KODAK Direct Positive Panchromatic Film 5246 (35mm)

Formulas and Processing

SUMMARY OF PROCESSING

NOTE: Drain film 10 to 15 seconds between successive baths.

Step	Treatment	Formula	Time of Treatment at 68 F (20 C)
1	First Development	KODAK Developer D-67	See table.
2	Rinse	Water	2 to 5 min.*
3	Bleach	KODAK Bleach Bath R-9	1 min
4	Clear	KODAK Clearing Bath CB-1	2 min†
5	Redevelopment	KODAK Fogging Developer FD-70	8 min
6	Rinse	Water or KODAK Stop Bath SB-1	1 min
7	Fix	KODAK Fixer or KODAK Fixing Bath F-5 or F-6	5 min
8	Wash	Water	20 min

*2 minutes is sufficient with adequate running-water wash and agitation.

†Avoid more than 2 minutes in the clearing bath because this bath tends to dissolve the silver halide, with a consequent loss in density of the positive image.

PROCESSING SOLUTIONS

The KODAK Direct Positive Film Developing Outfit contains chemicals for the convenient preparation of the following solutions: 1 quart each of first developer, bleach bath, and clearing bath, and 5 pints of redeveloper. The fixing solution can be prepared conveniently from KODAK Fixer. When using this outfit, follow the instructions in the package.

If preferred, suitable processing solutions can be made up according to the formulas given in the following pages. While the solutions made to the formulas are not identical chemically with those prepared from the packaged outfit, they produce the same photographic effects. With the formula solutions, the following instructions apply.

SAFELIGHT

Carry out all operations in total darkness until the bleaching has been completed. You can use a KODAK Safelight Filter OA (greenish yellow) with a 15-watt bulb at least 4 feet from the film during the subsequent operations. Do not examine the film before an illuminator or otherwise expose it to strong light until fixing has been completed; otherwise veiled highlights may result.

APPARATUS

The following procedure is recommended for use with small spiral reels, reel and trough, small noninvertible tanks, large spiral reels, or rack and tank. Rewind

processing is not recommended with the KODAK Direct Positive Film Developing Outfit.

Select the time of first development according to the degree of agitation (see following section) and the resulting rate of development obtained. Suggested times with various methods of processing are:

First Development Table

Processing Method	Approximate Time, in Minutes, at 68 F (20 C)
1. Small spiral reels	8
2. Reel and trough	6
3. Small noninvertible tanks	8
4. Large spiral reels	6
5. Rack and tank	9

WARNING: Because the bleach corrodes most metals, do not leave it in contact with metal equipment any longer than necessary. However, you can store bleach in polyethylene, earthenware, porcelain, rubber, glass, or enamelware receptacles having surfaces that are free from cracks or chips.

AGITATION

1. *Small Spiral Reels:* The best method of agitation is to move the reel up and down while it is under solution, and at the same time turn the reel back and forth through approximately half a revolution. Agitate continously during the first 30 seconds in each solution and for 5 seconds every minute thereafter. With some of these tanks, it is also possible to obtain satisfactory results with the cover on, by using the agitation procedure recommended in the instructions for the tank, but it is more convenient and otherwise preferable to use the cover-off method.

2. *Reel and Trough:* Rotate the reel at a convenient rate, and reverse the direction of rotation at 1-minute intervals.

3. *Small Noninvertible Tanks:* Follow the instructions included with the tank.

4. *Large Spiral Reels:* Lower the reel into the solution, giving it a vigorous turning motion sufficient to cause the reel to rotate one-half to one revolution. Raise and lower the reel approximately 1/2 inch (keeping the reel in the solution) for the first 15 seconds, tapping it against the bottom of the tank to release air bubbles from the film.

Agitate once each minute by lifting the reel out of the solution, tilting it approximately 30 degrees to drain for 5 to 10 seconds, and immersing it again with a vigorous turning motion sufficient to cause the reel to rotate one-half to one revolution in the solution. Alternate the direction of rotation each minute. Just before the end of the development time, drain the reel for fifteen seconds and proceed to the next step.

5. *Rack and Tank:* Agitate the film for 5 seconds under the solution when you first immerse it. At 1-minute intervals, lift the rack completely out of the solution, drain it for a few seconds, and reimmerse it. With this agitation, the developing time at 68 F (20 C) will be approximately 9 minutes. With the lower rate of agitation usually employed by commercial photofinishers, the developing time will be about 11 minutes.

PROCESSING TEMPERATURE

A temperature of 68 F (20 C) is recommended for all the processing solutions. In some instances, however, it may be more convenient to operate at some other temperature. The KODAK Direct Positive Film Developing Outfit will yield satisfactory results at temperatures from 65 F (18 C) to a least 85 F (29 C), provided the processing time is adjusted accordingly.

For development at a temperature higher than the recommended 68 F, the development time should be decreased about 1 minute for every 5.5 F (3 C) rise in temperature. Decreasing the temperature below 68 F will necessitate a similar increase in development times. At 85 F (29 C), the time in the baths following the developer should be about one-half that at 68 F (20 C). Optimum times should be determined by trial, because they will be affected by the type of processing equipment, time of agitation, and rate of agitation.

CAPACITY OF SOLUTIONS

The quantity of solution carried over from one bath to the next, and the degree of aeration, vary greatly with different methods of processing, and the capacities of the solutions depend to a considerable extent upon these factors.

About eight 36-exposure lengths of film (40 ft^2) per quart can be processed in each solution, except the redeveloper (fogging developer). Use only freshly prepared redeveloping solution. When fresh, this solution will satisfactorily process two 36-exposure lengths per pint, provided you treat them simultaneously or in quick succession. When you process two lengths in succession in 1 pint of the solution, redevelop the second length about 9 minutes at 68 F (20 C) in order to compensate for reduction in chemical activity. If the solution is more than 2 hours old, discard and replace it with freshly prepared redeveloper.

WATER RINSES

To increase the life of the bleach bath, a 2-to 5-minute rinse is recommended between first development and bleaching. To increase the life of the fixing bath, use a 1-minute rinse between redevelopment and fixing.

PROCESSING PROCEDURE

IMPORTANT: Drain the film 10 to 15 seconds after development and after each successive treatment. Unless otherwise indicated, the temperature of each bath should be 68 F (20 C).

1. First Development

Develop the film for the time required with the apparatus employed. (See page 2.)

The contrast of the final positive cannot be changed appreciably by varying the developer temperature or the time of development of the negative. Overdevelopment produces an effect similar to that of overexposure —decreased maximum density and loss of highlight detail. Underdevelopment gives dark highlights and a general effect similar to that of underexposure.

Keep the volume of the first developer solution constant by adding KODAK Replenisher D-67R. The activity of this replenisher is based on an average carry-over of about 5 fluidrams (about 18.5 ml) of solution per 36-exposure roll (approximately 5 feet) processed. To prevent an increase in developer activity, replace any loss of first developer greater than this quantity per roll with first developer solution (KODAK Developer D-67). If the volume of solution lost is less than 5 fluidrams (18.5 ml) per roll, remove sufficient solution to permit adding the correct volume of replenisher.

2. Rinsing

Rinse the film for 2 to 5 minutes in running water.

3. Bleaching

After rinsing the film, drain it for 10 to 15 seconds and bathe it for 1 minute in the bleach solution.

4. Clearing

Immerse the film in the clearing bath for 2 minutes. You can do this and subsequent steps under a KODAK Safelight Filter OA. Avoid white light, or the final transparency may be too dense, especially in the highlight areas. Also avoid times longer than 2 minutes, because this bath tends to dissolve the silver halide, with a consequent loss in density of the positive image.

5. Redevelopment

Process in the KODAK Fogging Developer FD-70 for about 8 minutes.

CAUTION: The redeveloper solution should be prepared **immediately before use,** because it will keep only 1 to 2 hours. For this reason, in order to process 8 rolls of film in each KODAK Direct Positive Film Developing Outfit, 2 rolls must be redeveloped in a pint of Redeveloper **in rapid succession.**

6. Rinsing

Rinse the film for 1 minute in running water or KODAK Stop Bath SB-1 at 65 to 70 F (18 to 21 C).

7. Fixing

Fix for 5 minutes at 65 to 70 F in KODAK Fixer or KODAK Fixing Bath F-5 or F-6. For reel-and-trough processing, use the relatively odorless F-6 Fixing Bath to avoid the odors of sulfur dioxide given off by the other two fixers.

8. Washing

After fixing the film, wash it for 20 to 30 minutes with an adequate supply of running water (sufficient to replace the water in the tank once each 5 minutes). If the processing equipment will permit, wipe the surface of the film carefully with a soft sponge or a KODAK Photo Chamois under the water. After removing the film from the wash water, squeegee and dry it in a location that is as dust-free as possible. The tendency for water-spot formation will be minimized and uniform drainage of water from the film facilitated by immersing the film in KODAK PHOTO-FLO Solution before drying.

To reduce washing time and conserve water, you can use KODAK Hypo Clearing Agent. First, remove excess hypo by rinsing the film in water for 30 seconds. Then bathe the film in the clearing agent solution for 1 to 2 minutes, with moderate agitation, and wash it for 5 minutes, using a water flow sufficient to give at least one complete change of water in 5 minutes.

NOTE: When processing valuable films for maximum permanence, use a fresh fixing bath (that has not been used for other material), and wash for as least twice the times recommended above. The KODAK Hypo Estimator provides a convenient means for checking the thoroughness of washing of important films.

FORMULAS

KODAK DEVELOPER D-67

	Avoirdupois U. S. Liquid	Metric
Water (about 125 F) (50 C)	16 ounces	500.0 ml
KODAK ELON Developing Agent	30 grains	2.0 grams
KODAK Sodium Sulfite (Desiccated)	3 ounces	90.0 grams
KODAK Hydroquinone	115 grains	8.0 grams
KODAK Sodium Carbonate (Monohydrated)	1 3/4 ounces	52.5 grams
KODAK Potassium Bromide (Anhydrous)	75 grains	5.0 grams
KODAK Sodium Thiocyanate (Liquid)	1 dram	3 ml
Water to make	32 ounces	1.0 liter

This developer can also be made from a solution of KODAK Developer D-19 (available in prepared form) as follows:

KODAK D-19 Solution	1 gallon	1.0 liter
KODAK Sodium Thiocyanate (Liquid)	4 drams	3 ml

KODAK REPLENISHER D-67R
FOR USE WITH *KODAK* DEVELOPER D-67

	Avoirdupois U. S. Liquid	Metric
Water (about 125 F) (50 C)	24 ounces	750.0 ml
KODAK ELON Developing Agent	30 grains	2.0 grams
KODAK Sodium Sulfite (Desiccated)	3 ounces	90.0 grams
KODAK Hydroquinone	115 grains	8.0 grams
KODAK Sodium Carbonate (Monohydrated)	1 3/4 ounces	52.5 grams
KODAK Sodium Thiocyanate (Liquid)	2 1/2 drams	7.5 ml
Water to make	32 ounces	1.0 liter

KODAK BLEACH BATH R-9

Water	32 ounces	1.0 liter
KODAK Potassium Dichromate (Bichromate) (Anhydrous)	140 grains	9.5 grams
*Sulfuric Acid (Concentrate)	3 drams	12.0 ml

CAUTION: Always add the sulfuric acid to the solution slowly, stirring constantly, and never the solution to the acid; otherwise, the solution may boil and spatter the acid on the hands or face, causing serious burns.

NOTE: KODAK Bleach for KODAK Direct Positive Paper (supplied in packages to make 1 gallon) can be used instead of this formula.

KODAK CLEARING BATH CB-1

Water	32 ounces	1.0 liter
KODAK Sodium Sulfite (Desiccated)	3 ounces	90.0 grams

NOTE: KODAK Clearing Bath for KODAK Direct Positive Paper (supplied in packages to make 1 gallon) can be used instead of this formula.

KODAK FOGGING DEVELOPER FD-70

Part A

EASTMAN* Sodium Dithionite †(sodium hydro-sulfite) (Cat. No. P533)	290 grains	5.0 grams

Part B

Water	115 ounces	900.0 ml
KODALK Balanced Alkali	1 oz 145 grains	10.0 grams
EASTMAN* 2-Thiobarbituric Acid (Cat. No. 660)	30 grains	0.5 gram
Water to make	1 gallon	1.0 liter

*Unlike photographic products, which are distributed solely through photo dealers, EASTMAN Organic Chemicals are available through laboratory supply houses or on direct order ($25 minimum in the United States and Canada; $50 overseas) from Eastman Kodak Company, Eastman Organic Chemicals, Rochester, N. Y. 14650. They are neither intended nor sold for household use. Catalog numbers should be given in the order. At the time of writing, the smallest quantity of sodium dithionite supplied is 500 grams; of 2-thiobarbituric acid, 100 grams.

†**CAUTION:** Flammable solid. May ignite if allowed to become damp. Keep containers tightly closed. Store in a cool, dry place.

Dissolve 290 grains of Part A in 1 gallon of Part B (or 5 grams in 1 liter) not more than 2 hours before use. Discard after one use.

CAUTION: KODAK Fogging Developer FD-70 contains compounds that are extremely active photographically. If the dry powder comes into contact with photographic materials, serious spotting may occur. Therefore, take care to prevent the powder suspended in the air from reaching photographic materials or areas where they are handled. Also, wash thoroughly not only your hands but also the containers used for mixing and using this solution.

KODAK STOP BATH SB-1

	Avoirdupois U. S. Liquid	Metric
Water	32 ounces	1.0 liter
*Kodak Acetic Acid (28%)	1 1/2 ounces	48.0 ml

*To make approximately 28% acetic acid from glacial acetic acid, dilute 3 parts of glacial acetic acid with 8 parts of water.

KODAK FIXING BATH F-5

Water, about 125 F (50 C)	80 ounces	600.0 ml
Kodak Sodium Thiosulfate (Hypo)	2 pounds	240.0 grams
Kodak Sodium Sulfite (Desiccated)	2 ounces	15.0 grams
*Kodak Acetic Acid (28%)	6 ounces	48.0 ml
†Kodak Boric Acid (crystals)	1 ounce	7.5 grams
Kodak Potassium Alum, Fine Granular, (Dodecahydrated)	2 ounces	15.0 grams
Water to make (cold)	1 gallon	1.0 liter

*To make approximately 28% acetic acid from glacial acetic acid, dilute 3 parts of glacial acetic acid with 8 parts of water.

†Crystalline boric acid should be used as specified. Powdered boric acid dissolves only with great difficulty, and its use should be avoided.

NOTE: Kodak Fixer (available in prepared form) can be used instead of the above formula.

KODAK FIXING BATH F-6

In warm weather and in darkrooms where the ventilation is inadequate, the odor of sulfur dioxide given off by Kodak Fixing Bath F-5 may be objectionable. To eliminate this odor almost entirely, omit the boric acid and substitute twice its weight in Kodalk Balanced Alkali.

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