

FORMULAS AND DIRECTIONS FOR



Defender
TRADE MARK

FILMS

If the film is to be repacked for mailing after exposure, it should be carefully interleaved with the original separating paper, rewrapped in the original wrapping and inserted in the complete three-part box. These precautions are necessary to avoid abrasion and other defects which are liable to be caused by rough treatment in the mail.

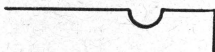
Since sensitized film is affected by heat and moisture, it should be kept in a cool dry place at all times. It is suggested that boxes and wrappers be preserved for storage of exposed film.

The emulsion side may be easily identified by notches cut in the top edge of each film. If films are held so that the notches appear in the position indicated below, the sensitized surface is towards the observer.

These notches are different for each brand of "Defender" Film. The illustrations below indicate how the film may be distinguished after being removed from the package or, as a negative, at any later time. "Defender" Films are coated on safety base only, and all films are coated with a neutral colored non-halation backing that disappears in the developer.

Blue Sensitive

PROCESS ORTHO

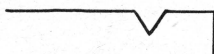


COMMERCIAL



Orthochromatic

PORTRAIT



"PENTAGON"



"X-F" ORTHO

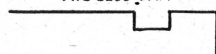


ORTHO 7

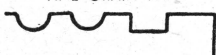


Panchromatic

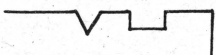
PROCESS PAN



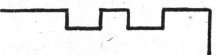
FINE GRAIN PAN



"X-F" PAN



"ARROW" PAN



"Arrow" Pan is a film with exceptionally high speed and quality. With its high red sensitivity, greatest speed advantage is by incandescent light. This type of sensitivity gives practically perfect color correction by daylight and also by daylight fluorescent lighting.

"X-F" Pan. A generally useful film. It possesses exceptionally high speed and is sensitive to all colors without being over-corrected for red. Its relative sensitivity to the natural brilliancy of all colors is as accurate as it is possible to manufacture.

"X-F" Pan Abrasion Proof Retouchable Surface. This film is manufactured with a special treatment which eliminates abrasion marks due to handling. At the same time this special treatment offers more tooth for retouching than a non-treated emulsion surface, thus overcoming the disadvantage of slickness normally associated with non-abrasion films. Etching and other special modifying treatments are in no way affected.

Fine Grain Pan. A film of about half the speed of "Defender X-F" Pan, with similar color sensitivity and especially intended for all work requiring a high degree of enlargement. As it is capable of being developed to a much greater contrast than "X-F" Pan, its utility covers a wider range than the faster film and it is clearly indicated for use in all kinds of commercial work.

Ortho 7 film is a very high speed orthochromatic material with medium contrast. The speed and contrast are such that it is suitable for both portraiture or commercial or press work, depending on the developer used.

"X-F" Ortho is highly orthochromatic, yet not red sensitive, so can be handled in a dark red safelight. Its high orthochromatic quality makes it nearly as fast as "X-F" Pan to mazda or tungsten light; it is suitable for all type of work, especially commercial.

Portrait Film is intended for all around portrait, landscape and commercial work. It is slightly orthochromatic and can be safely handled in a red safelight.

"Pentagon" Film is intended for general commercial work, can be used for portraiture, is excellent for copying, has a combined non-halation backing and retouching back which enables negative modification to be accomplished with greater ease. This film can be handled in a red safelight. It is highly orthochromatic.

Commercial Film is popularly described as non-color-sensitive, that is to say, it possesses the sensitivity of normal photographic emulsions to blue light and is not specially sensitized. It is intended for use by the commercial photographer. It is comparatively slow in speed, clear, of brilliant gradation, and can be handled in a bright red safelight.

Process Ortho Film is specially recommended for copying high contrast line work where color rendition is of minor importance.

Process Pan Film is recommended for line copy work where color rendition and high contrast are prime factors, such as the proper contrast and color rendition of blue prints.

"Defender" Light Filters are available in gelatin and lacquer protected gelatin in all the usual varieties and in varieties specially intended for use with "Defender" products.

EXPOSURE RATINGS—"DEFENDER" FILMS

Films	A.S.A.*		G.E.*		Weston*	
	Daylight	Tungsten**	Daylight	Tungsten	Daylight	Tungsten
"Arrow" Pan	125	80	160	100	100	64
Ortho 7	125	64	160	80	100	50
"X-F" Pan	64	40	100	64	50	32
"X-F" Ortho	64	20	100	32	50	16
F. G. Pan	32	20	40	24	24	16
"Pentagon"	32	20	40	24	24	16
Portrait	32	10	40	12	24	8
Commercial I	16	5	20	6	12	4
Process Ortho			10	5	6	3
Process Pan			20	12	12	8

*Tentative ratings, subject to further laboratory tests.

**These values are suggested for use with exposure meters or guides using the A.S.A. speed numbers or exposure index.

FILTER FACTORS FOR "DEFENDER" FILMS

"Defender" Filters	10-Y		50-Y		15-G		55-Y		30-O		40-R		40-G		50-B	
	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D
"Arrow" Pan	1.1	1.2	1.3	1.5	3.0	4.0	1.5	2.0	1.2	1.8	3	4.3	13	11	25	15
"X-F" Pan	1.3	1.5	1.5	2	3.0	4.0	1.6	3.5	1.8	3	4.5	9	6	8	13	5.6
Fine Grain	1.2	1.3	1.5	1.8	3.5	4.5	2.0	2.2	2.2	2.6	4.5	9.5	8	8	14	6
Process Pan	1.2	1.6	1.5	1.8	6	4.5	2.5	2.0	1.8	2.4	4.5	8.2	8	6	14	6
Ortho 7	1.5	1.7	2.0	4	3	4.5	3	9.5	3	5			4	8	5	3
"X-F" Ortho	1.5	1.7	2.0	4	3	4.5	3	9.5	3	5			4	8	5	3
"Pentagon"	2.5	3	4.0	7	5	8	7.5	17	9	24			9	28	4.5	3.5

"DEFENDER" GELATIN FILTERS

In addition to such filters as mentioned above there are available special Tri-color Separation Filters of 1:1:1 exposure ratios for "X-F" Pan with average Daylight (Nos. 40R, 50G, 100B) and tungsten lightings (Nos. 50R, 50G, 50B).

53-D All Purpose Developer

Stock Solution

	Avoirdupois	Metric
Water (125° F. or 52° C.).....	16 ozs.	500.0 cc.
Metol.....	45 grains	3.0 grams
Sodium Sulfite.....	1½ ozs.	45.0 grams
Hydroquinone.....	175 grains	12 grams
Sodium Carbonate Mono.†.....	2 ozs. and 278 grains	79.0 grams
†If desiccated, use.....	2¼ ozs.	67.5 grams
Potassium Bromide.....	27 grains	1.9 grams
Add cold water to make.....	32 ozs.	1 liter

Dilute 1 part stock solution with 2 parts water. Develop 5 to 7 minutes at 68° F. Greater contrast may be obtained by less dilution or increasing the developing time.

53-D developer is particularly recommended for use with "Defender" Ortho 7 film when used for press or commercial work.

4-D Borax Developer

Water (125° F. or 52° C.).....	24 ounces	750.0 cc.
Metol.....	37 grains	2.5 grams
Sodium Sulfite, desiccated.....	2½ ounces	75.0 grams
Hydroquinone.....	45 grains	3.0 grams
Borax, crystals.....	75 grains	5.0 grams
Add cold water to make.....	32 ounces	1.0 liter

Dissolve chemicals in the order given. Use full strength. Develop 6 to 9 minutes at 68° F. (20°C.) with intermittent agitation.

This developer is especially well suited for the processing of "Defender Arrow" Pan Film since the maximum effective emulsion speed of the film is obtained with this developer. In addition, this developer is very satisfactory for use with all "Defender" films and produces fine grained cold tone negatives very similar to the "Defender" 6-D formula.

4-DR Replenisher

Water (125° F. or 52° C.).....	1.0 liter
Metol.....	3.75 grams
Sodium Sulphite, desiccated.....	76.5 grams
Hydroquinone.....	4.5 grams
Borax.....	25.0 grams

Directions for replenishing 4-D as follows: (Based on 3½ gallon tank)

1. Develop first thirty 5 x 7 films or comparable area of other size.
2. Remove enough developer from tank to allow for adding 26 ozs. of replenisher solution.
3. Add enough previously removed developer to bring tank back to working level, before developing next batch of films.
4. Repeat replenishment for each batch of films on the basis of 184 ozs. per 5 x 7 film or .024 ozs. per square inch.

2-D Pyro-Metol Developer

Solution A		
Water (125° F. or 52° C.).....	28 ozs.	900.0 cc.
Metol.....	¼ oz.	7.5 grams
Sodium Bisulfite.....	¼ oz.	7.5 grams
Pyro.....	1 oz.	30.0 grams
Potassium Bromide.....	60 grains	4.0 grams
Add cold water to make.....	32 oz.	1.0 liter

Solution B		
Water (125° F. or 52° C.).....	28 ozs.	900.0 cc.
Sodium Sulfite, desiccated.....	5 ozs.	150.0 grams
Add cold water to make.....	32 ozs.	1.0 liter

Solution C		
Water (125° F. or 52° C.).....	28 ozs.	900.0 cc.
†Sodium Carbonate, monohydrated.....	2 ozs. 405 grains	88.0 grams
Add cold water to make.....	32 ozs.	1.0 liter

†If desiccated carbonate is used the quantity given above must be decreased to 2½ oz. (75 grams).

Dissolve the chemicals in the order given.

For use in tray: take 1 part each of Solution A, B and C, dilute with 8 parts of water. Develop 6 to 8 minutes at 68° F. (20° C.).

For use in tank: take 1 part each of Solution A, B and C, dilute with 13 parts of water

For replenishing the 2-D developer, take:

Stock Solution A.....	2 ozs.	64.0 cc.
Stock Solution B.....	2 ozs.	64.0 cc.
Stock Solution C.....	2 ozs.	64.0 cc.
Add cold water to make.....	8 ozs.	250.0 cc.

Mix Replenisher as needed and add to 2-D developer in sufficient quantity to maintain tank level.

The life of this developer will be prolonged if floating lid is used to retard oxidation.

777 Panthermic Developer

For those desiring a fine grain developer, 777 Developer is especially recommended. Used according to instructions this developer will always give a constant contrast with a constant time of development, gives exceptionally fine grain and can be developed with entire satisfaction at tropical temperatures.

TIME GAMMA TABLES

Gamma is the numerical expression given to the exact measurement of steepness of gradation.

The average Portrait negative has a gamma of about .7, Landscape and Commercial subjects between .9 and 1.0. There is considerable variation in personal preference and the printing process used must be considered.

The following tables enable users of "Defender" films to control understandingly

the contrast, or steepness of gradation, of their negatives.

The tables give the time of development in minutes for various developers at a temperature of 68° F. (20° C.). All times are for developers diluted as for tank use and based on constant agitation. Lower gammas will be obtained if the developer is not sufficiently agitated.

For Gamma .8

Developers	2-D	3-D	4-D	6-D	53-D
"Arrow" Pan	7½	4	8½		
"X-F" Pan	5¾	4¾	11	12	
Fine Grain Pan	5½	4	7¾	9½	
Ortho 7	10	30	33		5
"X-F" Ortho	5	5	8	11	
Portrait	7	4	9½	11	
"Pentagon"	6½	5¼	8½	14	
Commercial				6¼	

For Gamma .9

Developers	2-D	3-D	4-D	6-D	53-D
"Arrow" Pan	9½	5	10½		2
"X-F" Pan	7¼	6¾	14	13	
Fine Grain Pan	7	5	11	10½	
Ortho 7	24				6½
"X-F" Ortho	6	6	11	13	
Portrait	10	5	13½	13	
"Pentagon"	8½	7¼	11	18	
Commercial				8	

For Gamma 1.0

Developers	2-D	3-D	4-D	6-D	53-D
"Arrow" Pan	13	6	12½		2¾
"X-F" Pan	9	10	17	16½	2½
Fine Grain Pan	9	7	17	14	
Ortho 7					12
"X-F" Ortho	8	11	21	17	2¼
Portrait	12½	6¼	24	16	
"Pentagon"	12	11½	15	25	
Commercial				9½	2

For Gamma 1.1

Developers	2-D	3-D	4-D	6-D	53-D
"Arrow" Pan	18	7	14½		3½
"X-F" Pan	12			26	4
Fine Grain Pan	12	9		20	
Ortho 7					
"X-F" Ortho	11			19	4
Portrait		8		16	
"Pentagon"	18				
Commercial				11½	2¾

Tank development is recommended for its saving of time and trouble and for assuring more uniformity of negative quality. The film, being handled in hangers, is less likely to be damaged during development, fixation, washing or drying.

The film should be kept in the same hanger until dry. Both film and hangers should be well washed before they are hung to dry.

The formulas given, combined with the use of these tables will, we believe, meet the requirements of all negative makers. However, almost any accepted developing formula can be used with success on "Defender" Film.

Pyro developers naturally give a negative image of a warm color. The degree of this warmth or yellowness depends naturally upon the degree of oxidation of the Pyro solution. Although the time gamma tables given above are correct when the Pyro is fresh and no developing stain occurs, the greater the stain in any negative the higher will be the working gamma or contrast.

Color Separation Negatives: To avoid any possible chance of faint flow marks due to insufficient agitation of hangers, it is recommended that all 3-color separation negatives be developed in trays (preferably in three trays, one for each negative.)

FIXATION—FORMULAS

After development, films are rinsed briefly in fresh water and transferred immediately to Hardening and Check Bath.

Hardening: The hardening bath is not essential but helps to prolong life of the fixing bath and is particularly beneficial in hot weather.

2-S Hardening and Check Bath

Water (120° F.).....	112 ozs.	3600 cc.
Pot. Chrome Alum.....	2 ozs.	60 grams
Acetic Acid 28%.....	3 ozs.	96 cc.
Water to make.....	1 gal.	4 liters

1-F Acetic Acid Fixing Bath

Water (120° F.).....	112 ozs.	3600 cc.
Hypo.....	2 lbs.	960 grams
Sodium Sulfite (Anhyd.)	2 ozs.	60 grams
Acetic Acid 28%.....	6 fl. ozs.	192 cc.
Boric Acid Crystals.....	1 ozs.	30 grams
Potassium Alum.....	2 ozs.	60 grams
Water to make.....	1 gal.	4 liters

This bath will last longer than ordinary fixing formulas and gives great freedom from scum on the negative.

This fixing bath remains clear although exhausted. For this reason it is NOT recommended for paper, unless accurate check is kept on number of prints fixed. Using an exhausted fixing bath of this type may easily result in stains on the finished prints.

Washing: Fifteen minutes in running water will thoroughly wash out all traces of fixing chemicals. After washing, films are laid on wet glass and, if necessary, rubbed off front and back with wet cotton or a viscose sponge to remove any scum or surface deposit. The film negatives are then rinsed in clean water and hung up to dry. Keep them in the same position until water has drained off to avoid drop marks which cause spots or "teardrops."

The use of a wetting agent such as Aerosol is highly recommended for the prevention of cockle and water spots during drying. For use, take one part of a 10% Aerosol OT clear solution* (or its equivalent) and add 25 parts of water. Bathe films in this solution for 2 minutes after washing and then dry. One liter of the diluted bath will treat about 2000 square inches of film. Exhaustion is evident when the solution fails to run off freely.

*Available from your chemical dealer or American Cyanamid & Chemical Corporation, 30 Rockefeller Plaza, New York City.

In drying, films must not be allowed to come in contact with each other.

Films should be dried in a current of dust free, dry, cool air having equal velocity on both sides of film.

E. I. DU PONT DE NEMOURS & COMPANY

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PHOTO PRODUCTS DEPARTMENT

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