TECHNICAL INFORMATION

2000RT DEVELOPER/ REPLENISHER & FIXER/ REPLENISHER

LIQUID CONCENTRATE CHEMICALS FOR ALL RC PAPER MACHINE PROCESSING APPLICATIONS

DESCRIPTION

ILFORD 2000RT developer and ILFORD 2000RT fixer are liquid concentrate chemicals designed for high temperature, machine processing of resin coated, black and white photographic paper. Once diluted they can be used as both the process tank and the replenisher solutions. The addition of a developer starter solution is not needed for 2000RT developer.

2000RT developer and fixer are compatible with all types of machine used to process resin coated black and white photographic paper. They are particularly recommended for use with the past and present range of ILFORD roller transport paper processors.

2000RT developer and fixer are, economical, easy to use, clean working, robust and have a high print capacity. They are capable of producing superb quality prints from all ILFORD RC papers and the high quality RC papers made by other manufacturers. They can be used in the temperature range of 20–40°C (68–104°F).

With most neutral tone papers 2000RT developer gives an image colour just slightly cool of neutral.

2000RT fixer is a non-hardening rapid fixer, it must not be used with fix hardeners. 2000RT fixer is compatible with all methods of silver recovery but for maximum efficiency electrolytic methods are recommended as the treated fixer can be recycled or reused.

Mixing instructions

Working strength 2000RT developer and fixer solutions can either be mixed manually or by using automatic solution mixing equipment. If automatic mixing equipment is used follow the equipment manufacturer's recommendations and advice.

Note Photographic chemicals are not hazardous when used correctly. It is recommended that gloves, eye protection and an apron or overall are worn when handling and mixing all chemicals. Always follow the specific health and safety recommendations on the chemical packaging. Photochemical material safety data sheets containing full details for the safe handling, disposal and transportation of ILFORD chemicals are available from ILFORD agents or directly from the ILFORD web site at. **www.ilfordphoto.com**

For all paper machine processing applications 2000RT developer and fixer are diluted 1+4 with water.

Liquid chemical concentrates do not readily mix with water, particularly fixers, therefore to ensure a working strength solution performs correctly it is very important to stir it thoroughly during preparation. When making a solution make sure that the mixing vessel is large enough for the volume of solution to be mixed and stirred. Measure out the required amount of concentrate and water accurately. Pour the concentrate into the mixing vessel and gradually add the water while stirring.

Ensure that all utensils, processing tanks, replenishment tanks and mixing vessels are thoroughly rinsed and cleaned before mixing fresh batches of 2000RT developer or fixer. Wash out the mixing vessels thoroughly after use. Do not let developer contaminate the fixer or fixer contaminate the developer.

After filling a processor with fresh 2000RT tank and replenisher solutions, switch it on and allow it to get up to temperature and circulate the solutions. After the working temperature is reached leave it re-circulating for at least 10 minutes to ensure the fresh chemicals are thoroughly mixed before attempting to process any paper. Always replace any tank covers used on the process and replenishment solutions.

pH and specific gravity

The following table gives the pH and specific gravity (SG) for fresh, working strength 2000RT developer/replenisher and 2000RT fixer/replenisher. These figures were obtained under carefully controlled laboratory conditions and may differ slightly from measurements made by users in their own working areas. Users should make their own control measurements from their own accurately mixed fresh solutions for later comparison. Ideally a pH meter should be used to measure solution pH but if one is not available pH measurement sticks can be used. These are available in various pH ranges, for the developer those covering the range from pH9–pH11 can be used, whereas for the fixer those covering the range pH4–pH6 are necessary. SG can be measured by using a hydrometer and one covering the range from 1.000 to 1.200 is useful for a wide range of working strength photographic process solutions.

dilution 1+4	pH	SG at 20°C
2000RT developer	10.35–10.45	1.045–1.055
2000RT fixer	5.0–5.5	1.070–1.080

PROCESSING

The suggestions below are only a guide, before choosing a process temperature it is essential that the processing cycle of the processor is checked.

Suggested development times

The preferred temperature range is 20–30°C/68–86°F.

Temperature (°C/°F)	Development time (sec) including transfer time to next tank
20/68	46
25/77	32
30/86	22
35/95	15
40/104	12

These times are for non-replenished systems, with a maximum solution life of seven days. They are also for replenished systems with a solution life of up to three months. The suggested developer replenishment rate is 150–250ml/m^2 (14–23ml/ft^2) paper processed.

The solution life is dependent on paper throughput, and a suggested minimum is 2.8m^2 of paper/l (31ft^2/US quart) of working strength solution per week. If paper throughput is considerably less than this, to maintain print quality, it may be necessary either to make up fresh tank solution every 6 weeks instead of 12 weeks, or to double the replenishment rates.

Adjusting specific gravity SG

In high temperature processors the SG of the working strength developer bath may become too high, it concentrates due to water evaporation. This can be restored by topping up the tank with water. In some situations stirring may not be possible, e.g. in a roller transport processor, here the action of the processor's moving parts and re-circulation system should be enough to give sufficient stirring.

Suggested fixing times

The same times and temperatures as for development can be used for fixing. The actual fixing time, however, is shorter, and 20 seconds is ample above 20°C/68°F. These recommendations are suitable for both replenished and non-replenished systems. In non-replenished systems, the maximum paper throughput is 4m^2/l (44ft^2/US quart) of working strength solution. The suggested fixer replenishment rate for replenished systems is 300–450ml/m^2 (28–41ml/ft^2) of paper processed. The maximum silver concentration in the fixer bath can be 4–6g/l.

Note If fixing is not complete, then adequate washing is impossible.

Washing times

Wash for at least 15 seconds at temperatures above 5°C/41°F. Set the water flow so as to fill the wash tank in 4 minutes or less.

Drying

All hot air dryers can be used with resin coated black and white photographic papers at temperatures above 85°C/185 °F. Infra red dryers are recommended if a high even gloss is required on the paper.

CHECKING AND MAINTAINING 2000RT FIXER ACTIVITY

Stop Bath

After development and before fixing we recommend that whenever possible papers are rinsed in an acid stop bath. When tanks of process solutions are in use a stop bath immediately stops development and reduces carry over of excess developer into the fixer bath helping to maintain the activity and prolong the life of the fixer solution. However, the design of many paper processors means that a stop bath cannot be included in the process system, there should be no processing problems provided that the fixer activity is monitored and adequate fixer replenishment rates are used

When a stop bath can be used ILFOSTOP PRO is recommended for all machine processing applications.

ILFORD Stop Bath	ILFOSTOP PRO
Dilution	1+19
Temperature range	20–40 °C (68–104°F)
Time (seconds) 20°C (68°F)	10
Capacity - sheets of 20.3 x 25.4 (8 x 10 in) RC paper/ litre (unreplenished	90
Replenishment rate	100- 200 ml/m2 9 - 18 ml/ft2

The process time given is the minimum required at 20°C. Due to the design and configuration of some processing machines a longer stop bath time at a higher temperature would be given automatically, this should not cause any process problems provided it is not excessive.

Adjusting fixer pH

If a stop bath is not used and the pH of the fixer bath is found to be to high when measured, i.e. more alkali than it should be, then a few drops of a 50% acetic acid solution may be added to lower the pH value. This addition should be done gradually and with thorough stirring. Do not lower the pH of the fixer bath too far, the limits are given above.

Adjusting specific gravity SG

If the solution concentration of a fixer bath is too high or too low efficiency is reduced and poor fixing can be experienced.

If the SG of the working strength fixer bath is too low, i.e. the solution is too dilute, it can be restored by adding fresh fixer concentrate, however any addition of fixer concentrate must be stirred in thoroughly.

In high temperature processors the SG of the working strength fixer bath may become too high, it concentrates due to water evaporation. This can be restored by topping up the tank with water. In some situations stirring may not be possible, e.g. in a roller transport processor, here the action of the processor's moving parts and re-circulation system should be enough to give sufficient stirring.

Silver concentration

RC papers can be processed in fixers containing levels of silver between 4–6 g/l as the paper base is protected on both sides by an impervious polythene coating but the level of silver that can be tolerated really depends on the degree of image permanence required. If a high level of image permanence is required for commercial use the silver concentration in the fixer should be kept below 1g/l. This approximates to 20 20.3 x 25.4 cm (8 x 10 in) RC prints per litre.

However, print throughput can only be a guide to silver concentration as it depends on the proportion of exposed to unexposed areas on the prints being processed. Silver estimator papers are usually not sensitive enough to test the very low silver levels suitable for optimum permanence. For important prints it is recommended that paper is tested in the following way to ensure adequate fixing.

Prepare the testing solution by dissolving 2g of sodium sulphide in 125ml of water.

NB Take care to follow the health and safety information supplied by the sodium sulphide manufacturer.

For use, dilute the testing solution 1+9 with water.

To establish a permanent reference for a particular type of paper, place a drop of the diluted testing solution on a white area of a print that is known to be well fixed and thoroughly washed. (Use the two bath fixing method). Remove any excess solution with clean blotting paper or absorbent tissue and a barely visible cream tint should be left. This is the reference colour for a well fixed and washed print on this type of paper.

Any subsequent prints that show a yellowing of the test spot when tested are not properly fixed. Soak the prints in water for 5 minutes, then repeat the recommended fixing and washing sequence, using fresh fixer.

Prints must be well washed before using the test, it is not effective on prints direct from the fixer bath.

SILVER RECOVERY

Any method of silver recovery can be used with 2000RT fixer but for maximum efficiency the electrolytic method is recommended as the treated fixer can be recycled or reused. Electrolytic silver recovery units can be either an off-line remote unit, or an on-line unit in a processor's re-circulation system. When collecting silver by electrolytic methods care must be taken not to pass too large a current through the solution as this may cause the fixers active ingredients to breakdown when the silver concentration becomes too low. Silver sulphide may be formed and deposited on the units cathode, this is called sulphiding, the efficiency of the fixer and the silver recovery process are both reduced by sulphiding. Vigorous electrolysis may also lead to hazardous hydrogen sulphide gas (bad eggs smell) being released.

Properly set up an electrolytic silver recovery system can considerably reduce the silver in a fixer solution and thereby increase its efficiency and capacity and so allow lower replenishment rates to be used. Silver concentrations of around 50–100 ppm can be commonly achieved.

In conjunction with primary electrolytic silver recovery systems, a processor's fix and wash overflows can be further treated by secondary and tertiary units using ion exchange and metal exchange. Properly maintained these can reduce silver in the overflow to very low levels, around 3ppm, allowing processing waste discharges to meet to most demanding of effluent controls

To use silver recovery units for best results consult the information provided by the relevant silver recovery equipment and processor suppliers. More general information about silver recovery and other waste treatment, disposal and recycling is available from our web site at.
www.ilfordphoto.com

Working solution life

The life of a developer or fixer solution in a replenished paper system is mainly dependent on paper throughput, replenishment rates and processing temperature.

Properly replenished 2000RT developer in regular use should have a very long life but as a general guide it is advisable to replace it after 6 months in the processing tank.

Unreplenished 2000RT developer working strength solutions should last for up to:-

1 month in full tightly capped bottles
1 month in a tank with a floating lid
2 weeks in a half full tightly capped bottle.

Properly replenished 2000RT fixer in regular use should have a very long life. The only sure way of always knowing that the activity of a fixer is adequate is to use the techniques described above but as a general guide it is advisable to replace it after 12 months in the processing tank.

Unreplenished 2000RT fixer working strength solutions should last for up to:-

6 months in full tightly capped bottles
2 months in a tank with a floating lid
1 month in a half full tightly capped bottle.

STORAGE

Full, unopened bottles of 2000RT developer and fixer concentrates stored in cool conditions 5–20°C (41–68°F) will keep for two years. Once opened use completely within six months and keep all bottles tightly sealed until used.

AVAILABILITY AND CAPACITY

ILFORD 2000RT developer/replenisher is available in 5 litre bottles, 10 litre bag in box cubes, 25 litre kegs and 205 litre barrels.

At a replenishment rate of 200ml/m^2 (18ml/ft^2) a 5 litre bottle of 2000RT developer/replenisher concentrate makes enough working strength developer solution to replenish for 125m^2 (1375 ft^2) of paper equivalent to 2427 20.3 x 25.4cm (8 x 10 in) RC prints.

ILFORD 2000RT fixer/replenisher is available in 5 litre bottles, 10 litre bag in box cubes, 25 litre kegs and 120 litre barrels.

At a replenishment rate of 400ml/m^2 a 5 litre bottle of 2000RT fixer/replenisher concentrate makes enough working strength developer solution to replenish for 62.5 m^2 (687 ft^2)of paper equivalent to 1213 20.3 x 25.4cm (8 x 10 in) RC prints.

A wide range of fact sheets is available which describe and give guidance on using ILFORD products. Some products in this fact sheet might not be available in your country

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www.ilfordphoto.com