BOWENS ILLUMITRAN

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INSTRUCTION MANUAL

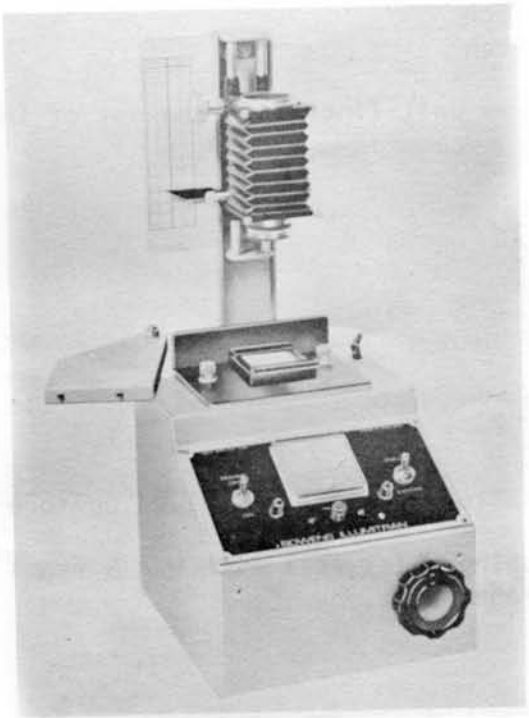
BOWENS ILLUMITRAN

The Bowens Illumitran is unique among transparency duplicators in that it combines constant color temperature electronic flash illumination (5600°K) with a continuously variable intensity control which does not affect the duration or color temperature of the flash. Thus, with careful use, consistency of a high order can be achieved even when copying transparencies of varying density and those requiring color correction. A few minutes spent reading this manual before working with the Illumitran will insure you many years of trouble-free and satisfying use.

GUARANTEE: This unit has been carefully inspected and should give trouble free performance for many years. It is fully guaranteed against defects in materials and workmanship for one full year from date of purchase (with the exception of components noted below) provided that it is returned freight prepaid to the Bogen Photo Corp. for servicing, carefully packed and insured, and providing that the guarantee card enclosed is filled out and returned to us within 10 days of purchase.

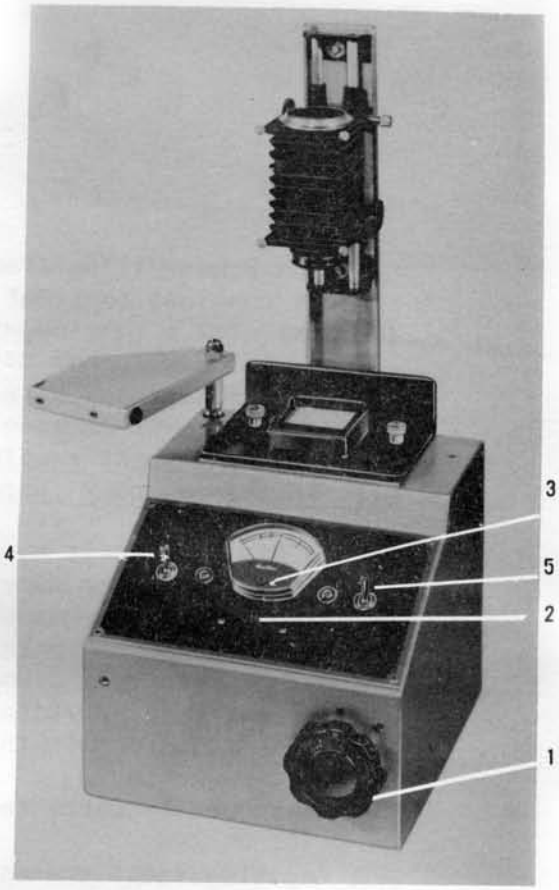
The flashtube is warranted for 10,000 flashes.

The focusing lamps are warranted for 1000 hours of use.



I. DESCRIPTION OF MAJOR ASSEMBLIES

The standard Illumitran is furnished with the following components illustrated in Photos 1 and 2 below:



A

A. Base Unit

1. Intensity control
2. Trimmer
3. Meter Zero set
4. Power On/Off Switch
5. Focus/Expose Switch

B. Camera Support/Bellows Unit (including one set of interchangeable lens and camera body adapters)

C. Holder for $2\frac{1}{4}$ x $2\frac{1}{4}$ slides in standard 2 3/4" x 2 3/4" mounts

D. Meter Probe Cell

E. Holder for transparencies up to 4 x 4cm in standard 2" x 2" mounts

The following are illustrated above, and are accessories which may be ordered for the Illumitran:

G. Frame Unit and transparency holder for sizes up to 4 x 5 inches

H. Extension cord for using meter cell with 4 x 5 frame unit (Included in price of 4 x 5 frame unit).

II. ASSEMBLY INSTRUCTIONS:

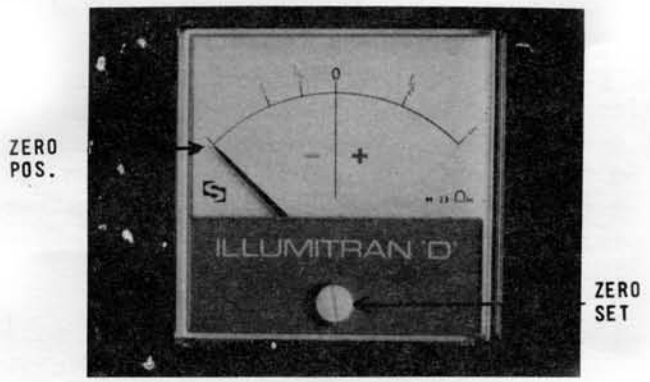
A. Check the voltage selector plug on the bottom of the base unit to make sure that the index mark is set opposit the appropriate voltage for your area. As shipped by us, it is set to the position marked "110" for operation on 105-125 volts, 60 cycle AC. Power consumption of the Illumitran is 100 watts.

B. The Bellows unit is mounted to the base unit by means of two knurled nuts on top (which also secure the transparency holders) and a large knob on the rear. This latter should be fastened finger tight in order to assure good alignment between the two units.

C. The camera body and lens adapters should first be fastened to the camera and lens, then attached to the bellows unit by means of the two knurled locking screws to be found at each end of the bellows.

D. The appropriate transparency holder should be set in place on the threaded studs at the top of the base unit, and fastened by means of the two knurled nuts. Note that the holes in the transparency holders are slightly oversize to permit axial adjustment of the position of the transparency to be copied. Where it is necessary to enlarge an off center section of a transparency, it may be placed in any position relative to the lens axis by first laying a piece of clear glass across the top of the holder. Unmounted transparencies can be copied by means of the accessory holders for 24 x 36mm and 6 x 6 cm sizes which are used in conjunction with the transparency holders for mounted slides.

E. Before plugging the meter into the socket provided for it on top of the base unit, turn on the power and allow the Illumitran to warm up for a few minutes. Then, note the position of the meter needle. It should point to the index mark on the left side of the scale, if it does not, adjust the Zero Set (A3) unit it does. <u>It should be standard procedure to check the position of the zero set every time the Illumitran is used by unplugging the cell and noting the position of the pointer</u>.



III. INITIAL CALIBRATION PROCEDURE

Note: When consistency of better than $\frac{1}{4}$ stop is required it is suggested that a regulated power supply be utilized.

A. Turn the illumitran on and allow a five minute warm up period. This should be done whenever the unit has been turned off.

B. Select a good original 35mm transparency of average density and contrast which can be retained as a standard. Place this in the transparency holder, making sure that the opal glass provided is in place in the bottom of the filter drawer. Set the switch A5 to the FOCUS position.

C. Set up and adjust the camera for 1:1 copy, focus through the finder, (for detailed instructions on setting up for any given ratio of image to subject size see section IV below).

D. Make sure camera shutter is set to proper speed (the fastest which will allow "X" synch for forcal plane shutters; 1/50th sec. for between the lens shutter). Plug in the shutter synchronizing lead to the "X" synch terminals of the camera.

E. Adjust the Intensity Control Knob (A1) until the red spot on it lines up with the matching spot on the front of the base unit.

F. Swing the photo-cell over the transparency.

G. Observe the meter, and adjust the trimmer control (A2) to bring the meter pointer to the zero point at the center of the scale. Do not touch the trimmer again after making this adjustment. Note: do not use the Illumitran in a highly illuminated area such as next to a window where bright sunlight may be reflected up the surface of the meter cell to produce false readings. Use under normal room illumination, however, is satisfactory. Effect of ambient illumination may be checked by turning the function switch (A5) to the Expose position and noting the position of the meter pointer when the cell is in place. If it shows a reading lower than one stop below the center position determined above, the ambient illumination will not affect its operation.

H. Swing the photo cell out of the way and switch A5 to the EXPOSE position. The neon indicator will show the readiness of the circuit to flash.

I. Now make a series of test exposures over the range of lens settings from f5.6 to f22 at half stop intervals. About five seconds between flashes will be required for recharging. With ASA 25 film, at a magnification ratio of 1:1 the best exposure will probably be between f11 and f16.

J. Examine the processed film and decide the aperture for correct exposure, on the basis of results obtained. This is the standard aperture to be used with the Illumitran for making duplicates at the same magnification range and with the same film. If the original calibration is done with a color reversal material, the aperture adjustments required for films of higher or lower ASA speed rating may be set proportionally to the differences in film speed. Because of its greater latitude, negative type film should not be used for calibration. (See section VIII for comments on choice of film for color reproduction)

IV. DETERMINING/IMAGE SUBJECT RATIOS

Your Illumitran is now equipped with a scale which will indicate exposure corrections to be made when copying originals at magnifications other than 1:1. This scale is direct reading for lenses of 50mm and 60mm nominal focal length. It can be used by extrapolation for lenses of 55mm focal length, and the exposure corrections for the 60mm scale can be used for 58mm lenses.

Use of the Exposure Compensating Scale will eliminate the need for calculations of exposure correction once the lens position for 1:1 magnification is determined and the scale is set.

The following is a simple procedure which can be used both to determine image/subject ratios and which will also provide information as to the actual area covered by the camera viewfinder system compared to the area of the film plane opening (many SLR cameras do not actually show in the viewfinder the entire picture area. The amount of cutoff can be more than 10% of the total image area, and in cases where cropping is critical, it is important to know what error exists in the viewfinder system).

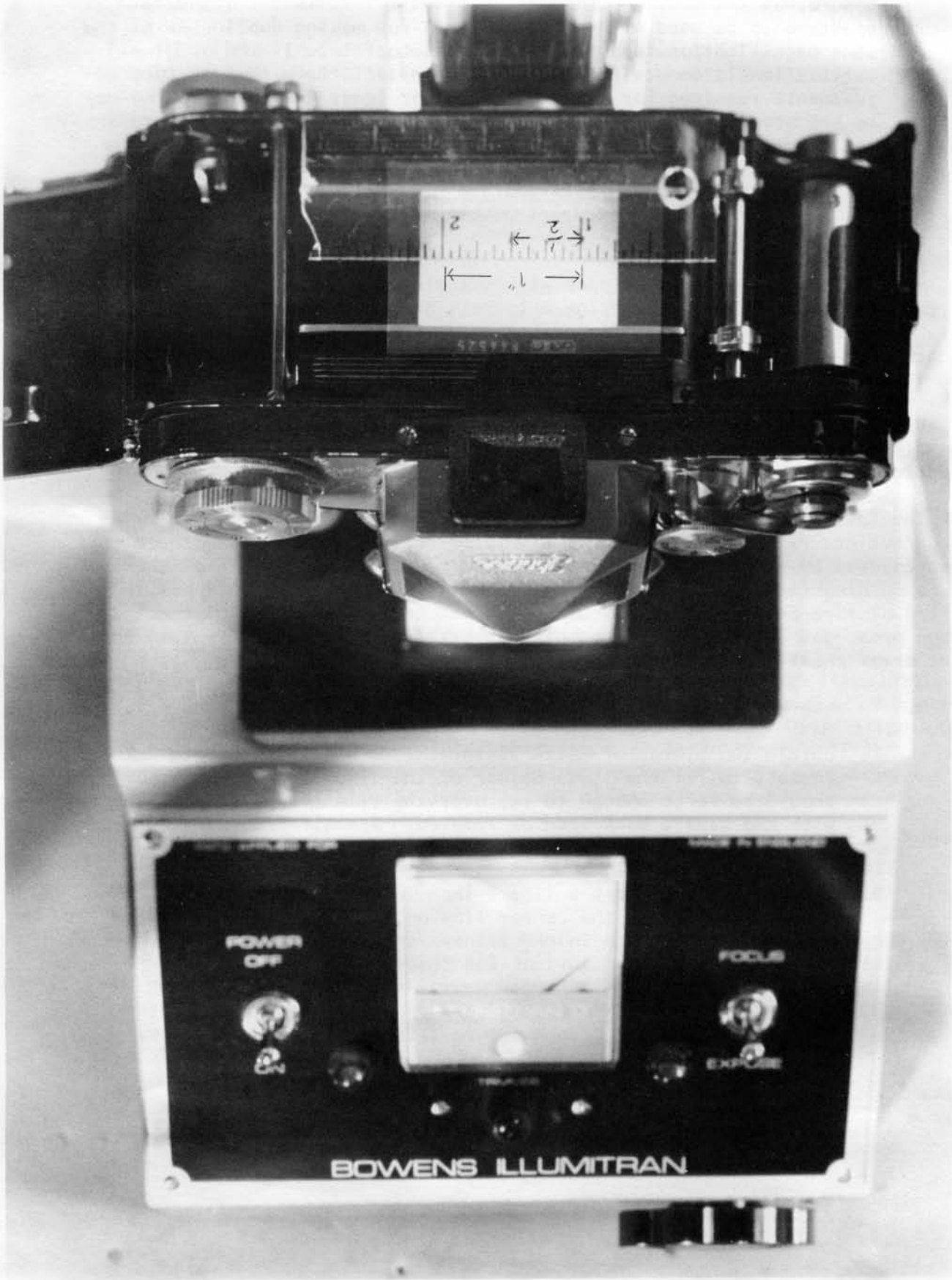
A. To determine camera/lens positions on bellows for 1:1 reproductions.

1. Obtain two pieces of matte acetate. One should be cut to 2x2 inches, to fit the slide holder of the Illumitran. The other should be large enough to lay over the film tracks of your camera with the camera back open or removed. A small transparent ruler is also required.

2. Draw with fine pencil a line 1 inch long with graduations each quarter inch along the center line on the 2 x 2 matte acetate and place this piece in the transparency holder with the line parallel to the long axis of the camera opening.

3. Disconnect the flash coupling cord from your camera and set the shutter to Time, or Bulb exposure (if the latter, a cable release with a lock will be needed).

4. Flip Function Switch to FOCUS, and open up the lens to its widest aperture.


POWER
OFF
ON
FOCUS
EXPOSE
BOWENS ILLUMITRAN

5. Place the second piece of acetate on the film channel so that it is over the opening in the camera body and in the film plane.

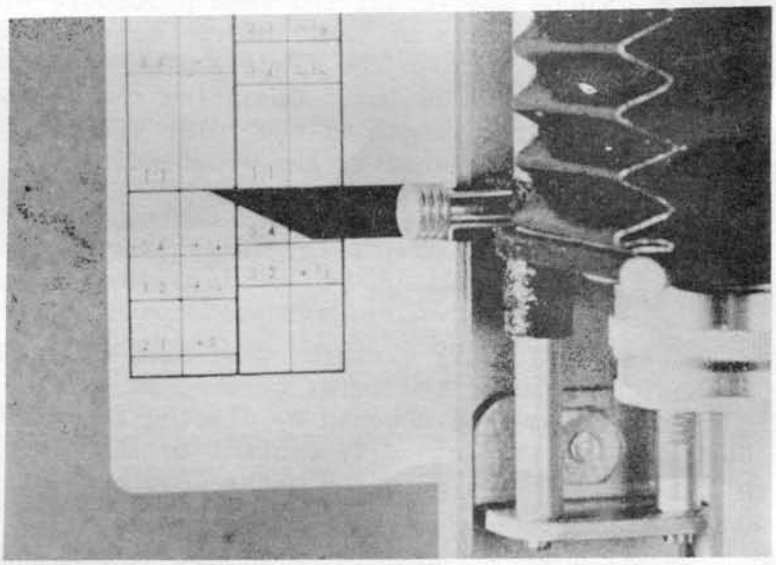
6. Using a magnifier to observe the image on the matte acetate, adjust the front and rear standards of the bellows assembly so that the image of the line as viewed on the acetate measures exactly one inch long.

7. Close the shutter to reactivate your viewfinder mirror, and recheck sharpness through the camera finder.

8. Carefully lock the lens in position by tightening the knurled lock knob on the lens focusing standard.

9. The Exposure Calibrating Scale is held in position by the two large screws on the rear side of the bellows assembly frame. Loosen these two screws slightly, just enough so that you can slide the Exposure Calibrating Scale up or down until the pointer fastened to the bellows standard lines up with the 1:1 position on the scale (see photo below).

10. Tighten the screws on the rear of the bellows frame so that the scale is firmly held in place.



The scale is now set, and does not have to be re-set unless another lens is substituted for the one originally used to calibrate it. To use the Exposure Calibrating Scale, simply not the indicated correction for any position of the lens under the column applying to the lens focal length.

There are two columns under each lens focal length. The first shows the approximate image to object ratio, i.e. the degree of magnification. The second figure shows the exposure correction necessary to compensate for the change in magnification from 1:1. Plus changes mean the lens must be opened up to a smaller number (large opening) or the intensity control must be rotated to produce a plus change in exposure. Negative signs mean that the f stop must be made smaller, or the intensity control must be turned to the point where it produces a corresponding reduction in exposure. For example, if your Illumitran is calibrated to produce correct exposure with a given film at 1:1 with a lens opening of f11, and you wish to crop a slide to produce the equivalent of 3:2 magnification, the scale will show that exposure must be increased by $\frac{1}{2}$ stop. You have two choices: (a) you can open up the lens half way between f11 and f8, or you can set the intensity control to show a $\frac{1}{2}$ stop increase in exposure without changing the lens opening.

Since camera lenses vary in actual focal length by as much as 2% from the nominal values marked on their engraved scales, the values shown on the scale for magnification are only approximate. When using the 55mm Repro-Claron lens, use an exposure correction midway between those shown for 50mm and 60mm lenses.

B. To Determine Coverage of Your Viewfinder

Use a transparent ruler, preferably calibrated in millimeters. With the camera set up as in A above, place the ruler on the transparency holder, making sure that it is parallel to the long axis of the viewfinder field. Focus and repeat the same procedure with the scale perpendicular to the long axis of the finder. Note how many millimeters on the scale you can see through the finder. The standard frame size for 35mm cameras is 24.5mm x 36.3mm. Comparing the dimensions of the film plane opening with the length of the ruler visible in the viewfinder will show the area covered by the viewfinder.

V. OPERATING INSTRUCTIONS

A. Standard Sequence of Operation

Note: Good operating procedure dictates that each time the Illumitran is used, the mechanical zero of the meter be checked (see section II E), and the setting of the trimmer be checked by placing the standard transparency in the holder, setting the Intensity Control to its mid position (the two red dots in line) and making sure the meter needle points to the center position on the scale when the function switch is set to the FOCUS position and the cell swung over it).

1. Advance Film
2. Set Switch A5 to FOCUS
3. Insert slide to be copied, check orientation.
4. Check focus and centering in camera viewfinder (if you open up lens to check focus to be sure to stop it down again)
5. Insert any filters you may be using for color compensation into the filter drawer.
6. Swing meter cell probe over slide

7. Adjust exposure with intensity control to bring pointer to center position.
8. Set Switch A5 to EXPOSE
9. Swing meter cell probe out of the way
10. As soon as the ready light comes on, you can expose.

B. Variations from Normal Procedure

The procedure outlined above will give a high percentage of acceptable results. However, experience will show that certain types of original transparencies do not reproduce in the best way with photo-electric control of exposure, and may require rather more or less exposure than they would receive if put through in the routine way. Such transparencies are usually those of very high contrast in which the exposure needs to be adjusted according to the density of a small section of the transparency rather than the average density of the whole. A simple modification to the routine procedure can be followed which will allow the operator to bias the exposure by a known amount without having to make a change in the lens aperture.

If this is required, procedure A.7 above is altered to bring the meter needle to a point on the scale to the plus or minus side of the arrow. The scale numbers represent exposure difference in terms of lens aperture. For example, if the meter reads plus $\frac{1}{2}$, this is equivalent to opening the lens aperture by $\frac{1}{2}$ a stop, compared with the exposure obtained with the meter reading to the centre arrow. Similarly, minus 1 is equivalent to closing the lens aperture by 1 stop.

C. Using the 4 x 5 Frame

This attaches to the top of the 'Illumitran' in place of the bellows assembly and access to the two retaining screws is obtained by removing the opal screen. For initial tests with an average transparency, set the brightness control to its mid-position (red spots together). Changes in exposure for different transparencies are best made by altering the lens aperture, always keeping the brightness control in its mid-position.* While the photo electric control cannot be used in its normal way, it is possible to employ the photo cell to obtain a measure of guidance on the relative density of different transparencies. For this purpose, unplug the photo cell and connect in the extension lead supplied with the 4" x 5" frame unit. Compare the meter readings obtained with the cell held close above selected areas of the different transparencies compared with those obtained with the test transparency, and adjust the lens aperture accordingly.

*NOTE Even illumination will not be obtained over the 4x5 area if the knob is moved from its mid-brightness position.

D. Duplicating with cameras other than 35mm

1. Film Strips:

The simplest way to produce film strips is to use a suitable single frame 35mm camera such as the Olympus Pen F or Pen FT. It is possible

to use the Pen F with the bellows furnished with the Illumitran provided that an enlarging lens of 60mm focal length is used. The advantage of this system is that if the lens is the same used on your regular 1:1 duplication of 35mm slides, the exposure corrections shown on the Illumitran's Compensation Scale for reductions from 35mm to single frame will apply.

2. Cameras larger than 35mm

Roll film single lens reflexes or press and view cameras can be used with suitable copy stands or tripods to copy any size original from the Illumitran (up to 4 x 5 with the accessory frame unit). The base unit of the Illumitran should be mounted on a level surface, and the alignment of the camera checked carefully with a sensitive level. You can also use a matte acetate target on which an accurate rectangle has been drawn and compare it to its image on the ground glass to check alignment.

The light output of the Illumitran is sufficient to permit enlarging a 35mm transparency to 4 x 5 with an exposure of between f5.6 and f8 using a material of ASA 32 to 64 speed. In order to obtain these magnifications within practical bellows extension limits, a short focal length lens, whose focal length is determined by the size of the original material being copied, is necessary. An enlarging or macro lens is preferred. For blowups from 35mm, for example, we have found the 50mm Componon mounted in a Compur shutter to be satisfactory.

VI. EXPOSURE COMPENSATIONS FOR CHANGES IN MAGNIFICATION

A. Lens aperture markings (f stops) are based on the assumption that the closest object upon the lens will be focused is at least 8 time its focal length away from it. When working at closer distances, therefore, it is obvious that the actual effective aperture is considerably smaller when the lens is racked out farther from the film to focus the image. There are two formulas normally used to calculate the change in lens setting required to compensate for this:

1. $E = \frac{D^2}{F^2}$

Where E = exposure factor, D^2 = actual lens to film distance and F = nominal focal length of lens.

2. $E = \frac{I}{S} + 1)^2$

Where E = exposure factor, I = height of image as measured at the film plane; S = height of subject.

In using either of these formulas, it must be remembered that they are based on a correction for bellows extension from infinity focus. Since it is assumed that you have calibrated your Illumitran in Sec. III for 1:1 reproduction, the calibration already includes a

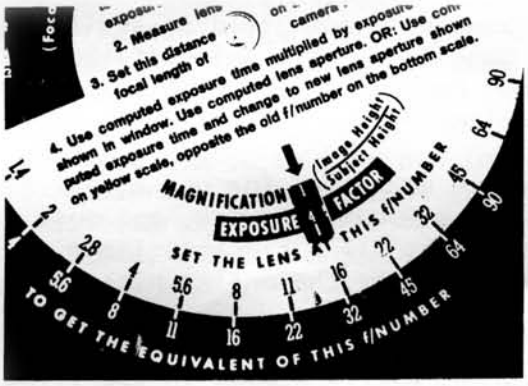
compensation for the bellows factor involved. It is essential, therefore, when using these formulas to compare the exposure factor obtained for the given magnification ratio to that for the ratio at which the Illumitran has been calibrated. It is also necessary to remember that since the flash duration is constant, compensations must be made in lens settings or with the intensity control.

For example, if the Illumitran was initially set up for 1:1 reproduction, an examination of the duplicates made from the standard transparency indicates the correct lens setting to be f16, it must be remembered that this setting includes the bellows compensation exposure factor of 4, determined by the formulas above. If you are copying down from a larger size to 35mm, for example, the image to subject ratio might be such that the indicated Exposure Factor, compared to infinity focus, would be only 2. Since the original exposure included a factor of 4, it is actually necessary to close the lens down one stop when working at this reduction ratio.

E. A SIMPLE SYSTEM FOR CALCULATING EXPOSURE FACTOR CORRECTIONS

A good deal of paperwork can be avoided by using the Effective Aperture Computer, found on page 31, of the Kodak Master Photoguide, Publication Ar-21, published 1968 by Eastman Kodak Company.

This computer gives the exposure factors which would be determined by either formula 1 or formula 2 above. It is particularly helpful when making reductions or blow-ups of such size that the Illumitran bellows unit is not used. For use in slide duplicating we recommend that image to subject height ratios (formula 2) be used since they are easier to measure than the bellows extension changes.



1. When using magnification ratios other than 1:1 determined the image to subject ratio either by measurement or by reference to your chart.

2. First set the window in the lower portion of the dial to the magnification used to calibrate the Illumitran and read on the lower black ring of numbers the equivalent f number opposite the lens setting on the camera lens which produced a properly exposed duplicate. For example, if you calibrated at 1:1 and the lens setting was f16, the dial would show that the Exposure Factor was 4, and that effective aperture, when your lens was set to f16, was really f32 (two stops down).

3. To determine the new lens setting, turn the dial to show the Magnification at which you will now be working. The effective aperture remains the same, since this produced a correct exposure when we calibrated the Illumitran. Therefore, what we must determine is the new lens setting which produces this effective aperture. We determine this by looking at the lower ring of numbers, as if to find effective aperture as determined in Step 2, then read against this the new lens setting. For example, in the example given in Step 2, the effective aperture is f32. If we are enlarging a slide, and the new image to subject ratio is 4:1, looking at the dial shows that f32 on the effective aperture ring corresponds to a setting almost midway between f5.6 and f8 on the camera lens i.e. we must increase exposure by $2\frac{1}{2}$ stops. These corrections can be made either by changing the lens setting or using the intensity control.

VII. ASSURING MAXIMUM SHARPNESS

A. Choosing a lens

While most camera lenses will provide a usable result, if maximum sharpness is required it will be found desirable to purchase a lens adapted to the requirements of slide duplicating. The faster lenses for 35mm cameras, especailly those with maximum apertures of F2.0 or larger will generally not yield as satisfactory results as a slower lens of the same type, especially if the latter is of symmetrical construction. Camera lenses suffer from two deficiencies which must be borne in mind:

1. They are corrected for use at infinity focus, rather than for close focussing work, and most exhibit too much curvature of field at 1:1 subject-to-image ratios to provide uniform sharpness over the entire picture area.

2. The faster lenses are composed usually of six or more elements. Since the aperture used in the Illumitran will generally be smaller than f11, most of these lenses with a large number of glass elements will exhibit unsharpness due to the diffraction of light passing through a small opening and so many surfaces.

   Therefore, a lens designed for work at close focusing ratios, such as a reproduction lens or an enlarging lens will prove more satisfactory. In enlarging lenses, a symmetrical lens, such as the 60mm Schneider Componon, will prove better than an assymetrical type such as the 50mm lens in the same series. When reductions are contemplated, such as copying $2\frac{1}{4}$ sq. slides on 35mm, the 60mm lens will be required in order to cover and focus the image.

When the Illumitran is to be used with several camera bodies, it will be found much more convenient to use one lens, preferably an enlarging lens, or a macro lens, with all bodies. In this way, magnification data and index markings for the lens only will be determined, and by focusing with the rear standards on the bellows, any other camera will provide the same size reproductions.

When camera lenses in helical focusing mounts are used, be sure always to set them to infinity when mounting them in the Illumitran so that the index marks for particular image/subject ratios remain valid.

B. Determining the sharpest aperture of your lens.

When the maximum sharpness possible in reproduction is desired, it is important to check out any lens, regardless of type, to determine its sharpest range of openings and also to determine if the aperture markings correspond sufficiently close to the light transmission of the lens to permit changing f stops (when required by changes in film speed) without further compensation or for exposure corrections.

The technique for checking a lens is as follows:

1. Use as 'original' copy a transparency made on one of the grainier emulsions, such as any of the higher speed reversal films.

   Set up the Illumitran for 1:1 reproduction and focus as sharply as you can.

2. Using the predetermined exposure, make a series of duplicates of the original slide on a relatively grainless film such as Kodachrome II at various apertures ranging from f16 up to f5.6. In order to correct for the changes in lens opening, Neutral Density filter material must be placed in the transparency holder filter drawer on top of the opal glass, corresponding to the light transmission change required for each change in lens opening in order to maintain constant exposure. Eastman Kodak offers gelatine ND Filters in 2 x 2 in. squares which will fit into the transparency holders for 2 x 2 slides, and in larger sizes which can be cut down to fit other size transparency holders. The values and the corresponding transmission and equivalent lens stop changes are as follows:

Density	%Transmission	Approx. F Stop Change
.20	.63	$\frac{1}{2}$
.30	.50	1
.40	.40	$1\frac{1}{2}$
.60	.25	2
.70	.20	$2\frac{1}{2}$

3. After processing examine the duplicates as follows:

   A. On a lightbox examine all the duplicates to see if the apparent density of each frame is the same as the others. This will show whether the markings on your lens are close enough to the various actual apertures to be useable without correction for the latitude of the film you are using.

   B. If you examine the original on a low power microscope, you should see a uniform grain pattern over its entire area. Examining the copies made at each aperture, and looking for the grain pattern from the original, will show whether the lens has a flat enough field to be satisfactory for your requirements, and will also show the sharpest range of openings. For critical work, these openings should always be used, and the necessary correction ND filters can be used in the filter drawer or on the camera lens.

VIII CONSIDERATIONS IN CHOOSING FILMS FOR DUPLICATION

A. General Considerations

Any copying process involves some loss of sharpness and detail compared to the original. The first consideration in choosing a film on which to make duplicates should be to minimize this loss by using the sharpest, finest grain film. The copying process also involves some increase in contrast in the duplicate, as compared to the original, although electronic flash illumination generally causes less contrast buildup than does tungsten illumination. Specific methods of controlling contrast are discussed below.

Generally speaking, within the range of products available from a given manufacturer, sharpness decreases as film speed increases, and contrast may increase as emulsion speed goes up. Kodachrome X for example is more contrasty than Kodachrome II. The best film to use, therefore, from the point of view of retaining maximum sharpness would be the slowest availabe in the type you prefer. The power output of the Illumitran is sufficiently high to allow films in the 10 to 32 ASA range to be used within a comfortable range of lens openings.

B. Color Rendition:

While any films blanced for daylight illumination can be used with the Illumitran, anyone who has experimented with various films knows that the color rendition of various types (from even the same manufacturer) varies. The choice, in this respect, is subjective. However, it is usually not necessary to change films to copy slides shot on various emulsions, most variations desired can be obtained by using filters while duplicating, as described in the section on Kodachrome II below.

C. Modifications in Processing:

When using materials such as the various Extachromes, Agfachrome, etc., and when you do your own processing or use a custom lab which offers special processing, it is possible to control both speed and

contrast in processing. For example, variations in the developing time of the first developer in process E-2 and E-4 will yield changes both in film speed and contrast with Ektachrome films. Similarly, Agfachrome duplicating film (ASA 16) which is designed for making transparency copies with daylight illumination, can be processed in either of two different first developers, depending on the contrast desired.

In each case it is desirable to consult your lab and to experiment to determine the combination of film and processing which meets your own requirements.

If a reasonable volume of work is being done, the best choices are probably the films made specifically for duplicating such as Kodak Type 5386 or 5388, which can be processed in standard Ektachrome chemistry; GAF Anscochrome 5470 which can go through standard Anscochrome processing, or the above mentioned Agfachrome Duplicating Film which is excellent but does require custom processing with a special soft developer.

D. Controlling Contrast and Color Shifts

Note: The following material is taken from Kodak publication No. S-8, "Producing Slides and Filmstripes"., 2-66.

When a copy slide is not as good as the original transparency, the loss in quality usually involves the following: (1) the contrast of the copy slide may be too high (2) the copy may have less saturated colors than the original, and (3) the colors of the copy may differ in hue from those in the original. A color slide is an approximation although usually a pleasing one, of the original subject. When you copy the slide, the result is an approximation of an approximation.

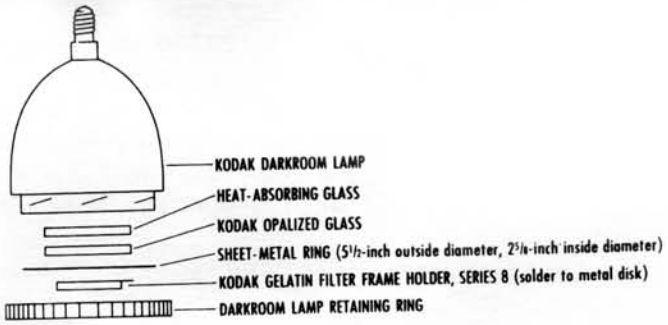
Controlling Contrast. The very short exposure times with electronic flash tend to prevent excessive contrast in copy slides. Also, some color films, such as Kodachrome II film, Daylight type, exhibit less contrast than other reversal films. When electronic flash is teamed with Kodachrome II Film, the results are usually satisfactory, provided the original slide is not too contrasty.

Preflashing the color reversal film is another way to control contrast. In this method, the film on which the transparencies are being copied is given a uniform exposure to light before the copy exposures are made. This flash exposure lowers the maximum density and the contrast of the shadows.

A convenient method of preflashing is to expose the film to the same light source as in used for the subject exposure, but without the transparency in place. The flash exposure should be about 1/100 of the subject exposure. This is easily accomplished by placing a Kodak Wratten Neutral Density Filter, No. 96, of 2.0 density over the camera lens and then giving the same exposure as will be used with the copy in place.

In an alternative procedure, you can modify a Kodak Darkroom Lamp as shown below and use it to flash a whole strip of film at one. Or, you can use an enlarger as a light source if the enlarger lens can be positioned about 6 feet away from the film to be flashed. The important consideration is uniform light intensity over the exposing plane. With the light source 6 feet away, a strip of film about 22 inches long can be flashed.

As a starting point, adjust the light source, such as Photo Enlarger Lamp No. 211 in a Kodak Darkroom Lamp on an enlarger to yield 2 foot



With a lamp, such as a Photo Enlarger Lamp No. 211, a modified KODAK Darkroom Lamp becomes a suitable light source for preflashing strips of film.

candles of illumination at the exposing plane. Then place over the light source Kodak Wratten Neutral Density Filters, No. 96 with a total density of 2.70 to increase the exposure time to a convenient length.

You may have to use a Kodak Color Compensating Filter in the light beam to obtain an approximately neutral maximum density in the flashed film.

The flash exposure depends on the film used and the strength of the color filter, if any, in the beam. Since the exposure is critical, you should make a number of tests. Under the general conditions outlined here, start the test with about a 20-second exposure.

Instead of subjecting film to a flash exposure before the subject exposure, you can flash the film after the subject exposure if you wish. The same procedures outlined above apply.

Filters. Color shifts can be corrected to some extent by placing Kodak Color Compensating Filters over the camera lens or between the slide and the exposing light source. Try to keep to less than three the number of filters used over the lens; otherwise, the definition of the copy slide may be impaired. Any number of filters can be used between the transparency and the light source. In a position behind the transparency, CC Filters do not affect definition. In fact, you can use the less expensive Kodak Color Printing (CP) Filters (Acetate) behind the slide if you wish.

View the test copy slide to determine the predominate color balance. For the next exposure, either add a filter that is complementary to this overall hue or subtract a filter of the color of the over-all hue. The following table may be useful in determining the filter adjustment:

If the overall color balance is:	Add these filters:	or Subtract these filters:
Yellow	Magenta + Cyan	Yellow
Magenta	Yellow + Cyan	Magenta
Cyan	Yellow + Magenta	Cyan
Blue	Yellow	Magenta+ Cyan
Green	Magenta	Yellow +Cyan
Red	Cyan	Yellow+ Magenta

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(The publication from which this material was taken contains much valuable information about duplicating, including a technique for masking slides to control excessive contrast).

E. Intermediate Negatives

The principle of operation on which the 'Illumitran' works in making duplicates of transparencies can be applied equally to produce intermediate negative of transparencies for printing on paper. The technique, however, depends on the availability of a negative material suitable for this purpose in regard to both color balance, contrast and speed. Photographers interested in the production of intermediate negatives are advised to seek the advice of sensitized material suppliers and obtain up-to-date guidance before proceeding.

IX. Routine Maintenance

The Illumitran is guaranteed for a period of one year from date of purchase, and should be returned to the distributor for any required service or repairs. The original packing material should be retained if possible for this purpose.

It is recommended that only a competent technician perform routine maintenance on the Illumitran.

A. Replacement of Modelling Lamps

The modelling lamps used for focusing are long life automotive lamps rated at a minimum of 1000 hours. Replacement of the set of both is desirable when either lamp fails. Replacement sets may be ordered from us at $2.00 per set.

To replace the lamps follow these steps.

1. Turn off the Illumitran first (the power switch also discharges the condenser) unplug it from the power socket, and <u>wait five minutes</u> for any residual charge to drain off.

2. Remove the transparency holder and turn the Intensity Control Knob to bring the lamp platform to the top.

3. The two modelling lamps are fastened in place with cartridge type clips. Lift out the old lamps and replace.

4. When focusing lamps are replaced, or if they have been in use for a long time, it is possible that there will be some change in the brightness which will affect the exposure balance to which the Illumitran was originally adjusted. This can be corrected as follows:

   a. Replace the original standard transparency in the Illumitran.

   b. Set the intensity control to its mid position so the dots coincide.

   c. Note meter reading, if it does not read at the center zero position adjust the trimmer control to bring it into balance.

B. Flashtube

If the tube fails to fire, first check that the fault is not in the camera by removing the synchronising lead and shorting across the plug contacts.(make sure the Illumitran is switched to 'expose' and the neon indicator is alight). The flashtube fitted to the Illumitran normally has a life in excess of 10,000 flashes; complete failure of the tube (necessitating replacement) is often preceeded by intermittent firing.

To replace the tube ½rpceed as in 1 and 2 above.

The tube is of the plug-in variety and is easily replaced. Observe that the new tube is fitted with the metalized stripe engaging the clip.

A replacement flashtube is available at $16.00.