

## How to use 777 Panthermic Developer

777 Panthermic Developer gives superb tonalities, excellent grain and acutance, and full film speed, with the added advantage that it can be used at temperatures anywhere between 60° and 90° F (15° and 32° C) with consistent results, by selecting the appropriate developing time. You should perform a set of experiments to establish the correct time-temperature relationship for your film and your working methods.

The following Kodak data provides a starting point:

	Developing time in minutes, for normal contrast			
	60F/15C	70F/21C	80F/27C	90F/32C
Kodak PANATOMIC-X	16	7	5.25	3
Kodak PLUS-X Pan	16	10	8	3.5
Kodak TRI-X Pan	20	12	9	4.5

### Use without replenishment

It is possible to use the 777 developer without replenishment. Speed and gamma will be reduced with each successive film if development time is held constant. Increasing development time to compensate will have undesirable effects. Contrast will increase, and highlight densities will be normal but shadow detail will be reduced. Effective film speed will drop.

### Use with replenishment

The 777 developer and replenisher start out as the same solution, divided between two containers. The working developer, in one container, is replenished after each use, the amount of replenisher added being a function of the unit area of the film that was developed. Developer activity remains constant, and the volume of working developer does not change.

When certain conditions are met, it is feasible and desirable to continue replenishment over a long period of time, and for many rolls of film. When the volume of replenisher added to the working developer approaches the original developer volume, the developer becomes highly stable. Many users report using tanks of 777 continually replenished over a period of years with perfectly satisfactory results.

There are two necessary conditions for extended replenishment: active use of the working developer, and frequent replenishment. A minimum of one film per week per unit of working developer is recommended. If long intervals elapse between replenishments, some deterioration can be expected, primarily due to oxidation.

It is normal to observe in heavily-used developer a buildup of finely-divided silver, in the form of a black sludge and noticeable turbidity. This silver has

no effect on film or the development process, but it is good practice to filter it out from time to time. It is also normal for the solution to become discolored, typically yellow or orange, due to the buildup of inert dyes and other byproducts washed out of processed films. The combination of turbid silver and dyes can give the developer a deep purple color. This discoloration is harmless, and should not be confused with oxidation.

However, developer that has taken on a strong red cast, or wine-red color, may have oxidized and should be tested, and if it has lost activity, replaced. Replenishment cannot reverse oxidation.

### **Replenishment Considerations**

The replenishment table below is based on average experience. It should be considered a starting point.

If you are developing a large proportion of your negatives to high gamma, then increased replenishment will be needed.

If you begin to notice a reduction in density on successive films, then either replenishment has been inadequate, or the developer has lost activity due to exposure to air. It is suggested that you double the quantity of replenisher at first, and then reduce it over time to the point where you are getting consistent density.

Replenishment should never be less than amount needed to maintain the original working developer volume. Typically, a 35mm or 120 film carries off about 20 to 25 ml of developer that has been absorbed in its emulsion. Normal evaporation and normal losses during handling also have a cumulative effect. Adequate volumes of replenisher are needed to compensate.

### **777 Continuous Replenishment Method**

When you first mix a supply of 777, divide the total solution into two equal halves. Pour one half into a container from which you can exclude air. That will be your replenisher. How you store the other half depends on the kind of tank you use.

#### **Replenishment Method, Daylight Tanks**

Pour the other half into the container in which you will be storing your working solution. Preferably, this would be a glass, HDPE, or PET bottle with a narrow neck. To prevent oxidation, there should be little or no air space above the solution level, and the container should have an airtight cap. Mark the side of the container level with the top of the liquid.

Measure out the required amount of developer, and process in the normal fashion. When development is complete, quickly dump the used developer

into an empty graduate or measuring cup. Continue normally until processing is finished.

Now, before returning the used developer to the container of working developer, carefully measure out the required amount of replenisher and pour it into the working developer first. Then pour the used developer back into the working solution until the liquid is level with the mark. Discard the remaining used developer.

### Replenishment Method, Deep Tanks

Be sure your tank is fitted with a floating lid to exclude air. After filling it with freshly-mixed developer, place a mark level with the top of the solution.

After each batch of negatives has been developed, calculate the amount of replenisher required. Remove a quantity of working developer from the tank. Then pour in replenisher, and pour back working developer until the volume is up to its original level. Discard what has not been poured back.

### Agitation

Agitation during development has a marked effect on negative quality. Continuous agitation is the only way to achieve exact repeatability and optimum density. Agitation should be continued in stop and fixing baths.

### Replenishment Table

Minimum required replenisher for average use. Actual replenishment rate should be adjusted to your conditions as experience dictates.  
In general, add 1 US fluid oz. (30ml) of replenisher for each 40 sq in (260 cm<sup>2</sup>) of film developed.

Roll film			
Size	No. of exposures	Oz. replenisher	ml replenisher
35mm	24	1	30
35mm	36	1.5	45
127	8	1	30
127	12	1	30
127	16		
120/620	8	1.5	45
120/620	12	1.5	45
120/620	16	1.5	45
220	24	2.25	65

Sheet film			
Size	No. of sheets	Oz. replenisher	ml replenisher
2-1/4 x 3-1/4 in	12	2-1/4	65
2-1/4 x 4-1/4 in	12	3	90
3-1/4 x 4-1/4 in	12	4-1/4	120
9 x 12 cm	12	5	140
4 x 5 in	12	6	170

777 Panthermic Developer can be purchased in one-gallon units,  
on-line from  
The Frugal Photographer  
<http://www.frugalphotographer.com>.