4 Using KODAK EKTACOLOR Chemicals in Roller-Transport Processors

This section lists the recommended steps, conditions, and replenishment rates for processing Kodak Color Papers and Display Materials in roller-transport processors using Process RA-4. KODAK EKTACOLOR RA Chemicals are designed for use with Process RA-4. Use these chemicals for processing the following color papers and materials designed for Process RA-4:

- KODAK PROFESSIONAL SUPRA ENDURA VC Digital Paper
- KODAK PROFESSIONAL ULTRA ENDURA Paper
- KODAK PROFESSIONAL ULTRA ENDURA High Definition Paper
- KODAK PROFESSIONAL ENDURA Metallic VC Paper
- KODAK PROFESSIONAL ENDURA Clear Display Material
- KODAK PROFESSIONAL ENDURA Transparency Display Material

Some processing options are available for Process RA-4; they are described in Section 6, *Processing Options with KODAK EKTACOLOR Chemicals*.

For information on mixing and handling EKTACOLOR RA Chemicals, see Section 1, *KODAK EKTACOLOR Chemicals*. For information on monitoring your process, see Section 6, *Process Monitoring and Troubleshooting with KODAK Control Strips, Process RA 4*.

For information on using the KODAK EKTACOLOR Processing Cartridge 92/110 in a KODAK PROFESSIONAL RP 30 or SRP 30 Laser Printer, see Publication CIS-239, *Using the KODAK EKTACOLOR Processing Cartridge 92/110, CAT No. 144 0775, for Professional Color Papers in KODAK PROFESSIONAL RP 30 and SRP 30 Laser Printers.*

For information on using KODAK EKTACOLOR Processing Cartridge 111, for use in all models of Fuji Frontiers, and some models of Noritsu Digital Minilab equipment, using Processes CP-48S and CP-49E, see KODAK Publication No. CIS-229, *Using the KODAK EKTACOLOR Processing Cartridge 111 with Digital Minilabs using Processes CP-48S and CP-49E.*

ROLLER-TRANSPORT PROCESSORS

Solutions in roller-transport processors are subject to increased oxidation and evaporation, because processor design and utilization rate differ from those of other types of processors. KODAK EKTACOLOR Developer Replenisher RT and KODAK EKTACOLOR Digital Developer Replenisher RT have been specifically formulated to reduce the effects of oxidation and evaporation.

KODAK EKTACOLOR Developer Replenisher RT is a robust performer in roller-transport processors, and can be used in a wide range of utilizations, from high utilization to low utilization. (See page 4-5 for Calculating Percent Utilization for your processor.) If your processor is operating in very low utilization conditions (less than 4%), you can further protect the developer from oxidation by adding EKTACOLOR RA Developer Additive (for further information, see EKTACOLOR RA Developer Additive, page 4-6).

Use KODAK EKTACOLOR Digital Developer Replenisher RT if you are processing primarily KODAK PROFESSIONAL ENDURA Display Materials, and your processor utilization is above 4%. This developer can also process any Kodak color negative paper as well, but it is specifically designed to yield higher D-max, higher contrast and saturation on display materials.

NOTE: You cannot use EKTACOLOR RA Developer Additive in KODAK EKTACOLOR Digital Developer Replenisher RT.

Do not use solutions intended for processors with higher utilization (i.e., KODAK EKTACOLOR RA Developer Replenisher or KODAK EKTACOLOR RA Bleach-Fix Replenisher NR) in roller-transport processors unless the utilization is at least 15 percent.

Steps and Conditions

Use the processing steps and conditions in Table 4-1 for processing KODAK Papers. See Table 4-2 for replenishment rates. To process KODAK PROFESSIONAL ENDURA Transparency and Clear Display Materials, use the steps and conditions in Table 4-3 and see Table 4-4 for replenishment rates.

Table 4-1 Processing Steps and Conditions for Process RA-4—Roller-Transport Processors

Solution/Step	Time* min:sec	Temperature °C (°F)	Comments
EKTACOLOR RA Developer Replenisher RT† or Digital Developer RT	0:45	35.0 ±0.3‡ (95.0 ±0.5)	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Bleach-Fix and Replenisher§	0:45	30 to 36 (86 to 96)	Recirculate and filter. Use squeegees at tank exit.
Wash¶	1:30	30 to 40 (86 to 104)	
Dry	As needed	Not over 96 (205)	

* Immersion time plus crossover time to the next tank. Developer time range is 44 to 48 seconds. Minimum times for other solutions can be one second less than the normal times. Longer than normal times should cause no adverse effect other than reducing the benefit of rapid access. For best results, use the recommended times with crossover times of 6 seconds or less. If the crossover time is longer than 6 seconds, the paper or material must be in the developer tank for at least 40 seconds.

† You can use EKTACOLOR RA Developer Replenisher in place of EKTACOLOR RA Developer Replenisher RT if your processor utilization is at least 15 percent.

‡ Check the developer temperature frequently with an accurate thermometer.

§ You can use EKTACOLOR RA Bleach-Fix and Replenisher NR if your processor utilization is at least 15 percent.

¶ Where water conservation is required, you can replace the wash with a stabilizer (see *Washless Option*).

Filtration

Processing solutions and wash waters may contain some insoluble materials. If you don't filter out these materials, they can stick to the paper, tank walls, rollers, and solution lines, and may damage the paper. Usually, filters with a porosity of 10 to 30 microns are effective for solutions and wash water. For incoming water supplies, use filters with a porosity of 15 microns.

You can use the following filter materials with processes that use EKTACOLOR Chemicals:

• bleached cotton

• cellulose with phenolic-resin binder

• fiberglass with phenolic-resin binder

• polypropylene

• spun polypropylene

• viscose rayon with phenolic-resin binder (**do not** use in the developer)

• activated carbon

Polypropylene is the most acceptable filter-core material and one of the least expensive. This material has no photographic effect, but the surfactants used to produce the polypropylene yarns may have an effect on your process. Therefore, monitor your process carefully when you first change filters. Replace filters weekly for developers and every two weeks for other solutions.

Replenishment Rates

The replenishment rates given in Table 4-2 are based on processor utilization; they are starting-point recommendations only. Actual rates depend on the type of processor, the paper or material processed, and the rate of evaporation and oxidation. If you process several products, use an average rate based on the product mix and adjust it as needed according to control-plot results. Avoid overcontrolling replenishment rates. Rate changes are likely to be small, and you may not see the full effect of changes for several weeks.

Table 4-2 Replenishment Rates for KODAK Papers

Product	Replenishment for EDGE/ROYAL, ROYAL Luminous, Photo Book Papers mL/M^2 (ML/ft^2)*	Replenishment for SUPRA VC, ULTRA, ULTRA HD, and Metallic VC Papers mL/M^2 (ML/ft^2)*
Developer Product		
EKTACOLOR RA Digital Developer RT	170 (15.8)	174 (16.2)
EKTACOLOR RA Developer Replenisher RT	170 (15.8) — above 7% utilization 205 (19) — 4 to 7% utilization	174 (16.2) — above 7% utilization 210 (19.5) — 4 to 7% utilization
EKTACOLOR RA Developer Replenisher RT (with Developer Additive, use below 4% utilization)	329 (30.6) — < 4% utilization†	339 (31.5) — < 4% utilization†
Bleach-Fix Product		
EKTACOLOR RA Bleach-Fix Replenisher	215 (20)	215 (20)
EKTACOLOR RA Bleach-Fix Replenisher (with Bleach-Fix Additive, use below 4% utilization)	323 (30)†	323 (30)†
EKTACOLOR RA Bleach-Fix Replenisher NR (utilization must be 15% and above to use NR)	54 (5)	54 (5)
Wash		
Wash, number of tanks = 1‡	10,800 (1,000) or higher	10,800 (1,000) or higher
Wash, number of tanks = 2	6,460 (600) or higher	6,460 (600) or higher
Wash, number of tanks = 3	4,300 (400) or higher	4,300 (400) or higher
Wash, number of tanks = 4	2,150 (200) or higher	2,150 (200) or higher
Washless Option		
PRIME Stabilizer and Replenisher LORR (4 tanks)§	195 (18)	195 (18)

* Starting point rates only, exact rate dependent upon utilization and image content.
† Increase replenishment rate as utilization goes down.
‡ Not recommended unless other modifications made to processor to limit bleach-fix carryover.
§ For three countercurrent-flow tanks, use a replenishment rate of ^{2}390 mL/m^2 (36 mL/ft^2); with two countercurrent-flow tanks, use 780 mL/m^2 (72 mL/ft^2).

Common Replenishment Systems—Some laboratories prefer to use a common replenishment system for continuous and roller-transport processors. The utilization of the roller-transport processor determines whether or not a common replenishment system is practical and the correct developer replenisher to use. Follow these guidelines:

If the roller-transport processor has—

• *Less than 4 percent utilization*

Do not use a common system, because you will need to add EKTACOLOR RA Developer Additive to the EKTACOLOR RA Developer Replenisher RT for additional protection from evaporation and oxidation. **Do not** use developer that is treated with additive with continuous processors.

• *4 to 15 percent utilization*

Use KODAK EKTACOLOR RA Developer Replenisher RT and EKTACOLOR RA Bleach-Fix and Replenisher in *both* types of processors with the replenishment rates in Table 4-2.

• *Greater than 15 percent utilization*

Use KODAK EKTACOLOR RA Developer Replenisher and EKTACOLOR RA Bleach-Fix and Replenisher NR in *both* types of processors with the replenishment rates in Table 4-2.

Washless Option

If your water supply is limited, you can use KODAK EKTACOLOR PRIME Stabilizer and Replenisher LORR in place of a wash. Use temperature-controlled, countercurrent-flow, filtered tanks that have a recirculation rate of 0.40 to 0.65 tank volumes per minute. If the recirculation or replenishment rate is too low, biological growth and precipitates may form and require frequent solution changes and tank cleaning. The stabilizer time and temperature are the same as for wash water. The stabilizer replenishment rate depends on the number of tanks (see Table 4-2 and footnote). This information applies *only* to roller-transport processors.

PROCESSING *KODAK PROFESSIONAL ENDURA* TRANSPARENCY AND CLEAR DISPLAY MATERIALS

Although you can use the same processing chemicals for processing KODAK PROFESSIONAL ENDURA Transparency and ENDURA Clear Display Materials as for color papers, longer processing times and higher replenishment rates are required because these materials have thicker emulsions.

Table 4-3 gives the steps and conditions for processing these display materials in roller-transport processors using Process RA-4. You can also use these conditions to process display materials in continuous processors; however, they are usually processed in roller-transport processors because of the inconvenience of rethreading a continuous processor. See Tables 4-3 and 4-6 for replenishment rates for these materials in roller-transport processors.

Table 4-3 Processing Steps and Conditions for Process RA-4—KODAK PROFESSIONAL ENDURA Transparency and ENDURA Clear Display Materials

Solution/Step	Time* min:sec	Temperature† °C (°F)	Comments
EKTACOLOR RA Developer Replenisher RT	2:00‡	35.0 ±0.3 (95.0 ±0.5)	Recirculate and filter. Use precise temperature control. Use squeegees at tank exit.
EKTACOLOR RA Bleach-Fix and Replenisher§	2:00¶	30 to 36 (86 to 96)	Recirculate and filter. Use squeegees at tank exit.
Wash**	4:00¶	30 to 40 (86 to 104)	
Dry	As needed	Not over 96 (205)	

* Immersion time plus crossover time to the next tank.
† Check the developer temperature frequently with an accurate thermometer.
‡ Nominal developer time range is 1:49 to 1:58. For best results, do not use extended development times with ENDURA Display Materials.
§ **Do not** use EKTACOLOR RA Bleach-Fix and Replenisher NR with Display Materials.
¶ Minimum times for other solutions can be one second less than the normal times. Longer than normal times should cause no adverse effect other than reducing the benefits of rapid access. For best results, use the recommended times with a crossover time of 6 seconds or less.
** Where water conservation is required, you can replace the wash with a stabilizer (see *Washless Option*).

Table 4-4 Replenishment Rates for Display Materials

Product	Replenishment for ENDURA Transparency and Clear Display Materials mL/M² (ML/ft²)*
Developer Product	
EKTACOLOR RA Digital Developer RT	495 (46)
EKTACOLOR RA Developer Replenisher RT	495 (46) — above 7% utilization 581 (54) — 4 to 7% utilization
EKTACOLOR RA Developer Replenisher RT (with Developer Additive, use below 4% utilization)	861 (80) — < 4% utilization†
Bleach-Fix Product	
EKTACOLOR RA Bleach-Fix Replenisher	495 (46)
EKTACOLOR RA Bleach-Fix Replenisher (with Bleach-Fix Additive, use below 4% utilization)	754 (70)†
Wash	
Wash, number of tanks = 1	Not recommended
Wash, number of tanks = 2	6,460 (600) or higher
Wash, number of tanks = 3	4,300 (400) or higher
Wash, number of tanks = 4	2,150 (200) or higher
Washless Option	
PRIME Stabilizer and Replenisher LORR (4 tanks)‡	390 (36)

* Starting point rates only, exact rate dependent upon utilization and image content.
† Increase replenishment rate as utilization goes down.
‡ For three countercurrent-flow tanks, use a replenishment rate of ²390 mL/m² (36 mL/ft²); with two countercurrent-flow tanks, use 780 mL/m² (72 mL/ft²).

LOW UTILIZATION

When a processor is used for a small percentage of its actual capacity, the processing solutions can be affected and yield less than optimum results. Percent utilization is a measure of how much of a processor's capacity is used. The utilization calculation for roller-transport processors compares the amount of paper or material that is actually processed to the maximum amount that could be processed at its full capacity. Percent utilization is the percentage of the capacity that is actually used.

Calculating Percent Utilization

Calculate the capacity of your roller-transport processor by first determining these four items:

1. Maximum width your processor can process in centimetres or inches.

2. Transport speed (m/min or ft/min). Determine this speed by measuring the amount of paper that travels by a given point in one minute.

3. The length of time (in hours) that the processor is up to temperature each day. Use the number of hours from the time the recirculation pumps and heaters are turned on to the time they are turned off.

4. Number of operating days per week.

When you have this information, use this formula to calculate the capacity in square metres per week:

$$C = \frac{W \times S \times 60 \times T \times D}{100}$$

Where:

C = Capacity (in square metres per week)

W = Width (in centimetres)

S = Transport Speed (in metres per minute)

T = Time processor is at process temperature each day (in hours)

D = Number of days per week the lab normally operates

To calculate capacity in square feet per week, use this formula:

$$C = \frac{W \times (S \times 12) \times 60 \times T \times D}{144}$$

Where:

C = Capacity (in square feet per week)

W = Width (in inches)

S = Transport Speed (in feet per minute)

T = Time processor is at process temperature each day (in hours)

D = Number of days per week the lab normally operates

Next calculate the total amount of paper and material actually processed by keeping a log. Each time paper or material is processed, note the date, time, and amount. For rolls, record the width and approximate length; for sheets, note the size (8 x 10 inch, 16 x 20 inch, etc.) and the number of sheets. At the end of the week, convert these figures to square metres or square feet by using the formulas below.

To calculate the total square metres in rolls of paper:

$$\frac{L1 \times W \times N}{100} = \text{total sq m}$$

To calculate the total square feet in rolls of paper:

$$\frac{L1 \times W \times N}{12} = \text{total sq ft}$$

To calculate the total square metres in sheets of paper:

$$\frac{L2 \times W \times N}{10,000} = \text{total sq m}$$

To calculate the total square feet in sheets of paper:

$$\frac{L2 \times W \times N}{144} = \text{total sq ft}$$

Where:

- L1 = Length of roll in metres (or feet)
- L2 = Length of a sheet in centimetres (or inches)
- W = Width of roll or sheet in centimetres (or inches)
- N = Number of rolls or sheets of a particular size

Add the total square metres (or square feet) of all paper and material processed for the week. To calculate the percent utilization, divide this figure by the figure you obtained for capacity according to the following formula:

$$U = \frac{P}{C} \times 100$$

Where:

- U = Percent utilization
- P = Amount of paper and material processed in one week (in square metres or square feet)
- C = Weekly capacity of processor (in square metres or square feet)

Compensating for Low Utilization

The amount of processor utilization affects process stability. Low utilization causes chemical changes in the solution through evaporation and oxidation. Increased replenishment can compensate for lower utilization up to a point; however, at extremely low utilization in roller-transport processors, additional protection is needed to maintain process stability. To obtain this additional protection, you can add KODAK EKTACOLOR RA Developer Additive to KODAK EKTACOLOR RA Developer Replenisher RT and KODAK EKTACOLOR RA Bleach-Fix Additive to EKTACOLOR RA Bleach-Fix and Replenisher. Add these chemicals *only* to replenisher solutions; *do not* add them to the tank solutions.

KODAK EKTACOLOR RA Developer Additive

If processor utilization is consistently less than 4 percent, use EKTACOLOR RA Developer Additive. When you mix this concentrate with EKTACOLOR RA Developer Replenisher RT, follow the instructions carefully. When you add the concentrate to the replenisher, you must also dilute the mix by adding more water. For example, if you use this additive to treat a 12 $^1/_2$-U.S. gallon (47 litre) mix of EKTACOLOR RA Developer Replenisher RT, you must bring the mix to a final volume of 15.6 gallons (59 litres)—instead of 12 $^1/_2$ gallons. Once you treat the EKTACOLOR RA Developer Replenisher RT with the developer additive, use only the replenishment rates given in Tables 4-2 for paper and 4-4 for display materials. *Do not* add this additive directly to the developer tank solution or use it with EKTACOLOR RA Developer Replenisher.

Note: You cannot use EKTACOLOR RA Developer Additive in KODAK EKTACOLOR Digital Developer Replenisher RT.

KODAK EKTACOLOR RA Bleach-Fix Additive

Mix EKTACOLOR RA Bleach-Fix and Replenisher according to the instructions packaged with the chemicals. If your processor utilization is consistently less than 4 percent, add KODAK EKTACOLOR RA Bleach-Fix Additive to the bleach-fix replenisher. *Do not* add any additional water to the bleach-fix replenisher when you use the additive. *Do not* add the bleach-fix additive *directly* to the bleach-fix tank solution. Use the amount of additive shown in Table 4-4. Use the replenishment rates given in Tables 4-2 for paper and 4-4 for diplay materials.

Table 4-5 Mixing Bleach-Fix Replenisher for Low-Utilization Processing

If Your Final Replenisher Volume is	Use This Amount of EKTACOLOR RA Bleach-Fix Additive
1 L	15.2 mL
10 L	152 mL
20 L	304 mL
25 gal (95 litres)	1440 mL

Other Adjustments for Evaporation and Oxidation

In addition to using additives in the developer and bleach-fix as part of your routine processing, you can make the following adjustments to compensate for evaporation and oxidation.

Bring Tank Solution Back to Level—When the tank level drops, it is usually because of evaporation, but first check that it was not caused by a leak. If the cause is not a leak, bring the tank to the proper level by adding water at the start of the processing day to keep the solutions from becoming too concentrated. Overconcentration affects developer and bleach reactions, and can cause process-control problems and excessive crystal formation on the tank walls and racks. At the end of each processing day, rinse the top rollers and sides of the racks and tanks with warm water.

Minimize Processor Operating Time—To reduce oxidation, minimize the amount of time that the processor is kept at operating temperature. Turn the processor off at the end of each work day and whenever you know that it will not be used for several hours during the day.

Turn Off the Transport Drive Except During Processing—To reduce oxidation further, turn off the transport drive except during processing. Install a standby switch that allows you to turn off the transport drive without shutting down the recirculation pumps and temperature control.

Use of Activated Carbon Filters to Remove Stain

In roller-transport and other processors, a build-up of oxidized chemicals in the developer tank solution can stain prints (typically yellow stain). To remove these oxidized chemicals and prevent staining, install an activated-carbon filter. You will see a significant stain reduction within 24 hours. The life of the filter cartridge depends on the amount of oxidation products that are treated and the size of the processor tank; however, typical length of use is about 14 days with a 75-litre (20-gallon) tank.

To reduce the possibility of contamination from the filter, pre-soak it in a small amount of developer replenisher for 24 hours before you install it. Discard the developer used for the pre-soak. You can use the following filters:

Filter	Manufacturer
Serfilco Filter Model No. SFC-10W-CARBO-FYNE	Serfilco, Inc. 2900 MacArthur Blvd. Northbrook, Illinois 60062-2005 (847) 509-2900 (800) 323-5431 www.serfilco.com
	Serfilco Europe Broadoak Industrial Park Ashburton Rd. West, Trafford Park Manchester, M17 1RW, England 44-(0)0161-872-1317 www.serfilco-europe.com
	Service Filtration of Canada. Ltd. 4141 Sladeview Crescent, Units 12&13 Mississauga, Ontario, L5L 5T1 Canada 905-820-4700 800-565-5278 (Canada only) www.service-filtration.com
Filter Micro-Carbon Model No. MGSWC4-93-710	Trumpler Clancy Inc. 75 Elmview Ave. Hamburg, New York 14075 (716) 649-9330 (888) 825-2629 www.trumplerclancy.com