KODAK Color Internegative Film 2273, 3273 / ESTAR Base

Kodak

TECHNICAL DATA / **COLOR INTERNEGATIVE FILM**

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KODAK Color Internegative Film 2273 (35mm), 3273 (16 mm) / ESTAR Base are medium-speed films with excellent image structure characteristics and color-correction masking. They are intended for making 35 mm or 16 mm internegatives from reversal color originals or from color prints when the original color negative has been damaged. The internegatives can then be printed onto KODAK Color Print Film.

BASE

KODAK Color Internegative Films 2273 and 3273 have a clear ESTAR Base (polyester) without rem-jet backing.

DARKROOM RECOMMENDATIONS

Do not use a safelight. Handle unprocessed film in total darkness.

STORAGE

Store unexposed film at 13°C (55°F) or lower. For extended storage, store at -18°C (0°F) or lower. Process exposed film promptly. Store processed film according to these recommendations:

	Short Term (less than 6 months)	Long Term (more than 6 months)
Unexposed film in original, sealed package	13°C (55°F) RH below 60%	-18 to -23°C (0 to-10°F) RH below 50%
Exposed film, unprocessed	-18 to -23°C (0 to-10°F) RH below 20%	Not recommended. Process film promtly.
Process film	21°C (70°F) RH 20 to 50%	2°C (36°F) RH 20 to 30%

This relates to optimized film handling rather than preservation; static, dust-attraction and curl-related problems are generally minimized at the higher relative humidity. After usage, the film should be returned to the appropriate medium- or long-term storage conditions as soon as possible.

Store processed film according to the recommendations in ISO 18911:2010, *Imaging Materials - Processed Safety Photographic Films - Storage Practices*.

Warm-upTimes

To prevent film telescoping, moisture condensation, and spotting, allow your film to warm to room temperature before use:

Film Package	Typical Warm-up Time (Hours)	
	14°C (25°F) Rise	55°C (100°F) Rise
16 mm	1	1 1/2
35 mm	3	5

For more information about film storage and handling, see ANSI/PIMA ISO-18911, SMPTE RP131-2002, and KODAK Publication No. H-845, *The Essential Reference Guide for Filmmakers*, available online at www.kodak.com/go/referenceguide.

EXPOSURE

Without pre-flashing, 2273 Film is significantly higher in contrast than EASTMAN Color Internegative Film 5272. Pre-flashing the film before exposing the negatives helps lower the contrast. As a starting point, we recommend that you pre-flash raw stock to densities +0.30, +0.32, +0.2 above D-min for R, G and B, respectively.

Reciprocity Characteristics

You do not need to make any filter corrections or exposure adjustments for exposure times from 1/1000 to 1 second. For exposures in the 10 second range, it is recommended that you increase exposure by 1/3 of a stop and use a KODAK Color Compensating Filter CC 10R.

Printer Conditions

All printer setups for printing onto this film should include heat-absorbing (infrared) filter such as a KODAK Heat Absorbing Glass No. 2043, and a KODAK WRATTEN Gelatin Filter No. 2B to absorb ultraviolet (UV) light. For high light output with very long bulb life, the printer bulb should be operated at approximately 80 percent of rated voltage. A well-regulated constant-current DC power supply is recommended. The Laboratory Aim Density (LAD) control film should be printed at the center of the printer balance range, usually TAPE 25-25-25 on an additive printer. The other scenes in the original should be printed as determined by color timing relative to the reversal LAD control film. The printer speed and filtration should be chosen to normalize the TRIM settings near the center of their range to allow for slight variations in film and printer.

On subtractive printers, the filter pack and diaphragm chosen should allow for the removal and addition of filters for color correction.

On optical printers, the lens aperture should be set considering sharpness, depth of focus, and light transmittance characteristics. Ground glass or other diffusers may be used to improve uniformity of illumination, at a cost of printer light output. Printer optics should be cleaned and aligned for optimum light output and uniformity.

PROCESSING

Process in Process ECN-2.

Compared to EASTMAN Color Internegative Film 5272, 2273 Film is significantly higher in contrast. Lower contrast can be achieved by reducing temperature, TOD (Time of Development) or pH changes. Changing the temperature to 102°F (vs. 106°F) is the most effective.

Most commercial motion-picture laboratories provide a processing service for these films. See KODAK Publication No. H-24.07, *Processing KODAK Color Negative Motion Picture Films, Module 7* available online at www.kodak.com/go/h24, for more information on the solution formulas and the procedure for machine processing these films. There are also pre-packaged kits available for preparing the processing solutions. For more information on the KODAK ECN-2 Kit Chemicals, check *Kodak's Motion Picture Films for Professional Use* price catalog, also available online at www.kodak.com/go/motion.

IDENTIFICATION

After processing, the product code numbers (2273, 3273), emulsion, roll, and strip number identification, KEYKODE Numbers, and manufacturer/film identification code (ES) are visible along the length of the film.

POST PRODUCTION

Laboratory Aim Densities (LAD)

To maintain optimum quality and consistency in the final prints, the laboratory must carefully control the color timing, printing, and duplicating procedures. The LAD Control Film provides both objective sensitometric control and subjective verification of the duplicating procedures used by the laboratory.

The status M LAD values for KODAK Internegative Film are as follows:

	Status M Densities			Recommended Tolerance
	Red	Green	Blue	
Internegative LAD Aim	0.90	1.30	1.70	+/- 0.12 density

For making prints, time the processed internegative relative to a negative LAD control film supplied by Eastman Kodak Company, using densitometry or an electronic color analyzer. The LAD on the print film is a neutral gray of 1.0 visual density.

The LAD control method assumes that the film and process sensitometry are within specification.

IMAGE STRUCTURE

For more information on image-structure characteristics, see KODAK Publication No. H-845, *The Essential Reference Guide for Filmmakers* available online at www.kodak.com/go/referenceguide.

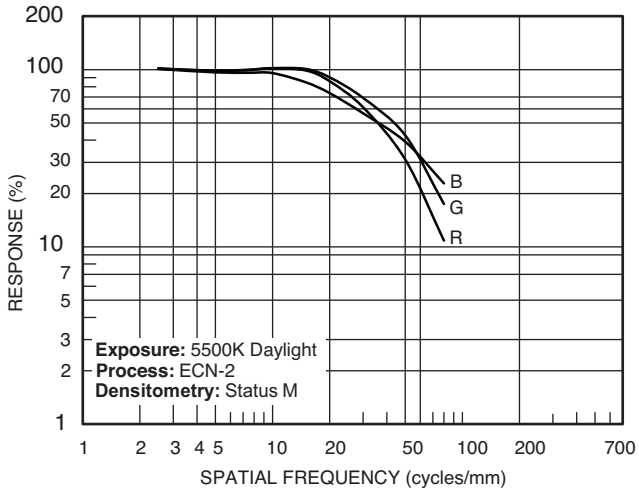
The modulation-transfer curves, and the diffuse rms granularity data were generated from samples of 2273 Film exposed with daylight illumination and processed as recommended in Process ECN-2 chemicals.

Note: The sensitometric curves and data in this publication represent product tested under the conditions of exposure and processing specified. They are representative of production coatings, and therefore do not apply directly to a particular box or roll of photographic material. They do not represent standards or specifications that must be met by Eastman Kodak Company. The company reserves the right to change and improve product characteristics at any time.

Modulation Transfer Function

The "perceived" sharpness of any film depends on various components of the motion picture production system. The camera and projector lenses and film printers, among other factors, all play a role. But the specific sharpness of a film can be measured and is charted in the Modulation Transfer Function Curve.

Modulation-Transfer Function Curves

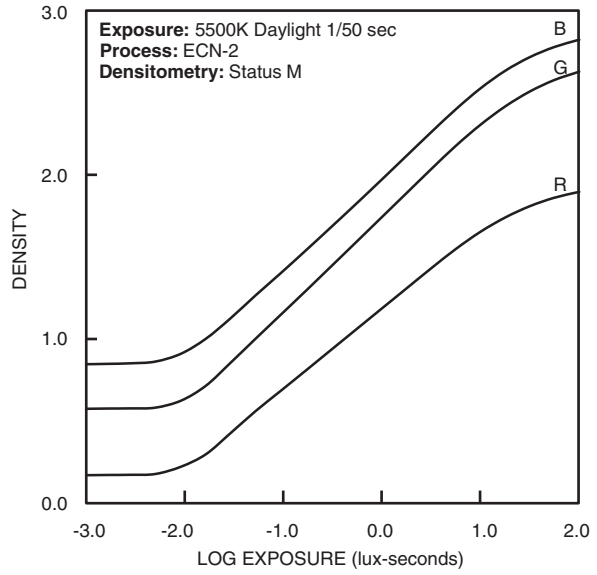


This graph shows a measure of the visual sharpness of this film. The x-axis, "Spatial Frequency," refers to the number of sine waves per millimeter that can be resolved. The y-axis, "Response," corresponds to film sharpness. The longer and flatter the line, the more sine waves per millimeter that can be resolved with a high degree of sharpness—and, the sharper the film.

Sensitometry

The curves describe this film's response to red, green, and blue light. Sensitometric curves determine the change in density on the film for a given change in log exposure.

Sensitometric Curves

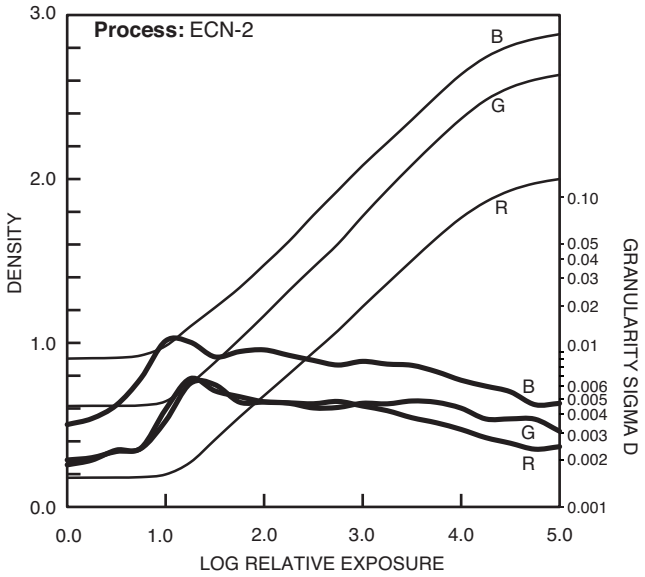


rms Granularity

Read with a microdensitometer, (red, green, blue) using a 48-micrometer aperture.

The "perception" of the graininess of any film is highly dependent on scene content, complexity, color, and density. Other factors, such as film age, processing, exposure conditions, and telecine transfer may also have significant effects.

Diffuse rms Granularity Curves



To find the rms Granularity value for a given density, find the density on the left vertical scale and follow horizontally to the characteristic curve and then go vertically (up or down) to the granularity curve. At that point, follow horizontally to the Granularity Sigma D scale on the right. Read the number and multiply by 1000 for the rms value.

Note: This curve represents granularity based on modified measuring techniques. Sensitometric and Diffuse RMS Granularity curves are produced on different equipment. A slight variation in curve shape may be noticed.

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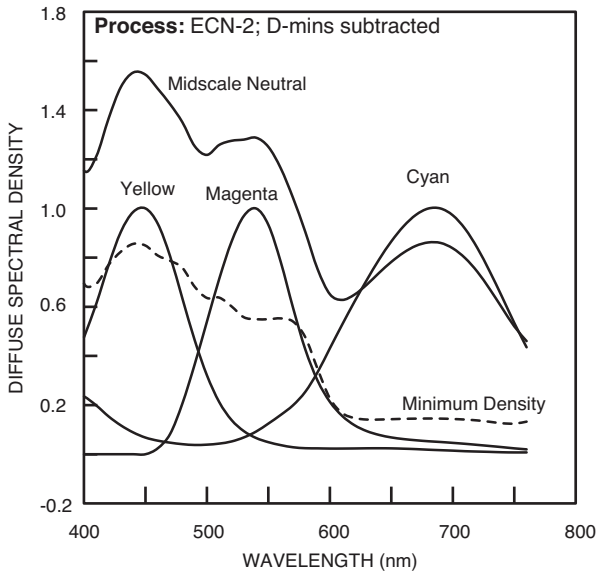
Spectral Dye Density

Processing exposed color film produces cyan, magenta, and yellow dye images in the three separate layers of the film. The spectral dye density curves indicate the total absorption by each color dye measured at a particular wavelength of light and the visual neutral density at (1.0) of the combined layers measured at the same wavelengths.

The wavelengths of light, expressed in nanometers (nm) are plotted on the x-axis, and the corresponding diffuse spectral densities are plotted on the y-axis.

Spectral Dye Density Curves

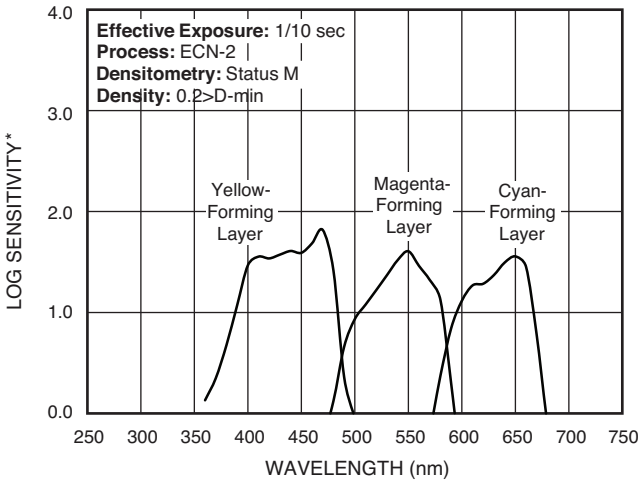


Note: Cyan, Magenta, and Yellow Dye Curves are peak-normalized.

Spectral Sensitivity

These curves depict the sensitivity of this film to the spectrum of light.

Spectral Sensitivity Curves



*Sensitivity = reciprocal of exposure (erg/cm^2) required to produce specified density

SIZES AVAILABLE

See the *KODAK Motion Picture Products Price Catalog*, available online at www.kodak.com/go/motion.

To order film in the United States and Canada, call 1-800-621-FILM (3456).

Worldwide customers can find the nearest sales office at http://motion.kodak.com/motion/About/Worldwide_Sales_Offices/index.htm.

MORE INFORMATION

Outside the United States and Canada, please contact your Kodak representative. You can also visit our web site at www.kodak.com/go/motion for further information. You may want to bookmark our location so you can find us easily the next time.

H-2	*Cinematographer's Field Guide*
H-845	*The Essential Reference Guide for Filmmakers*
H-24	*Manual for Processing KODAK Motion Picture Films, Process ECN-2 Specifications, Module 7*
H-61	*LAD—Laboratory Aim Density*
H-606	*KODAK Telecine Tool Kit and Reference Manual*

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