$\frac{1}{3}$	3100 K	3290 K
Yellowish	81	$\frac{1}{3}$	3300 K	3510 K
	81A	$\frac{1}{3}$	3400 K	3630 K
	81B	$\frac{1}{3}$	3500 K	3740 K
	81C	$\frac{1}{3}$	3600 K	3850 K
	81D	$\frac{2}{3}$	3700 K	3970 K
	81EF	$\frac{2}{3}$	3850 K	4140 K

*These values are approximate. Check critical work accurately, especially if you use more than one filter.

Neutral Density Filters

In black-and-white and color photography, filters such as the KODAK WRATTEN Gelatin Filter / Neutral Density Filter, No. 96, reduce the intensity of light reaching the film without affecting the tonal rendition in the original scene. In motion-picture work or other photography, neutral density filters allow for the use of a large aperture to obtain differential focusing. You can use them when filming in bright sunlight or with very fast films. These filters control exposure when the smallest aperture is still too large. Also available are KODAK WRATTEN Gelatin Filters with combinations of neutral density and color conversion filters (for example, No. 85N3). These filters combine the light-conversion characteristics of KODAK WRATTEN Gelatin Filter, No. 85 with neutral densities.

KODAK WRATTEN Gelatin Filter / Neutral Density Filter, No. 96

Neutral Density	Percent Transmittance	Filter Factor	Exposure Increase in Stops*
0.1	80	1¼	⅓
0.2	63	1½	⅔
0.3	50	2	1
0.4	40	2½	1⅓
0.5	32	3	1⅔
0.6	25	4	2
0.7	20	5	2⅔
0.8	16	6	2⅔
0.9	13	8	3
1.0	10	10	3⅓
2.0	1	100	6⅔
3.0	0.1	1000	10
4.0	0.01	10,000	13⅔

*These values are approximate. Check critical work accurately, especially if you use more than one filter.

Approximate Correlated Color Temperature for Various Light Sources

Source	Degrees Kelvin
Artificial Light	
Match flame	1700
Candle flame	1850
40-watt incandescent tungsten lamp	2650
75-watt incandescent tungsten lamp	2820
100-watt incandescent tungsten lamp	2865
500-watt incandescent tungsten lamp	2960
200-watt incandescent tungsten lamp	2980
1000-watt incandescent tungsten lamp	2990
3200-degree kelvin tungsten lamp	3200
Molarc “brute” with yellow flame carbons & YF-101 filter (approx.)	3350
“C.P.” (color photography) studio tungsten lamp	3350
Photoflood and reflector flood lamp	3400
Daylight blue photoflood lamp	4800
White flame carbon arc lamp	5000
High-intensity sun arc lamp	5500
Xenon arc lamp	6420
Daylight	
Sunlight: sunrise or sunset	2000
Sunlight: one hour after sunrise	3500
Sunlight: early morning	4300
Sunlight: late afternoon	4300
Average summer sunlight at noon (Washington, D.C.)	5400
Direct mid-summer sunlight	5800
Overcast sky	6000
Average summer sunlight (plus blue skylight)	6500
Light summer shade	7100
Average summer shade	8000
Summer skylight will vary from	9500 to 30,000

NOTE: Sunlight is the light of the sun only. Daylight is a combination of sunlight plus skylight. The values given are approximate because many factors affect color temperature. OUTDOORS: the sun angle, and the conditions of the sky—clouds, haze, dust particles—raise or lower the color temperature. INDOORS: lamp age (and blackening), voltage, type of reflectors and diffusers affect tungsten bulbs—all of these can influence the actual color temperature of the light. Usually a change of 1 volt equals 10 degrees Kelvin. But this is true only within a limited voltage range and does not always apply to “booster voltage” operation, since certain bulbs will not exceed a certain color temperature regardless of the increase in voltage.

TIPS AND TECHNIQUES

Introduction

This collection of ideas is provided by Kodak people and others who work in the professional motion picture industry. The section discusses force processing, flashing, and shooting for television, what you need in the well-stocked ditty bag, and tools to survive. Also in this section (on the double foldout pages), is a filmmaker's flow chart that can help you with production scheduling.

If you have further questions about our films or their applications, please refer to the last few pages in this guide for the names, addresses, and phone numbers of Kodak people worldwide who can help.

Aspect Ratios

The aspect ratio is the relationship between the width and height of an image. While the image dimensions may vary in size according to projection requirements, the aspect ratio should comply with the cinematographic intent.

The industry standard for 35 mm theatrical motion pictures remained a constant 1.37:1 between the introduction of sound and the introduction of Cinemascope in 1953, when "wide-screen" presentations arrived. The non-anamorphic or "flat" wide-screen presentations had aspect ratios of 1.66:1, 1.75:1 and 1.85:1. Today 1.85:1 is the wide-screen (flat) presentation format of choice in the USA, while in Europe 1.66:1 is used.

In the early 1950's, television's demand for feature films increased. The typical television display provides a fixed aspect ratio of 1.33:1 (4 x 3) and many of the films shown on television, to fill the picture height, lost a substantial part of the image when this was "matted off" at the edges. To rectify this incompatibility, the academy aperture was introduced for flat (non-anamorphic) presentations. The academy aperture produced an image of greater height so that it would fill a television screen without compromising the width. The usual procedure when filming productions for both theatrical release and conventional television transmission is called "shoot and protect." The camera viewfinder is "matted" to indicate 1.85:1 for theatrical presentation and to keep all

pertinent action within this area. The cinematographer must make certain no scene rigging, microphone booms, cables, or lights are included in the expanded area that will be transmitted on television at 1.33:1. Subsequent interpositives, duplicate negatives, and prints contain sufficient frame height to provide normal telecine transmission. In the theater, the projectionist must use a 1.85:1 aperture plate and exercise some judgment in adjusting the projector framing.

Super 16 is a format that employs single-perforation 16 mm film stock and has two objectives. Super 16 was introduced in the early 1970s to provide an image suitable for enlargement to a 35 mm print for wide-screen presentation and for origination that will be displayed on wide-screen television (1.78:1 = 16 x 9). Super 16 and 3-perforation 35 mm are great fits for wide-screen television. The Super 16 camera aperture extends into the area used for a sound track on conventional 16 mm film providing more negative area to achieve a 1.66:1 aspect ratio, with some loss of image height when enlarged to wide-screen 35 mm film (1.85:1) and to 1.78:1 (16 x 9) for wide-screen television.

The Super 35, 4-perforation system uses the entire width of the film and is primarily used to extract an anamorphic print for theatrical release by optical reduction printing. This system is quite versatile; from a Super 35 negative, 70 mm blow-up prints can be produced, as well as extractions for 16 x 9 (1.78:1).

The Super 35, 3-perforation system is used for extracting 16 x 9 (1.78:1) prints and for origination for wide-screen television.

The 65 mm, 5-perforation system has a camera aperture of 2.29:1. It is primarily used for special effects, but when used in feature films, is projected on the screen using 70 mm release prints having an aspect ratio of 2.20:1. In lieu of origination on 65 mm for theatrical presentation, productions shot on 35 mm film with an anamorphic lens or in the Super 35 system are optically enlarged onto 70 mm release prints.

Other formats employing 65 mm negatives include 8-perforation (HydroFlex Iwerks 870 camera), 10-perforation and the Imax 15-perforation (horizontal) format.

You can obtain more information from ANSI and/or SMPTE by requesting a copy of the standards documents Image Areas, Cameras; Image Areas, Projector; and also Copy Dimensions for the sizes of the films you will use.

Force (Push) Processing

Force, or push, processing *increases* the effective speed of negative or reversal films by manipulating the time of development. This processing technique is usually requested to create a special effect, to compensate for an error in film exposure, or because not enough light is available. While you may increase the film speed, the effect may be detrimental to visual screen quality. Pushing color film by 1 stop may have a minimal effect, but further forcing may show a noticeable increase in grain and a softening of the shadows. Similar pushing conditions for black-and-white film will increase the grain and the contrast. Forced processing is considered one of the working tools of the motion-picture industry, but before requesting any forced processing, you should gain some familiarity with possible results through testing or discussion with laboratory personnel. However, today's faster films have decreased the need for forced processing. In any case, remember the following important ideas:

1. Find out if (and to what extent) your processing lab is prepared to offer force processing.
2. When possible, discuss your needs in advance of your assignment with a customer service representative or lab manager. A quick phone call usually gives you an answer.
3. Use the filter recommendations the lab may offer. This helps you avoid unwanted color balance shifts.
4. Be aware of the limits of the process. Decide beforehand if you can tolerate the losses in image quality that are associated with force processing your film. The best advice is usually available at the processing laboratory.

Storage and Care of Motion Picture Films

Although Kodak manufactures all KODAK Motion Picture Camera Films to very high-quality standards, you need to exercise a certain amount of care in the storage of unexposed, exposed unprocessed, and processed films. Given the care outlined in the chart on page 14, your films and film images will last longer and will not be adversely affected by short-term extremes of temperature and humidity.

Deviations from the recommended storage conditions can initiate degradation and cause instability of the silver or dye image. Deviations also weaken the mechanical properties of the support, can delaminate the emulsion layers, and deform and distort the film. The recommended storage requirements must be maintained if quality is to be retained.

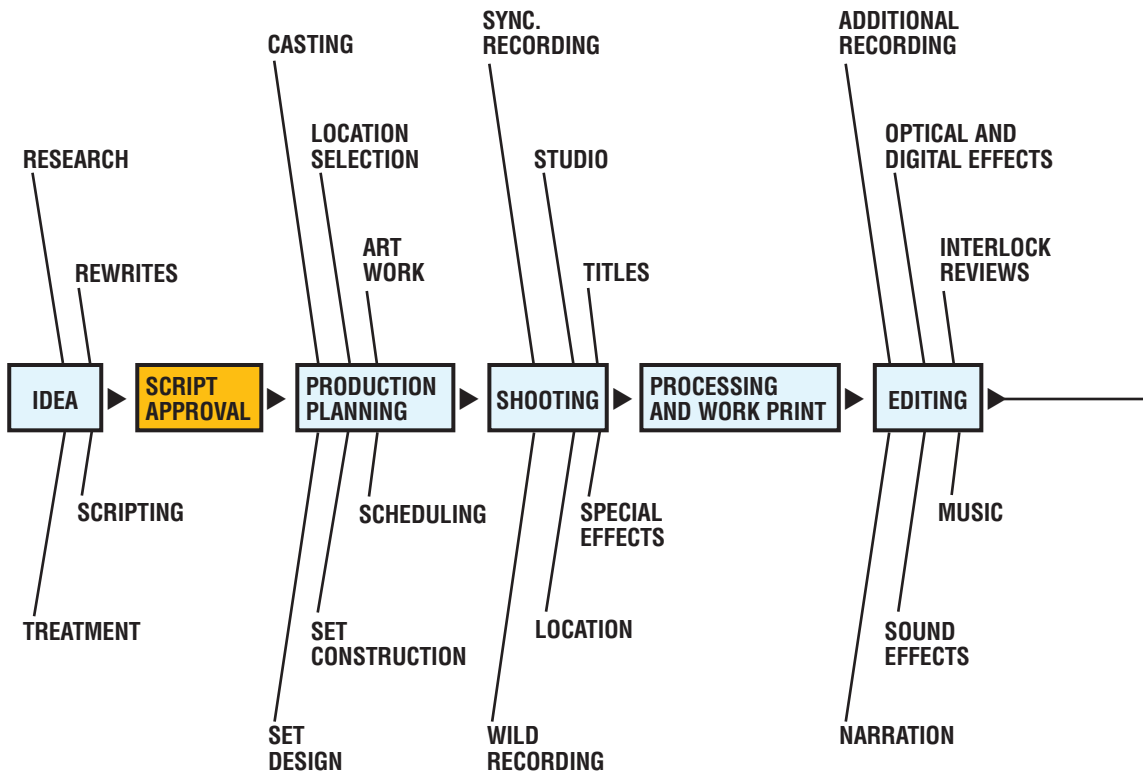
There is further information on film storage and preservation in *The Book of Film Care*, KODAK Publication No. H-23. This publication also discusses theatrical projection, dye stability, film handling, rejuvenation and restoration, and it includes a Film Care Checklist. You can purchase *The Book of Film Care*, in the U.S. only, through Eastman Kodak Company, Dept. 412L. For ordering information see page 30. In countries outside the U.S., contact the nearest Kodak company or distributor in your country. Specifications for stability of imaging media on film are outlined in detail in ANSI Standard IT9.1-1989 and ANSI Standard IT9.11-1991.

Raw Stock Relative Humidity

The quantity of moisture held by a photographic film at equilibrium is determined by US chemical properties and the relative humidity of the air.

Motion picture raw stock is packaged in taped cans. Until opened, the cans are water-vapor tight and do not require humidity-controlled storage. However, avoid storage at relative humidities of 60 percent or above. Such high humidities can damage labels and cartons (from moisture and mold), and can rust the cans. Keep raw stock in its original taped can until you are ready to use the film.

Filmmaker's Flow Chart



Storage Conditions

	Short Term (less than 6 months)		Long Term (more than 6 months)	
	Temperature	% Relative Humidity	Temperature	% Relative Humidity
Raw Stock (in original sealed cans)	13°C (55°F)	below 60	-18 to -23°C (0 to -10°F)	below
Exposed Unprocessed	-18 to -23°C† (0 to -10°F)‡	below 20*	Not Recommended (see text below)	
Processed B&W	21°C (70°F)	60 or lower	21°C (70°F)	20 to 30
Color	21°C (70°F)	20 to 50	2°C (36°F)	20 to 30§

*Keep sealed (in original cans) until temperature is above the dew point of outside air. (See table of warm-up times.)
†With possible loss of quality.
‡Process exposed film as soon as possible after exposure.
§For infrequent use and when maximum useful life is primary concern.

Temperature

Storage of raw stock at -18 to -23°C (0 to -10°F) reduces sensitometric deterioration but does not preserve the film indefinitely. When you remove a package of raw stock from cold storage, allow it to warm up until its temperature is above the dew point of the outside air before you open it. For film in standard packages, use the following table as a guide for warm-up times:

Film Package	Warm-Up Time (hours) for Sealed Packages	
	14°C (25°F) Rise	55°C (100°F) Rise
super 8	1	1/2
16 mm	1	1 1/2
35 mm	3	5

Damage from moisture condensation occurs when you remove the can from cold storage and do not allow sufficient warm-up time before you remove the seal.

Protection Against Harmful Gases and Radiation

Certain gases, such as formaldehyde, hydrogen sulfide, hydrogen peroxide, sulfur dioxide, ammonia, illuminating gas, motor exhaust, and vapors of solvents, mothballs, cleaners, turpentine, mildew or fungus preventives, and mercury can damage unprocessed and processed film. It is safest to keep film away from such contaminants.

Film and Airports

For the protection of travelers, all domestic airports use electronic devices and X-ray equipment to check passengers and hand-carried luggage. Film can tolerate some X-ray exposure but excessive amounts will result in objectionable fog (increase in base film density, and noticeable increase of grain). This is particularly true for very high-speed films. In the United States, passenger inspection inflicts only very low level rates of X-rays which should not perceptibly fog most films (inspection stations can vary in radiation intensity). However, the effects of X-rays are cumulative, so repeated X-ray inspections can lead to an increase of fog and grain. **Be cautious.** You can avoid this danger to unprocessed film by hand carrying it, including film in cameras, and asking the attendant to hand inspect it, thus bypassing the X-rays.

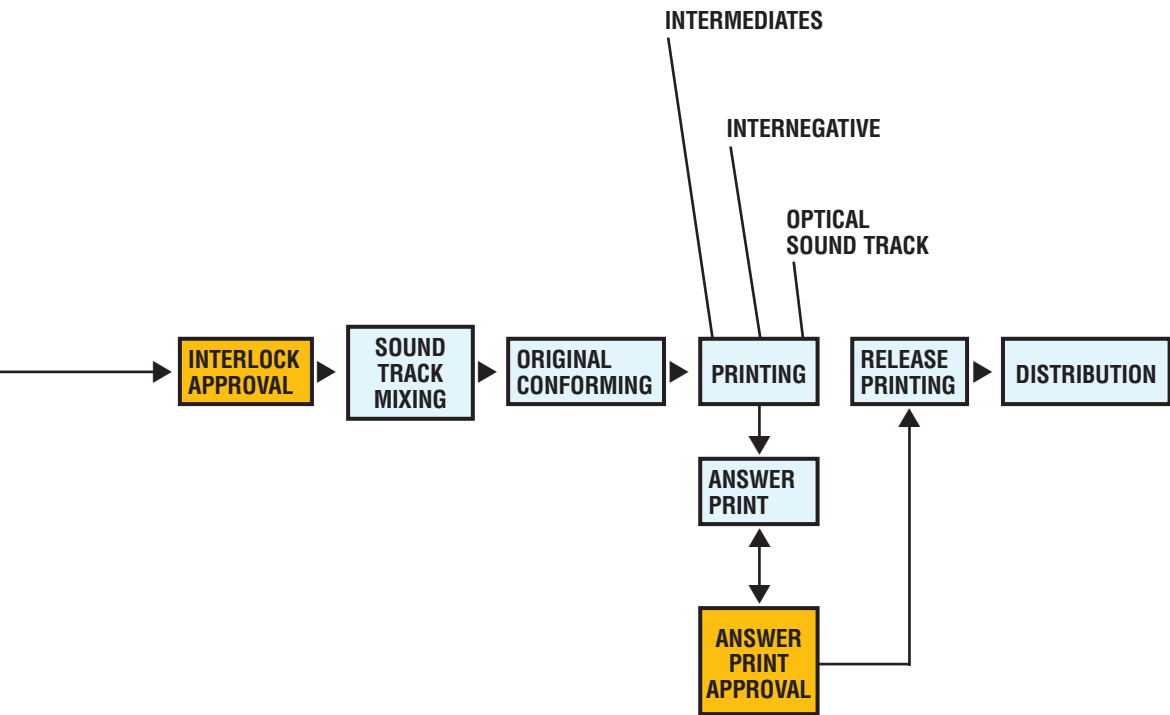
Foreign Travel

Airport security measures at international and foreign airports can pose a threat to unprocessed film. Not only is there a danger from X-rays, but security and customs agents may open containers of unprocessed film, ruining weeks of work.

The best protection, when traveling abroad, is to write to the airport manager well in advance of your arrival and explain the relevant details of your trip. Give them your arrival time, flight number and departure time. List the equipment and film you're bringing to your destination. Ask if there are any steps you can take to expedite matters and ensure the safety of the film. Repeat the process before leaving the foreign country. Speak with the airport manager and customs people, if possible, and make all advance arrangements that can be made.

For international travel, you may find it worthwhile to work with an export company or customs broker. There are private companies that expedite the handling of international shipments and do the paper work involved. Check the telephone directory yellow pages under "Exporters."

Another way to avoid problems is to have the film processed in the country where it was exposed. Eastman Kodak Company can help you find a local laboratory. Just consult one of the offices listed in the back of this book.



Unprocessed Film Before and After Exposure

Exposed film, particularly color film, deteriorates more rapidly than unexposed film. Process films as soon as possible after exposure.

Do not keep film in the camera or magazine longer than necessary. If you load magazines a long time ahead of use, protect them from excessive temperature and relative humidity until you load the camera.

Keep loaded cameras or magazines and carrying cases out of closed spaces that can trap heat from the sun or other heat sources. Closed automobiles, airplanes, or the holds of ships should not be used for storage.

Immediately after exposure, return the film to its can and retape the can to help prevent any increase in moisture content.

Processed Film Storage

The following suggestions apply to extended storage of all motion picture films. Be aware that color dyes are more prone to change than are silver images over extended periods, with heat and humidity being the chief damaging factors. Before any extended storage (ten years or more), these minimum guidelines should be followed:

1. Make sure the film is adequately washed to remove residual chemicals, and that the residual hypo level does not exceed the recommended maximum. ANSI PH 4.8-1985 describes a test method for residual hypo.
2. At present, only EASTMAN EKTACHROME Motion Picture Films require stabilization during processing for dye stability. Be sure process specifications have been strictly followed.
3. All film should be as clean as possible. Cleaning is best done professionally. If you use a liquid cleaner, provide adequate ventilation. Adhere to local municipal codes in using and disposing of any solvents.
4. Keep film out of an atmosphere containing chemical fumes, such as hydrogen sulfide, hydrogen peroxide, sulfur dioxide, hydrogen sulfide, ammonia, coal gas, and automobile engine exhaust.
5. Do not store processed film above the recommended 21°C (70°F), 20 to 50 percent RH for acetate or for polyester, if extended life expectancy is to be maintained.

6. Wind films with emulsions in and store flat in untaped cans under the above conditions.

Shooting for Television

The television industry is changing. Advanced standards for high-definition television (HDTV) put more demands on the cinematographer. Even with the new standards, film remains the ideal, independent origination format. With film, you have the ability to transfer to any electronic format, without conversions problems.

Film origination format and aspect ratio are more important than ever before. Film choices for origination include 16 mm, super 16 mm, and 35 mm. When cinematographers and producers compose the image, they must decide to use the current 4:3 aspect ratio or 16:9 for HDTV. Some are shooting 4:3 and protecting the edges for 16:9.

The most widely used films in the television industry are KODAK Color Negative Films.

In all likelihood, your film will still end up on a video format for broadcasting. An important part of this process is the telecine transfer. Because the video output of the telecine is only as good as the film transfer input, this critical procedure must be performed with the highest quality standards.

No matter what format or aspect ratio you choose, the best television images start with the best practices in cinematography.

In general, photography expressly for television release should avoid high-contrast scenes and scenes with important details in dark shadows or against very bright backgrounds. The recommendations below should help you get the best possible results.

1. Always have a white reference (something brighter than a face) in every shot.
2. The white reference should not be more than 1½ stops brighter than your subject's face.
3. Keep your subjects away from windows or other high-brightness backgrounds, such as white walls or large expanses of open sky, except for a desired effect.

4. Don't photograph dark-skinned people against very bright or very dark backgrounds.
5. Try to maintain a range of 5 to 6 stops from the brightest to the darkest parts of the shot. A lighting ratio of 2:1 is a good starting point.
6. If you must shoot white or extremely bright costumes, try to maintain a good face-to-face white reference relationship. For these scenes, use soft lighting, such as that produced by an overcast day or open shade.
7. Flat lighting will give very good results for television, but may not be acceptable if the film is later released for theaters.

Getting Ready

Utility Bag

- Sanford Sharpie, both fine and ultra-fine point
- ear syringe
- small mag-type flashlight
- camel-hair lens brush
- lens tissue and lens cleaner
- dental mirror
- magnifying glass
- white cloth camera tape
- black camera tape
- masking tape
- highest quality gaffer's tape (NOT duct tape)
- scissors
- tweezers
- orange sticks
- *American Cinematographer Manual*
- assorted filters (85, 81EF, LLD, complete set of neutral density filters; yellow filters Nos. 2 thru 8 for B/W film)
- pencils and ballpoint pens
- screwdrivers
- paint brush (1-inch size with tapered bristles is preferred)
- leakproof precision oil can (the kind that looks like a fountain pen)

- rubber bands
- black cloth
- magazine belt clips and pick

Tools for Camera Maintenance

- longnose pliers
- diagonal cutters
- channel lock pliers
- screwdrivers—standard and Phillips head
- jeweler's screwdriver set
- Allen wrenches
- open end and box wrench sets
- files (for metal and wood)
- pocket knife
- "C" clamps 3-in. (7.5 cm)
- spring clamps
- scribe
- $\frac{1}{4}$ x 20 screws 1- and 2½-in. (2.5 and 6 cm)
- $\frac{3}{8}$ x 16 screws 1- and 2½-in. (2.5 and 6 cm)
- washers
- tape measure (one 12 ft. and one minimum 50 ft.)
- voltmeter (w/adequate range to cover anticipated voltages)
- electrical tape
- ground adapters (both the 3-pin plug adapter and water pipe clamp types)
- electric drill and bits, up to $\frac{3}{8}$ -in. (0.75 cm)
- DREMEL Tool Kit and bits
- soldering iron and solder
- batteries: AA (12), AAA (12), 9V (4), and at least (2) spare batteries for light meter
- small and medium crescent wrenches
- expansion bit (and bit brace, if not electric)
- KODAK Gray Card Plus
- canned air
- blank camera reports
- clapper board

Camera Accessories

- 100-ft (30 m) camera spool*
- spare film cores (6 minimum)
- spare 85 conversion filters
- assorted ND filters (at least 0.3, 0.6, and 0.9)
- black camera tape
- gaffer tape
- insert slate
- log sheets
- dental mirror
- magnifier

Camera Operator's Meter Case

- favorite filters
- diffusion (gauzes or discs)
- two exposure meters
- color meter
- viewing filters
- calculators
- handbook (this one fits in almost any meter case)
You may also want a copy of the ASC Manual.
- magnifying glass
- small hand mirror
- aspirin tablets

Some items on these lists you may not use often—the key is the word often—but even if you need an item only once and have it among your photo gear, you will be thankful that you remembered to bring it along.

*Load and unload all camera spools in subdued light.

Flashing Camera Films to Lower Contrast

“Flashing” means to deliberately fog film by giving it a uniform exposure before processing. The amount and type of exposure will vary with the “look” desired. This slight exposure lowers the film’s contrast to some extent, primarily in the upper scale (shadow) areas, and allows for more detail in the shadows. The results are similar whether the film is pre- or post-flashed in a laboratory or on the camera (using equipment supplied by camera manufacturers).

Flashing is often done to establish a closer match between films of different contrast characteristics that will be intercut. Or to create pastels from more saturated colors—enhancing shadow details that have less fill light, etc. Effects such as changing the color of shadows can be made by selective filtering (non-neutral light source).

The amount of flash will affect the result, but flashing intensity has its limits, and too much will distort the image. Flashing is often measured in percentages by cinematographers and laboratory personnel. There is no consensus about what these percentages mean—this is usually perceived through past experience, and, as with most other creative techniques, it is important to work closely with the laboratory and gain experience through contacts and testing.

Exposed Film—What Now?

A Final Thought About Laboratories

Establish good communication with your lab. Doing so will help this step of your production go smoothly.

Know your needs—Know what you need from a lab and then discuss those needs with several labs before making a choice. Consider such things as editing, dubbing, special effects, animation, etc., so the lab can help you accomplish those tasks in the best way possible.

Get acquainted—Once you have made your choice of labs, get to know the people who will do your work. Tell them as much as you can about yourself, your needs, and your style. The more you communicate with them about yourself and your production, the better they can serve you.

Get it In writing—Face-to-face discussions and telephone calls are necessary for efficient work flow; but when it comes to specifying what you want, when you want it, and how much it will cost, a carefully written document—the purchase order—is a must.

FORMATS AND PACKAGING

Introduction

This short section is important because it provides information on the various spools and cores, sizes, windings, and packages for motion picture films. Specification numbers, perforation types, and ordering quantities are also explained.

Also included is a detailed description of a typical film can label that will answer all your questions about film can label nomenclature. (See “How to Read a Film Can Label.”)

See your price catalog for additional listings of formats and specifications.

Specification Numbers for Camera Films

Sp No.	Film Width		Core/Spool/Mag	Winding	Remarks
	in	mm			
35 mm					
239	35	35 mm BH	Y		Footage numbered
240	35	35 mm BH	Y		Same as Sp 239-wound emulsion out, footage numbered
241	35	35 mm DH	Y		Long pitch (0.1870); footage numbers
242	35	35 mm BH	Y		For high-speed cameras; footage numbered
417	35	35 mm BH	S-83 100-ft spool		none
441	35	35 mm BH		Y	No footage numbers
651	35	35 mm KS		AA	none
665	35	35 mm KS		U	none
666	35	35 mm KS	Y		none
668	35	35 mm KS	Y		none
670	35	35 mm KS	Y		No edgeprint
701	35	35 mm BH	Y		none
674	35	35 mm KS	K		No edgeprint
678	35	35 mm KS	U		Footage numbered
683	35	35 mm KS	Y		No edgeprint
718	35	35 mm BH	U		Footage numbered
722	35	35 mm BH	U		Tighter tolerance perfs
727	35	35 mm BH	U		Footage numbered

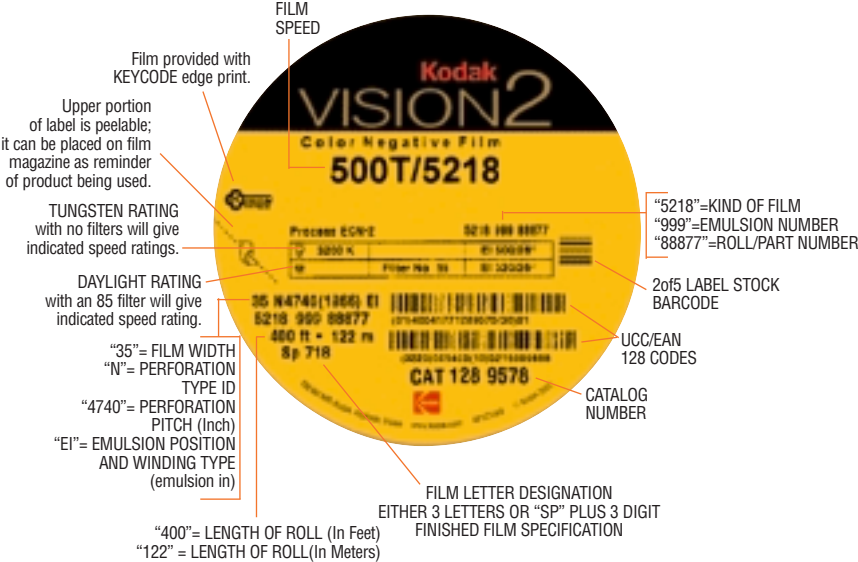
Note: When you combine a Specification Number with a film emulsion letter designation, it is known as the Identification Number (e.g., EXH718).

Specification Numbers for Camera Films (continued)

Film Width		Perforation	Core/Spool/Mag	Winding	Remarks
Sp No.	in mm				
35 mm (continued)					
732	35	35 mm BH	U		Short pitch (0.1866)
739	35	35 mm BH	Y		Footage numbered, except ESTAR Base
746	35	35 mm BH	U		For leader stock
767	35	none	Y		Non-canned packaging, no frame line markings
779	35	35 mm KS	Y		none
789	35	35 mm KS	Y		none
798	65	35 mm BH	U		Long pitch (0.1870); latent image print footage
35 mm Multi-Perforated					
256	35 mm	35/32-4 Row	Y		none
258	35 mm	32/16-2 Row	V 1000-ft spool		Perfs 1 and 3
694	35 mm	35/32-2 Row	Y		none
730	35 mm	35/32-2 Row	Y		Non-canned packaging, no frame line markings
733	35 mm	35/16-3 Row	Y	B	Non-canned packaging, no frame line markings
735	35 mm	35/16-3 Row	Y	B	none
780	35 mm	8 mm-2 Row	U	A	none
791	35 mm	35/32-2 Row	U		none
65 mm and 70 mm					
331	65 mm	65 mm KS	P		No edge markings
332	65 mm	KS1866	P	Emulsion In	Latent image sequential numbers every 120 perfs
333	65 mm	65 mm KS	P		Latent image sequential numbers every 80 perfs
334	65 mm	KS	PA	Emulsion In	Latent image sequential numbers every 120 perfs
473	65 mm	none	J		none
475	65 mm	70 mm BH	S-84 100-ft spool		Sequentially numbered every 3-9/16 inches
512	65 mm	70 mm BH	S		none
542	65 mm	65 mm KS	S		none

Note: When you combine a Specification Number with a film emulsion letter designation, it is known as the Identification Number (e.g., EXH718).

How to Read a Film Can Label



Specification Numbers for Camera Films (continued)

Sp No.	Film Width in mm	Perforation	Core/Spool/Mag	Winding	Remarks
16 mm					
324	16	16 mm-2 Edges	G45		Emulsion out, attached with steel clip to core
430	16	16 mm-2 Edges	R-90 100-ft spool		0.3000 pitch for high-speed cameras
432	16	16 mm-2 Edges	R-190 200-ft spool		0.3000 pitch for high-speed cameras
434	16	16 mm-2 Edges	S-153 400-ft spool		0.3000 pitch for high-speed cameras
435	16	16 mm-2 Edges	Z		0.3000 pitch for high-speed cameras
437	16	16 mm-1 Edge	S-153 400-ft spool	B	none
438	16	16 mm-2 Edges	No. 6 Magazine		No edgeprint; no edge numbers
445	16	16 mm-1 Edge	A	A	For Aaton A-Minima® Camera
449	16	16 mm-2 Edges	R-90 100-ft spool		none
450	16	16 mm-2 Edges	R-190 200-ft spool		none
451	16	16 mm-2 Edges	T		2-in. O.D. core for lengths through 400 ft
452	16	16 mm-2 Edges	Z		3-in. O.D. core for lengths over 400 ft
452N	16	16 mm-2 Edges	Z		0.2994 pitch
455	16	16 mm-1 Edge	R-90 100-ft spool	B	none
455P	16	16 mm-1 Edge	R-90 100-ft spool	B	Processing included
456	16	16 mm-1 Edge	R-190 200-ft spool	B	none
457	16	16 mm-1 Edge	T	B	2-in. O.D. core for lengths through 400 ft
458	16	16 mm-1 Edge	Z	B	3-in. O.D. core for lengths over 400 ft
458J	16	16 mm-1 Edge	Z	B	0.2994 pitch
462N	16	16 mm-2 Edges	R-232 50-ft spool		0.3000 pitch for high-speed cameras
467	16	8 mm-2 Edges	Z		3-in. O.D. core for lengths over 400 ft
561	16	16 mm-2 Edges	Z		Non-canned packaging; 3-in. O.D. core for lengths over 400 ft
565	16	16 mm-1 Edge	Z	A	Non-canned packaging; 3-in. O.D. core for lengths over 400 ft
578	16	16 mm-2 Edges	S-153 400-ft spool		none
611P	16	16 mm-1 Edge	R-90 100-ft spool	B	Processing included
618	16	16 mm-1 Edge	Z	A	3-in. O.D. core for lengths over 400 ft
622	16	Super 8 (1-4)	Z		none
628	16	Super 8 (1-3)	Z	B	For 1-4 position; use Sp 622
635	16	none	Z		none
636	16	none	R-90 100-ft spool		none
637	16	8 mm-1 Edge	Z	A	none
Super 8 mm					
464	8	8 mm-1 Edge	Super 8 Cartridge	B	For Super 8 silent movie cameras

Note: When you combine a Specification Number with a film emulsion letter designation, it is known as the Identification Number (e.g., EXH718).

Perforations

Bell & Howell—“Negative” perforation used on most camera negative films. Evolved from early “round” perforations.

Kodak Standard—“Positive” perforation. Large size, rounded corners are used for extra strength. Used primarily for release prints.

16 mm—perforations are the same form (size and shape) for all film types; however, camera origination (negative or reversal) have tighter tolerances.

Cores and Spools

You can purchase KODAK Motion Picture Films on several types of cores and spools, their design depending upon the equipment in which the films are to be exposed. The standard core and spool types, shown on page 25 are described below.

Type T Core—16 mm. A plastic core with a 2-in. (51 mm) outside diameter (OD). Contains a 1-in. (25.4 mm) diameter center hole with keyway and a film slot. *Used with 16 mm films up to 400 ft (122 m) in length.*

Type Z Core—16 mm. A plastic core with a 3-in. (76 mm) OD. Contains a 1-in. (25.4 mm) diameter center hole with keyway and a film slot. *Used with camera and print films in roll sizes longer than 400 ft (122 m) in length.*

Type U Core—35 mm. A plastic core with a 2-in. (51 mm) OD. Contains a 1-in. (25.4 mm) diameter center hole with keyway and a film slot. *Used with camera negative, sound, print, and sound recording films, and positive films used in title cameras.*

Type Y Core—35 mm. A plastic core with a 3-in. (76 mm) OD. Contains a 1-in. (25.4 mm) diameter center hole with keyway and a film slot. *Used with various lengths of print, intermediate, and sound recording films.*

Type P Core—65 mm. A plastic core with a 3-in. (76 mm) OD. Contains a 1-in. (25.4 mm) diameter center hole with keyway and a film slot. *Used with various lengths of print, intermediate, and sound recording films.*

R-90 Spool—16 mm. A metal camera spool with a 3.615-in. (92 mm) flange diameter and a 1¼-in. (32 mm) core diameter. Square hole with single keyway in both flanges. Center hole configuration aligns on both flanges. For 100 ft (30 m) film loads.

R-190 Spool—16 mm. A metal camera spool with a 4.940-in. (125 mm) flange diameter and a 1¼-in. (32 mm) core diameter. Square hole with single keyway, two offset round drive holes, and one elliptical hole in both flanges. Side 1 and 2 markings. For 200 ft (61 m) 16 mm film loads.

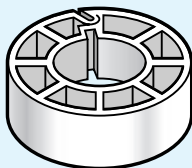
R-232 Spool—16 mm. A plastic camera spool with a 2.790-in. (71 mm) flange diameter and a 1¼ in. (32 mm) core diameter. Square hole with single keyway, two offset round drive holes in both flanges. side 1 and 2 markings. For 50-ft. 16 mm film loads.

S-83 Spool—35 mm. A metal camera spool with a 3.662-in. (93 mm) flange diameter and a 3½ in. (25 mm) core diameter. Square hole with single keyway in both flanges. Center hole aligns on both flanges. For 100 ft (30 m) and 150-ft. (46 mm) film loads.

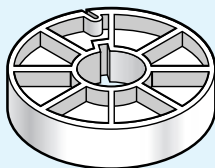
S-153 Spool—16 mm. A metal camera spool with a 6.625-in. (168 mm) flange diameter and a 3½ in. (25 mm) core diameter. Square hole with single keyway in both flanges. Center hole aligns on both flanges. For 400- and 450-ft. 16 mm film loads.

A plastic core is normally used with all 16 mm films in lengths over 200 ft (61 m) and with all 35 mm films in lengths over 100 ft (30 m). Camera spools are supplied with some 35 mm x 100-ft (30 m) rolls and 16 mm x 100-ft (30 m), 200-ft (61 m) and some 400-ft (122 m) rolls.

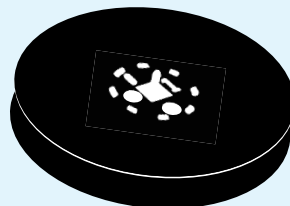
Samples of cores and spools currently in use



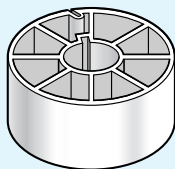
Type T Core
16 mm film up to
400 ft (122 m)



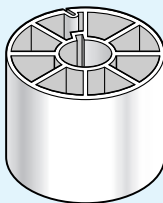
Type Z Core
16 mm film
over 400 ft (122 m)



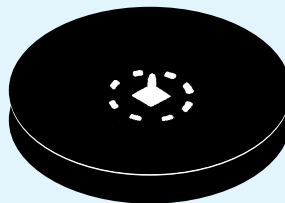
R-190
16 mm Camera Spool
200 ft (61 m)



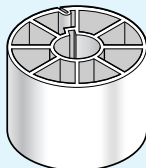
Type Y Core
35 mm film
over 1000 ft (305 m)



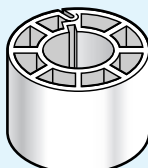
Type S Core
70 mm film
various lengths



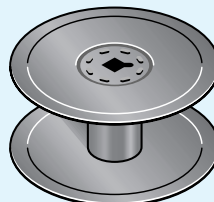
R-90 Spool
16 mm Camera Spool
100 ft (30 m)



Type P Core
65 mm film
1000 ft (305 m) and over



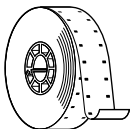
Type U Core
35 mm film
up to and including
1000 ft (305 m)



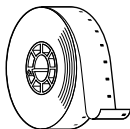
S-83 Spool
35 mm Camera Spool
100 ft (30 m)

Winding Designations

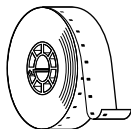
In the sketches below, the film is wound on cores and the emulsion side of the film faces the center of the roll. All 35 mm camera films and many 16 mm camera films have perforations on both edges (2R in the sketch). All one-edge perforated 16 mm camera films are Winding B.



2R



1R-WINDING B



1R-WINDING A

Perforation Types

35 mm and 65 mm End Use

1. BH-1870—35 mm Bell & Howell negative perforations with a pitch measurement of 0.1870 in. (4750), long pitch, (ANSI/SMPTE 93-1996)
2. BH-1866—35 mm Bell & Howell negative perforations with a pitch measurement of 0.1866 in. (4740), short pitch, (ANSI/SMPTE 93-1996)
3. KS-1866—35 mm and 65 mm KODAK Standard Positive perforations with a pitch measurement of 0.1866 in. (4740), short pitch, (ANSI/SMPTE 139-1996; ANSI/SMPTE 145-1993)
4. DH-1870—35 mm Dubray-Howell perforations with a pitch measurement of 0.1870 in. (4750), long pitch, (ANSI/SMPTE 237-1993)
5. KS-1870—70 mm film perforated 65 mm KODAK Standard Positive perforations with a pitch measurement of 0.1870 in. (4750), long pitch, (ANSI/SMPTE 119-1993)

16 mm End Use

6. 2R-2994—16 mm film perforated two edges with a perforation pitch of 0.2994 in. (7605), short pitch, (ANSI/SMPTE 109-1996)
7. 2R-3000—16 mm film perforated two edges with a perforation pitch of 0.3000 in. (7620), long pitch, (ANSI/SMPTE 109-1996)
8. 1R-2994—Same as No.6 except perforated one edge (ANSI/SMPTE 109-1996)
9. 3R-2994—35 mm film perforated 16 mm with a perforation pitch of 0.2994 in. (7605), short pitch, (ANSI/SMPTE 171-1996)
10. 1R-3000—Same as No.7 except perforated one edge (ANSI/SMPTE 109-1996)
11. 3R-3000—Same as No. 9 except with a perforation pitch of 0.3000 in. (7620), long pitch, (ANSI/SMPTE 171-1996)

Note: For other perforation types or formats, consult your Kodak Entertainment Imaging office.

Quantities—Standard Packages

For faster service and easier handling, order case-lot quantities whenever possible.

Film Width	Film Type	Roll Length	Case Quantity	Approx. Case Weight
35 mm	camera films (color/b&w)	100 ft (30 m)	50	35 lb (16 kg)
		200 ft (61 m)	20	28 lb (13 kg)
		400 ft (122 m)	10	25 lb (11 kg)
		1000 ft (305 m)	5	30 lb (14 kg)
16 mm	camera films (color/b&w)	100 ft (30 m)	50	22 lb (10 kg)
		200 ft (61 m)	30	30 lb (14 kg)
		400 ft (122 m)	30	30 lb (14 kg)
		800 ft (244 m)	12	37 lb (17 kg)
		1200 ft (366 m)	15	57 lb (25 kg)

ORDERING RAW STOCK

Introduction

All of the information presented in this field guide is intended to help you determine—

- the right film (performance characteristics), in
- the right quantities (shooting time/ratio), and
- the right format (width, perforations, winding, packaging, etc.).

How to Order

In this section, we briefly explain how to write (or phone) an order so you can get the film you need to begin or continue production on *schedule*. After you place an order with a Kodak company or distributor in your country, they'll arrange for all the other particulars of your order, such as product availability, terms of payment, applicable taxes, transportation, and returns.

The Catalog Number (CAT No.)

This number is perhaps the most important piece of information to know when you want to buy film from Kodak. The CAT No. describes a particular kind of film, the size, length, perforation, pitch, and other format information to Kodak representatives. For example, the CAT No. for 100 ft (30 m) of KODAK VISION2 500T Film 5218 (35 mm), BH-1886 (4740) perforation type, with a film identification number of SP417, on a spool is 113 4493. That seven-digit CAT No. describes only one film package.

To receive your order as quickly as possible, give us the correct CAT No. listed in your Kodak price catalog. That seven-digit number is the key to your film order—all additional related numbers and descriptions verify the CAT No. and rule out the possibility that the number was recorded incorrectly. Once the CAT No. is written in our order sheet, we know the exact film you need, the length of one roll, the specific core or spool, the perforation pitch, the price, and a multitude of other important details.

Let's look at one example:

If you order a 400-ft (122 m) roll of 35 mm KODAK VISION 200T Color Negative Film 5274, the CAT No. is 171 6984. That number tells us exactly what you need.

To verify that number, include:

- the name of the film (5274)
- Iden No. (VXM718)
- roll length (400 ft [122 m]) on core
- perforation pitch (BH-1866 [4740]).

Product and Technical Information

Throughout the world, Eastman Kodak Company provides the motion picture industry with a full range of quality products, supported by worldwide technical services and distribution. The goal is simple: to provide customers with products and services to help them achieve the best screen image possible.

The vast majority of filmmakers choose KODAK Motion Picture Films to generate quality images. Cinematographers and laboratory professionals know they can count on Eastman Kodak Company for fast, experienced technical assistance and a film-distribution network that reaches just about every corner of the globe. Our involvement extends to theaters where we assist exhibitors in providing first-class viewing environments.

A worldwide network is available to supply you with KODAK Motion Picture Products and to answer any technical questions. For information, call Kodak in your area of operations listed on pages 31 through 39. For technical information in the United States, call the Kodak Information Center at 1-800-242-2424, Ext. 16, 9 a.m. to 7 p.m. (Eastern time), Monday through Friday. To place an order in the United States, call 1-800-621-FILM. To place an order in countries outside the U.S., contact Kodak in your country or the nearest distributor.

Visit the Entertainment Imaging website at www.kodak.com/go/motion for complete technical data sheets on KODAK Motion Picture Films, or call the Kodak Information Center.

Two internationally recognized sources of technical information for motion picture procedures and standards are the **Society of Motion Picture and Television Engineers (SMPTE)**, located at 595 West Hartsdale Avenue, White Plains, New York 10607, 914-761-1100, and the **American National Standards Institute (ANSI)**, 550 Mamaroneck Ave., Harrison, New York 10528, 212-642-4900.

The *American Cinematographer Film Manual*, from the American Society of Cinematographers, covers virtually every phase of motion picture photography. The seventh edition is available from A.S.C. Press, P. O. Box 2230, Hollywood, California 90078.

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Fax: 323-468-2124

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360 West 31st Street
New York, New York 10001-2727

Tel: 212-631-3400
Fax: 212-631-3470

Chicago, Illinois

Information

Tel: 630-910-4929

Dallas, Texas

Information

Tel: 972-346-2979

KODAK SHOOTSAVER

Film Delivery Service (U.S. Only)

Tel: 800-404-2016

INTERNATIONAL
Kodak Locations and Distributors

ARGENTINA

El Business Center
Bonpland 1930-32 Tel: 54-11-4778 7009 / 54-11-5016 0832
CP 1414 Buenos Aires, Argentina Fax: 54-11-4773 6105

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Kinocenter Boyana Fax: ++359 2 958 6487
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Web: www.boyanafilm.bg

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Kodak Canada Inc. Tel: 1-416-761-4922
3500 Eglinton Avenue West Orders: 1-800-621-FILM (3456)
Toronto, Ontario Fax: 1-416-761-4948
Canada M6M 1V3 Toll Free Fax: 866-211-6311

Kodak Canada Inc.
4 Place du Commerce, Suite 100
Ile des Soeurs
Verdun, Quebec
Canada H3E 1J4

Orders: 1-800-621-FILM (3456)
Fax: 1-866-211-6311

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