TI2443 Revised 01-00

KODAK PROFESSIONAL Single-Use Chemistry Kit, Process E-6

Chemicals

The KODAK PROFESSIONAL Single-Use Chemistry Kit, Process E-6, is specially designed for customers who process small batches of color reversal films in rotary-tube processors, small tanks, or other single-use processes. Each kit makes 5 litres of first developer, reversal bath, color developer, pre-bleach, bleach, fixer and final rinse to give you the reliable performance you expect from Kodak chemicals.

KODAK PROFESSIONAL Single-Use Chemistry Kit, Process E-6 (US version, CAT 107 7643[1])					
Solution	**To Make 350 mL, Use:**	**To Make 500 mL, Use:**	**To Make 1 L, Use:**	**To Make 2 L, Use:**	**To Make 5L, Use:**
Step 1: Start with this volume of water at 68 to 104°F (20 to 40°C):					
	210.0 mL	300.0 mL	600.0 mL	1200.0 mL	3 L
Step 2: Add this volume of concentrate:					
First Developer	70.0 mL	100.0 mL	200.0 mL	400.0 mL	1000.0 mL (entire bottle)
Reversal Bath	8.8 mL	12.5 mL	25.0 mL	50.0 mL	125.0 mL (entire bottle)
Color Developer A[2]	50 mL	71.3 mL	142.5 mL	285.0 mL	712.5 mL (entire bottle)
Color Developer B	16.5 mL	23.5 mL	47.0 mL	94.0 mL	235.0 mL (entire bottle)
Pre-Bleach	24.5 mL	35.0 mL	70.0 mL	140.0 mL	350.0 mL (entire bottle)
Bleach	108.5 mL	155.0 mL	310.0 mL	620.0 mL	1550.0 mL (2 entire bottles)
Fixer	24.5 mL	35.0 mL	70.0 mL	140.0 mL	350.0 mL (entire bottle)
Final Rinse[1]					(entire bottle)
CAT No. 107 7643	3.5 mL	5.0 mL	10.0 mL	20.0 mL	50.0 mL
CAT No. 839 6210	5.5 mL	7.8 mL	15.6 mL	31.2 mL	78.0 mL
Step 3: Finally, add water to bring volume to:					
	350.0 mL	500.0 mL	1 L	2 L	5 L

[1]CAT 107 7643 is the newest version of this product, replacing CAT 839 6210. The final rinse mixing instructions have changed. Find the CAT number on your packaging, and mix your final rinse accordingly.

[2]When mixing the color developer, start with water. Add Part A and stir. Then add Part B and top off with water.

KODAK PROFESSIONAL Single-Use Chemistry Kit, Process E-6 (European version, CAT 525 6763)					
Solution	**To Make 350 mL, Use:**	**To Make 500 mL, Use:**	**To Make 1 L, Use:**	**To Make 2 L, Use:**	**To Make 5L, Use:**
Step 1: Start with this volume of water at 68 to 104°F (20 to 40°C):					
	140.0 mL	200.0 mL	400.0 mL	800.0 mL	2 L
Step 2: Add this volume of concentrate:					
First Developer	70.0 mL	100.0 mL	200.0 mL	400.0 mL	1000.0 mL (entire bottle)
Reversal Bath	8.8 mL	12.5 mL	25.0 mL	50.0 mL	125.0 mL (entire bottle)
Color Developer A[1] Color Developer B	70.0 mL 17.5 mL	100.0 mL 25.0 mL	200.0 mL 50.0 mL	400.0 mL 100.0 mL	1000.0 mL (entire bottle) 250.0 mL (entire bottle)
Pre-Bleach	35.0 mL	50.0 mL	100.0 mL	200.0 mL	500.0 mL (entire bottle)
Bleach	140.0 mL	200.0 mL	400.0 mL	800.0 mL	2000.0 mL (2 entire bottles)
Fixer	24.5 mL	35.0 mL	70.0 mL	140.0 mL	350.0 mL (entire bottle)
Final Rinse	7.0 mL	10.0 mL	20.0 mL	40.0 mL	100.0 mL (entire bottle)
Step 3: Finally, add water to bring volume to:					
	350.0 mL	500.0 mL	1 L	2 L	5 L

[1]When mixing the color developer, start with water. Add Part A and stir. Then add Part B and top off with water.

Storage

For best results, store mixed solutions a maximum of 4 weeks if stored under nitrogen or 1 week if stored in partially filled bottles. Store chemicals at 5 to 29°C (40 to 85°F). Don’t store chemicals at extremely high or low temperatures.

Solution Volumes

For best sensitometric results, use no less than 250 mL of each solution per square foot of film (235 mL for two 135-36 rolls). This kit is designed to use an equal volume of all solutions. Some film holders or tubes may require more solution to produce better uniformity or to compensate for solution oxidation. Check your processor manual for the solution volume recommended for your processor.

Effluent

The bleach and fixer, along with the rest of the solutions in this kit, are designed for simplicity of use. They should not be re-used or regenerated.

Silver Recovery

You can recover silver from used fixer by collecting the solution, and using any conventional silver recovery method, including TMT precipitation, KODAK Chemical Recovery Cartridge, or electrolytic desilvering. The fixer effluent can be collected and combined with fixer effluent from other processes for terminal silver recovery.

Steps and Conditions: Rotary-Tube Processing

These are general recommendations to use as a starting place for setting up your rotary-tube processor. For additional information, refer to the information provided by your processor manufacturer.

Step	Time[1] (min:sec)	Temperature °C (°F)	Comments
Use process manufacturer's recommended warm-up.	6:00[2]	38.0 +/- 1.0 (100.4 +/- 1.8)	Processor may be warmed with running warm water, warm air, or water jacketing, depending on the equipment manufacturer's recommendation.
Perform these steps in total darkness.			
Film warm-up	4:00	38.0 (100.4)	Load tube with film and insert tube in processor.
Pre-wet[3]			
First Developer	6:00 to 7:00[4]	38.0 +/- 0.3 (100.4 +/- 0.5)	

Wash	2:00	38.0 +/- 1.0 (100.4 +/- 1.8)	Rotary-tube manufacturers have several different wash modes. Use the wash mode that most resembles a continuous wash.[5]
Reversal Bath[6]	2:00	38.0 +/- 1.0 (100.4 +/- 1.8)	
Color Developer	4:00	38.0 +/- 1.0 (100.4 +/- 1.8)	
Remaining steps can be done in room light.[6]			
Pre-Bleach	2:00	35 to 40 (95 to 104)	
Bleach	6:00	35 to 40 (95 to 104)	
Fixer	4:00	35 to 40 (95 to 104)	
Wash Wash Wash	1:00 1:00 2:00	35 to 40 (95 to 104)	Two 1-minute running water washes, then a 2-minute wash, are recommended.
Final Rinse	1:00	Ambient	This step can be performed in the rotary tube or in a separate tank outside the processor.
Dry	As needed	Up to 60 (140)	
Post-Cycle Wash	5:00	24 (75)	

[1] All times include 10- to 20-second drain time.

[2] Determine the exact time and temperature for your processor.

[3] A pre-wet step is not recommended. If the processor manufacturer recommends a film pre-wet, note that it can cause sensitometric effects with some emulsions in both speed and color balance. Since some emulsions are affected more than others, your control strip may not reflect the results you get with all films. Contact your processor's manufacturer to find out how to disable the pre-wet step.

[4] You can vary this time from 5 to 8 1/2 minutes to produce an in-control process at a selected temperature. Once you have chosen the time, maintain it within +/- 5 seconds; once you have selected a temperature from the 36 to 40°C (97 to 104°F) range, control it within +/- 0.3°C (+/- 0.5°F).

[5] Two short 20- to 30-second washes followed by a third 1-minute wash most resembles a continuous a 2-minute continuous wash.

[6] Although you can open the processor after the reversal bath step, it is best to leave it closed throughout the process to avoid heat loss in the processing chamber.

Pre-Cycle Steps
The pre-cycle steps and conditions recommended are designed to compensate for solution heat loss during processing. The processor warm-up and film warm-up steps minimize changes in the first developer temperature by raising the temperature of the processing chamber. Follow the processor manufacturer's recommendations.

A pre-wet step is not recommended, even if the rotary tube manufacturer specifies one. A pre-wet can cause sensitometric effects with some emulsions in both speed and color balance. Since some emulsions are affected more than others, your control strip may not reflect the results you get with all films.

Post-Cycle Steps
The post-cycle step is simply a cleaning operation. Thoroughly rinse all inner surfaces of the processor tray, tube and film holders to remove all traces of chemicals—especially fixer. If the last chemical to go through the delivery system is fixer, make sure you completely wash it away before starting the next process. If you intend to run another processing cycle immediately, you may need to keep the post-cycle temperature at approximately 24°C (75°F). If you have dried your processor with a hot-air dryer, allow it to cool to room temperature to minimize film speed variations. With some processors, the tube, tray, and processor cabinet may have to be at the same temperature before each run.

Agitation
Agitation is provided by rotation of the processor tube. Good agitation is necessary for film uniformity. Follow your processor manufacturer's recommendations.

Process Control
Each processor may provide slightly different results. The design of the tube, film holder, processing tray, and means of rotating the tube can affect agitation, heating capacity, and amount of solution oxidation.

There are two ways you can monitor your process using KODAK Control Strips, Process E-6.

If you are interested in monitoring the consistency of your **production**, you can run a control strip in the process along with your actual production. This will provide you with assurance that your process is in control while processing film.

1. Load a KODAK Control Strip, Process E-6, on a processing reel. It can be placed on the same reel as a 135-24 roll, when running a single roll, or on a separate reel if you are not.
2. Follow your normal processing cycle to process the film along with your control strip.
3. Measure the D-max, HD, LD, TD, and D-min densities of the control strip on a densitometer. Calculate and plot the differences from aim for that batch of control strips on a *KODAK Process Record Form*, KODAK Publication No. Y-55.

   If the differences from aim are within the control limits, and the processed transparencies are acceptable, the process cycle you used is satisfactory. Include a control strip with each run, and plot the differences from aim for each strip.

   If the differences from aim plot outside the control limits, analyze the results (see "Analyzing and Adjusting Your Process," below).

If you are interested in monitoring the consistency of your **processing system**, including your chemical mixing, chemical keeping, agitation and temperature control, you can keep a control chart on control strips run in a separate process before running your actual production. This will give you a tool to ensure your process is in control before processing your, or your customer's, film, and a tool for trouble-shooting.

1. Load a KODAK Control Strip, Process E-6, on a processing reel. It is important to run your control strip in the same position from one process to another.
2. Follow your normal processing cycle to process the control strip.
3. Measure the D-max, HD, LD, TD, and D-min densities of the control strip on a densitometer.

You will see different densities when you process only a control strip. This is because the chemicals in each solution are used at a different rate depending on the amount of film processed together. What you are looking for is the consistency of your system when using this type of process control. The process level for 'control only' strips will not be the same as those used for production control.

One way to determine where your 'control only' strips should plot is by running a 'control only' process directly after a successful production run. Do this several times to establish your average expected densities.

Analyzing and Adjusting Your Process

If the difference from aim plot outside the control limits and your processed transparencies are not acceptable, modify your processing cycle. The most common out-of-control situations and possible remedies are described below.

Fast Speed—The green densities of the LD step plot below the control limit. Properly exposed transparencies appear light.

1. Decrease the first-developer time in 15-second increments until the densities of the LD step plot within the action limits. Modify your normal processing cycle to include this change. Do not decrease your first-developer time below 5 minutes.

- OR -

2. Reduce your starting process temperature by 0.5°C (0.9°F) by decreasing the processor heater thermostat setting, and the first developer, first wash, reversal bath, color developer, and pre-cycle running water temperatures by 0.5°C (0.9°F). Continue to reduce the temperatures until the densities of the LD step plot in control or until you reach the minimum process temperature of 36°C (97°F).

   If your first developer temperature is 36°C (97°F), do not decrease it in an attempt to get the control strip readings within the control limits. Other conditions, such as contamination (i.e. fixer remaining because of inadequate post-cycle washing), storage, or mixing errors may be causing the problem. Do not reduce the temperature to less than 36°C (97°F) or the time below 5 minutes.

   When you find a temperature that produces an in-control process, use this as your normal temperature for future processes.

Slow Speed—The green densities of the LD step plot above the control limit. Properly exposed transparencies appear dark.

1. Make these changes, one at a time. Process a control strip after each change.

   a. Increase the processor warm-up time by 2 minutes.

   b. Increase the film warm-up time by 1 minute.

   c. Check the volume of the first and color developers to make sure the volume meets recommendations.

- OR -

2. If any one of these changes increases the densities of the LD step significantly, modify your cycle to include the change.

- OR -

3. Increase the first developer time in 15-second increments until the densities of the LD step plot within the action limits. Modify your normal processing cycle to include this change. Do not increase the first developer time beyond 8 1/2 minutes.

- OR -

4. If none of these steps corrects the slow speed, increase your process temperature by 0.5°C (0.9°F). Continue to increase the temperature until the control values plot in control. Do not increase the processing temperature beyond 40°C (104°F). If all of these steps do not correct the slow speed, check for chemical-mixing or storage errors, and solution contamination.

Variable Speed—Control strips from successive processing runs plot out of control with some results plotting above the aim (too slow) and some results plotting below the aim (too fast). Properly exposed transparencies appear too dark from some processes, and too light from other processes.

Your operating conditions may be inconsistent. Variable speed can also be caused by inconsistent mixing of the first developer. If more consistent operating procedures do not eliminate the speed variations, you may need to modify the pre-cycle step. Try the following changes one at a time. If any change reduces variability, include it in your normal process cycle.

1. If the first process you run after the processor has been idle for more than a few hours is consistently slower than other runs, increase the machine warm-up time for the first run by 2 minutes. Then return to your normal warm-up time.

If the processes you run immediately after other processes are consistently faster, increase the post-cycle wash time to 10 minutes.

2. If process-speed variability seems to be random, try the following steps—one at a time.

   a. Increase the processor warm-up time by 2 minutes.

   b. Increase the film warm-up time by 2 minutes.

Yellow D-min Stain—The blue D-min densities and sometimes the green plot high. The D-min is yellow overall, and there are yellow streaks and patches of varying densities from run to run. It is usually most noticeable in large areas of low density.. To eliminate yellow D-min stain, try the following modifications—one at a time.

1. Increase the time of the pre-bleach to 4 minutes.

2. Blow nitrogen into the processing chamber during the color-developer step.

3. The pre-bleach may be exhausted. Make a new pre-bleach.

4. The color developer may be oxidized. Make a new color developer.

5. Add a 30-second spray or flowing wash between the color-developer and pre-bleach steps and replace the final rinse with KODAK FLEXICOLOR Stabilizer III Replenisher.
   Important: Adding a wash between the color developer and pre-bleach steps, without the corresponding change to Stabilizer III, will result in unsatisfactory magenta-image stability.

6. Increase the amount of pre-bleach used by 50 percent.

If none of the changes corrects the problem, check for chemical-mixing or storage errors, and solution contamination.

If you have a large processor, the yellow D-min stain may be most evident in the film that is farthest from the solution inlet. Sometimes the solution flow may leave pre-bleach at the inlet while color developer collects at the opposite end. To minimize this, move the position of the inlet to the center of the tray or install inlets at the ends as well as at the center. This change will also produce more consistent results with the other processing steps.

Poor Color Balance—A blue or yellow color balance in your control plots can be caused by color-developer alkalinity (pH) that is too low or too high, by using lower than recommended volumes of processing solutions, or by incorrect mixing of the color developer. You can adjust color-developer alkalinity (pH) by adding small amounts of sodium hydroxide (5N NaOH) or sulfuric acid (5N H2SO4). Adding sodium hydroxide increases alkalinity and corrects a blue color balance; adding sulfuric acid decreases alkalinity and corrects a yellow color balance. BEFORE ADDING ACID OR BASE, VERIFY THAT THE COLOR DEVELOPER MIX HAS BEEN MADE CORRECTLY AND THAT THE CORRECT SOLUTION VOLUMES ARE BEING USED.

Other Problems—Refer to KODAK Publication Z-119, “Using KODAK Chemicals, Process E-6” for additional problem-solving information.

Steps and Conditions: Small Tank Processing

Step	Time[1] (min:sec)	Temperature °C (°F)[2]	Comments
Perform these steps in total darkness.			
First Developer	6:00 to 7:00[3]	38.0 +/- 0.3 (100.4 +/- 0.5)	Initial and subsequent agitation.[4]
Wash	2:00	35.0 to 40 (95 to 104)	If a flowing wash is not available, use several (3 to 4) short washes over the two-minute time. Use initial and subsequent agitation.[4]
Reversal Bath[5]	2:00	35.0 to 40 (95 to 104)	Initial agitation[4]
Color Developer	6:00	38.0 +/- 1.0 (100.4 +/- 2.0	Initial and subsequent agitation[4]
Remaining steps can be done in room light.[5]			
Pre-Bleach	2:00	35 to 40 (95 to 104)	Initial agitation[4]
Bleach	6:00	35 to 40 (95 to 104)	Initial and subsequent agitation[4]
Fixer	4:00	35 to 40 (95 to 104)	Initial and subsequent agitation[4]
Wash	6:00	35 to 40 (95 to 104)	If a flowing wash is not available, use several (3 to 4) short washes over the six-minute time. Use initial and subsequent agitation.[4]

Final Rinse	1:00	Ambient	Initial agitation[4]
Dry	As needed	Up to 60 (140)	

[1]All times include a 10- to 20-second drain time.

[2]Use a temperature-controlled water bath to maintain the temperature of the solutions.

[3]You can vary this time from 5 to 8 1/2 minutes to produce an in-control process at a selected temperature. Once you have chosen this time, maintain it within +/- 5 seconds; once you have selected a temperature from the 36 to 40°C (97 to 104°F) range, control it within +/- 0.3°C (+/- 0.5°F).

[4]Small tank agitation techniques are described in the next section.

[5]Although you can open the tank after the reversal bath step, it is best to leave it closed throughout the process to avoid heat loss.

Agitation

Agitation in small-tank processors is provided manually. Good agitation is necessary for film uniformity. There are two types of tanks: invertible and non-invertible; and two types of agitation: intial and subsequent.

	Invertible Tanks		**Non-Invertible Tanks**	
	First Developer, Color Developer, Bleach, Fixer, Washes	**Reversal Bath, Pre-Bleach, Final Rinse**	**First Developer, Color Developer, Bleach, Fixer, Washes**	**Reversal Bath, Pre-Bleach, Final Rinse**
Initial	Tap tank to dislodge air bubbles. Turn tank over 7 or 8 times in 15 seconds. Return tank to water bath.		Tap tank to dislodge air bubbles. Return tank to water bath. Rotate reel 4 or 5 times during first 5 to 10 seconds.	
Subsequent	At 30-second intervals, remove tank from water bath. Quickly turn tank over 2 or 3 times. Return tank to water bath.	None	At 30-second intervals, rotate reel 4 or 5 times.	None

Steps and Conditions: Sink Line Processing

The KODAK PROFESSIONAL Single-Use Chemistry Kit, Process E-6 is not designed for use in a replenished sink-line process. For replenished systems, the 10-litre sized KODAK Chemicals, Process E-6 are a more appropriate choice. If you do choose to use this product in a sink-line processor, follow the recommendations below (solutions are used for a given amount of film and then discarded).

Limitations

Approximately 10 to 12 square feet of film (about twenty 135-36 rolls) can be processed through a 5-litre sink line using this chemistry in a batch mode. After this much film has been processed, you can increase your first developer time by 20 to 30 seconds and your bleach time from 6 to 10 minutes to process another 5 to 6 square feet of film (about ten 135-36 rolls) with satisfactory sensitometric results.

Processing more film will require even longer first developer times and will result in high contrast images. This may be acceptable for some appplications (e.g. graphics / text presentations), but not for general photographic images. In any case, do not process more than a total of fifty 135-36 rolls in a 5-litre mix of this chemistry.

Step	Time[1] (min:sec)	Temperature °C (°F)	Comments
Perform these steps in total darkness.			
First Developer	6:00[2]	38.0 +/- 0.3 (100.4 +/- 0.5)	Nitrogen agitation. One 2-second burst every 10 seconds.
Wash	2:00	38.0 +/- 1.0 (100.4 +/- 1.8)	Flowing wash. Manual agitation[3] every 30 seconds.
Reversal Bath	2:00	38.0 +/- 1.0 (100.4 +/- 1.8)	No agitation. Tap to dislodge air bubbles.
Color Developer	6:00	38.0 +/- 1.0 (100.4 +/- 1.8)	Nitrogen agitation. One 2-second burst every 10 seconds.
Remaining steps can be done in room light.			
Pre-Bleach	2:00	35 to 40 (95 to 104)	No agitation. Tap to dislodge air bubbles.
Bleach	6:00[4]	35 to 40 (95 to 104)	Air agitation. One 2-second burst every 10 seconds.
Fixer	4:00	35 to 40 (95 to 104)	Air agitation. One 2-second burst every 10 seconds.
Wash	4:00	35 to 40 (95 to 104)	Flowing wash. Manual agitation every 30 seconds.
Final Rinse	1:00	Ambient	No agitation. Tap to dislodge air bubbles.
Dry	As needed	Up to 60 (140)	

[1] All times include a 10-second drain time. Increase the first developer time 15 seconds when you process roll films on reels with manual agitation.

[2] You can vary this time from 5 to 7 minutes to produce an in-control process at a selected temperature. Once you have chosen the time, maintain it within +/- 5 seconds; once you have selected a temperature from the 36 to 40°C (97 to 104°F) range, control it within +/- 0.3°C (+/- 0.5°F). See “Limitations” section above.

[3] Initially immerse rack fully into solution and tap to dislodge air bubbles. Then lift and lower racks several times for each manual agitation cycle.

[4] See “Limitations” section above. After the equivalent of twenty 135-36 rolls have been processed, increase the bleach time to 10 minutes. Some films may be harder to bleach and may require an increase in time before the 20-roll (or equivalent) limit has been processed.

Note: If you have questions or need assistance, contact your local Kodak representative.

Note: The contents of this publication are subject to change without notice.

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End of Instruction Sheet