

Ethol Developers

Chemistry For Black & White Films and Papers

***Ethol* Chemicals, Inc.**

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ethol UFG film developer

Introduction: There is no miracle developer that will do all things for all people. But Ethol UFG comes as close as a developer possibly can.

There is no miracle technical bulletin that can give you all the methods, techniques and probabilities within such limited space, but this bulletin will answer most major questions. It does not, please contact our technical department.

Description: UFG is an ultra fine grain developer that is soft-working and will produce negatives of normal contrast, high acutance with extreme latitude. It may be used at temperatures from 60°F to 90°F. It is recommended for all format from subminiature to large sheet films.

UFG may be used in normal stock solution (full strength) and then replenished (or not, as you wish) as well as in one-shot form by using a dilution of 1:5. (See paragraph on dilution below). When UFG developer and replenisher are fresh, they may be anywhere from a clear to a slight yellowish-weak-tea color. This is normal and does not indicate oxidation. If you feel that the color is too dark and are concerned about the activity of the developer, we urge you to develop a control strip of film or 3 or 4 frames of 35mm film to assure yourself of the developer's life.

Preparation: UFG in powder form should be dissolved in water at temperatures from 70°F to 90°F. It is advisable to mix at the coolest temperature possible since this will give you increased developer life. Preference is to mix with distilled, deionized or boiled water, for added life and improved negative quality. The liquid form UFG is ready to use.

Development of Film: The development times listed on the charts will give negatives of normal contrast based upon use in a double condenser enlarger. When using a cold light or diffusion enlarger, you will normally require 20-25% increase in development time. **Remember:** The times listed in the charts are derived from controlled laboratory conditions and will no doubt be different than the results you achieve; so do not hesitate to alter your times as required. Do not alter temperature - only times. If possible do not pour solutions in and out of daylight tanks. Preferably fill tanks with developer first, and in the dark, drop the loaded reel into it. Following development, lift reel out, then into next solution, instead of pouring in and out. This contributes to more accurate timing and more uniform development of the negative. Negatives exposed by electronic flash having a duration shorter than 1/2000th second, will require from 25-50% increase in development time.

If your negatives are consistently too low in contrast, increase development time; if too high, decrease development time.

Remember: Contrast is a product of development and density is a product of exposure.

Good Housekeeping: Cleanliness is a must. UFG, as well as other film developers can be contaminated by foreign matter; especially by fixers or other developers as well as impure water. This will cause rapid exhaustion. Tanks and reels should be cleaned periodically, particularly when changing from another developer to UFG. A solution of 2 oz. sodium sulfite and 3 oz. sodium carbonate per gallon of hot water is an excellent cleaner. Allow tanks and reels to remain in this solution over night, then rinse with hot water. Always rinse tanks and reels **immediately** after use and dry with a clean lint-free towel. From time to time, the developer may require filtering to remove particles of foreign matter due to the developing process. A stainless steel filter funnel is recommended.

Dilution: Where longer development times are preferred, UFG may be diluted. In the dilution method you will have greater control of time, slightly finer grain and effective film speed, contrast control and higher acutance. **Never dilute UFG that has had replenisher added to it or has been used in stock form.** In diluted form you **must use constant agitation.** If you do not, your negatives will be too soft and thin. As a guide, dilute UFG 1:5 and multiply the times shown on the chart by 2½ or 3 times. **And don't forget - constant agitation.** For those who wish to develop for longer times, but do not wish to dilute, add 1 oz. of sodium bisulfite per gallon of developer and triple the development time shown on the chart. If you wish to replenish this solution, you may do so by adding 2 oz. sodium bisulfite per gallon of replenisher. Using sodium bisulfite makes UFG reusable and is not in the category of a one-shot developer as when dilution is used. Sodium bisulfite does not affect the quality, but care must be exercised if film speed is important, as the speed will be slightly affected.

Agitation: For 35mm and 120 roll films, tanks are preferred that can be inverted during agitation. Immediately after immersing films, agitate for the first 15 seconds; thereafter, agitate for 5 seconds at the **End** of each 30 second interval. Our method is 3 gentle inversions while rotating counter clockwise during each 5 second interval, followed by putting the tank down with a gentle tap at the end of each 5 second interval to dislodge any air bubbles. If a multiple reel tank is used to develop just one roll of film, insert empty reels to fill the tank in order to avoid too violent agitation.

Short Stop: A short-stop is not recommended except in cases where the temperature exceeds 80 degrees. If temperatures over 80 degrees are used, a hardening stop bath is advised; use (1) teaspoon of sodium bisulfite and (1) teaspoon of potassium chrome alum per quart of water. Use once and discard. In lieu of the shortstop, a brief water rinse of 30 seconds to 1 minute should be used while agitating gently.

Fixing Film: Use a rapid hardening fixer. Fix for twice the clearing time. Do not overfix as delicate half tones may be destroyed. If your fixer is not fresh, fogged or stained film may result.

Storage: If UFG is stored properly in full or covered containers, away from excessive heat, it will last approximately one year. Where possible, store UFG in the cooling chamber (not freezer) of your refrigerator. Filled sheet film tanks should be covered with floating lids or with air-tight plastic such as Saran Wrap.

Replenishment: Although development may be carried out in UFG without replenishment, it is not generally recommended. If you are developing in this manner, then add 10% to the developing time after your 2nd roll and limit to 25 rolls per quart. Replenishment is definitely recommended, if UFG is not used with the "dilution and discard" method. The average rate of replenishment is at the rate of ½ oz. per 80 square inches of developed film - this means (1) roll of 120 or 35mm, 36 exp. (4) sheets of 4x5 or (1) 8x10. Add the replenisher to the "stock" after each batch of film and stir well. Replenisher may be added, until the amount of replenisher added equals the amount of the original "stock" UFG. Properly replenished it will develop at least 60 rolls of film per quart. Replenishment is affected by types of emulsions, storage conditions, over exposures, contamination, etc; therefore we can only give you a guide.

ethol UFG film developer

Washing - Drying: Washing is preferably done in one of the high speed units such as the Wat-Air which clears film in 3-5 minutes. Following the wash, immerse the film in a good wetting agent for 30 seconds using very gentle agitation; remove and hang to dry. Keep a viscose photo sponge in your wetting agent, squeeze it out and gently wipe your film down once on each side. Allow the film to dry in a dust-free area and at a temperature as close to the processing temperature as possible. Use not heat or fan.

Film Speed: The recommended E.I. (exposure index) listed in this bulletin may be above or below that listed by the film manufacturer, but has been determined by Ethol to give the best exposure index to arrive at the optimum negative with proper development in UFG. This does not mean that you cannot or must not use the film manufacturers rated index. If you prefer lower rated indices, simply reduce the development time listed in the chart by 10-20% as a starting point.

Recommended Exposure Indexes and Developing Times

	Exposure Index	TIME / TEMPERATURE		
		70°	75°	80°
35MM FILMS				
Kodak T-Max 100	320	9½	7	5¾
	100	6	4¼	3½
Kodak T-Max 400	1000	7¼	6	5
	200	3¾	3	2½
Kodak T-Max P3200	1600	5½	4¾	4
	3200	7½	6½	5½
	6400	10½	9	7½
Agfa APX-100	160	5	4½	3½
Agfa APX-25	80	5¾	4½	3¼
	40	4¾	4	2¾
Ilford HP5 Plus	800	5¼	4½	3¾
	500	4½	4	3¼
Neopan 400	1000	5½	4¾	3¾
	640	5	4½	3½
Neopan 1600	2400	5	4¼	3¼
	1600	4	3½	2¾
Kodak 2475	4000	10½	8¾	7½
Kodak Tri-X	1280	5¼	4¼	3½
	400	3	2¾	2¼
Kodak Plus-X	320	4	3½	3
	125	3	2½	2¼
Kodak Panatomic-X	80	2½	2	1½
Ilford Pan-F	80	2¼	---	---
Ilford FP-4	320	3½	2¾	2¼
Ilford HP-5	1000	5	4½	3¾
Efke (Adox) KB-14	40	1½	1¼	1
Efke (Adox) KB-17	64	2	1¾	1½
Efke (Adox) KB-21	200	3½	3	2¾
Agfapan 100	160	2½	2¼	1¾
Agfapan 25	50	2¾	2¼	1¾
Agfapan 400	1280	6	5½	5
Agfa Superpan	400	3¾	3	2¼

Recommended Exposure Indexes and Developing Times

	Exposure Index	TIME / TEMPERATURE		
		70°	75°	80°
120 FILMS				
Kodak T-Max 100	80	4½	3½	2¾
	160	5¾	4½	3½
Kodak T-Max 400	400	3¾	3¼	3
	800	5	4½	4
Agfa APX-100	160	4¾	4¼	3¼
Agfa APX-25	50	5	4¼	3¼
Kodak Tri-X	1280	5¼	4¼	3½
	400	3½	3	2½
Kodak Tri-X Pan Prof.	800	5	3½	2½
Kodak Plus-X Pan Prof.	320	5	3¾	2¾
	125	2¼	2	1½
Kodak Verichrome Pan	160	2½	2¼	1¾
Kodak Panatomic-X	80	4½	3¼	2½
Ilford Pan-F	80	3	2¼	1¾
Ilford FP-4	200	3½	2¾	2
Ilford HP-5	1000	6½	6	5½
Agfapan 25	40	3¼	2¾	2½
Agfapan 100	200	2½	2	1½
Agfapan 400	640	8	6¼	5
Adox R-14	40	1½	1¼	---
Adox R-17	100	2	1½	1¼
Adox R-21	200	2½	2	1¾
XP-1 - 400	250	12	---	---
4 x 5 SHEET FILMS				
Kodak T-Max 100	320	6¼	4½	3½
Kodak T-Max 400	640	3½	3	2½
Kodak Tri-X Pan Prof.	500	3¼	2½	2
Kodak Plus-X	160	4	3¼	2¾
Kodak Super XX	200	7¼	5¾	4¾
Kodak Ektapan	100	5¾	4½	3¾
Kodak Royal-X Pan	1280	11	9¼	8
Kodak Royal Pan	400	4	3¼	2½
Agfapan 25	32	6¾	5¾	5
Agfapan 100	100	5½	4¾	3½
Agfapan 200	250	8½	7¼	6¼
Agfapan 400	400	7¾	6½	5¼
Ilford FP-4	160	5½	4	3
Ilford HP-4	400	7	5½	4½

ethol Blue film developer

The High Performance Concentrated Film Developer

Description: Ethol Blue is a new concept in film development, highly concentrated for the dilution and one-time-use method of processing. It is panthermic and may be safely used at temperatures from 65 to 90°F, preference is limited to the range of 65° to 80°F.

General Information: Ethol Blue provides high, effective film speeds, a maximum of shadow detail, high acutance, medium fine grain, processing control, ease of use and economy. It is ideally suited to the requirements of the photojournalist and the available light photographer.

BLUE is available in a 4 oz. and 1 gallon liquid concentrate. It is normally diluted 1:30 for use, but for extended processing control or for special applications, it may be diluted up to 1:120.

The recommended E.I. (exposure index) listed in this brochure may be considerably above that listed by the film manufacturer, but has been determined by us to be the best exposure index for a negative of optimum quality with proper development in Ethol Blue.

If possible, do not pour solutions in and out of daylight loading tanks, Preferably, fill the tank with developer and, in the dark, drop the loaded reel into it. Following development, lift the reel out, into the next solution. This contributes to more accurate timing and more uniform development of the negatives:

Dilution: Where longer developing times are desirable, or greater contrast control is needed, then extended dilution upwards to 1:120 is suggested; discard immediately after one-time use. **Do Not Be Alarmed If Any Crystallization Occurs In The "Stock" Developer. Simply Place Bottle In Hot Water, Shaking Occasionally Until Crystals Dissolve.** If they do not dissolve shortly, you may still use the stock, since they will dissolve when you make your diluted solution.

Storage: Ethol Blue has extremely long shelf life in its "stock" solution form. Do not dilute "stock" until ready to use. Simply store bottle at room temperature. Do not refrigerate. Ethol Blue will last well over one year if kept tightly stoppered in its original bottle. Occasionally the stock solution will darken to a brown or a black color. This is due to peculiarities in certain raw materials and does not indicate that the developer is exhausted. Continue to use as recommended.

Agitation: For 35mm and 120 roll films, tanks that can be inverted during agitation are preferred. Immediately after immersing the films, agitate for the first 15 seconds; then agitate 5 seconds at the end of each 30 seconds. Our method is (3) gentle inversions with a gentle rotation during the 5 seconds every 30 seconds, followed by putting the tank down with a gentle tap at the end of each 5 second agitation period, to dislodge any air bubbles that may have formed. This method of agitation is advised for even

development of the films and consistently reproducible results. If you are getting consistent negatives, but the developing times in the tables are too short for your purposes, then do not change your agitation, but instead change the development times - based upon your dilution or the need of more or less contrast. Where deep roll film tanks are used, it is suggested reels be placed on a long wire and the agitation be carried out by a gentle lifting and turning of the reels during the agitation periods. Do not lift reels out of the solution during developing procedure.

Short Stop: An acid short stop is not recommended. Instead of an acid stop-bath, a brief rinse of 20-30 seconds in plain water may be used. If temperatures of over 75°F are encountered, a hardening stop-bath of 1 tsp. sodium bisulfite and 1 tsp. of potassium chrom alum in a quart of water is recommended. Use once and discard.

Fixing The Film: Use a rapid hardening fixer and fix for twice the clearing time. Don't over fix.....delicate half-tones will be lost and grain clumping will result. If fixer isn't fresh, it is possible film may be fogged or stained.

Washing - Drying: Wash film in a rapid washer, such as the Wat-Air film washer. Follow the wash with a brief 30 to 60 second immersion in a good wetting agent; remove film from reel and hang up by the end. Soak a photo viscose sponge in the wetting solution, squeeze out, and wipe gently down film one side at a time. Allow film to dry in a dust-free area and at a temperature as close as possible to the processing temperature that was used. Use no heat.

Temperature: The importance of accurate temperature uniformity throughout the developing procedure cannot be overemphasized. Inaccuracies in thermometers are very common, and can play havoc with negative contrast. Check your thermometer often. Keep developer, fix, wash and drying at the same temperature. Avoid high temperature processing of high speed films, if possible or chemical fog may result.

Time and Temperature Table: Photography is not an exact science, and variables are encountered with each photographer and his equipment. The following tables are furnished as a guide; a STARTING POINT so that you may achieve the optimum negative quality. Using a double condenser enlarger, the E.I.'s given in the table should give optimum print quality when the negatives are developed as instructed. Negatives that are to be enlarged with a semi-diffusion or diffusion type enlarger will require about 20% to 30% longer developing times respectively, as they require a negative to be developed to a higher contrast for ease of printing. There is NO SINGLE CORRECT DEVELOPING TIME to give optimum results UNDER ALL CONDITIONS.

ethol Blue film developer

Recommended Exposure Indexes and Developing Times

	EXPOSURE INDEX	DILUTION developer : water	TIME / TEMPERATURE		
			70°	75°	80°
35MM FILMS					
Kodak T-Max 100	160	1:30	6½	5½	4¾
Kodak T-Max 400	800	1:30	6¼	5¼	4½
Kodak P3200	3200	1:30	14¼	12	10½
	6400	1:30	20	17	14½
Agfa APX-100	200	1:30	4¾	3½	3
Agfa APX-25	64	1:30	5	4	3¼
Ilford HP5 Plus	1000	1:30	6½	5¼	4¼
Neopan 400	800	1:30	7	5½	4½
Neopan 1600	2400	1:30	7¼	6	4¾
Kodak Tech pan 2415	64	1:120	6	5½	4½
Kodak 2475	2400	1:30	10	8	6¼
Kodak Tri-X	2400	1:30	6¾	5½	4½
Kodak Tri-X	1600	1:30	5¼	3¾	2¾
Kodak Plus-X	400	1:30	3	2½	2¼
Kodak Panatomic-X	64	1:60	3¾	3	2½
Ilford FP4	320	1:30	3	2½	2
Ilford HP5	1000	1:30	5	4½	4
120 FILMS					
Kodak T-Max 100	200	1:30	7½	6¾	5¾
Kodak T-Max 400	1000	1:30	6½	5½	4½
Agfa APX-100	250	1:30	4½	3½	3
Agfa APX-25	80	1:30	4½	3¼	2¾
Kodak Tri-X Pan Prof.	800	1:30	4½	3¾	3
Kodak Tri-X	1600	1:30	5	4	3
Kodak Panatomic-X	32	1:60	3¼	2¾	2
Kodak Verichrome Pan	200	1:60	5	3¾	3
Kodak Plus-X	320	1:30	3½	2¾	2¼
Ilford FP4	160	1:30	2½	2¼	1¾
Ilford HP5	1000	1:30	7	5¾	4¾
4 x 5 SHEET FILM					
Kodak T-Max 100	200	1:30	6½	5½	4½
Kodak T-Max 400	800	1:30	6¼	5¼	4¼
Kodak Tri-X Pan Prof.	500	1:30	5½	4¼	3½
Kodak Plus-X Pan Prof.	160	1:60	7	6¼	5¾
Kodak Royal-X Pan	2000	1:30	9¾	8	6½
Kodak Royal Pan	640	1:30	6	5	4¼
Kodak Ektapan	125	1:60	6¾	5¼	4
Kodak Tech Pan 2415	50	1:120	7½	6¼	5¼
Ilford FP4	200	1:60	6¾	6	5
Ilford HP4	500	1:30	6	5	4¼

ethol 90 film developer

Description: Ethol 90 is a fine grain, normal contrast, long scale, very rapid working developer. It is used in an extremely broad range of general and scientific photographic applications, including press, industrial and commercial photography, available light, macrophotography, electron microscopy, holography, x-ray, cineflure, cardiology, and in automatic processing of motion picture negative and positive films.

General: No special equipment or procedures are required. Ethol 90 is available in both powder and liquid form. It also has its own replenisher, both powder and liquid. The liquid 90 is a ready-to-use working solution. Simply bring the liquid to the required temperature and process. The powder form is dissolved in $\frac{3}{4}$ ths the final volume of water at 80°F - 100°F. Then add cold water to make up the balance.

The powder is very concentrated so getting it into solution is not simple. Nevertheless, do not mix hotter than 100°F., for the higher the temperature that is used, the shorter the developer life. Also do not mix too vigorously for aerating the developer can also shorten its effective life.

Use: Normal development times for most films, exposed at double their ASA rating, is 90 seconds at 70°F. with **Constant Gentle Agitation**. If development is extended to about 6 minutes the ASA rating for slow films may be increased to 3X, and for fast films up to 6X. If impractical to hold temperature at 70°F, follow the chart below. Times may be changed to meet individual contrast and density requirements.

Degrees, F.	60	65	70	75	80	85	90	95	100
Time, Seconds	180	120	90	60	50	40	30	25	20

If you prefer longer development times, this is accomplished by diluting 1 part 90 to 10 parts water, or 1 part 90 to 20 parts water. This will give slightly increased film speed, as well as slightly finer grain. For slower, thin-emulsion films, the dilution method is recommended. Used in this manner, 90 becomes a one-time developer, and must be discarded after use. Do not use developer in which film has been processed, or to which replenisher has been added, for the dilution method.

Replenisher: For more stable life and constant results, we recommend the use of Ethol 90 replenisher, when using 90 stock developer. As a starting point, use $\frac{1}{2}$ oz. Ethol 90 replenisher for each 80 sq. in. of film processed (1 roll 35mm, 36-exp., 1 roll 120 film, or about 5 feet of film). This applies to both hand tank use or automatic processors.

Time and Temperature Tables: There is not exact developing time to give optimum results under all conditions, and since Ethol 90 is so broad in scope, we are not attempting to give you a table covering all films. We are setting forth a few of the most popular films, which should give you a starting point, a guide to continue with tests on films other than those indicated herein.

Film	Exposure Index	Dilution	Agitation	Time and Temperature
T-Max 100 - 35mm	200	Full strength	Constant	70°F. 100 seconds
T-Max 400 - 35mm	800	Full strength	Constant	70°F. 90 seconds
T-Max 100 - 120	250	Full strength	Constant	70°F. 105 seconds
T-Max 400 - 120	640	Full strength	Constant	70°F. 105 seconds
T-Max 100 - 4x5	250	Full strength	Constant	70°F. 100 seconds
T-Max 400 - 4x5	1000	Full strength	Constant	70°F. 90 seconds
T-Max P3200	3200	Full strength	Constant	75°F. 105 seconds
Agfa APX-100 - 35mm	160	Full strength	Constant	70°F. 90 seconds
Agfa APX-100 - 120	160	Full strength	Constant	70°F. 2 minutes
Agfa APX-25 - 35mm	80	Full strength	Constant	70°F. 90 seconds
Agfa APX-25 - 120	100	Full strength	Constant	70°F. 105 seconds
Ilford HP-5 Plus - 35mm	800	Full strength	Constant	70°F. 2 minutes
Neopan 400 - 35mm	1000	Full strength	Constant	70°F. 2 minutes
Neopan 1600 - 35mm	3200	Full strength	Constant	70°F. 2 minutes
Tri-X - 35mm	400	Full strength	Normal	70°F. 1 1/2 min.
Tri-X - 35mm	1600	Full strength	Normal	70°F. 6 minutes
Tri-X - 35mm	2000	1:10	Normal	70°F. 9 minutes
Panatomic-X - 35mm	80	1:20	Constant	70°F. 5 1/4 minutes
Plus-X - 35mm	250	1:20	Normal	70°F. 5 1/2 minutes
Plus-X - 35mm	320	1:20	Constant	70°F. 5 1/2 minutes
High Contrast Copy Film	64-80	Full strength	Normal	70°F. 4 1/4 min. (for line copy work)

ethol 90 film developer

Since Ethol 90 has a degree of compensating action, push processing will give but a minimum increase in grain, and will not block highlights while the developer continues to work in the shadow areas.

CINEFLURE FILM: In processing of cineflure films, Ethol 90 will give better contrast. The film base is extremely clear, compared to films processed in other developers.

Radiation factors may be reduced by 50% or more. (Reduce KV by 10, or reduce milli-ampereage by 50%). The 50% factor is conservative. If development is extended to about 6 min. at 70°F, the ASA rating of slow films may be increased by 3X and fast films to 8X. Normal X-Ray fixers may be used. Aside from lower radiation levels, improved contrast, and a clearer film base, Ethol 90 gives a lower tube load; therefore longer life. Low gain, borderline image tubes may still be useable and life extended; less radiation to the doctor and the patient, and fewer repeat examinations.

Since there are such a great variety of automatic processors on the market, we cannot cover the entire field. We therefore submit a brief table which should give processors of Cineflure, and other films, an adequate starting point on which to base their individual tests.

FILM	MACHINE	RATE OF TRAVEL	DEV. TIME	TEMP.
Double-X	Fisher-Processall	25' per min.	48 sec.	85°F. (1)
Double-X	Fisher-Processall	3.8' per min.		75°F.
Double-X	Fisher-Processall	5½' per min.		75°F.
Double-X	Fisher-Processall	4' per min.		75-82°F. (2)
Shellburst	Fisher-Processall	3' per min.		78°F. (3)
Shellburst	Fisher-Processall	3½' per min.		70°F.
Cineflure	Fisher-Processall	4' per min.	88-90 sec.	75°F.
Cineflure	Fisher-Processall	4' per min.	1½ min.	84°F.
Double-X	Combilabor	3' per min.		78°F.
Shellburst	Combilabor	3' per min.		71.6°F. (2)
Cineflure	Picker-Smith (with Nitrogen Burst Agitation)	2' per min.	3 min.	68°F. (4)
Double-X	Jamieson	45' per min.		75°F. (7)
EK Fine Grain Pos.	Houston-Fearless	3' per min.	3 min.	75°F. (4)
EK Fine Grain Sound Recording #7375	Hill Machine	50' per min.	30 sec.	90°F. (6)
Ilford G	X-ray diffraction film - Manual process in tray at 1:1 dilution varying time with temperature.			(5)

1. Replenishment rate 63 - 72 cc per min.
2. Replenish with fresh 90 Dev. at 10 cc per each 200' of film. With this method start new batch after each 2000' film processed.
3. Use Ethol 90 Replenisher.
4. Dryer temperature at 120°F.
5. Double Coated Radiographic film.
6. Replenish at 4.7 oz. per min.
7. Replenish with developer at 150 cc. per minute and dump after 2200 ft.

Some of the above named machines which are primarily plastic do not react well to harsh detergents or stainless steel cleaners. Using such may cause film fog. To wash such machines use a mild soap such as Ivory soap, scrub well with a clean cloth and rinse well. Other machines composed primarily of stainless steel may be cleaned with systems cleaners or a cleaner composed of 2 oz. Sodium Sulfite and 3 oz. Sodium Carbonate per each gallon of HOT water. Scrub well then rinse with hot water. If you wish to use the Sulfite Carbonate cleaner you may do so by allowing your machine and utensils to soak in this solution over night - then rinse well the following day and proceed as usual. Try to schedule cleaning regularly for better quality and better machine action. The average hospital cleans its machines every two weeks. You may do more or less frequently depending upon your volume.

ELECTRON MICROSCOPY: In using Ethol 90 for processing of plates and films for electron microscopy, you will find that you obtain superior contrast along with much shorter developing time (2 min. to 6 min. at 70°F) than that obtained with other developers. To get acutance and contrast, you may use constant agitation.

To retain normal contrast, use one-half oz. Ethol 90 Replenisher for each 80 sq. in. of film processed. If you desire more contrast in your negatives, you may use more replenisher, up to an amount which will maintain the original volume of developer.

As previously stated, Ethol 90 will not block highlights, and will give excellent shadow detail.

To obtain superior clarity, sharpest detail, and highest resolution for extreme enlargements, there is no finer combination than Ethol 90 for negative processing and a point light source enlarger for printing.

ethol T.E.C. film developers

Concentrate or 2-Solution

Description: T.E.C. is a compensating developer, offering maximum shadow detail, economy, developing control, and acutance. T.E.C. is panthermic, and may safely be used at temperatures from 60° to 80°F.

General Information: T.E.C. is available as a liquid concentrate. For use it is diluted 1 part developer to 15 parts water; use once and discard. It is recommended that a temperature of 70° to 75°F be used.

2-Solution T.E.C.: T.E.C. is also available in 2 solution powder form. To use, dissolve Can 'A' in ½ gallon of water and Can 'B' in ½ gallon of water. This becomes your "stock" solution. Place in 2 separate containers. Plastic juice containers will do. You may use any two types of containers for processing - plastic, Kinderman or Nikor. Fill one container with the 'A' Solution and the other the 'B' Solution, adjust temperatures to 75°F. Place the film reels into 'A' and then into 'B' for the recommended times **without any rinse between**. Follow with water rinse and rapid fixer. For longest life and quality, use distilled water for the "stock" solution. Normal color of solution after dissolving powders is clear to a weak tea color. Occasionally, however, the color may be somewhat darker, which may be due to variables in raw materials. 2-Solution T.E.C. is extremely long lasting when using the stock form (A & B separately), developing up to 200 rolls of 35mm 36 exposure film, or up to 120 rolls of 120 - 12 exp. film. During the useful developing life of this product the solutions will become darker and darker in color. This will not affect the high quality of the negatives. The longer life of 2-Solution T.E.C. is normal, due to the separation of the chemicals.

Note: For economy and negative control: 'A' is the developing agent, which will help control your density. 'B' is the activator for controlling contrast. Times may be changed in 'A' or 'B' or both in order to achieve the desired control. If you desire to develop by inspection, start your inspection as you are ready to remove the film from the 'A' bath.

For more economy in the one-shot method, you may take **unused fresh stock solutions** of the 2 bath method (solutions A & B) and mix 1 oz. of A solution and 1 oz. B solution with 14 oz. water; to make a total of 16 oz. solution; use once and discard; use times as shown for the dilution discard method.

- The recommended E.I. (exposure index) listed in this bulletin may be above or below that listed by the film manufacturer, but has been determined by us to be the best exposure index to arrive at the optimum negative with proper development in T.E.C.
- Water quality is important for quality processing. It should be as pure as possible. If your water supply is not free of minerals and foreign matter, the use of distilled or bottled water is recommended.
- If possible, do not pour solutions in and out of daylight loading tanks. Preferably, fill the tank with developer, and, in the dark, drop the loaded reel into it. Following development, lift the reel out, into the next solution. This contributes to more accurate timing and more uniform development of the negatives.
- High speed films will achieve maximum definition when developed in T.E.C., but will have slightly more grain than if developed in a fine grain developer. There is NO film speed loss to high speed films when developed in T.E.C. (Tri-X 35mm exposed at ASA-50 to ASA-2400 on the same strip of film, renders printable negatives from each frame).

Good Housekeeping: Cleanliness is a must. T.E.C. as well as other film developers can be contaminated by foreign matter. Tanks and reels should be cleaned periodically; a tooth brush makes an excellent tool for cleaning reels. Always dry tanks and reels **immediately** after use, with a clean, lintfree towel.

Storage: Liquid T.E.C. will keep almost indefinitely in the original sealed container. After opening a bottle and using part, it is recommended that the remainder be placed in a refrigerator, either in the same bottle or in new, unused, 1 oz. amber bottles. **Do Not Freeze.** Contrary to the 2-Solution T.E.C., the liquid concentrate is oxidized if it turns dark. **Do Not Use The Liquid Concentrate If It Has Turned Brown Or Reddish In Color.**

Agitation: For 35mm and 120 roll films, tanks that can be inverted during agitation are preferred. Immediately after immersing film, agitate for the first 15 seconds, then agitate 5 seconds at the end of each 30 seconds. Our method is 3 gentle inversions during the 5 second with a gentle rotation of the tank followed by putting the tank down with a gentle tap at the end of each interval to dislodge any air bubbles that may have formed. Where very deep roll film tanks are used, it is suggested reels be placed on a long wire and agitation carried out by a gentle lifting and turning of the reels during the agitation periods. **Do Not Lift Out Of Solutions.**

Developing in a tray or dish, with constant agitation, will reduce developing time by approximately 20%.

Short Stop: A short-stop is **not recommended** except in cases where the temperature exceeds 75°F. If temperatures over 75°F are encountered, a hardening stop bath is advised. Use 1 tsp. sodium bisulfite and 1 tsp. potassium chrome alum per qt. of water. Use once and discard. In lieu of the short stop, a brief water rinse of 20 to 30 seconds may be used, if desired.

Fixing The Film: Use a rapid hardening fixer. Fix for twice the clearing time. Thick emulsion or high speed films will require about ½ longer to fix than the slower, thin emulsion films. Do not overfix.....delicate half-tones will be destroyed and grain clumping will result. If your fixer is not fresh, fogged or stained film may be expected.

Washing - Drying: Washing is preferably done in a high speed unit such as the Wat-Air which clears film in 3-5 minutes. Following the wash, immerse the film in a good wetting agent (about 3-4 droplets of wetting agent to one quart of water; distilled if possible) while gently agitating for about 30 seconds. Remove film to dry. Keep a good photo viscose sponge in the wetting agent at all times; squeeze it out and gently wipe your film down once on each side. Allow the film to dry in a dust free area and at a temperature as close as possible to the processing temperature used. Do not use a fan or heat.

Temperature: The importance of accurate temperature uniformity throughout the developing procedure cannot be overemphasized. Inaccuracies in thermometers are very common, and can play havoc with negative contrast. Check your thermometer often. Keep developer, fix, wash and drying at the same temperature. Avoid high temperature processing of high speed films; chemical fog may result.

ethol T.E.C. film developers

Concentrate or 2-Solution

Time & Temperature Table: Photography is not an exact science, and variables are encountered with each photographer and his equipment. The following tables are furnished as a guide; a Starting Point so that you may achieve the optimum negative quality. The normal speed index (E.I. rating for the film processed in Ethol T.E.C.) may be higher or lower than its official ASA rating. This is the optimum rating for Ethol chemistry, and should not be confus-

ed with "pushed index". Using a double condenser enlarger, the E.I.'s given in the table should give optimum print quality when the negatives are developed as instructed. Negatives that are to be enlarged with a diffusion type of enlarger will require about 20% longer developing times, as they require a higher gamma. **There is no single correct developing time to give optimum results under all conditions.**

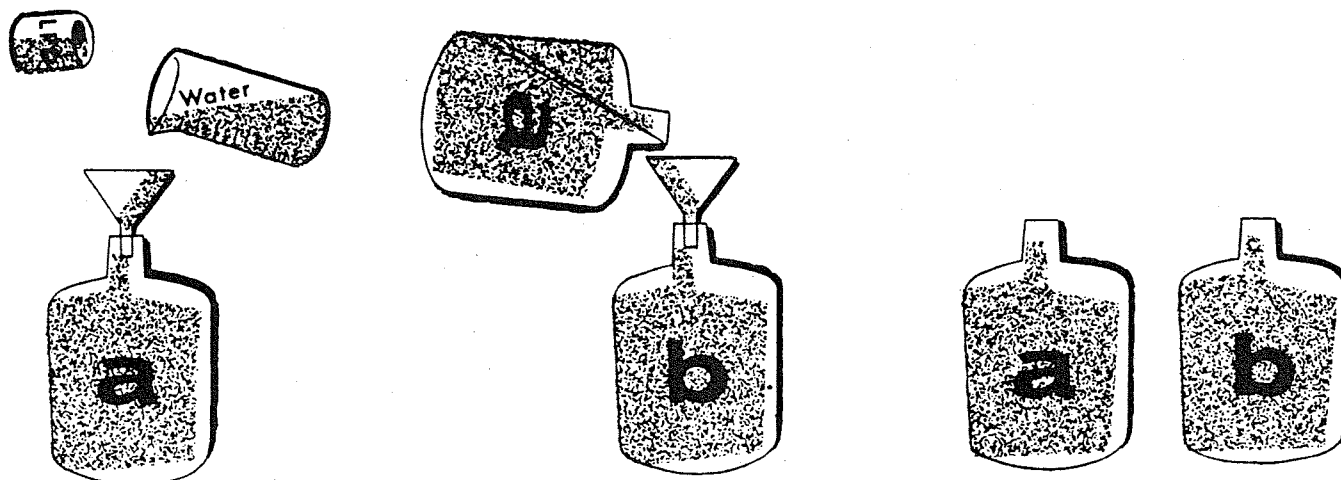
ONE-SHOT METHOD from concentrate					E.I. Used For 2-SOLUTION METHOD Chemistry at 75°F		
	Exposure Index	TIME / TEMPERATURE			Exposure Index	"A"	"B"
		70°	75°	80°			
35MM FILMS							
Kodak T-Max 100	100	14½	11½	8¾	160	4 min.	2½ min.
	160	17	13¾	10¼	---	---	---
Kodak T-Max 400	320	15¼	12½	9½	400	4 min.	3 min.
	640	18½	15	11½	---	---	---
Kodak T-Max P3200	3200	17½	14¼	11½	3200	6 min.	5 min.
	6400	22¾	18½	15	---	---	---
Agfa APX-100	160	13¼	11	8¼	250	3 min.	2 min.
	250	17¾	14¼	10½	---	---	---
Agfa APX-25	64	15	12	9	64	3 min.	2 min.
	80	17¾	14¼	10½	---	---	---
Ilford HP5 Plus	640	14¼	11¼	8½	800	4 min.	3½ min.
	800	17¾	14	10½	---	---	---
Neopan 400	500	14	11¼	8½	800	4¼ min.	3 min.
	1000	18	14½	11	---	---	---
Neopan 1600	1600	24	19¼	14½	2000	5¼ min.	3 min.
	2400	27	21½	16½	---	---	---
Kodak Tri-X Pan	1000	12	9½	7¼	1200	4 min.	3 min.
Kodak Plus-X	400	12	9¾	7¾	500	3 min.	3 min.
Kodak Panatomic-X	80	5½	4¾	4½	80	1½ min.	1 min.
Kodak 2415 (dilute 1:30)	100	5½	NR	NR	100	2 min.	¾ min.
Ilford HP-5	1600	15	13¼	11¾	1280	5 min.	5 min.
Ilford FP-4	320	10	8¾	7¾	320	3½ min.	3 min.
Ilford Pan-F	64	6½	5½	4¾	100	2¼ min.	2 min.
Efke (Adox) KB-14	100	7	---	---	80	1½ min.	½ min.
Efke (Adox) KB-17	160	7	6½	6	125	2 min.	½ min.
Efke (Adox) KB-21	400	10	9½	8¾	---	---	---
Agfapan 25	64	5	4¾	4¼	40	3 min.	½ min.
Agfapan 100	200	5½	4¾	4	200	1½ min.	1 min.
Agfapan 400	1000	11	9½	NR	800	4 min.	2 min.
VTE Pan (dilute 1:30)	64	10	---	9	---	---	---
VTE Ultra (dilute 1:45)	25	20	17	14½	---	---	---

ethol T.E.C. film developers

Concentrate or 2-Solution

ONE-SHOT METHOD from concentrate					E.I. Used For 2-SOLUTION METHOD Chemistry at 75°F		
	Exposure Index	TIME / TEMPERATURE			Exposure Index	"A"	"B"
		70°	75°	80°			
120 FILMS							
Kodak T-Max 100	200	14	11¼	8½	200	4 min.	3½ min.
	320	17	13½	10¼	---	---	---
Kodak T-Max 400	400	14½	11½	8¾	650	4 min.	3 min.
	800	17	13½	10¼	---	---	---
Agfa APX-100	250	13¼	10¼	7¾	320	3 min.	2½ min.
Agfa APX-25	50	13½	10¾	8¼	64	3 min.	2¼ min.
	100	15¾	12¾	9¾	---	---	---
Kodak Tri-X Pan	800	13	11	9½	640	4 min.	3 min.
Kodak Tri-X Pan Prof.	400	14½	11½	9½	400	2½ min.	2 min.
Kodak Plus-X Pan	320	9	7¼	6	400	3 min.	3 min.
Kodak Panatomic-X	80	6	4¾	3¾	100	2¼ min.	2¾ min.
Kodak Verichrome Pan	320	8	6½	NR	320	3 min.	3 min.
Ilford HP-5	800	15	12¾	10½	1000	5 min.	5 min.
Ilford FP-4	250	6½	5¾	5	400	3 min.	3 min.
Ilford Pan-F	80	7	6½	6	100	2¼ min.	2¾ min.
Agfapan 25	50	6	5	4¼	50	5 min.	1 min.
Agfapan 100	250	5½	4¼	3½	250	1½ min.	1 min.
Agfapan 400	640	19	14¼	10¾	640	4 min.	3 min.
VTE Pan (dilute 1:45)	50	13	---	---	---	---	---
4 x 5 SHEET FILM							
Kodak T-Max 100	80	20	16½	13	160	4 min.	3½ min.
	160	24	20	15¾	---	---	---
Kodak T-Max 400	400	18½	15¼	12	500	4 min.	3 min.
	640	21¾	18	14¼	---	---	---
Kodak Tri-X Pan	400	9¾	8½	7½	320	2 min.	2 min.
Kodak Plus-X	250	12	10¼	8¾	200	4¾ min.	4 min.
Kodak Ektapan	100	14¼	12	10¼	160	5 min.	5 min.
Kodak 2415 (dilute 1:30)	80	9	NR	NR	80	2 min.	¾ min.
Ilford FP-4	160	14½	12	10	250	7 min.	9 min.
Ilford HP-4	400	17¾	15½	14	640	7 min.	9 min.
Agfapan 25	25	10	8¾	7½	---	---	---
Agfapan 400	500	21½	16¾	13¼	---	---	---

Replenishing LPD Paper Developer (from powder form)

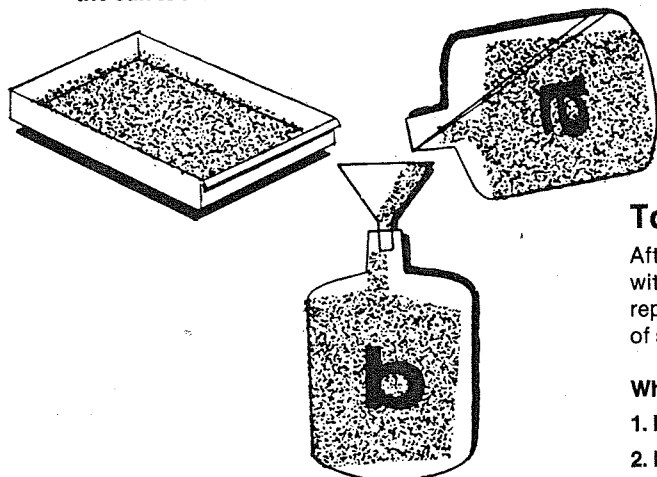


1. Mix well as per directions on the can to make stock solution.

2. Pour ½ into another bottle.

3. Fill both bottles with water and mix well.

A - becomes replenisher
B - becomes working solution.



To Replenish

After printing 15 - 8x10 prints in tray containing 1 quart of solution, replenish with 5 oz. of replenisher. After 30 prints in tray using ½ gallon of solution, replenish with 10 oz. of replenisher. After 60 prints in tray containing 1 gallon of solution, replenish with 20 oz. replenisher.

When done with print session:

1. Pour solution remaining in tray back into working solution bottle.
2. Replace depleted portion from replenisher bottle.

Continue until all replenisher has been used. Then start procedure with fresh solutions.

Note: The above diagrams apply to single weight paper, 8x10 size, at the 1:2 dilution.

For those who wish to use this system with double weight papers, you may compute that each 8x10 double weight paper uses approximately ½ oz. of developer.

Do not attempt to print 70 or 80 prints before replenishing. Replenish as indicated in the diagram. This will assure you that your solution is at full strength, for as explained previously, a Phenidone developer regenerates quickly.

For those who prefer a more contrasty type of solution or for those who use continuous automatic machines or for those who wish to hold working time to a minimum, make working solution by diluting stock solution 1:1. For this purpose, use straight stock solution as your replenisher.

For Softer Prints: Make solution on a 1:4 basis and replenish as follows. Make the original stock solution. Remove 1/5 of this into another bottle and fill with water to make your working solution. Now take the first bottle which still has 4/5 of the solution remaining and split into 2 bottles containing equal amounts of solution and fill these two bottles with water. You now have 2 bottles of replenisher from which you may replenish on the same basis as the above.

In the event you are a user of **Concentrate / LPD** and wish to use a replenishment system, take a quart or gallon of the Concentrate, and add twice as much water. This becomes your replenisher. Then, when printing, using the normal concentrate working solution; after approximately each 20 prints, add enough of the replenisher to the tray to bring it up to the original level.