

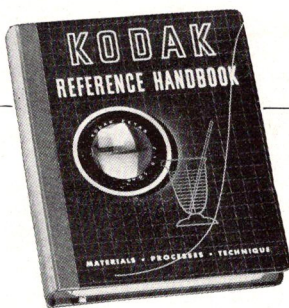
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DATA BOOK ON

# KODAK PAPERS

*New Edition Punched for Kodak Reference Handbook*





*This Data Book is punched to permit its use in revising the Papers section of the*

## **KODAK REFERENCE HANDBOOK**

KODAK PAPERS discusses the photographic and physical characteristics of Kodak Photographic Papers for both contact printing and enlarging. The section on Printing for Quality offers information relative to choice of paper surface and contrast grade, printing and enlarging equipment, exposure determination, print faults, and mounting. Processing instructions and formulas appear in the Appendix.

In addition, this Data Book has been specially planned and punched so that it can be used to replace the Papers section of the Kodak Reference Handbook. *If the latest copyright date opposite page 3 in the introductory section of your Kodak Reference Handbook is 1943, or earlier, this Data Book provides you with an up-to-date revision of information about Kodak Photographic Papers.*

The cover must be removed to permit the insertion of the Data Book in the Handbook. The Appendix at the end of the book can also be discarded since this information is duplicated in other sections of the Handbook. If you prefer the pages to be loose-leaf, remove the wire stitches and cut the pages apart, a few at a time, along the fold.

If you do not own a Kodak Reference Handbook, see your Kodak Dealer. This comprehensive reference book contains sections devoted to Lenses, Films, Filters, Color Films, Papers, Processing, Formulas, Copying, and Slides.

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## APPENDIX (following page 38)

*This information appears in the Processing and Formulas sections of the Kodak Reference Handbook. The Appendix pages can therefore be discarded when this Data Book is used to replace the Papers section of the Handbook.*

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DATA SHEETS

Contrast

Effects  
of Variations  
in Development

Speed  
Values

Image  
Tone

Choice of Paper  
Surface, Color,  
and Contrast

Exposure  
Determination

Processing

Special  
Purpose  
Papers

AZO

VELOX

KODABROMIDE

PROJECTION

OPAL

KODALURE

ROYAL  
BROMIDE

# KODAK PAPERS

THE object of most photographic work is to produce a print of good quality. This involves two things: selection of the proper negative, and the photographer's personal interpretation of the subject through the printing procedure. A good negative is obtained by correct exposure and development. A print of high quality will result only if an appropriate printing paper is used, and if care is taken to expose and develop it so that full advantage is taken of its ability to give that quality for which it was designed.

The manufacturer of photographic printing papers aims to produce materials which will give good prints from negatives of varying characteristics, and which will permit a wide range of quality to be attained in the final results. This is necessary because there are many different purposes for which prints are made, and because there is much variety in the personal tastes of photographers.

The following pages are intended to guide the photographer in the proper choice and use of papers for contact printing and enlarging, and in this manner to assist him in obtaining the best results that his negatives will yield. The characteristics and purposes of Kodak Photographic Papers and the recommended methods of handling these papers are described in detail. Kodak Papers are noted for their quality, uniformity, and ease of manipulation, factors which aid the user in producing consistently good prints.

# CHARACTERISTICS OF KODAK PAPERS

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PHOTOGRAPHIC printing papers differ in a great many respects. A knowledge of these differences and the reasons for them will greatly assist in the intelligent choice and use of a photographic paper. Among the more important properties are (1) contrast, the factor which fits the paper to the contrast of the negative, and (2) relative speed, which fits the paper to the printing method or equipment. The choice of tone of the image, and surface and tint of the paper stock depend largely on the subject matter and the intended use of the print.

Contrast and its related aspects are considered here under the general heading of Photographic Characteristics. Relative speed, another photographic characteristic, depends largely on the type of the emulsion. For this reason a discussion of the nature of the light-sensitive emulsions also is included here. Surface texture, paper tint, tone of the image, and so forth, are treated as Physical Characteristics. These distinctions will lead perhaps to a clearer conception of the properties of Kodak Photographic Papers.

## THE NATURE OF PHOTOGRAPHIC PAPER EMULSIONS

THE light-sensitive emulsion, generally speaking, is a light-sensitive silver salt suspended in gelatin. The chemical composition of the silver salt, the method of its formation, and the addition of special agents determine such photographic qualities as speed, contrast, and tone of the image. Photographic papers may be considered as representing three general types. Mention of the type of paper so classified is frequently required on the entry blank used in submitting prints to photographic salons.

**Chloride papers** have emulsions which consist principally of silver chloride in gelatin. These papers have comparatively low speed and are intended for contact printing. Among Kodak chloride papers are included Azo, Ad-Type, Velox, and Professional Azo.

**Bromide papers** are coated with silver bromide emulsions. As a result of their high speed they have been used generally for enlarging, but are now being replaced largely by "chloro-bromide" papers.

**Chloro-bromide papers** have emulsions containing both silver chloride and silver bromide as principal ingredients. The speeds of these papers vary over a wide range, depending largely on the proportions of silver bromide to silver chloride. In the faster papers, such as Kodabromide, the silver bromide predominates; while in the slower ones, such as Vitava

Opal and Kodalure, there is a larger proportion of silver chloride.

Some papers of this type, such as Opal and Kodalure, permit wide variation in the warmth of the image tone, and give more pleasing rendering in the shadow tones than bromide papers.

## **PURPOSE OF KODAK PAPERS**

PAPER CHARACTERISTICS are summarized briefly here, listed with respect to the methods used in printing.

### **Contact Printing—**

#### **With Negatives Varying in Contrast**

VELOX: Six contrast grades, one surface, blue-black image.

AZO: Six contrasts, three surfaces, rich black image.

PROFESSIONAL AZO: Three contrasts, five surfaces, warm black image.

#### **With Negatives of Uniform Contrast**

VITAVA OPAL: One contrast, four surfaces, warm black image.

KODALURE: One contrast, three surfaces, rich brown image.

### **Enlarging—**

#### **With Negatives Varying in Contrast**

KODABROMIDE: High speed, five contrasts, five surfaces, rich black image.

VITAVA PROJECTION: Medium speed, two contrasts, two surfaces, warm black image.

ROYAL BROMIDE: Extreme speed, four contrasts, six surfaces, blue-black image.

#### **With Negatives of Uniform Contrast**

VITAVA OPAL: Low speed, one contrast, four surfaces, warm black image.

KODALURE: Low speed, one contrast, one surface, rich brown image.

## Photographic Characteristics of Printing Papers

### CONTRAST

CONTRAST is a property of a printing paper with which the photographer is especially concerned. Contrast involves two factors: *density range* and *exposure scale*.

**Density Range** is the range of reflection densities\* from clear unexposed areas to the deepest black which the paper will produce. Since the print is viewed by reflected light, the density in the highlights is practically that of the clear paper, while the density of the deepest possible shadows is limited by the light reflected from the surface of the developed silver particles and the gelatin. The density range varies also with the surface texture of the paper, and to a lesser extent with the emulsion type.

Maximum density of glossy papers such as Azo F is about 1.70. For smooth and fine-grained lustre surfaces, such as Kodabromide N and E, the value is about 1.50. The matte-surface papers have maximum density values between 1.30 and 1.20. Density range affects visual contrast of a print. For example, if the same negative is printed on both glossy and matte papers, chosen to have the same exposure scale, the glossy print appears more contrasty even though both papers are exactly suited to the negative. Thus, the higher the density range of photographic paper—other things being equal—the more contrasty is the appearance of the print.

**Exposure Scale** must not be confused with the speed or exposure time required, but relates to the range of light intensities required to produce a print having the full range of useful tones from white to black. For example, in the case of Velox 0, if a light intensity of 1 produces a just noticeable effect, then a light intensity 30 times as great is required to produce a full black. The exposure scale values given in the Data Sheets are based on gradient or slope measurements on the characteristic curves and indicate the exposure interval between one point on the low or highlight end of the curve and another point on the shoulder or shadow end of the curve. This interval is related to the range of light intensities transmitted by the significant parts of the appropriate negative.\*\*

The essential difference between contrast grades of the same paper is

\*The term "reflection density" is explained in "Characteristic Curves."

\*\*For a discussion of methods of determining exposure scale, see "Control of Photographic Printing by Measured Characteristics of the Negative," L. A. Jones and C. N. Nelson, *Journal of the Optical Society of America*, October 1942, page 558.

one of exposure scale. The higher the contrast of the paper, the lower the exposure scale. For different surfaces of the same contrast grade of a given paper, exposure scale is essentially the same, e.g., the value for Azo No. 2 applies equally well to Azo E or F, No. 2.

**Paper Contrast Grades Available:** As mentioned before, the difference between contrast grades is essentially one of exposure scale.

Azo, Velox, Projection, and Kodabromide are supplied in several contrast grades to fit negatives which differ in contrast. Such differences may be due to variations in subject, lighting, exposure, or development. Other papers, such as Vitava Opal, Kodalure, and Professional Azo, are intended for use with negatives of uniform quality made under more carefully controlled conditions of lighting, exposure, and development, and for this reason are supplied in fewer contrast grades. The various paper contrast grades are listed in the Data Sheets.

### **Effects on Contrast of Variations in Development**

THE contrast of photographic papers is, for most practical purposes, inherent in the emulsion and the paper surface; hence it can be controlled only within narrow limits by variations in development time or developer composition.

**Development Time:** The effect of different development times on the contrast of different papers will be of interest to many photographers and darkroom operators. In the curves which follow, samples of each paper tested were exposed to tungsten light at 2800°K. for four seconds, and developed for the times marked on the curves. Although only three specific paper types are charted, each is representative of the other similar papers, as indicated in the captions.

The extremely long development times given on the curves should not be used unless processing conditions are ideal. This assumes that the solutions are fresh and that there is no danger of safelight fog.

The principal effect of increased development time with a chloride printing paper such as Azo or Velox is to give the appearance of increased exposure, or greater over-all print density, rather than increased contrast. The contrast of a chloro-bromide paper can be varied through a somewhat wider range. Even in the latter case, the contrast variation is much less than that which can be obtained by varying the development time of a negative material.

The behavior of Velox is similar to that of Azo. Likewise, the behavior of Projection, Illustrators' Special, and Kodalure is similar to Opal in



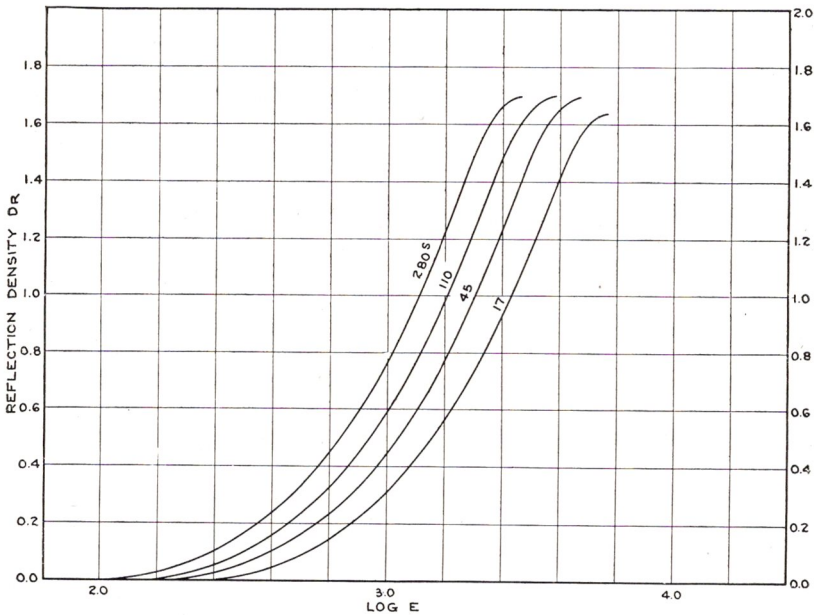
the growth of density and contrast with longer development.

For best results, a paper of suitable contrast should be chosen to fit the negative and should be exposed for proper density when developed for the recommended time.

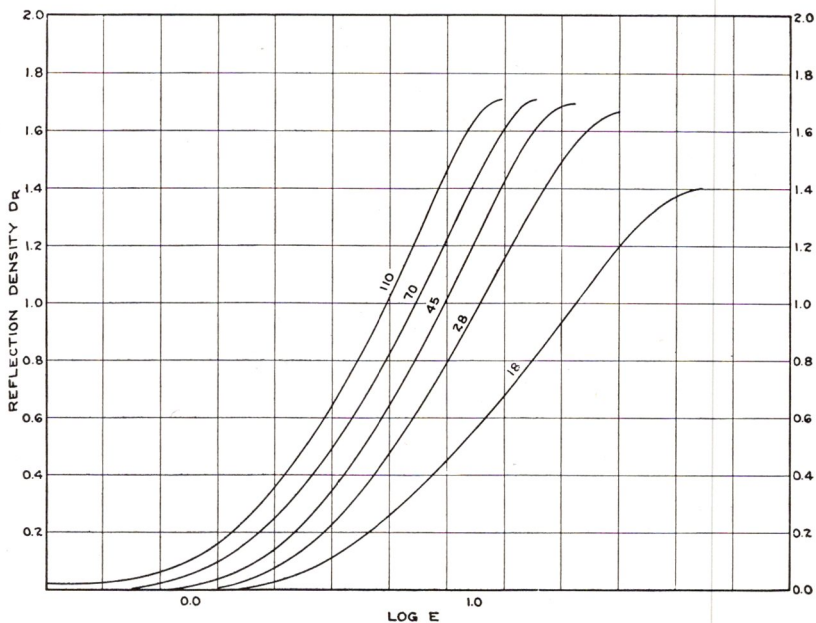
**Developer Composition:** Slight changes in the contrast of a chloride paper can be obtained by adjusting the developer composition. Slightly greater control of contrast is possible with chloro-bromide papers. With the latter, however, the principal change produced by adjusting the composition of the developer is a change in the color or "tone" of the image.

### Contrast and Enlarger Illumination

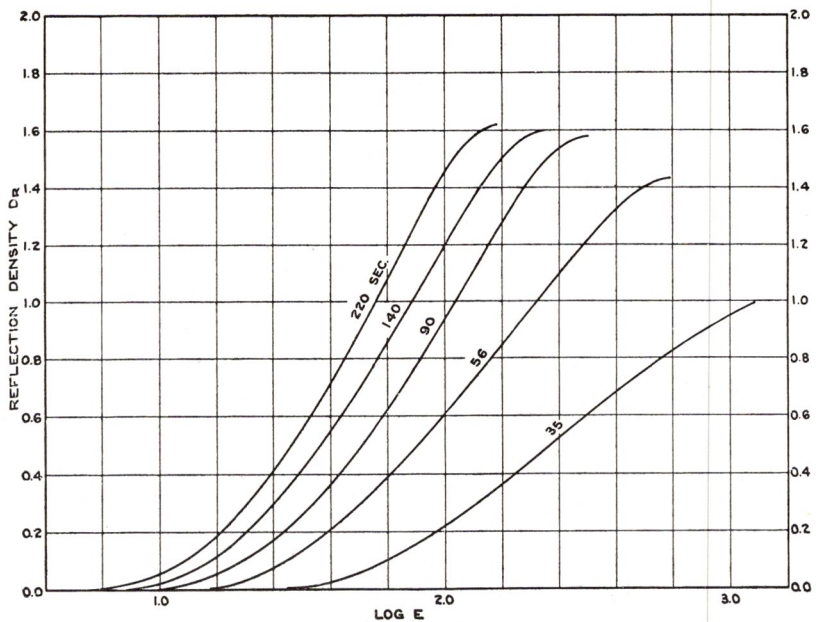
ENLARGERS equipped with condensing lenses produce prints of higher contrast than enlargers with diffuse illumination, other factors being equal. In general, the degree of contrast obtained with completely diffuse illumination is of the order of that obtained in contact printing. Effects on contrast by such variations often amount to the difference between adjacent contrasts of paper.



Sensitometric curves for different development times for chloride emulsions of the Azo type



Sensitometric curves for different development times for chloro-bromide emulsions of the Kodabromide type



Sensitometric curves for different development times for chloro-bromide emulsions of the Vitava Opal type

## RELATIVE SPEED

THE speed of photographic papers is, in general, less than that of negative materials, and is so adjusted that exposures will be of convenient duration under conditions of average use. The various brands of Kodak Photographic Papers differ widely in speed, from comparatively slow contact printing papers such as Azo, Velox, and Professional Azo, through moderately fast papers like Vitava Opal and Kodalure which can be used for either contact printing or enlarging, to the fast enlarging papers such as Kodabromide and Royal Bromide.

**Relative Speed Values:** Relative speed values are of direct interest to the photographer in determining exposures when papers are used interchangeably. For example, it may be desirable to make a print on Opal after the exposure has been determined for Kodabromide for the same or a similar negative. The question of any needed change in exposure time is answered directly by the relative speed values.

Relative speed values are given in the table below and in the Data Sheets. These values may be regarded as shadow speeds. They are based on the light intensity required, with fixed exposure time, to produce the maximum useful density. This represents a change from the older method of determining speed values of Kodak Papers which was based on exposures in the low part, or highlight portion, of the curve. The values can be applied to the average range of exposure time to the illumination of long-life tungsten printing lamps. The relations between these values may not hold for tungsten lamps of other efficiencies and probably will not hold for other illuminants.

<i>Paper</i>	<i>Relative Speed Value</i>
Azo, Ad-Type	2.5
Velox	6
Velox Rapid	23
Kodalure	100
Vitava Opal, Illustrators' Special	125
Portrait Proof	180
Vitava Projection	240
Kodabromide	400
Royal Bromide	1,000

The question of paper speeds is complicated by a great many factors so that published speeds cannot be regarded as absolute values. For individual problems, speed values should be computed by the user by careful trial.

Since no one system of deriving such values is in general use, the data given here on relative speeds and scale values are not necessarily comparable with similar values published elsewhere.

**Printing Speed and Lamp Voltage:** When an incandescent lamp is burned below its rated voltage, both the total illumination and the proportion of blue-violet radiation are greatly reduced. This results in a lower photographic effectiveness often interpreted as lower paper sensitivity. In some cases, a drop of 5 volts may require as much as 30% increase over normal exposure time. It is recommended that the correct line-voltage be ascertained (from the local power company) and that a lamp of next lower voltage rating be used. This assumes that the lead wire from the fuse box is large enough to carry the load with no appreciable voltage drop.

### **EXPOSURE LATITUDE**

EXPOSURE latitude is the interval between the greatest and the least printing exposure times which produce satisfactory results, the development time being varied for compensation. As already mentioned, the best possible prints are obtained by exposing so that development takes place in the recommended time. Acceptable prints, however, may be obtained throughout a reasonable exposure range. Throughout the exposure and development latitude of Velox and Kodabromide, for which both are noted, there is practically no change of image tone. Warm-toned papers such as Opal grow progressively colder with increased development.

### **COLOR SENSITIVITY**

COLOR sensitivity of photographic papers usually lies in the ultraviolet, violet, blue, and in some cases blue-green portions of the spectrum. This makes it possible to handle the papers under comparatively bright yellow, yellow-green, or orange safelights.

### **CHARACTERISTIC CURVES**

CHARACTERISTIC curves have been included for those interested in the technology of photographic printing. These curves give information with regard to tone rendering, and also on the fundamental differences between the contrast grades. The curves were obtained by exposing the paper to a scale of light intensities followed by proper development, and by measuring and plotting the resulting density against their exposure values. Density measurement is carried out by an instrument known as a densitometer. In the case of paper, *reflection* density is

measured. This is done by illuminating the paper at 45° to the normal and viewing it along the normal by the densitometer. The reflection density value of a sample is taken as:

$$\text{Logarithm} \frac{(\text{Reflection factor of clear paper})}{(\text{Reflection factor of sample})}$$

Thus zero density is the density of the undeveloped but fixed-out paper.

These curves and the values quoted for exposure scale and relative speeds apply to the average of the product designated as exposed and processed under conditions which closely approximate average practice. When results of high precision are required, a calibration of the material being used should be made under actual working conditions.

### **Physical Characteristics**

AMONG those characteristics here termed "physical," those of most importance are the image tone, the surface texture, tint, and weight or thickness of the paper stock.

**Image Tone** refers to the color of the silver deposit in the finished print. If brownish, the print is said to be "warm" in tone, and if blue-black, it is described as "cold." These differences in color are caused by variations in size and condition of the silver grains which form the image, and are controlled by the emulsion composition and the conditions of development. Velox normally develops to a cold, blue-black image, while Azo, Professional Azo, and Vitava Opal are progressively warmer in tone. Kodalure Papers are specially designed to give a very warm tone.

The relationship of the different Kodak Papers with regard to tone may be listed according to increasingly warmer tone:

COLD TONE (blue-black to black)	{ Velox Royal Bromide Kodabromide Azo E, F, C (Kodak D-72) Ad-Type
SLIGHTLY WARM BLACK	Vitava Projection
WARM TONE	Vitava Opal and Professional Azo
VERY WARM TONE	Kodalure

With some papers, notably Professional Azo, Vitava Opal, Kodalure, and Vitava Projection, warmth of tone can be varied considerably by changes in the developer. Kodak Dektol and D-72 produce comparatively cold tones, while Kodak Selectol and D-52 yield increasingly



**EIGHT BELLS**—Pictorial subjects in low key can be printed effectively on rough-surfaced papers.

warmer tones as potassium bromide is added and exposure is increased so that development is complete in the normal time. In general, the slower the paper, the greater is its response to such treatment. Attempts to secure warm tones with cold-toned papers by over exposure and underdevelopment lead to prints of poor quality.

Since warm tones are due to extremely small size of the silver grains in the image, prolonged fixation destroys the warmth of tone even before it produces noticeable fading. Prints which are very warm in tone should be fixed not longer than ten minutes in a fresh bath. Therefore, in order to insure complete fixation, they must be kept separated and in motion in the fixing bath.

**Surface Texture** of Kodak papers varies in two general respects:

1. Character of surface texture. Kodak papers are classified as Smooth, Fine Grained (slightly pebbled), and Rough. In addition, there are special textures as Silk, Tweed, and Suede.

2. Sheen or surface gloss of Kodak papers is designated as Glossy, Lustre, and Matte.

**Paper Stock:** The paper stock of Kodak papers is of highest quality, both physically and chemically, for permanence and ease of manipulation of the prints. These fine paper stocks also contribute much to the beauty and attractiveness of prints.

Depending on the thickness of the paper stock, Kodak papers are classified as single, medium, or double weight. Single weight paper is satisfactory for small prints. Double weight paper is preferable for larger prints. Some papers are furnished in light weight for special purposes.

**Color of Paper Stock:** Kodak papers are furnished in white, cream white, and old ivory (buff).

**Baryta Coating** is a sizing layer of barium sulfate in gelatin, applied to the paper stock to form a foundation for the emulsion and to increase the reflecting power of the paper. All Kodak papers have this baryta coating except Ad-Type, Insurance Bromide, Kodabromide A, and Royal Bromide A. These papers are intended for uses that generally involve the need for routine mailing purposes. Eliminating the baryta coating avoids probability of cracking the prints when they are folded.

# PRINTING FOR QUALITY

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“QUALITY” is considered here as referring specifically to the degree of technical excellence of the final print. A poor negative cannot produce a technically good print, that is, one which reproduces (within the limits of an image reflected from paper) the original subject with respect to line, brightness range, and scale of light values. Here, a good negative is assumed as a necessary means to the end.

The factors upon which the production of a print of good quality depends may be divided broadly as (1) those involving good judgment, and (2) those demanding careful and intelligent handling. Both are important, and proficiency can be attained only with experience.

The Print Quality Kodaguide for Kodabromide describes the many details, both technical and aesthetic, in making excellent prints.

## *The Choice of Paper Surface and Color*

THIS selection is governed by personal taste and the intended use of the print. The paper selected should harmonize with the subject and never be conspicuous. Examining prints in leading photographic exhibitions will aid in choosing paper surface and tint to suit the subject.

### **SURFACE**

**Glossy** paper should always be used for prints intended for reproduction or for prints in which extremely fine detail is important. Glossy paper reproduces a wider brightness range than matte or semi-matte paper.

**Smooth** paper lacks the sheen of glossy stock but has no noticeable surface texture to interfere with the rendition of fine detail.

**Fine-Grained** paper has a slightly pebbled surface which adds richness to a print without loss of definition. It is useful for portraits of young women and children, and clear architectural views. It also makes a popular medium for exhibition prints. This surface is generally a safe selection, as it has wide application.

**Rough** paper possesses a noticeable surface texture which tends to subdue fine detail; thus the larger masses and planes of the subject are emphasized. Landscapes not dependent upon fine detail for interest, character studies, and portraits of elderly people often lend themselves to the mellowing effect of this surface.

**Matte** papers subdue the brilliance of a scene; this is often desirable with high-key pictures and “atmospheric” landscapes.

**Silk** paper has a shining, clothlike surface texture which adds sparkle to many still-life subjects and to some snow or water scenes.



**Tweed** paper is extremely rough. It is recommended only for subjects requiring great subordination of detail, and often imparts a sense of restraint and dignity. Tweed is most effective in large print sizes.

**Suede** paper is absolutely matte and smooth and lends itself particularly well to high-key and many types of low-key pictures when a short brightness range is required. It is particularly useful when a perfectly matte surface is desired, as in portrait, pictorial and salon work.

### **COLOR**

**White** should always be used for cold-toned subjects, unless there is good reason for choosing a tinted stock. It is recommended for snow scenes and seascapes, high-key subjects, and for prints to be toned blue.

**Cream white** is probably the best choice for general use and should be used unless there is good reason for selecting another tint. It is suitable for both sunlit and artificially lighted scenes.

**Old ivory** is buff in color. It is effective in giving warmth and sunniness to all subjects. It adds richness to sunsets, scenes suggesting lamplight or firelight, character studies of elderly people, etc.

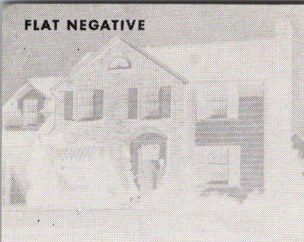
It is suggested that for amateur printing a single surface be chosen for most work. For enlarging, Kodabromide G with its five contrast grades is especially recommended.

### **Choice of Paper Contrast Grade**

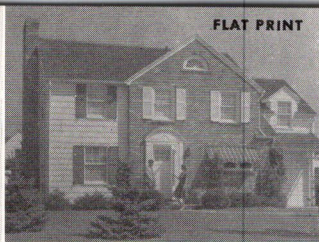
JUDGMENT in the choice of the most suitable contrast of the enlarging paper should be sought earnestly. The subject of exposure scale has been treated earlier in this book. It should be kept in mind that choosing the right contrast involves selecting a paper of a scale suitable for the density range and contrast in the negative. The density range and contrast of a negative are usually judged by inspection, rather than by any numerical measurements. (See illustration following.) Developing all negatives to a given degree of contrast does not warrant always printing them all on paper of the same scale or contrast. Tone and lighting contrasts in the original subject also govern the proper choice.

A graphic illustration of the effects of paper contrast upon print quality is obtained by making prints from a negative of average contrast upon all the available grades of Azo, Velox, or Kodabromide Paper. The muddy appearance which results from using a paper too soft for a given negative, and the glaring appearance of a print of too high contrast can then be compared with the best print of the series. In this way, judgment is soon acquired. It is valuable to file negatives with a note of the paper found to give the most satisfactory print.

Judgment may be gained by noting carefully the appearance of each



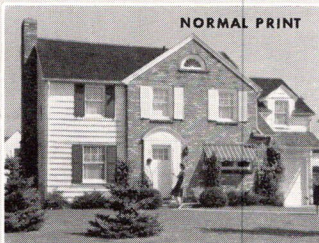
PRINTED ON TOO SOFT PAPER,  
TRY No. 3, 4, or 5



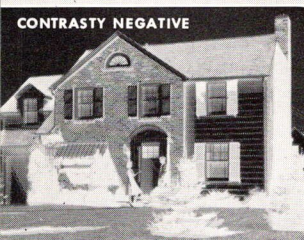
PAPER  
TOO SOFT

PRINT ON CONTRASTY PAPER,  
No. 3, 4, or 5

TRY No. 2



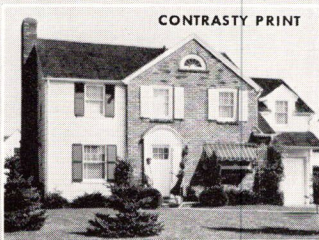
PRINT ON PAPER OF NORMAL  
CONTRAST, No. 2



PAPER TOO  
CONTRASTY

PRINT ON SOFT PAPER,  
No. 0 or 1

TRY No. 2



PRINTED ON TOO CONTRASTY PAPER,  
TRY No. 0 or 1

### Selecting Paper of Proper Contrast

good print and the negative with respect to density differences between highlight and shadow. One will learn then to select the correct contrast grade of paper by examining the negative. Negatives for salon prints preferably should be exposed and developed to fit a paper of normal contrast, such as Vitava Opal or Kodabromide No. 2.

A print made on paper of wrong contrast may seem passable until it is compared with one of correct contrast made from the same negative. As an aid in selecting the correct paper contrast, decide which of the illustrated negatives most nearly matches the contrast of the one to be printed. The directions in the black arrow leading from that negative should be followed. Thus, a normal negative should be printed on No. 2 paper. The proper choice of paper contrast makes it possible to compensate for high or low negative contrast, while the use of the wrong paper contrast results in prints that are too gray and flat or too harsh and contrasty. In judging a wet print, it should be remembered that prints dry slightly flatter and apparently darker than they

seem when wet. This effect should be allowed for, or the prints can be blotted and dried quickly with a fan.

Faulty contrast can be corrected by following the instructions in the white arrow connecting the illustrations most similar to that print and the negative from which it was made.

### **Checking Darkroom Illumination**

Fog or veiling in a print degrades highlight quality and may be caused by stray white light or incorrect safelighting. The presence of stray light can be tested by leaving a strip of Kodabromide No. 1 on the paper board for 15 minutes with all safelights off; development in a fresh developer for the normal time shows whether the margins covered by the paper holder appear lighter than the rest. Then, if no fog results, the safelight can be tested thus: Different sections of a strip of Kodabromide are exposed 2 minutes, 1 minute, 30 seconds, and no exposure on the working space below the safelight. After development, if any of the exposure steps are discernible, check the condition and distance of the safelight, and the wattage of the bulb.

### **The Enlarger**

#### **Cleaning the Lens**

DUST, which will gather in time on the upper surface of the lens of any vertical enlarger, and finger marks, often made inadvertently on the lower surface of the lens, degrade image contrast. A camel's-hair brush is useful for dusting the lens and negative carrier. After being dusted, the lens should be cleaned with Kodak Lens Cleaner.

#### **Importance of Negative Masks**

STRAY light masks are built into or provided for most enlargers and are located at or close to the negative holder. Their primary purpose is to prevent unwanted light from passing the edges of the negative. When they are situated in the plane of the negative, they also may be used to produce clearly defined white margins on the enlargement.

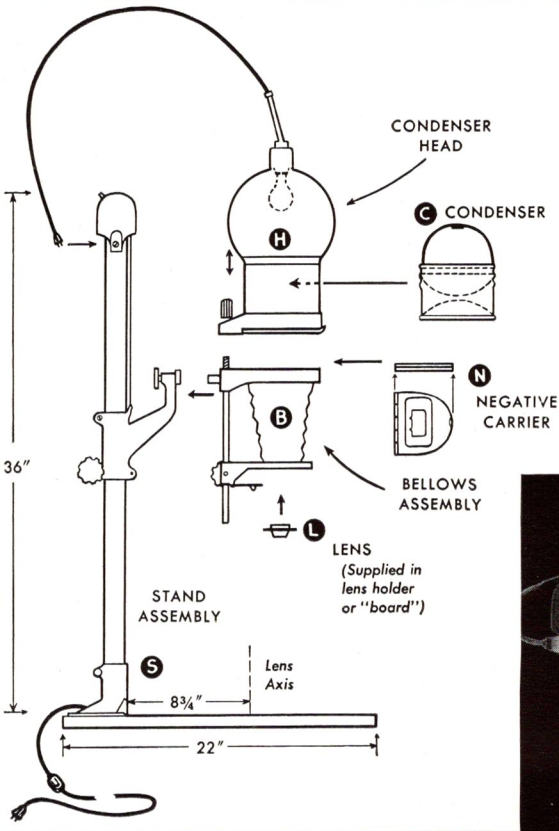
A common cause of degraded highlights is failure to mask the negative in the negative carrier. Light passing around the negative is reflected about inside the enlarger and scattered over the projected image. Adjustable masks should be used to mask this light, or masks of fixed size, such as Kodak Ruby Printing Masks, should be used. Masks can also be cut from Ruby Kodaloid or black paper.

#### **Focusing**

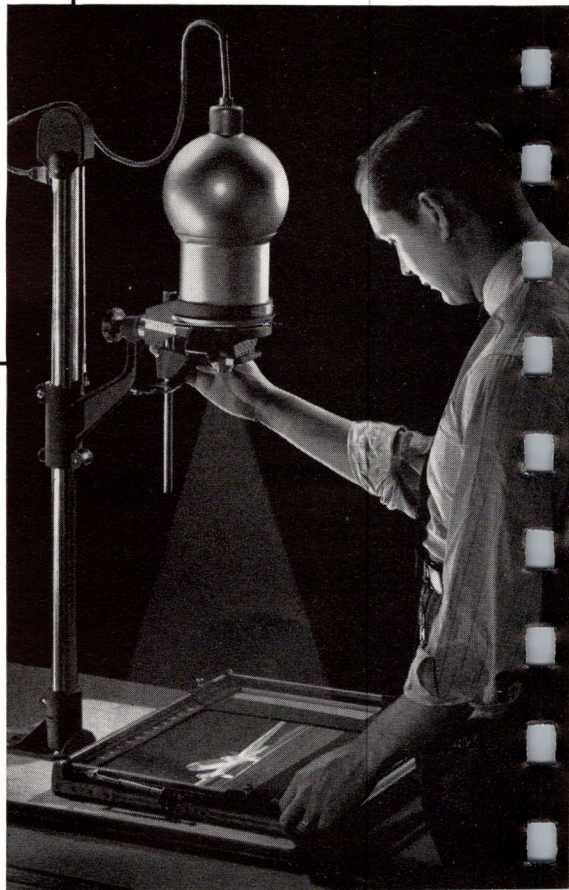
GOOD print definition is obtained only by sharp focus and by freedom from vibration. On occasion, diffused prints may be wanted. Diffusion

# KODAK PRECISION ENLARGER

## BASIC REQUIREMENTS FOR ENLARGING



Diagrams show component parts and accessories

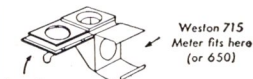


An unusually versatile instrument, designed for utmost convenience in operation

18 KODAK PAPERS

## ENLARGING ACCESSORIES

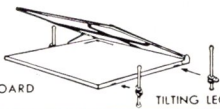
### EXPOSURE METER BRACKET



### DIFFUSING DISK



ROLL FILM CUPS



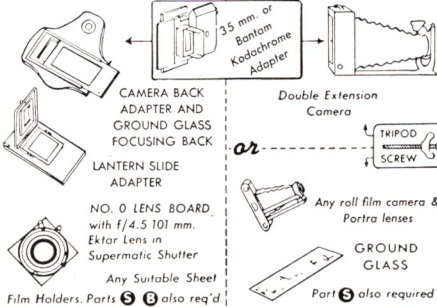
MASKING PAPER BOARD

TILTING LEGS

## PHOTOGRAPHY, COPYING, ETC.

### USING BELLOWS ASSEMBLY

### USING OTHER CAMERA



CAMERA BACK ADAPTER AND GROUND GLASS FOCUSING BACK

Double Extension Camera

LANTERN SLIDE ADAPTER

NO. 0 LENS BOARD with f/4.5 101 mm. Ektar Lens in Supermatic Shutter Any Suitable Sheet Film Holders. Parts ⑤ ③ also req'd.

Any roll film camera & Partra lenses

GROUND GLASS

Part ⑤ also required

## PHOTOMICROGRAPHY



MICROSCOPE ATTACHMENT

Standard Microscope, parts ⑤ ③ and CAMERA BACK ADAPTER required

## FOR COLOR SEPARATION NEGATIVES FROM KODACHROME TRANSPARENCIES

24 x 36, 28 x 40 mm.



TRANSPARENCY HOLDER (2 Sizes)



EKTAR LENS



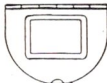
TRICOLOR FILTER HOLDER (not illustrated)

Any Suitable Sheet Film Holders

Parts ⑤ ③ ④ also required

## INTERCHANGEABLE ENLARGING ACCESSORIES

### NEGATIVE CARRIERS, ETC.



GLASSLESS NEGATIVE CARRIERS



COMBINATION NEGATIVE CARRIER A

for  
24 x 36, 28 x 40 mm.  
1 3/16 x 1 1/16, 1 3/8 x 2 1/4  
1 3/8 x 1 3/8, 2 1/4 x 3 1/4  
2 1/4 x 2 1/2, 2 1/4 x 3 1/4  
2 1/4 x 2 1/2



KODALOID MASKS FOR ABOVE CARRIER

### SPECIAL LENS BOARDS

- NOT DRILLED
- ⊗ for CONTAX LENSES
- ⊙ for LEICA LENSES

### LENSES and CAPS

3 KODAK PROJECTION ANASTIGMATS



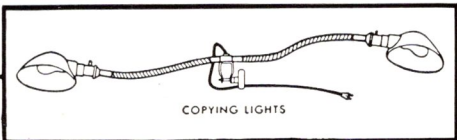
2" 3" 4" LENS CAPS

3 KODAK PROJECTION EKTARS



2" 3" 4"

### CONDENSER



COPYING LIGHTS

## FOR CINE TITLING



Ciné-Kodak



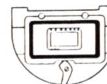
TRIPOD SOCKET SCREW

Supplementary Lenses Partra 1+, 2+, 3+

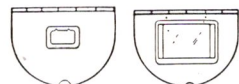
Focusing Finder for Magazine Ciné-Kodak Part ⑤ also required

## FOR BLACK and WHITE PRINTS FROM KODACHROME TRANSPARENCIES

### TRANSPARENCY HOLDER



### NEGATIVE CARRIERS



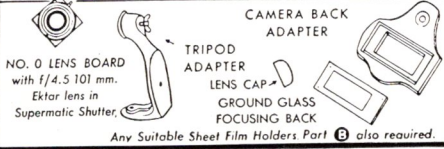
24 x 36 or 28 x 40 mm. 2 1/4 x 3 1/4 COMBINATION GLASSLESS STYLE NEGATIVE CARRIER

LENS Ektar Preferable

KODALOID MASKS

Parts ⑤ ③ ④ also required

## USING BELLOWS ASSEMBLY AS INDEPENDENT CAMERA



NO. 0 LENS BOARD with f/4.5 101 mm. Ektar lens in Supermatic Shutter.

TRIPOD ADAPTER

LENS CAP

GROUND GLASS FOCUSING BACK

CAMERA BACK ADAPTER

Any Suitable Sheet Film Holders. Part ⑤ also required

is best accomplished by adding some diffusing device, such as the diffusion disks supplied for enlargers. The enlarger lens should *not* be thrown out of focus for such a purpose.

Every care should be taken to assure maximum sharpness. The projected image of the negative is seen at relatively low brightness; therefore, when examined carelessly, the projected image may appear sharp, though the finished print proves otherwise. Lenses of larger aperture providing a higher brightness level are more easily focused than those of smaller aperture. Any enlarger lens should be focused at its greatest aperture. The use of the Kodak Enlarging Focus Finder aids considerably in critical focusing, regardless of the lens aperture used.

If a diffusion disk is to be used, which sometimes is desirable in subduing detail, the enlarger must first be focused sharply. A sharp print is always useful as a comparison for judging the degree of diffusion suitable for a given subject.

### **Covering Power of Enlarger Lens**

ANOTHER definition fault, particularly common with homemade enlargers, is fuzzy corners in the print due to a lens whose covering power is not sufficient for the negative size. A poor enlarger lens can nullify the benefits of a good camera lens. It is desirable, therefore, to use projection lenses of good quality for enlarging.

### **Enlarger Surroundings**

LIGHT from the image reflected by the easel, and reflected by light walls or clothing, sometimes causes fogging of faster types of papers. Kodak Panchromatic Green Paint, or other means of reducing wall reflection, and the wearing of a darkroom apron reduce the amount of reflected light, whatever its source. To avoid stray enlarger light, the enlarger dome should always be properly positioned in its lighttrap.

### **Dodging**

DODGING is a standard and useful method of adjusting the distribution of light to areas of extremely high or low density. Matte black paper should be used and, if dodging is done close to the paper at a distance consistent with the required diffuse dodging outlines, no fogging or veiling should result.

## **The Contact Printer**

THE glass in the printer should be cleaned thoroughly before use. Evenness of contact over the negative area may be checked by making a test print from a negative rich in fine detail. The platen should be adjusted or renewed if there is evidence of poor contact. Contact is fur-

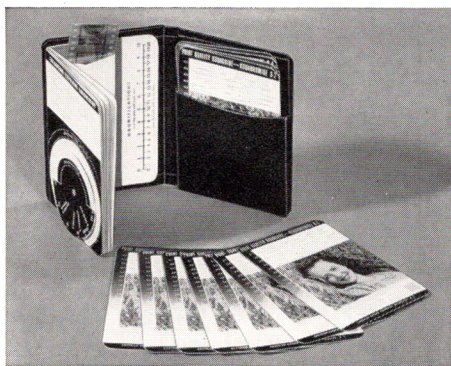
ther improved by placing the negative on top of the masking strips if the printer is so equipped. It may be taped there if many prints are to be made. A printer should furnish uniform illumination over the contact surface. This may be checked by flashing a *short* exposure onto a piece of contrasty paper on the printer. Upon complete development, the evenness of the illumination may be judged.

The Kodak All-Metal Printer and the Eastman and Crown Printers offer many time-saving and quality-producing refinements.

## **Exposure Determination**

### **Print Quality Kodaguide for Kodabromide**

THE Print Quality Kodaguide for Kodabromide (see illustration) contains, in a single kit, information and aids for making enlargements of excellent quality. Included as an integral part of the guide is a novel exposure calculator. This computes exposures (after the time for a test print is known) when magnification, aperture, or type of paper is changed. Other features of this pocket-size Kodaguide are: (1) Func-



tional prints of all Kodabromide surfaces and on the four contrasts of one surface. Each print bears an informal portrait, full-range gray scale, graininess and resolution charts, processing recommendations and other data. (2) A 32-page booklet on print quality. (3) A transparency incorporating a focusing chart and a magnification scale.

### **Kodak Projection Print Scale**

Also available is the Kodak Projection Print Scale which consists of a series of ten sectors, each indicating a different printing time in seconds. Exposure is made through the print scale onto a piece of enlarging paper, and upon development a ten-sector image appears. Inspection determines the best exposure. Full directions are included with the scale.

### **Test Strips**

Another practical and widely used physical aid for gauging exposure is the test strip. After the enlarger has been adjusted for making an enlargement, a narrow strip of the paper to be used is placed within

the projected image area so as to include the most important parts of the picture. Successive areas of the test strip are given progressively increasing exposures by intercepting the light beam close to the strip with a sheet of black photographic paper moved along the strip with the desired steps in exposure time. The exposed strip is given the full recommended development. Approximately correct exposure may then be determined visually according to the density of the several "steps." For example, one-third of a strip can be exposed 8 seconds, another third uncovered and given 4 seconds more, and the last third given another 4 seconds. The three areas will then have 4, 8, and 16 seconds exposure. If normal development shows that the 8-second exposure is not quite enough and the 16-second exposure is too much, an exposure of 11 or 12 seconds will probably be correct.

### **Using an Exposure Meter**

THE Kodak Precision Enlarger is provided with a bracket to hold the Weston Exposure Meters, Models 650 and 715. A method has been worked out for integrating the light transmitted by the negative to calculate the required exposure. This method, instructions for which are packed with the enlarger, results in economy of paper and time. Other photometric methods can also be used.

## **Processing of Papers**

COMPLETE processing recommendations appear in the Appendix of the Data Book, *Kodak Papers*, and in the Processing section of the Kodak Reference Handbook.

## **Print Quality Requirements**

THE quality required in a print depends somewhat on the purpose for which the print is made, as for viewing or copying.

Prints made for hanging on the wall of a home should be slightly lighter than prints made for mounting in an album or for exhibition, because the amount of light on the walls of a house is seldom sufficient for the proper illumination of a normal print.

Prints made for copying should be on smooth paper and should show full detail in both highlights and shadows. To achieve this, the lightest white should be slightly grayed, while the darkest black should be not quite the deepest that can be recorded by the paper. A print of this character makes it possible to preserve the whole scale of the scene in the copy negative.

In making special-effect prints, as in high-key and low-key work, the best exposure and development must be determined by trial.



## **Print Faults**

ANY defects in the negative will be reproduced in the print or enlargement, often exaggerated to a certain extent. In addition, improper handling can produce faults in prints made from perfect negatives.

Following are listed several print faults, the causes, and the remedy.

*Blurred Image:* In enlargements; enlarger out of focus, or enlarger vibrated during exposure. In contact prints; improper contact between paper and negative because of warping of printer platen, badly fitted hinge or other part of printer, or excess thickness of margin masks. Negative may have been reversed, with its base toward the paper.

*Cracks:* In paper base or emulsion, caused by rough handling during processing or too violent agitation in washing.

*Spots:* Round white spots usually caused by air bells on the surface of the print during development. Round or irregular dark spots caused by air bells on prints, or several prints matting together, in fixing bath. Develop prints face up, and move prints about occasionally during fixing.

*Mealy, Mottled Prints:* Indicate overexposure and short development, oxidized developer, or prints not kept moving when first immersed in fixing bath. Sometimes obtained with old paper.

*Flatness:* Due to the choice of the wrong contrast grade of paper, underdevelopment, or a dirty enlarger lens.

*Fog:* Stray light at negative carrier not masked out, or safelight fog of several types.

### **STAINS**

*Brown or Red:* Result of using old or oxidized developer. Also caused by trace of hypo on prints during development or by using warm developer. Fixing bath lacked sufficient acid and prints were not kept moving to allow uniform or sufficient fixing. Insufficient washing causes stains which appear during drying, particularly if heat is used.

*Purple discoloration:* Often appearing after some time on finished print, caused by incomplete fixation.

*Yellow:* General, or yellowing whites. Forced development, too weak, too old, or too warm developer, development in dirty tray, prints rinsed too long after developing and before fixing, or prints not agitated when first immersed in fixing bath. Insufficient fixing and washing.

*Greenish tones:* Overexposure and underdevelopment, too much bromide or not enough carbonate in developer, or developer may be too old or too cold.

*White deposit on surface:* Hardener scum from old fixing bath, or precipitated on print which was not rinsed between development and fixation. Sulfur from fixing bath sulfurized by heat, excess acid or insufficient sulfite.

*Yellowish white image, faded highlights, on old prints made on developing-out paper.*

By conversion of silver image to yellowish white silver sulfide, with age. Due to thiosulfates left by incomplete washing, sulfur from sulfurized fixing bath, exposure to sulfurous gases in the air, or sulfur compounds in the mount.

A faded print can often be restored by bleaching in Kodak Stain Remover S-6 and redeveloping in a non-staining developer such as Kodak D-72, diluted 1:2.

For treatment of more difficult cases, see the booklet, "Stains on Negatives and Prints," obtainable from the Sales Service Division, Eastman Kodak Company, Rochester 4, N. Y.

## **Mounting**

MOUNTING involves a need for a certain amount of manual skill and good taste; an unsuitable mounting can nullify the care and judgment used in making the print.

The function of the mount is to disassociate the print from its surroundings. Such emphasis on the print itself should be accomplished appropriately and neatly without garishness of the mount.

Small prints should be mounted in albums soon after they are made, to prevent loss and to keep them in good condition. The newer book-type albums offer several advantages.

For salon or exhibition use, prints should usually be mounted on 16 x 20-inch card stock. This is carried by artists' supply houses in several different styles and thicknesses, one of the most popular being a pebbled stock, natural white on one side and cream white on the other. Its dual surface characteristics make it suitable for prints on either ivory or white papers.

Since most salons specify 16 x 20-inch mounts, prints for these should ordinarily be made on 14 x 17, 11 x 14, or 8 x 10-inch paper, and mounted so that the mount always can be hung vertically. If paper larger than 14 x 17 inches is used, there will not be enough border

to create a pleasing effect. Prints smaller than 8 x 10 inches are inclined to look lost unless they have unusual appeal. Sub-mounts add an illusion of magnitude to small prints.

Kodak Dry Mounting Tissue, Kodak Rapid Mounting Cement, Kodak Photo Paste, and Kodak Photo Paste Powder provide convenience in mounting prints and contribute to neatness as well.

### **DRY MOUNTING WITH A FLATIRON**

THE most permanent and satisfactory method of mounting prints is by means of Kodak Dry Mounting Tissue. The tissue is "tacked" to the back of the print with a Kodak Tacking Iron or an electric flatiron. Tissue and print are trimmed to the desired size, then permanently attached to the mount by heat and pressure from the iron. For small-sized prints, this procedure is exceedingly simple. Nevertheless, the novice might encounter some difficulty in doing a neat job when mounting a salon print upon the standard 16 x 20-inch heavy mount. If a Kodak Dry Mounting Press and Kodak Tacking Iron are not available, the following procedure is recommended:

Make a flat layer of newspapers, about 25 leaves thick, upon a flat bench or table. The iron, heated to a temperature at which it just sizzles (about 230°F.) when touched with a wet finger, is used to smooth out this pile. It must not be hot enough to scorch the paper. The back of the mount is then ironed all over until it curls slightly upward at the edges. The mount is turned over, and the print, bearing the trimmed tissue, is placed in the right position and held down with a paperweight in its center. After the corners of the tissue are tacked down, the weight is removed, and the whole mount covered with one smooth sheet of tissue paper and two leaves of newspaper. The layers are then ironed with steady, heavy strokes starting at the center and eventually covering the *whole mount*. The iron should never be stopped during this part of the operation, and it must be just hot enough to give the tissue proper adhesion. If too hot, the adhesive becomes temporarily soft, permitting the print to pull away from the mount. Also, the gelatin on the print is in danger of melting.

This treatment gives the mount a slight "face" curl. The mount should be turned over and ironed on the back until it has a slight "back" curl. The mount is reversed, warmed, and flattened on the print side with a few strokes of the iron, a cold board or mount is placed quickly on top of the newspapers, and pressed down for a few minutes. If a sub-mount is used, it should be mounted in this manner and the print mounted over it.

## FINISHING EXHIBITION PRINTS

OBSERVING these suggestions will improve appearance of salon prints:

1. Prints which are on white stock require white mounts and black or blue-gray sub-mounts.
2. Prints on tinted stock or with warm-toned images should be mounted upon *pale* cream or ivory mounts with black or sepia sub-mounts.
3. Sub-mounts should leave only a narrow border, about  $\frac{1}{8}$  inch, around the print and that border should have parallel edges. Light stocks should be used with dark pictures and dark stocks with high-key photographs.
4. Titling may be tastefully done with a colored pencil of the same general tone as the print. The title and signature should be small and neat. Avoid complicated line designs drawn around the print.
5. Kodak Spotting Colors are recommended. Spotting on glossy and lustre paper surfaces is less noticeable if a small amount of mucilage or glue is mixed with the spotting colors. The higher the surface gloss, the greater is the amount of mucilage required.



## PAPERS FOR SPECIAL PURPOSES

IN ADDITION to the papers already described, there are several papers and positive materials for special purposes. A brief outline of the uses and characteristics of some of these materials follows.

**Velox Rapid Paper** is designed for use with the Velox Rapid Printer or similar optical printers. It is faster than Velox, and is designed for the production of oversize prints of the same tone quality as Velox contact prints. Velox Rapid is available in Single Weight only, white, glossy, smooth, in all six contrast grades. It is suitable for fast contact printing, but is too slow to be used for projection purposes with standard enlargers.

**Illustrators' Special E** has a full-scale, brilliant emulsion of the quality and speed of Vitava Opal. It is an excellent medium for commercial illustration and reproduction purposes, and the surface is well suited to retouching or other forms of art work. This paper can also be used for combination pictures and "paste-in" photomontages. It is supplied only in a lustre, white, fine-grained surface, both Single and Double Weight.

**Ad-Type A** is a contact printing paper having the same speed as Azo. It is designed to fold without cracking, and is an excellent medium for photographic greeting cards. Ad-Type is coated on white, lustre, smooth stock, Light Weight, and is supplied in six contrast grades, similar to Azo.

**Translite Film** is intended for making black-and-white transparencies to be viewed by transmitted light. Transparencies on Translite have a remarkable quality of roundness and depth. It is also useful for making enlarged negatives in paper negative work, and renders fine detail to a greater extent than an actual paper negative. It consists of a safety film base coated on both sides with an emulsion similar in speed and contrast to Vitava Projection Paper, No. 2. The emulsion contains a matting agent which improves the characteristics of the transparencies for viewing and for coloring, on the back, with Kodak Transparent Oil Colors.

**Portrait Proof Paper** is a rough, Single Weight paper, slightly slower than Vitava Projection. It is normally intended for making proofs from professional portrait negatives. This is a developing-out paper, not a printing-out paper. Its pleasing surface texture has made this paper relatively popular for finished work. It is also used in making photo-murals. It is supplied in two surfaces, matte T and lustre R.

**Studio Proof Paper** is a smooth, white, Single Weight printing-out proofing paper which requires sunlight or extremely brilliant artificial light for printing. It is supplied in two surfaces, glossy F and lustre N.

**Super Speed Direct Positive Paper** provides a direct positive image by chemical reversal, and is useful for making prints directly from transparencies. It can also be used in the camera. The emulsion is orthochromatic, and has a short range of exposure latitude.

**Recording Papers** are designed for many scientific and technical applications which require a fast paper of high contrast for recording steady and transient phenomena. Recording Papers are supplied in standard and special sizes for such instruments as oscillographs, electrocardiographs, etc.

**Papers for Industrial Use** are a group of sensitized materials which have been made available to meet the ever expanding need for new and more efficient materials for reproducing all types of drawings, documents, records, and the like. These materials, which include Linagraph and Reflex Copy Papers, have wide application in the commercial and legal facsimile reproduction fields as well as in the engineering and architectural fields.

There are other photographic papers for specialized purposes not mentioned here. For information on specific applications involving such papers, or for additional information concerning those papers mentioned, the photographer is invited to write to the Eastman Kodak Company, Rochester 4, N. Y.

## Data—AZO AND PROFESSIONAL AZO PAPER

**Purpose:** Azo is a contact printing paper of uniformly high quality. Professional Azo is somewhat faster and is warmer in tone. The warmth of Professional Azo makes it especially suitable for final contact prints from paper negatives.

**Tone:** Azo, E, F, and CF are quite neutral in tone; Professional Azo Papers have a pleasing warm tone.

**Special Applications:** Because of its warm tone, Professional Azo is particularly acceptable as a portrait paper.

### Contrast Grade, Speed, and Exposure Scale Values:

<i>Contrast Grade</i>	<i>Speed</i>	<i>Exposure Scale Value</i>	<i>Type of Negative Suited</i>
0	2.5	1:40	Very Contrasty
1		1:32	Contrasty
2		1:20	Average
3		1:16	Flat
4		1: 9	Extremely Flat
5		1: 3.5	Very Thin and Flat

### Weights and Surfaces:

<i>Type of Surface and Color</i>	<i>Single Weight*</i>	<i>Double Weight*</i>	<i>Post Card</i>
White, Glossy, Smooth	F** No. 0, 1, 2, 3, 4, 5	F** No. 0, 1, 2, 3, 4, 5	F** No. 1, 2, 3, 4
White, Glossy, Smooth	CF** (C) No. 0, 1, 2, 3, 4, 5		
White, Lustre, Fine Grained	E** No. 0, 1, 2, 3, 4, 5	E** No. 0, 1, 2, 3, 4, 5	E** No. 1, 2, 3, 4
Cream White, Lustre, Fine Grained		G No. 1, 2, 3	
Cream White, Matte, Smooth		C (AA) No. 1, 2	
Cream White, Lustre, Smooth		B No. 1, 2, 3	B No. 1, 2, 3
Cream White, Lustre, Silk		Y No. 1, 2, 3	
Old Ivory, Smooth, Lustre		J No. 1, 2	

\*Letter in parentheses following surface letter denotes former letter by which paper was designated.  
\*\*Azo Papers—All other surfaces are Professional Azo.

**Safelight Recommendations:** Wratten Safelight Series OO or Series OA.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>	<i>Purpose</i>
Dektol or D-72 Selectol or D-52	1:2 1:1	60 sec. 120 sec.	45 to 120 sec. 90 to 240 sec.	Cold Tones Warm Tones for Professional Azo

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

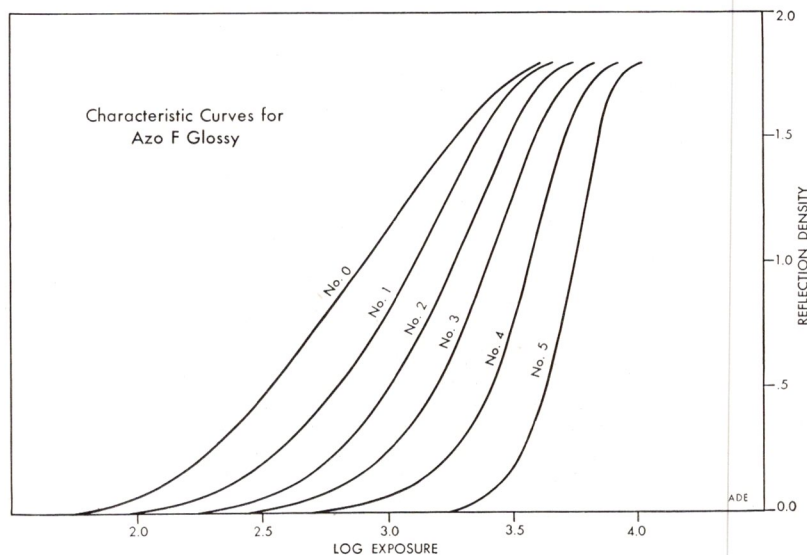
**Fixing:** 5 to 10 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Exposure and Development Latitude:** Azo has some latitude on the underexposure side, making possible a degree of forced development when the printing exposure has been somewhat less than necessary.

**Characteristic Curves:**



**Recommended Toners:** Kodak Selenium Toner is recommended for Professional Azo Papers and yields very good sepia prints. Kodak Gold Toner T-21 gives rich sepia tones with all surfaces. Kodak Blue Toner produces pleasing cold blue tones suitable for certain subjects on Professional Azo. Azo (E, F, and CF) can be toned in Kodak Hypo Alum Toner T-1a.



## Data—VELOX PAPER

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**Purposes:** Velox is the ideal contact printing paper for making album prints. This paper has a uniform tone throughout all contrast grades. Six degrees of contrast make it ideal as a medium for making prints from a variety of negatives of different degrees of contrast.

**Tone:** Blue-black, uniform through all degrees of contrast, and equally uniform for a range of development times.

### Contrast Grade, Speed, and Exposure Scale Values:

<i>Contrast Grade</i>	<i>Speed</i>	<i>Exposure Scale Value</i>	<i>Type of Negative Suited</i>
0	6	1:32	Very Contrasty
1		1:18	Contrasty
2		1:11	Average
3		1: 8	Flat
4		1: 5	Extremely Flat
5		1: 3.5	Very Thin and Flat

**Weights and Surfaces:** Single Weight only, white, smooth, glossy, all contrasts.

**Safelight Recommendations:** The Wratten Safelight Series OA is preferable for judging print depth during development, but the Wratten Series O may be used.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>
Dektol or D-72	1:2	60 sec.	45 to 120 sec.

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

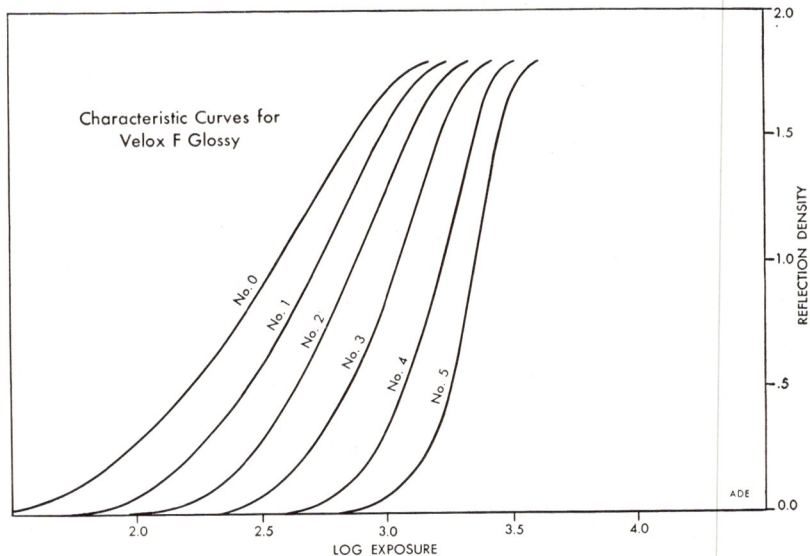
**Fixing:** 5 to 10 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy Velox prints can be ferrotyped.

**Exposure and Development Latitude:** When the exposure has been miscalculated and is greater than necessary, Velox stands a degree of overexposure up to 1.5 times normal very well. Velox may be removed from the developer slightly before the recommended time without great danger of mottle and attendant troubles.

### Characteristic Curves:



**Recommended Toners:** For brilliant sepia toned prints, Kodak Sulfide Sepia Toner T-7a is recommended. Kodak Sepia Toner, prepared tubes, is also recommended.

7-45

**32 KODAK PAPERS**

**Snow scenes are best printed on a white, lustre paper such as Kodabromide N or E.**



## Data—KODABROMIDE PAPER

**Purpose:** Kodabromide is an enlarging paper well suited for the making of exhibition prints which require brilliant and rich blacks. Its speed makes its use practical with any type of enlarger. Additional features include a long-scale emulsion, five degrees of contrast, wide latitude in exposure and development, and a physically hardened emulsion, all of which make it ideal as a general-purpose enlarging paper. Kodabromide F No. 1 or N No. 1, both in Single Weight, are recommended for positives and negatives for the paper negative process. Kodabromide F is widely used for news pictures and withstands the treatment in rush handling.

**Tone:** Brilliant, rich black, uniform through all degrees of contrast and especially uniform for a wide range of development times.

### Contrast Grade, Speed, and Exposure Scale Values:

<i>Contrast Grade</i>	<i>Speed</i>	<i>Exposure Scale Value</i>	<i>Type of Negative Suited</i>
1	400	1:28	Very Contrasty
2		1:14	Average
3		1: 8	Flat
4		1: 5	Very Flat
5		1: 4	Extremely Flat

### Weights and Surfaces:

<i>Type of Surface and Color</i>	<i>Single Weight</i>	<i>Double Weight</i>
White, Glossy, Smooth	F No. 1, 2, 3, 4, 5	F No. 1, 2, 3, 4, 5
White, Lustre, Smooth	N No. 1, 2, 3, 4, 5	N No. 1, 2, 3, 4, 5
White, Lustre, Fine Grained	E No. 1, 2, 3, 4, 5	E No. 1, 2, 3, 4, 5
White, Lustre, Smooth	<i>Light Weight</i> A No. 1, 2, 3, 4, 5	
Cream White, Lustre, Fine Grained		G No. 1, 2, 3, 4, 5

**Safelight Recommendations:** Wratten Safelight Series OA.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>	<i>Purpose</i>
Dektol or D-72	1:2	60 sec.	45 to 120 sec.	Normal Development
Dektol or D-72	1:4*	120 sec.	90 to 240 sec.	Slower Development
Selectol or D-52	1:1	120 sec.	90 to 240 sec.	Warm Tones

\*Add ¼ oz. (8 cc.) 10% Potassium Bromide solution to each 32 oz. (1 liter) of diluted developer.

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

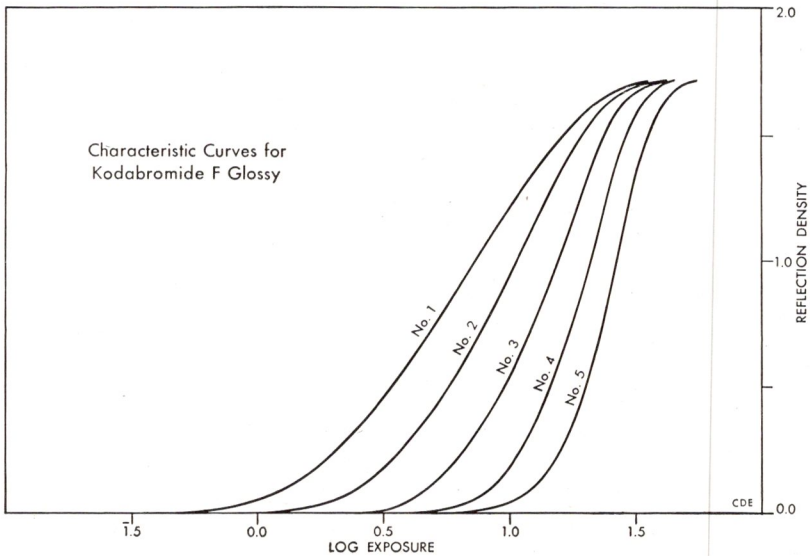
**Fixing:** 10 to 15 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Exposure and Development Latitude:** Kodabromide is noted for an exceptionally wide latitude both in exposure and development.

**Characteristic Curves:**



**Recommended Toners:** Beautiful sepia prints may be obtained in Kodak Sulfide Sepia Toner T-7a and Kodak Sepia Toner.

## Data—VITAVA PROJECTION PAPER

**Purposes:** Vitava Projection is a fast paper for enlarging, with a little less warmth than Vitava Opal. It is well suited for making exhibition prints, especially of large heads and other subjects rendered more pleasing with a slight amount of warmth.

**Tone:** Slightly less warm than Vitava Opal, but warmer than Kodabromide. Slightly warmer tones result from overexposure, and slightly colder tones result from underexposure and consequent changes in development time. The range of over and underexposure is naturally limited.

### Contrast Grade, Speed, and Exposure Scale Values:

<i>Contrast Grade</i>	<i>Speed</i>	<i>Exposure Scale Value</i>	<i>Type of Negative Suited</i>
2	240	1:18	Normal Slightly Flat
3		1:10	

### Weights and Surfaces:

<i>Type of Surface and Color</i>	<i>Double Weight</i>
Cream White, Lustre, Fine Grained	G No. 2, 3
Cream White, Lustre, Silk	Y No. 2, 3

**Safelight Recommendations:** The Wratten Safelight Series OA is preferable for judging print depth during development, but the Wratten Series O can be used.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>	<i>Purpose</i>
Selectol or D-52	1:1	120 sec.	90 to 240 sec.	Normal Development

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

**Fixing:** 5 to 10 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Recommended Toners:** Vitava Projection is especially suited for sepia toning in Kodak Hypo Alum Sepia Toner T-1a. Excellent results can also be secured with Kodak Gold Toner T-21. Kodak Selenium Toner produces pleasing brown tones and Kodak Blue Toner, cold blue tones.

## Data—VITAVA OPAL PAPER

**Purpose:** Vitava Opal has ample speed for enlarging with faster equipment. It is ideal for projection prints and can be used for contact prints from paper negatives or from original negatives of normal contrast, by using reduced printing illumination. Vitava Opal's warmth and quality make it excellent for exhibition prints, especially of large heads and other subjects improved by warmth of tone.

**Tone:** Somewhat warmer than Vitava Projection, not so warm as Kodalure. Tone can be controlled within certain limits by varying the exposure and development time. It responds quite well to developer manipulation.

**Contrast Grade:** Vitava Opal is supplied in one contrast grade only, for negatives of average contrast. Exposure scale value is 1:11.

**Relative Speed:** 125.

### Weights and Surfaces:

Type of Surface and Color	Single Weight*	Double Weight
Cream White, Matte, Fine Grained		H
Cream White, Lustre, Rough		L
Cream White, Lustre, Smooth	B (A)	B
Cream White, Lustre, Fine Grained		G

\*Letter in parentheses following surface letter denotes former letter by which paper was designated.

**Safelight Recommendations:** The Wratten Safelight Series OA is preferable for judging print depth during development, but the Wratten Series O can be used.

**Development Recommendations:** (at 68° F.—20° C.)

Kodak Developer	Dilution	Recommended Time	Useful Range	Purpose
Selectol or D-52	1:1	120 sec.	90 to 240 sec.	Normal Development

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

**Fixing:** 5 to 10 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Recommended Toners:** Vitava Opal Papers tone well in Kodak Hypo Alum Sepia Toner T-1a and in Kodak Sulfide Sepia Toner T-7a. For toning in Kodak Gold Toner T-21, Opal Paper is probably the best suited of all the Kodak Photographic Papers. Kodak Blue Toner produces pleasing blue tones. Kodak Selenium Toner can also be used.

## Data—KODALURE PAPER

**Purpose:** Kodalure produces rich, warm tones by direct development, and has exceptional quality and depth. It has the speed range and the gradation quality of Vitava Opal, and therefore is suitable for enlarging with faster equipment. It is ideal for making warm-toned exhibition prints by projection or by the paper negative method. This paper is not intended for rough usage and must be handled carefully.

**Contrast Grade:** Kodalure is supplied in only one contrast grade for average negatives. Exposure scale value is 1:16.

**Relative Speed:** 100.

**Weights and Surfaces:** Kodalure is supplied only in Double Weight.

<i>Type of Surface and Color</i>	<i>Double Weight</i>
Cream White, Lustre, Fine Grained	G

**Safelight Recommendations:** The Wratten Safelight Series OA is preferable for judging print depth during development, but the Wratten Series O can be used. The apparent depth of prints when wet is affected by the color of the safelight, and prints generally dry darker.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>
Selectol or D-52	1:1	120 sec.	90 to 240 sec.

The print surface must *not* be rubbed in development.

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

**Fixing:** *Not more than 10 minutes* in Kodak F-1 at 68° F. Keep prints in motion to insure even fixing. Overfixation will result in a loss in warmth of tone.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Recommended Toners:** For general requirements Kodalure's warm tone eliminates any need for further toning. However, for those who desire even more warmth, the use of Kodak Gold Toner T-21 is recommended. The prepared Kodak Selenium Toner produces pleasing brown tones and Kodak Blue Toner, cold blue tones.

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## Data—ROYAL BROMIDE PAPER

**Purpose:** Royal Bromide is an enlarging paper of extreme speed, well suited to the requirements of many commercial photographers and photofinishers. Because of its speed, this paper is also popular with many amateur photographers whose enlargers are of low light intensity.

**Tone:** Blue-black.

### Contrast Grade, Speed, and Exposure Scale Values:

<i>Contrast Grade</i>	<i>Speed</i>	<i>Exposure Scale Value</i>	<i>Type of Negative Suited</i>
1	1,000	1:25	Contrasty Average Flat Very Flat
2		1:14	
3		1: 9	
4		1: 6	

### Weights and Surfaces:

<i>Type of Surface and Color</i>	<i>Single Weight</i>	<i>Double Weight</i>
White, Smooth, Glossy	F—Nos. 1, 2, 3, 4	F—Nos. 1, 2, 3, 4
White, Fine Grained, Lustre	E—Nos. 1, 2, 3	E—Nos. 1, 2, 3, 4
Cream, Fine Grained, Lustre		G—Nos. 1, 2, 3, 4
White, Smooth, Matte	M—No. 1	M—Nos. 1, 2, 4
Cream, Tweed, Matte	T—Nos. 1, 3	
	<i>Light Weight</i>	
White, Smooth, Lustre	A—Nos. 1, 2, 3, 4	

**Safelight Recommendations:** Wratten Series OA.

**Development Recommendations:** (at 68° F.—20° C.)

<i>Kodak Developer</i>	<i>Dilution</i>	<i>Recommended Time</i>	<i>Useful Range</i>	<i>Purpose</i>
Dektol or D-72	1:2	60 sec.	45 to 120 sec.	Normal Development

**Acid Stop Bath:** Rinse at least 5 seconds in Kodak SB-1, with agitation.

**Fixing:** 5 to 10 minutes in fresh Kodak F-1, with agitation.

**Washing:** One hour in running water, with agitation, or five minutes in each of 12 changes of water. Rate of flow should change water completely every five minutes.

**Drying:** Glossy prints can be ferrotyped. All other prints should be put face down on clean glass and excess water removed with a roller, sponge, or squeegee; they can then be dried in the Kodak Photo Blotter Roll, between clean photographic blotters, or face down on clean cheesecloth stretchers or an old, well-laundered sheet.

**Recommended Toners:** Beautiful sepia prints may be obtained with Kodak Sepia Toner or Kodak Sulfide Sepia Toner T-7a.



## PROCESSING OF PAPERS

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CORRECT processing of papers is vital to print quality and is secured by following the manufacturer's recommendations which are based on exhaustive research on the many factors which affect quality, convenience, and economy. Development recommendations appear in the table, *Development Times for Kodak Papers*, and in the Data Sheets.

### **Time of Development**

Excellent prints are possible only when the printing exposure is such that proper print density is secured in approximately the recommended development time. A common cause of "muddy" prints is underdevelopment. There is a natural tendency to pull out a rapidly darkening print before development is completed, but the resultant image is poor in tone, lacking in contrast, and often is mottled from uneven development. Exposures *must* be carefully timed to suit development.

Some papers having more latitude than others require less critically timed exposure. Kodabromide Paper is particularly noted for exposure latitude, and a reasonable range of development times is possible.

Overdevelopment or long treatment in an overworked solution is likely to cause a yellow stain due to developer oxidation products. Oxidation may also result from other causes such as exposing the developing print to air or using an exhausted fixing bath. Processing stains even in slight degrees degrade print quality.

### **Uniform Development**

The developing tray should be somewhat larger than the print. This allows proper agitation and convenience in handling the prints. Kodak trays are made with this need in mind, for example, an 8 x 10-inch tray measures about 9 x 11 inches. The exposed print is slipped edgewise and face up into the developer solution so that it is covered quickly and evenly. During development, the solution should be agitated by rocking the tray or by keeping the prints in motion. The prints must be kept completely immersed during development.

### **Stop Bath**

After development, the print should be immersed for at least 5 seconds in a stop bath, such as Kodak SB-1, and agitated to insure thorough access of the solution to all parts of the print. If the stop bath is made much stronger than the Kodak SB-1 formula, or if prints are left in the stop bath longer than necessary, a mottled effect may result.

The Kodak Testing Outfit for Stop Baths and Fixing Baths provides a simple test for determining definitely when the stop bath is exhausted.

## **Processing of Papers**

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The Kodak Stop Bath with Indicator, which is supplied as a prepared powder, changes color when it is neutralized and thus indicates automatically when the stop bath should be discarded.

### **Fixing**

The print should be transferred to stop and fixing baths quickly, without any intermediate examination. After the prints have been rinsed carefully in Kodak Stop Bath SB-1, they should be fixed for about 5 to 10 minutes at 68° F. (20° C.) with agitation in a suitable acid hardening fixing bath such as the solution prepared from Kodak Acid Fixing Powder with Hardener or from the formula for Kodak Fixing Bath F-1. Agitation of the prints in the bath insures thorough access of the solution to all parts of the print surface.

In order to insure complete fixation, it is desirable to use two baths, treating the prints in the first for about 5 minutes, then transferring them to the second for another 5 minutes.

Prolonged fixing should be avoided, particularly with warm-toned prints, because of the tendency of the bath to bleach the image and change its tone. As a general rule, prints should not be fixed in a bath that has been used for fixing films or plates.

### **Appearance of the Print in the Fixing Bath**

The appearance of the fixed print in the hypo tray is slightly deceptive. Upon drying, prints become somewhat darker and lose contrast, especially on matte and warm-toned papers. One method of discounting the contrast and brilliance of a wet print is to tilt the safelight away from the hypo or wash tray, so that the print is viewed by dimmer light. Its appearance should then be darker and less contrasty, corresponding more closely to the appearance of the dry print. After experience with this method, errors in flatness and overdensity will be detected easily.

### **Washing**

The prints must be washed for at least one hour with a flow of water sufficient to change the water in the tray 10 to 12 times an hour.

The washing tray must not be loaded to the point where the prints mat together and the stream of water cannot keep them moving. The Kodak Automatic Tray Siphon is a convenient device for providing efficient circulation of the water. Prints are washed much more slowly in cold water than in warm water. When possible, the wash water temperature should be maintained between 65° and 75° F.

When greatest permanence is desired, or when the time for washing

## **Processing of Papers**

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is limited, the prints should be treated in the Hypo Eliminator HE-1, followed by the Kodak Gold Protective Solution GP-1.

### **Drying**

After being washed, the prints should be placed on a clean glass or a board covered with oilcloth or linoleum so that excess water can be swabbed off with cotton or a viscose sponge. Glossy paper should be dried on ferrotype tins or drums when high gloss is desired.

Small quantities of prints which do not require ferrotyping can be dried in the Kodak Photo Blotter Roll, larger quantities in the Eastman Professional Print Dryer. Prints can also be dried on clean cheesecloth stretchers or between clean blotters. In the latter case, the drained prints should be pressed between blotters for a few minutes, then transferred to dry blotters. Kodak Blotting Paper is of special photographic quality. Ordinary blotters are too soft and linty and may contain impurities which will affect the prints.

If prints curl after drying, they can be flattened by dampening their backs with water (or equal parts of alcohol and water), then re-drying between blotters under heavy pressure for two or three hours. Kodak Print Flattening Solution can be used to prevent curling and possible cracking of the emulsion.

When prints are imperfectly washed, the drying supports become contaminated with hypo which may transfer to prints subsequently dried.

### **Toning**

The choice of the various papers offers a selection in the warmth of tone of the print, as shown under "Physical Characteristics." Also, the warmth of tone of some papers, such as Professional Azo, Vitava Opal, Kodalure, and Vitava Projection, can be varied by the choice of the developer; for example, Kodak Selectol and D-52 produce warmer tones than Kodak Dektol and D-72.

When a more definitely colored image is desired, it is usually necessary to submit the developed and fixed image to some process in which a color or tone is produced by replacement of the silver image with inorganic salts or with dyes. Toners can be obtained in packaged form, or they can be prepared from formulas. Although most toning processes are quite simple, correct exposure and development of the original print are extremely important factors and overfixing must be avoided. Small variations in tone of the original silver image may be accentuated with wide variations in the color of the toned print.

## DEVELOPMENT TIMES FOR KODAK PAPERS

KODAK PHOTOGRAPHIC PAPERS	RECOMMENDED DEVELOPMENT 68°F. (20°C.)			WRATTEN SAFELIGHT SERIES †
	<i>Kodak Developer* and Dilution</i>	<i>Recommended Development Time in Seconds</i>	<i>Useful Development Range in Seconds</i>	
<i>Contact Papers</i> Azo  Professional Azo Ad-Type Velox	{ D-72(1:2) D-52(1:1) Warm Tones }  D-52(1:1) D-72(1:2) D-72(1:2)	60 120  120 60 60	45-120 90-240  90-240 45-120 45-120	00, 0A  00, 0A 00, 0A 0A, 0
<i>Contact or Projection Papers</i> Velox Rapid Vitava Opal Illustrators' Special Kodalure }	D-72(1:2)  D-52(1:1)	60  120	45-120  90-240	0A, 0  0A, 0
<i>Fix Kodalure not more than 10 minutes at 68° F.</i>				
<i>Projection Papers</i> Vitava Projection } Portrait Proof }  Kodabromide  Royal Bromide	D-52(1:1)  { D-72(1:2) D-52(1:1) Warm Tones } D-72(1:2)	120  60 120 60	90-240  45-120 90-240 45-120	0A, 0  0A, 0 0A, 0
<i>Special Papers</i> Super Speed Direct Positive Recording Papers	<i>See instructions in package.                      Information on request.</i>			
<i>Special Printing Films</i> Translite Film	D-52(1:1)	120	90-240	0A

\*NOTE—Prepared Developers: Kodak Dektol can be substituted for D-72, and Kodak Selectol for D-52, with the same dilutions and development times. Kodak Versatol, a concentrated universal liquid developer, can also be used with the above papers; directions appear on the label.

†Used 3 feet from working surface in a suitable safelight lamp with recommended bulb. Where the Series 00 is recommended, the 0A can be used, although it gives less light.

## Kodak Formulas for Processing Papers

THE following formulas are suitable for processing Kodak Photographic Papers. Specific recommendations for their use are given in the table *Development Times for Kodak Papers* and in the Specifications.

### Kodak Developer D-52 For Warm Tone Papers

#### Stock Solution

	Avoirdupois	
	U. S. Liquid	Metric
Water, about 125°F. (50°C.) . . . . .	16 ounces	500 cc.
Elon . . . . .	22 grains	1.5 grams
Kodak Sodium Sulfite, desiccated . . . . .	¾ ounce	22.5 grams
Kodak Hydroquinone . . . . .	90 grains	6.3 grams
Kodak Sodium Carbonate, desiccated . . . . .	½ ounce	15.0 grams
Kodak Potassium Bromide . . . . .	22 grains	1.5 grams
Cold water to make . . . . .	32 ounces	1.0 liter

Dissolve chemicals in the order given.

For use, take 1 part of stock solution to 1 part of water. Develop about 2 minutes at 68° F. (20° C.).

NOTE: More bromide may be added if warmer tones are desired.

### Kodak Developer D-72 For Papers, Films, and Plates

#### Stock Solution

	Avoirdupois	
	U. S. Liquid	Metric
Water, about 125°F. (50°C.) . . . . .	16 ounces	500 cc.
Elon . . . . .	45 grains	3.1 grams
Kodak Sodium Sulfite, desiccated . . . . .	1½ ounces	45.0 grams
Kodak Hydroquinone . . . . .	175 grains	12.0 grams
Kodak Sodium Carbonate, desiccated . . . . .	2¼ ounces	67.5 grams
Kodak Potassium Bromide . . . . .	27 grains	1.9 grams
Water to make . . . . .	32 ounces	1.0 liter

Dissolve chemicals in the order given.

For dilution and development times, see individual recommendations listed for each material.

### Kodak Stop Bath SB-1 For Papers

	U. S. Liquid	Metric
Water . . . . .	32 ounces	1.0 liter
*Kodak Acetic Acid, 28% . . . . .	1½ ounces	48.0 cc.

\*To make approximately 28% acetic acid from glacial acetic acid, dilute three parts of glacial acetic acid with eight parts of water.

Rinse prints for at least 5 seconds. Capacity: about twenty 8x10-inch prints per quart (liter).

## Kodak Formulas for Processing Papers

### Kodak Fixing Bath F-1

#### For Papers

	Avoirdupois	
	U. S. Liquid	Metric
Water . . . . .	64 ounces	2.0 liters
Kodak Sodium Thiosulfate (Hypo) . . . . .	16 ounces	480.0 grams

When the hypo is dissolved completely, add the following hardener solution slowly to the cool hypo solution while stirring the latter rapidly.

Water, about 125°F. (50°C.) . . . . .	5 ounces	160 cc.
Kodak Sodium Sulfite, desiccated . . . . .	1 ounce	30.0 grams
*Kodak Acetic Acid, 28% . . . . .	3 ounces	96.0 cc.
Kodak Potassium Alum . . . . .	1 ounce	30.0 grams

\*To make approximately 28% acetic acid from glacial acetic acid, dilute three parts of glacial acetic acid with eight parts of water.

Dissolve chemicals in the order given. (See directions under Kodak F-1a.) If it is desired to mix a stock hardener solution, use the following formula.

### Kodak Hardener F-1a

#### Stock Solution For Preparing Kodak Fixing Bath F-1

	Avoirdupois	
	U. S. Liquid	Metric
Water, about 125°F. (50°C.) . . . . .	14 ounces	425 cc.
Kodak Sodium Sulfite, desiccated . . . . .	2 ounces	60.0 grams
*Kodak Acetic Acid, 28% . . . . .	6 ounces	190.0 cc.
Kodak Potassium Alum . . . . .	2 ounces	60.0 grams
Cold water to make . . . . .	32 ounces	1.0 liter

\*To make approximately 28% acetic acid from glacial acetic acid, dilute three parts of glacial acetic acid with eight parts of water.

Dissolve the chemicals in the order given. The sodium sulfite should be dissolved completely before the acetic acid is added. After the sulfite-acid solution has been mixed thoroughly, add the potassium alum with constant stirring.

For use, add 1 part of cool stock hardener solution slowly to 4 parts of a 25% cool hypo solution (2 pounds of hypo to the gallon of solution). If the hypo is not thoroughly dissolved before adding the hardener, a precipitate of sulfur is likely to form.

### Kodak Fixing Bath F-6

#### Odorless Bath For Films, Plates, and Papers

	Avoirdupois	
	U. S. Liquid	Metric
Water, about 125°F. (50°C.) . . . . .	20 ounces	600 cc.
Kodak Sodium Thiosulfate (Hypo) . . . . .	8 ounces	240.0 grams
Kodak Sodium Sulfite, desiccated . . . . .	½ ounce	15.0 grams
*Kodak Acetic Acid, 28% . . . . .	1½ ounces	48.0 cc.
Kodalk . . . . .	½ ounce	15.0 grams
Kodak Potassium Alum . . . . .	½ ounce	15.0 grams
Cold water to make . . . . .	32 ounces	1.0 liter

\*To make approximately 28% acetic acid from glacial acetic acid, dilute three parts of glacial acetic acid with eight parts of water.

Dissolve chemicals in the order given.

This bath should be used in conjunction with a stop bath such as Kodak SB-1 or SB-1a to obtain the full useful hardening life. With a water rinse the life is about one-half that obtained when an acid stop bath is used. A stock hardener (Kodak F-6a) can be prepared according to the following formula.

## Kodak Hardener F-6a

### Stock Solution For Preparing Kodak Fixing Bath F-6

	Avoirdupois	
	U. S. Liquid	Metric
Water, about 125°F. (50°C.) . . . . .	20 ounces	600 cc.
Kodak Sodium Sulfite, desiccated . . . . .	2½ ounces	75.0 grams
*Kodak Acetic Acid, 28% . . . . .	7½ ounces	235.0 cc.
Kodak . . . . .	2½ ounces	75.0 grams
Kodak Potassium Alum . . . . .	2½ ounces	75.0 grams
Cold water to make . . . . .	32 ounces	1.0 liter

\*To make approximately 28% acetic acid from glacial acetic acid, dilute three parts of glacial acetic acid with eight parts of water.

Dissolve chemicals in the order given.

Add one part of the cool stock hardener solution slowly to four parts of cool 30% hypo solution (2½ pounds per gallon of solution), while stirring the hypo rapidly.

## Hypo Eliminator HE-1

### For Professional and Amateur Use

	U. S. Liquid	Metric
Water . . . . .	16 ounces	500 cc.
Hydrogen Peroxide (3% solution) . . . . .	4 ounces	125.0 cc.
Ammonia (3% solution) . . . . .	¾ ounces	100.0 cc.
Water to make . . . . .	32 ounces	1.0 liter

**Caution:** Prepare the solution immediately before use and keep in an open container during use. Do not store the mixed solution in a stoppered bottle, or the gas evolved may break the bottle.

**Directions for Use:** Wash the prints for about 30 minutes at 65° to 70° F. in running water which flows rapidly enough to replace the water in the vessel (tray or tank) completely once every 5 minutes. Then immerse each print about 6 minutes at 68° F. in the Hypo Eliminator HE-1 solution and finally wash about 10 minutes before drying. At lower temperatures, increase the washing times.

**Approximate Capacity:** Fifty 8x10-inch prints or their equivalent per gallon (4 liters).

**Test for Hypo:** Process with the batch of prints, an unexposed *white* sheet of photographic paper (same weight and size as majority of prints in batch). After the final wash, cut off a strip of this sheet and immerse it in a 1 per cent silver nitrate solution for about 3 minutes; then rinse in water and compare *while wet* with the *wet untreated portion*. If the hypo has been completely removed, no color difference should be observed. A yellow-brown tint indicates the presence of hypo. The depth of the tint increases with increased hypo content. A positive test with silver nitrate may also be obtained in the absence of hypo if hydrogen sulfide or wood extracts are present in the water supply.

#### Occasional Effects When Using the Peroxide-Ammonia Treatment (HE-1)

1. Slight tendency for prints to stick to belt on belt dryers. To prevent this effect bathe the prints about 3 minutes in a 1 per cent solution of formaldehyde prior to drying.
2. An almost imperceptible change in the image tone. To prevent this effect, add 15 grains of potassium bromide to each quart (1 gram per liter) of the peroxide-ammonia bath (HE-1).
3. A very faint yellowing of the whites (undetected on buff papers). To minimize this effect, bathe the prints in a 1 per cent sodium sulfite solution for about 2 minutes immediately after treatment in HE-1 and prior to the final wash.

**NOTE:** With *buff papers*, it is possible to use a higher concentration of peroxide (maximum about 500 cc. of 3% solution per liter) and thus extend the exhaustion life to about eighty 8x10-inch prints per gallon. This more concentrated bath is *not* recommended for use with white papers used by professional photographers because the yellowing would be objectionable.

## Kodak Formulas for Processing Papers

### Kodak Gold Protective Solution GP-1 For Increasing the Permanency of Silver Images

	Avoirdupois	
	U. S. Liquid	Metric
Water . . . . .	24 ounces	750 cc.
*Kodak Gold Chloride . . . . . (1% stock solution)	2½ drams	10.0 cc.
Kodak Sodium Thiocyanate . . . . .	145 grains	10.0 grams
Water to make . . . . .	32 ounces	1.0 liter

\*A 1% stock solution of Kodak Gold Chloride may be prepared by dissolving the contents of one tube (15 grains) in 3¼ ounces of water (1 gram in 100 cc. of water).

Add the Gold Chloride stock solution to the volume of water indicated. Dissolve the Sodium Thiocyanate *separately* in 4 ounces (125 cc.) of water. Then add the thiocyanate solution slowly to the gold chloride solution while stirring the latter solution rapidly.

**For Use:** Immerse the well washed print (which preferably has received a hypo elimination treatment) in the Gold Protective Solution for 10 minutes at 68° F. (20° C.) or until a just perceptible change in image tone (very slightly bluish black) takes place. Then wash for 10 minutes in running water and dry as usual.

**Approximate Capacity:** Thirty 8x10-inch prints per gallon. For best results the Kodak GP-1 solution should be mixed immediately before use.

**Films and Plates:** The above procedure may also be used with fine-grained images on films and plates when maximum permanency is desired.

### Kodak Hypo Alum Sepia Toner T-1a

	Avoirdupois	
	U. S. Liquid	Metric
Cold water . . . . .	90 ounces	2800 cc.
Kodak Sodium Thiosulfate (Hypo) . . . . .	16 ounces	480.0 grams

Dissolve thoroughly, and add the following solution:

Hot water, about 160°F. (70°C.) . . . . .	20 ounces	640 cc.
Kodak Potassium Alum . . . . .	4 ounces	120.0 grams

Then add the following solution (including precipitate) *slowly to the hypo-alum solution while stirring the latter rapidly.*

Cold water . . . . .	2 ounces	64.0 cc.
Kodak Silver Nitrate, crystals . . . . .	60 grains	4.2 grams
Sodium Chloride . . . . .	60 grains	4.2 grams

After combining above solutions.

Add water to make . . . . .	1 gallon	4.0 liters
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NOTE: The silver nitrate should be dissolved completely before adding the sodium chloride, and immediately afterward the solution containing the milky white precipitate should be added to the hypo-alum solution as directed above. The formation of a black precipitate in no way impairs the toning action of the bath if proper manipulation technique is used.

For use, pour into a tray supported in a water bath and heat to 120° F. (49° C.). At this temperature prints will tone in 12 to 15 minutes depending on the type of paper. Never use the solution at a temperature above 120° F. (49° C.). Blisters and stains may result. Toning should not be continued longer than 20 minutes at 120° F. (49° C.).



## Kodak Formulas for Processing Papers

In order to produce good sepia tones, the prints should be exposed so that the print is slightly darker than normal when developed normally (1½ to 2 minutes).

The prints to be toned should be fixed thoroughly and washed for a few minutes before being placed in the toning bath. Dry prints should be soaked thoroughly in water. To insure even toning, the prints should be immersed completely, and separated occasionally, especially during the first few minutes.

After prints are toned, they should be wiped with a soft sponge and warm water to remove any sediment, and washed for one hour in running water.

The bath is particularly suitable for use with papers having slightly warm tones, such as Azo, in which the images are composed of comparatively fine grains. Vitava Opal and Vitava Projection also tone well in Kodak T-1a. It is not satisfactory for use with warm-toned papers such as Professional Azo.

### Kodak Sulfide Sepia Toner T-7a

#### Stock Bleaching Solution A

	Avoirdupois	
	U. S. Liquid	Metric
Kodak Potassium Ferricyanide . . . . .	2½ ounces	75.0 grams
Kodak Potassium Bromide . . . . .	2½ ounces	75.0 grams
Kodak Potassium Oxalate . . . . .	6½ ounces	195.0 grams
*Kodak Acetic Acid, 28% . . . . .	1¼ ounces	40.0 cc.
Water . . . . .	64 ounces	2.0 liters

\*To make approximately 28% acetic acid from glacial acetic acid, dilute 3 parts of glacial acetic acid with 8 parts of water.

#### Stock Toning Solution B

Kodak Sodium Sulfide, (not Sulfito) . . . . .	1½ ounces	45.0 grams
Water . . . . .	16 ounces	500.0 cc.

Prepare Bleaching Bath as follows:

Stock Solution A . . . . .	16 ounces	500 cc.
Water . . . . .	16 ounces	500 cc.

Prepare Toner as follows:

Stock Solution B . . . . .	4 ounces	125 cc.
Water to make . . . . .	32 ounces	1.0 liter

The print to be toned should first be washed thoroughly. Place it in the Bleaching Bath, and allow it to remain until only faint traces of the halftones are left and the black of the shadows has disappeared. This operation will take about one minute.

NOTE: Particular care should be taken *not* to use trays with any *iron* exposed, otherwise blue spots may result.

Rinse *thoroughly* in clean cold water.

Place in Toner Solution until original detail returns. This will require about 30 seconds. Give the print an immediate and thorough water rinse; then immerse it for five minutes in a hardening bath composed of 1 part of the stock hardener Kodak F-1a and 16 parts of water. The color and gradation of the finished print will not be affected by the use of this hardening bath. Remove the print from the hardening bath and wash for one-half hour in running water.

This toning bath tends to give warm tones, an advantage with papers such as Velox, Kodabromide, and Royal Bromide. With the inherently warm-toned papers, such as Azo, Professional Azo, Vitava Opal, Vitava Projection, and Kodalure, it tends to produce rather disagreeable yellow tones.

**Kodak Gold Toner T-21**

THE Kodak Gold Toner T-21 has the advantage that a variety of excellent brown tones may be obtained by varying the time of toning, that is, the prints may be removed at any time from the bath when the desired color is reached. It is particularly recommended for use with warm-toned papers such as Professional Azo, Vitava Opal, and Kodalure.

**Stock Solution A**

	Avoirdupois	
	U. S. Liquid	Metric
Warm water, about 125°F. (50°C.) . . .	1 gallon	4.0 liters
Kodak Sodium Thiosulfate (Hypo) . . .	2 pounds	960.0 grams
Kodak Ammonium Persulfate . . . . .	4 ounces	120.0 grams

Dissolve the hypo completely before adding the ammonium persulfate. Stir the bath vigorously while adding the ammonium persulfate. If the bath does not turn milky, increase the temperature until it does.

Prepare the following solution and add it (including precipitate) slowly to the hypo-persulfate solution while stirring the latter rapidly. *The bath must be cool when these solutions are mixed.*

Cold water . . . . .	2 ounces	64.0 cc.
Kodak Silver Nitrate, crystals . . . . .	75 grains	5.2 grams
Sodium Chloride . . . . .	75 grains	5.2 grams

NOTE: The silver nitrate should be dissolved completely before adding the sodium chloride.

**Stock Solution B**

Water . . . . .	8 ounces	250.0 cc.
Kodak Gold Chloride . . . . .	15 grains	1.0 gram

For use, add 4 ounces (125 cc.) of Solution B slowly to Solution A while stirring the latter rapidly.

The bath should not be used until after it has become cold and has formed a sediment. Then pour off the clear liquid for use.

Pour the clear solution into a tray supported in a water bath and heat to 110° F. (43° C.). During toning the temperature should be between 100° and 110° F. (38° and 43° C.).

Prints to be toned should be washed for a few minutes after fixing before they are placed in the toning solution. Dry prints should be soaked thoroughly in water before toning.

Keep at hand an untoned black-and-white print for comparison during toning. Prints should be separated at all times to insure even toning.

When the desired tone is obtained (5 to 20 minutes), remove and rinse the prints in cold water. After all prints have been toned, return them to the fixing bath for five minutes, then wash for one hour in running water.

The bath should be revived at intervals by the addition of Gold Solution B. The quantity to be added will depend upon the number of prints toned and the time of toning. For example, when toning to a warm brown, add 1 dram (4 cc.) of gold solution after each fifty 8x10-inch prints or their equivalent have been toned. Fresh solution may be added from time to time to keep the bath up to the proper volume.

## KODAK CHEMICAL PREPARATIONS

THE Eastman Kodak Company makes available the following formulas in prepared form. The photographer need only dissolve the powders in the proper volume of water according to directions printed on the package. The use of prepared developers and other processing solutions is a quick, convenient, and safe method of working which assures the user of purity, uniformity, and economy.

<b>DEVELOPERS</b>		
NAME	SIZES AVAILABLE	USE
Kodak Dektol	5, 25, and 50 gal. Stock solution	Improved, long life, D-72 type developer for films, plates, and papers
Kodak Selectol	$\frac{1}{2}$ , 1, and 5 gal. Stock solution	Improved D-52 type developer for warm tone papers
Kodak Versatol	8 and 16 oz., 1 and 5 gal. Stock solution	Concentrated liquid universal developer for films, plates, and papers
Kodak D-72	1 qt., $\frac{1}{2}$ and 1 gal. Stock solution	General use; papers, fast development films and plates
Kodak Direct Positive Paper Black-and-White Outfit	1 gal. each solution	Makes developer, bleach, and clearing baths for Kodak Direct Positive Paper
<b>OTHER PREPARATIONS</b>		
NAME	SIZES AVAILABLE	USE
Kodak Odorless Sepia Toner	1 gal.	Sepia redeveloper for Direct Positive Paper
Replenisher for Kodak Odorless Sepia Toner	$\frac{1}{2}$ gal.	Replenisher for Odorless Sepia Toner
Kodak Stop Bath with Indicator	1 gal.	Dry powder to make acid rinse bath which turns color when exhausted
Kodak Liquid Hardener	4 and 8 oz. $\frac{1}{2}$ and 5 gal.	Dilute to make hardening rinse or add to hypo solution to make hardening fixing bath
Kodak Acid Fixing Powder with Hardener	1 qt. $\frac{1}{2}$ and 1 gal.	Single powder acid fixing bath for films, plates, and papers
Kodak Testing Outfit for Stop Baths and Fixing Baths	1 oz. of each test solution, 8 oz. bottles	For determining when stop baths and fixing baths for films or papers are exhausted
Kodak Sepia Toner	1 qt. bleach 1 qt. toner	Sepia toner for contact or projection prints, lantern slides, and transparencies
Kodak Rapid Selenium Toner	8 oz., 1 qt., 5 qts., 12 $\frac{1}{2}$ gal. Stock solution	Concentrated single solution toner for cold brown permanent tones. Dilute 1 to 3 for use
Kodak Blue Toner	1 qt.	Gold toner for blue-black to blue tones on prints. Also reddish tones on sepia prints
Kodak Toning and Fixing Powders for Studio Proof Paper	4 oz.	For permanently toning and fixing Studio Proof or similar printing-out papers
Kodak Anti-Cal	4 oz. and 1 lb.	For addition to developers for prevention of calcium scums, sludges and incrustations
Kodak Photo-Flo	5, 10, and 50 gal.	To minimize water marks when drying films and to facilitate application of water colors, opaques, etc.
Kodak Ferrotypc Plate Polish	8 oz.	For polishing ferrotypc plates to prevent sticking of prints
Kodak Print Flattening Solution	8 oz. 1 and 5 gal	To keep prints flexible and prevent curling
Kodak Spotting Colors	3-color set	Black, white, sepia for spotting prints
Kodak Print Lacquer	8 oz. 1 gal.	For protecting prints against finger marks, grease, gases, etc.
Kodak Print Lustre	4 oz.	For producing a lustre on prints
Kodak Transparent Water Color Outfit	12 colors	For coloring prints and lantern slides
Kodak Transparent Oil Color Outfit	15 colors	For coloring portraits and prints on matte or semi-matte surfaces
Kodak Photo Paste Powder	1 lb.	Powder for preparing photo paste
Kodak Photo Paste	4 oz.	Small jar ready for use
Kodak Rapid Mounting Cement	$\frac{1}{2}$ oz. tube	Mounting photographic prints

# SELECTED KODAK PUBLICATIONS

*On Sale at Kodak Dealers*

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**Kodak Reference Handbook.** Over 400 pages of authoritative technical information on photographic materials, processes, and techniques, uniquely planned for convenience as a reference source. This book can be kept up to date by replacing sections with new printings of Kodak Data Books. Illustrated in color.

**Kodak Lenses, Range Finders and Shutters.** A Data Book on the characteristics of these vital camera parts and their use, with specifications, depth of field and field-size tables, and useful optical formulas.

**Filters and Pola-Screens.** A Data Book which discusses the theory and use of filters and Pola-Screens, with Data Sheets for the more popular Wratten Filters. Illustrated in color.

**Kodak Films.** A Data Book treating the physical and photographic properties of black-and-white films, and including Data Sheets for Kodak roll films, film packs, and sheet films.

**Kodak Papers.** A Data Book on the characteristics of contact and enlarging papers, and methods of selection and use of papers for prints of high quality. Data Sheets and formulas included.

**Formulas and Processing.** A Data Book presenting a comprehensive list of Kodak formulas. It discusses principles and procedures for processing films, plates, and papers.

**Kodachrome and Kodacolor Film.** A Data Book on still photography and home movies in color. Discusses lighting, exposure, and many special subjects. Illustrated in color.

**Photography with Kodachrome Professional Film.** A Data Book on Kodachrome sheet film, with particular attention to make-up, portrait lighting, and other special problems. Illustrated in color.

**Copying.** A Data Book dealing with the copying of all types of originals. Data Sheets and formulas included.

**Slides.** A Data Book on the making and showing of slides and transparencies in black-and-white and color.

**Infrared and Ultraviolet Photography.** A Data Book describing both principles and practice in two specialized fields of photography.

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