

Retouching Transparencies on KODAK EKTACHROME Film



This publication describes two methods for retouching transparencies on KODAK EKTACHROME Films intended for reproduction or duplication. The first method uses bleaches to remove dyes from the film:

- Selective bleaching lightens or removes one color at a time.
- Overall bleaching reduces equal densities of all three colors simultaneously.
- Total bleaching completely removes all three colors simultaneously.

The other method uses dyes to alter or enhance the color of specific areas of a transparency or to adjust the overall color balance.

Note: If you use both bleaching and dye retouching on a transparency, you must do the bleaching *first*.

Retouching transparencies successfully requires a lot of practice. If possible, practice retouching on a duplicate transparency. Practicing on a duplicate allows you to develop a good technique before you retouch a valuable original, and accidentally damage it. When you retouch an original transparency, plan your method carefully and work slowly.

In 2001, we began converting sheet formats of EKTACHROME Films to ESTAR Thick Base. ESTAR Thick Base is already the industry standard for all other cut sheet films—black-and-white, color negative, medical x-ray, and graphics. EKTACHROME Films on ESTAR Thick Base have exactly the same emulsions and should produce exactly the same results. You should notice no difference in performance other than improved handling. ESTAR Thick Base is slightly stiffer than the acetate base, so it holds its shape better and lies flatter. It also offers improved strength and dimensional stability, and is less likely to tear or kink when handled.

Unlike other Kodak sheet films, Kodak Ektachrome sheet film has historically been coated on an acetate base. When composition work was all done manually, this offered a great advantage because the base was soluble in acetone, facilitating “cutting and butting” and other similar techniques (described in KODAK Publication E-97, *Photographic Retouching*). Today, with the majority of composition work being done digitally, a soluble base is no longer needed.

EQUIPMENT AND SUPPLIES

To **bleach** color transparencies, you will need these materials:

- Bleaches (prepared according to the formulas given in this publication)
- KODAK PHOTO-FLO 200 Solution
- Cotton swabs
- Nylon brush (for bleaching small areas)
- Trays (for bleaching large areas)
- Frisket material (for bleaching large areas)
- Goggles or safety glasses
- Waterproof apron
- Impervious gloves made of a material such as Neoprene or nitrile
- Material Safety Data Sheets (MSDSs)*

To retouch color transparencies with **dyes**, you will need these materials:

- KODAK E-6 Transparency Retouching Dyes: cyan dye concentrate (CAT No. 139 6084)
magenta dye concentrate (CAT No. 122 4989)
yellow dye concentrate (CAT No. 139 6100)
- Palette with wells
- KODAK PHOTO-FLO 200 Solution
- Brushes, such as Winsor-Newton series 7 brushes, No. 0, 1, and 2
- Cotton swabs
- Absorbent cotton
- Frisket material

* You can obtain MSDSs for Kodak chemicals from our website at www.kodak.com/go/MSDS.

VIEWING TRANSPARENCIES

Light Sources

The photographic and graphic-arts industries use ANSI Standard PH2.30-1989, *Viewing Conditions—Color Prints, Transparencies, and Photomechanical Reproductions*, as the standard for critical evaluation of photographic color transparencies on a diffuse illuminator. To obtain a copy of this standard, write to American National Standards Institute, 11 West 42nd Street, New York, New York 10036

This standard specifies the following:

- The illuminator should have a color temperature of 5000 K and a Color Rendering Index* (CRI) of 90 or higher.
- The chromaticity of the illuminator surface should be approximately CIE Illuminant D50.
- The average luminance of the illuminator surface should be 1400 ± 300 candelas per square metre.

The standard also describes the required diffusion characteristics of the illuminator.

Several companies manufacture fluorescent lamps that meet the standards of 5000 K and a CRI of 90 or higher. MacBeth Proflite, Phillips 5000 K Ultralume, and General Electric Chroma 50 fluorescent lamps are currently available. For information on ready-made transparency illuminators that meet the standard, check with your supplier of photographic products.

Not all advertising or decorative display illuminators have to conform exactly to ANSI Standard PH2.30-1989. Light sources that range in color temperature from 3800 to 5000 K are satisfactory *if* they emit adequate amounts of red, green, and blue light. You can use cool white deluxe fluorescent lamps with a color temperature of about 4200 K and a CRI of about 89 in display illuminators. Cool white fluorescent lamps are *not* satisfactory (even though they are rated at a color temperature of 4200 K), because they have a low CRI (approximately 66), and do not emit enough light in the red portion of the spectrum. The red areas in a transparency will look gray if you view it with cool white fluorescent lamps.

Using Color Compensating Filters

You can view a transparency through KODAK Color Compensating (CC) Filters to determine the amount of retouching required or to determine the effects of an overall color shift.

To correct a transparency with an off-color area, view it through CC filters of varying colors and densities to determine which color is required to correct the area. These filters change the overall color balance slightly and indicate the bleach required of the color of dye you should add to the area to correct the color balance. You can use filters singly or in combination for almost any correction. You will need filters in a variety of densities and colors; a good starting selection is a 0.05, 0.10, and 0.20 density of each color. The number printed in the corner of the filter indicates the filter density; the final letter indicates the color of the filter.

Use this chart as a guide to which bleach or color dye you need.

If looking through this CC filter corrects the color imbalance	Subtract color by bleaching this dye layer	Or add this dye
Cyan	Yellow + Magenta (or Red)	Cyan
Magenta	Yellow + Cyan	Magenta
Yellow	Magenta + Cyan	Yellow
Red	Cyan	Magenta + Yellow
Green	Magenta	Cyan + Yellow
Blue	Yellow	Magenta + Cyan

Note: You can also use separation filters when you retouch with dyes; see *Using Separation Filters*.

* Color Rendering Index (CRI) relates the visual effect of light sources on eight standard pastel colors. These eight colors are viewed under the light source being rated and under a blackbody source that has the same color temperature. The average difference in the appearance of the colors is used to determine the CRI, using a scale of 0 to 100. If the light source closely matches the blackbody source in its rendition of the standard colors, its CRI will be high; CRI=100 is a perfect correlation.

BLEACHING TRANSPARENCIES

Note: If you are going to use bleaches **and** dyes to retouch a transparency, do all the bleaching first.

Information on using the three types of bleaches is given in the following sections. The table below lists the types of bleaches and the effects they have on transparencies. It also tells you if the dye(s) you bleach can be restored or regenerated.

Dye Bleach	Dye Layer(s) Affected	Can Dye(s) be Regenerated?
For Selective Bleaching		
Cyan SR-31	Lightens or removes cyan dye	Yes
Magenta SR-32	Lightens or removes magenta dye	Yes
Yellow SR-33	Lightens or removes yellow dye	No
Yellow SR-34	Lightens or removes yellow dye	No
Red SR-35	Lightens or removes magenta and yellow dye	No
For Overall Bleaching		
Neutral	Reduces equal densities of cyan, magenta, and yellow dye simultaneously	No
For Total Bleaching		
Total SR-30	Completely removes all three colors simultaneously	No

Selective Dye Bleaches

Use a selective bleach to alter the density of a particular color layer of a transparency. Selective bleaches lighten or remove one color at a time.

For uniform bleaching, prewet the emulsion side of the area you will retouch for about one minute with water that contains a small amount of KODAK PHOTO-FLO 200 Solution. Try one drop of PHOTO-FLO Solution to 30 mL (1 fluidounce) of water; the amount of PHOTO-FLO Solution you should use depends on the quantity of the water, the cleanliness of the film, and your preference.

To lighten a small area of a transparency, use a cotton swab or a nylon brush moistened with bleach. For a shift in color over the whole transparency, immerse the film in a tray of the appropriate bleach. You must also agitate the bleaching solutions in varying directions on the area of the transparency you are bleaching; however, take care to protect the emulsion from damage.

The temperature of the bleach will affect the rate of bleaching, the control you have, and the effect of the dyes on the emulsion layers. For example, Magenta Dye Bleach SR-32 used at 24°C (75°F) removes only magenta dye. At 38°C (100°F), the magenta bleach will remove an equivalent amount of magenta dye in a shorter time, but it will also remove a significant amount of cyan dye. We recommend a temperature of 24°C (75°F).

All the selective dye bleaches except for Red Dye Bleach SR-35 are unstable, especially when they are exposed to high temperatures. They will also be exhausted after bleaching a few transparencies. For the most predictable results, use freshly prepared solutions at a constant temperature (preferably 24°C [75°F]). If bleaching doesn't seem effective even when you have freshly mixed solutions, you may have prepared the solutions from outdated chemicals.

If you use bleaches at temperatures lower than 24°C (75°F), a barely noticeable amount of dye will be removed in the first minute of bleaching. The ration of bleaching increases with time in the solution.

When you use more than one bleach, bleach yellow or red before bleaching cyan and magenta. If you bleach cyan and magenta first, the dyes will be regenerated when you bleach yellow and red. (This does not apply to magenta dye bleached with Red Dye Bleach SR-35.)

If you use Yellow Dye Bleach SR-33, apply 10-percent sodium bisulfite solution to the transparency after bleaching to remove the stain.

After you use any of these selective bleaches, wash the transparencies thoroughly in running water at 24°C (75°F) for at least 10 minutes. *Thorough washing is important to prevent regeneration of bleached cyan and magenta dyes during storage.* To conserve water and energy, you can use three separate fresh-water baths instead of a running-water bath.

Because transparencies on EKTACHROME Film appear opalescent when the emulsion is wet, you must dry them before you can accurately judge the effect of bleaching.

Regenerating Cyan and Magenta Dyes: If you have overbleached cyan or magenta dye separately, regenerate them by using Cyan and Magenta Dye Regenerator RG-1 for up to 5 minutes. Immerse the transparency in a tray, or brush the solution onto the surface. You can regenerate these two dyes partially or completely. However, you cannot regenerate magenta dye that was bleached with Red Dye Bleach SR-35; nor can you regenerate bleached yellow dye or areas treated with a total bleach.

Overall Bleach

To lighten the overall density of a transparency, use Neutral Dye Bleach to reduce equal amounts of cyan, magenta, and yellow dye. For the formula see *Neutral Dye Bleach*; use the mixed solution in a tray or with a brush. *Thorough washing is important to prevent regeneration of bleached cyan and magenta dyes during storage.*

To achieve the same effect as using Neutral Dye Bleach, you can bleach each layer individually, or apply Red Dye Bleach SR-35 to remove magenta and yellow dyes simultaneously, and then use Cyan Dye Bleach SR-31 to remove cyan dye (for the formulas see *Yellow Dye Bleach SR-34* and *Red Dye Bleach SR-35*).

Note: Don't mistake Total Dye Bleach SR-30 for overall bleach. Applying a total bleach to a transparency removes **all** the density from all three emulsion layers. *You cannot dilute Total Dye Bleach SR-30 and use it as an overall bleach to lighten an area.*

Total Dye Bleach

Use total dye bleach to remove all three dyes from small or large areas of the film. With experience and experimentation with total dye bleaching, you will develop a preference for a procedure (see the three procedures described below) and you will easily be able to identify areas of images that would benefit from total bleaching.

Bleaching Small Areas: . To bleach small areas, such as dark spots or streaks on transparencies, use a **nylon brush** to apply Total Dye Bleach SR-30 (for the formula see *Total Dye Bleach SR-30*). Procedure 1 is the gentlest of the three procedures; it gives your work a soft edge. Procedure 3 takes a lot of practice to control; it can give your work a hard edge. We recommend that you start with Procedure 1, and then try the other procedures if Procedure 1 is not effective.

Procedure 1

1. Premoisten the area to be bleached with 7-percent acetic acid solution (35 mL of 20-percent acetic acid and 65 mL of water).
2. Apply Solution A with a series of quick brush strokes. Swab the area with cotton soaked in 7-percent acetic acid after each application.
3. Clear the permanganate stain with 10-percent sodium bisulfite solution.
4. Rinse the area two or three times with water to remove the sodium bisulfite solution.
5. Repeat steps 1 through 4 until all the dye is removed. Then rinse the area four or five times with water. Let the transparency dry before judging the effect of bleaching.
6. If you will apply dyes to the bleached area, swab it with 1-percent acetic acid solution.

Procedure 2

1. Premoisten the area to be bleached with a cotton swab moistened with water and 1 drop of PHOTO-FLO Solution per fluidounce.
2. Apply Solution A with a series of quick brush strokes. Swab the area with water-moistened cotton after each application.
3. Apply Solution B by using the same procedure as in step 2.
4. Clear the permanganate stain with 10-percent sodium bisulfite solution.
5. Rinse the area two or three times with water to remove the sodium bisulfite solution.
6. Repeat steps 1 through 5 until all the dye is removed. Then rinse the area four or five times with water. Let the transparency dry before judging the effect of bleaching.
7. If you will apply dyes to the bleached area, swab it with 1-percent acetic acid solution.

Procedure 3

1. Premoisten the area to be bleached with a cotton swab moistened with water and 1 drop of PHOTO-FLO Solution per fluidounce.
2. Prepare the bleach solution by combining one part Solution A and one part Solution B. Apply the bleach to the area with one or two light brush strokes. Immediately swab the area with cotton moistened water and PHOTO-FLO Solution after each application.
3. Clear the permanganate stain with 10-percent sodium bisulfite solution. (Pick up excess solution with cotton moistened with water between applications.)
4. Repeat steps 2 and 3 if necessary.
5. Rinse the area several times with cotton moistened with water and PHOTO-FLO Solution. Let the transparency dry before judging the effect of bleaching.
6. If you will apply dyes to the bleached area, swab it with 1-percent acetic acid solution.

Bleaching Large Areas: Use Total Dye Bleach SR-30 to remove *all* of the dye from relatively large areas of transparencies by following the procedure at the right.

Apply waterproof frisket material to protect the areas of the transparency that you do not want to bleach. One type of frisket material is a clear plastic material with a pressure-sensitive adhesive on one side. It is supplied in rolls. One brand, Transpaseal, is manufactured by Coating Specialties, Ltd, in England, and is available from A I. Friedman Company, 44W. 18th Street, New York, New York 10011-0461 (212-243-9000). To use this material, cut a piece the same size as the film, remove the release paper, and cover the *emulsion side* of the transparency. Using a frisket knife, X-Acto knife, or razor blade, cut the frisket away from the area(s) that you want to bleach. (Practice cutting frisket material applied to scrap pieces of film to determine the pressure you need to cut through the material without touching the emulsion with the blade.) After cutting the frisket, carefully peel it from the areas that require bleaching, (Use a pair of tweezers or press a piece of masking tape to a portion of the material and lift it from the film.) Rub down (or burnish) the edges of the frisket to prevent leaking. When you have finished bleaching, remove all the frisket material before you wash the transparency.

Note: If you use sodium hypochlorite bleach (approximately 5 percent, e.g., undiluted Clorox bleach) to remove a background to create a silhouette, apply a frisket to the base side as well as the emulsion side. Sodium hypochlorite will destroy the emulsion and the gelatin retouching layer on the base side. (If you do not protect the base, the transparency will curl and it will be impossible to apply dye because there will be no retouching layer to absorb it.)

For more information see *Total Dye Bleach SR-30* on page 8. The bleach solution consists of two parts SR-30 Stock Solution A to one part SR-30 Stock Solution B. When mixed, the bleach is stable until it turns brown.

Using Total Dye Bleach SR-30

For this procedure, you will need three clean trays that are large enough to hold your transparency. The bleaching time depends on the density of the image you are bleaching; higher density or D-max areas will need more time than area with less density. **Do not** bleach transparencies for longer than 60 seconds or the emulsion may be damaged.

1. Prepare a 20-percent acetic acid solution in the first tray.
2. In the second tray, prepare the bleach solution by combining two parts SR-30 Stock Solution A and one part SR-30 Stock Solution B. Be sure that the bleach temperature does not exceed 24°C (75°F).
3. Prepare a 10-percent sodium bisulfite solution in the third tray.
4. Apply frisket material to the emulsion side of the transparency wherever you want to protect it from bleaching.
5. Immerse the transparency emulsion side up in the acetic acid (tray 1) and agitate for 60 seconds by rocking the tray. Drain the transparency thoroughly.
6. Immerse the transparency in the bleach solution (tray 2) and agitate for 30 to 60 seconds by rocking the tray. **Do not** bleach the transparency for longer than 60 seconds or the emulsion may be damaged. Drain the transparency thoroughly.
7. Immerse the transparency in the 10-percent sodium bisulfite solution (tray 3) and agitate for about 10 seconds by rocking the tray. The stain *will not* completely clear in this solution.
8. Reimmerse the transparency in the 20-percent acetic acid solution (tray 1) and agitate for 15 seconds by rocking the tray. Discard this solution after this step.
9. Reimmerse the transparency in the 10-percent sodium bisulfite solution (tray 3) and agitate for at least 2 minutes for final clearing. Leave the transparency in the solution for the entire time *even if the film looks clear before the 2 minutes have elapsed*.
10. Wash the transparency for 5 minutes in running water at 24°C (75°F).
11. If you will apply dyes to the bleached area, immerse the transparency in 1-percent acetic acid solution.
12. Dry the transparency in a dust-free area.

Replace the 20-percent acetic acid solution (tray 1) after bleaching each transparency. Do not wash the transparency between solutions; washing can destroy the emulsion.

this procedure should yield satisfactory results. However, if your transparency had high-density areas that retained a residual image after bleaching, try the following:

- Prepare Total Dye Bleach SR-30 Stock Solutions A and B with distilled or deionized water.
- Use fresh 10-percent sodium bisulfite solution for each transparency.

Bleach Formulas

Note: Some of the following solutions and chemicals can be dangerous if they are mishandled. We strongly recommend that you use personal protective equipment, such as a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you mix these solutions. Good ventilation in your work area is essential; use a chemical fume hood if possible. Store and mix bleaches and solutions in tightly stoppered glass containers.

Cyan Dye Bleach SR-31 (for Selective Bleaching)

Dissolve the chemicals in the order shown. Discard any unused SR-31 Bleach after 48 hours.



Warning

Sodium dithionite is a flammable solid. May ignite if allowed to become damp. Keep containers tightly closed. Store in a cool, dry place.

	Tray Use	Brush Use
Water at 24 to 27°C (75 to 80°F)	1 L	200 mL
Sodium Acetate (desiccated or anhydrous)	22 g	22 g
Sodium Dithionite (sodium hydrosulfite; KODAK Chemical No. P533)*	1.5 g	1.5 g

* KODAK Organic Chemicals are available from laboratory-supply dealers, or you can order them directly from Kodak by calling (800) 225-5352. If you order chemicals by mail, include the statement "These chemicals will not be used for drug purposes or sold by us for such use" to avoid delay in shipment. Be sure to request the MSDS for each chemical you order. You can obtain MSDSs for Kodak chemicals from our website at www.kodak.com/go/MSDS.

Magenta Dye Bleach SR-32 (for Selective Bleaching)

Dissolve the chemicals in the order shown. Discard any unused SR-32 Bleach after 48 hours.

	Tray Use	Brush Use
Water at 24 to 27°C (75 to 80°F)	1 L	200 mL
Ethylenedinitrilo Tetraacetic Acid Disodium Salt (KODAK Chemical No. 6354*)	1 g	1 g
Stannous Chloride (KODAK Chemical No. P435*)	10 g	10 g

Note: Old or impure stannous chloride may not dissolve readily. Not all of the stannous chloride will go into the solution; you can add approximately 2 mL of sulfuric acid to help dissolve it. Discard any undissolved residue.

The white precipitate that forms in this solution is extremely difficult to remove from the film once it has dried. Wipe the film with a clean viscous sponge while it is immersed in the wash.

Yellow Dye Bleach SR-33 (for Selective Bleaching)

Prepare fresh solution for each use, and discard any unused portion.

	Tray Use	Brush Use
Water at 20°C (68°F)	900 mL	200 mL
Total Dye Bleach SR-30, Stock Solution A	5 mL	5 mL
Total Dye Bleach SR-30, Stock Solution B	10 mL	10 mL



Caution

Use Yellow Dye Bleach SR-33 in glass, porcelain, or enamel containers only.

Rinse the transparency with 10-percent sodium bisulfite solution after bleaching, and then wash it to prevent staining.

Yellow Dye Bleach SR-34 (for Selective Bleaching)

Prepare fresh solution for each use, and discard any unused portion.



Warning

Chloramine-T is an extremely irritating compound when the dust is inhaled or allowed to come in contact with skin. When it is dissolved in water, toxic chlorine gas is released. Prevent all skin and eye contact and inhalation of gas.

	Tray Use	Brush Use
Water at 24 to 27°C (75 to 80°F)	1 L	200 mL
Chloramine-T (KODAK Chemical No. 1022)*	10 g	10 g
7% Acetic Acid Solution (for the formula see 7% Acetic Acid Solution)	Add by the drop, and stir until cloudiness persists.	



Caution

Use Yellow Dye Bleach SR-34 in glass, porcelain, or enamel containers only.

Red Dye Bleach SR-35 (for Selective Bleaching)

This solution bleaches magenta and yellow dyes. Applying SR-35 Bleach followed by SR-31 Bleach will have an overall bleaching effect. You can prepare this solution in advance and store it.

	Tray Use
Water at 20°C (68°F)	900 mL
Sulfuric Acid (concentrated— KODAK Chemical No. 114 6919)*	150 mL



Warning

Always add concentrated sulfuric acid to water slowly, stirring constantly. *Never* add the water to the acid; the solution may boil and spatter the acid on your hands and face, causing serious burns. Wear a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you prepare and use this solution. **Do not** prepare a stronger concentration than the formula given here.



Caution

Do not use Red Dye Bleach SR-35 for brush use because of danger to health and property.

Cyan and Magenta Dye Bleach RG-1

Use for up to 5 minutes to regenerate cyan and magenta dyes that have been overbleached. However, this solution will not regenerate magenta dye that has been bleached with Red Dye Bleach SR-35. Wash the transparency after you treat it in this solution. You can prepare this solution in advance and store it.

	Tray Use	Brush Use
Water at 24°C (75°F)	1 L	200 mL
Potassium Ferricyanide	5 g	5 g

Neutral Dye Bleach (for Overall Bleaching)

Do not use the stock solutions separately. Always combine Stock Solution A and Stock Solution B; use the mixed solution in a tray or with a brush.

Stock Solution A

Water at 24°C (75°F)	350 mL
Hydroxylamine Sulfate (KODAK Chemical No. 102 3977)*	20 g
Sulfuric Acid (concentrated— KODAK Chemical No. 114 6919)*	150 mL

Dissolve the hydroxylamine sulfate in the water, then add the sulfuric acid as you stir the solution.



Warning

Always add concentrated sulfuric acid to water slowly, stirring constantly. *Never* add the water to the acid; the solution may boil and spatter the acid on your hands and face, causing serious burns. Wear a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you prepare and use this solution. **Do not** prepare a stronger concentration than the formula given here.

Stock Solution B

Water at 24°C (75°F)	500 mL
Potassium Iodide (granular— KODAK Chemical No. 113 0095)*	20 g

Store Solutions A and B separately. Combine the solutions just before you use them.

Bleaching for 1 minute in a solution made from 1 part Solution A and 1 part Solution B will result in a neutral dye loss of approximately 10CC.

After bleaching, wash transparencies for 10 minutes in running water.

Total Dye Bleach SR-30 (for Total Bleaching)

SR-30 stock solutions are stable; you can prepare them in advance.



Warning

These are dangerous chemical solutions. Avoid contact with skin or eyes. **Do not** use or store these solutions in metal or plastic containers.

Stock Solution A

Water at 60 to 80°C (140 to 176°F)	350 mL
Potassium Permanganate	50 g
Water at 20°C (68°F)	600 mL

Dissolve the permanganate crystals completely in the hot water before adding the cooler water.

Stock Solution B

Water at 20°C (68°F)	900 mL
Sulfuric Acid (concentrated— KODAK Chemical No. 114 6919)*	100 mL

* KODAK Organic Chemicals are available from laboratory-supply dealers, or you can order them directly from Kodak by calling (800) 225-5352. If you order chemicals by mail, include the statement "These chemicals will not be used for drug purposes or sold by us for such use" to avoid delay in shipment. Be sure to request the MSDS for each chemical you order. You can obtain MSDSs for Kodak chemicals from our website at www.kodak.com/go/MSDS.



Warning

Always add concentrated sulfuric acid to water slowly, stirring constantly. *Never* add the water to the acid; the solution may boil and spatter the acid on your hands and face, causing serious burns. Wear a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you prepare and use this solution. **Do not** prepare a stronger concentration than the formula given here.

Miscellaneous Formulas

Prebath (20% Acetic Acid Solution)

Water at 20°C (68°F)	800 mL
Acetic Acid (glacial)	200 mL



Warning

Always add the acid to the water slowly, stirring constantly. *Never* add the water to the acid; the solution may boil and spatter the acid on your hands and face, causing serious burns. Wear a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you prepare and use this solution.

10% Sodium Bisulfite Clearing Bath

Use this solution with Total Dye Bleach SR-30

Water at 20°C (68°F)	900 mL
Sodium Bisulfite	100 g

Dissolve the sodium bisulfite crystals in the water. Store the solution in a tightly closed container.

7% Acetic Acid Solution

Acetic Acid (glacial)	70 mL
Water at 24°C (75°F)	930 mL
or	
20% Acetic Acid	200 mL
Water at 24°C (75°F)	800 mL
or	
28% Acetic Acid	250 mL
Water at 24°C (75°F)	750 mL



Warning

Always add the acid to the water slowly, stirring constantly. *Never* add the water to the acid; the solution may boil and spatter the acid on your hands and face, causing serious burns. Wear a waterproof apron, impervious gloves made of a material such as Neoprene or nitrile, and goggles or safety glasses when you prepare and use this solution.

DYE RETOUCHING

Use KODAK E-6 Transparency Retouching Dyes to retouch images on all KODAK EKTACHROME Professional Films in sheets (original and duplicate transparencies) that you plan to use for duplication or separation for photomechanical reproduction. When you use the dyes according to the instructions, their spectral transmission characteristics are similar to those of the image dyes. Other dyes may produce a visual match, but may not reproduce as well as E-6 Transparency Retouching Dyes. You can use the dyes at full strength or you can dilute them with water or dilute PHOTO-FLO 200 Solution. For best results, use fresh dyes.

Always discard dyes that are completely dried.

Store E-6 Transparency Retouching Dyes in tightly stoppered glass bottles to prevent evaporation. Concentrated solutions of dyes will be stable for at least a year if you keep them in *stoppered* glass bottles. Evaporation adversely affects the penetration and duplication quality of the dyes.

Dye Mixtures. Mix the three dyes—cyan, magenta, and yellow—in any proportion on a palette to produce the color(s) you need. For example, you can mix the four colors listed in the table below by combining the dyes in the proportions given.

To Make This Color Dye	Use These Proportions of Dyes	Storage Time
Neutral (or black)	Equal volumes of cyan, magenta, and yellow dyes	12 hours
Red	Equal volumes of magenta and yellow dyes	1 week
Green	Equal volumes of cyan and yellow dyes	12 hours
Blue	Equal volumes of magenta and cyan dyes	1 week

These dye mixtures are unstable; if you store them longer than the times given, the colors will change and will not reproduce accurately.

To increase the penetration rate of E-6 Transparency Retouching Dyes, mix them with dilute acetic acid. Mix one drop of 7-percent acetic acid with 10 drops of *undiluted dye*. This solution is helpful when you need maximum dye penetration and you are using a semi-dry brush for fine detail. **Do not** use stronger concentrations of acetic acid, because they have an adverse effect on the dye uniformity and color-reproduction quality of transparencies. If more dye coverage is required, let the film dry, then reapply the dyes.

You can apply dyes to either side of a transparency; however, the emulsion will turn cloudy or opalescent when

liquid comes into contact with it, and judging color changes may be difficult. For optimum stability of the image dyes, apply dye to the base side. The dyes will penetrate the gel backing more easily and will dry faster. For uniform application *on the base side*, premoisten the area with a tuft of cotton dampened with a solution made from one drop of KODAK PHOTO-FLO 200 Solution and 30 mL (1 fluidounce) of cool water.

You can use a cotton swab to retouch a large area of a transparency. For example, when a background color is too light to provide contrast with the main subject, you can add dye to the base side of the transparency to make the background darker or produce hue changes. If you want to add dye to only certain areas of the transparency, use a frisket material to protect the areas that don't need retouching. For tray dyeing, cover the emulsion side with a frisket.

Note: If streaks become visible on the base side when you apply dye over a large area, use one of the following techniques to help prevent streaking.

- Wash the transparency for 5 to 10 minutes in running water at 43 to 49°C (110 to 120°F).
- Premoisten the base side of the transparency with 1-percent sulfuric acid. Remove excess sulfuric acid with a tuft of cotton moistened with water. If the dyes absorb more quickly than they normally do, use dyes that are more dilute.

For smaller areas, use a good retouching brush, such as the Windsor-Newton series 7, No. 0, 1, or 2. Mix diluted dyes on a palette to obtain the right color, and apply the dye to the transparency.

Build up density a little at a time. After each application, wipe the area with a tuft of cotton moistened with water and PHOTO-FLO 200 Solution. Continue adding dye until you have the color and density you want.

Check your retouching by looking at the transparency through the filters described under *Using Separation Filters*. Using filters is especially helpful when you are trying to match a color in the transparency.

Sometimes you may need to add dye to the emulsion side to avoid the effects of parallax, to retouch along a sharp edge, or to produce a higher density if the dye saturation on the base side is insufficient. If you apply dyes to the emulsion side, use diluted PHOTO-FLO 200 Solution (one drop of solution to 30 mL [1 fluidounce] of water) to dilute the concentrate. To avoid bleeding, **do not** premoisten the emulsion side.

Use diluted PHOTO-FLO 200 Solution to remove any excess dye concentrations from the surface of the transparency. Minimize water spotting by wiping retouched areas with anhydrous denatured alcohol.

Using Separation Filters

To evaluate the effect of retouching or to determine what color dye to add, you can view transparencies through a set of three separation filters: KODAK WRATTEN Gelatin Filters No. 25 (red), No. 58 (green), and No. 47B (blue).

Because the retouching dyes, as well as the dyes in the film, are subtractive primary colors, you can view a retouched transparency through additive primary color filters, i.e., filters used to make color-separation negatives for photomechanical reproduction. You can visually inspect each film layer and the retouching that affects it.

Use a light source of the appropriate color rendering index (see *Viewing Transparencies*) to view a retouched transparency. Viewing a transparency through a WRATTEN Gelatin Filter No. 25 (red) allows you to see only the cyan dye layer and the cyan retouching dye. The transparency appears to be red, with different densities where the cyan is located. A WRATTEN Gelatin Filter No. 58 (green) will reveal only the magenta dye layer and the magenta retouching dye, and a WRATTEN Gelatin Filter No. 47B (blue) will show the yellow layer and the yellow retouching dye. Unsatisfactory retouching will appear as lighter or darker tones against the surrounding area.

Complementary Colors		
WRATTEN Gelatin Filter		Retouching Dye Color
No.	Color	
25	Red	Cyan
58	Green	Magenta
47B	Blue	Yellow

To use the separation filters to determine what color dye to add, follow this procedure:

1. Select an area of the proper color and density on the transparency to serve as a guide for comparison.
2. Determine what color dye to add by viewing the transparency successively through the three filters.
3. Start retouching by adding dye that is complementary to the filter that shows the *greatest degree* of density variation in the area to be retouched when you compare it to the reference area. View the transparency through the filter as you add the dye until the density variation almost matches the area of proper color and density.
4. While viewing through the filter that showed the second-greatest degree of density variation, add the complementary dye to the area to be retouched. Add the dye until the density variation almost matches the area of proper color and density.
5. Viewing through the remaining filter and using its complementary dye, add dye until the density variation of the final layer almost matches the area of proper color and density.
6. Repeat steps 3 through 5 as required. Each time you add dye, bring the dye densities closer to the tone you want, until you do not see density differences when you view the transparency through each of the filters.

If the retouched area shows more density than the reference area when you view it through any one of the three filters, there is too much dye that is complementary to the filter. To remove some of the dye, follow the procedure described under *Removing Dye Retouching*.

Removing Dye Retouching

You can remove dye that has been applied to the base or the emulsion side of a transparency by washing it in running water at $24 \pm 1^\circ\text{C}$ ($75 \pm 2^\circ\text{F}$). Adjust the wash time according to the amount of dye you want to remove. Follow the wash with a 1-minute rinse in dilute PHOTO-FLO 200 Solution. Dry the transparency at a temperature of 43°C (110°F) or lower.

To remove a slight amount of retouching dye from the *base* side of a transparency, swab the area with water-moistened cotton. To remove a moderate amount of dye from the *bade* side, swab the area with 14-percent ammonium hydroxide solution (made from equal parts of 28-percent ammonium hydroxide and water), and then rinse the transparency in water. If the dye is only on the base side of the transparency, you can remove it quickly with permanganate bleach, such as Total Dye Bleach SR-30. (See the formula for *Total Dye Bleach SR-30*) After you apply the bleach, wipe the area with cotton moistened with 10-percent sodium bisulfite solution to remove the brown stain left by the permanganate bleach. Remove the permanganate stain completely before adding any new dye, or the transparency may not duplicate properly.

Note: Do not use 14-percent ammonium hydroxide solution on any area of the emulsion that you have treated with Total Dye Bleach SR-30; this solution can damage the emulsion.

Notice: We have found that the procedures described in this publication give satisfactory results. As professional users of color materials gain production experience, new techniques will be developed in retouching and methods of control. The information here is intended to serve as a guide in using these materials and as an aid in solving problems.

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Retouching Transparencies on KODAK EKTACHROME Film

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The following publications are available from Kodak Customer Service, from dealers who sell Kodak products, or you can contact Kodak in your country for more information.

- E-70 *Retouching Prints on KODAK EKTACOLOR and EKTACHROME Papers*
- E-71 *Retouching Color Negatives*
- O-10 *Retouching Black-and-White Negatives and Prints*

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