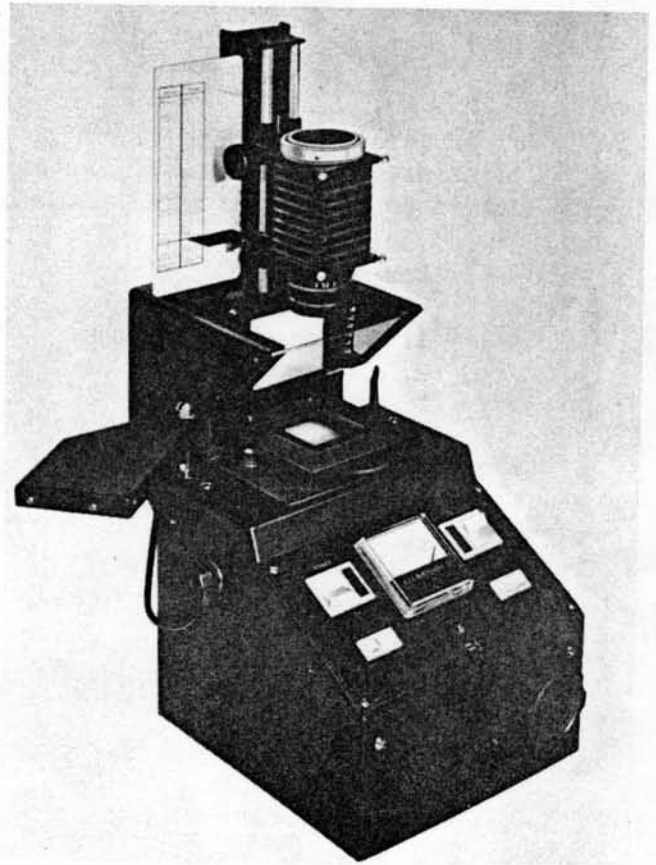
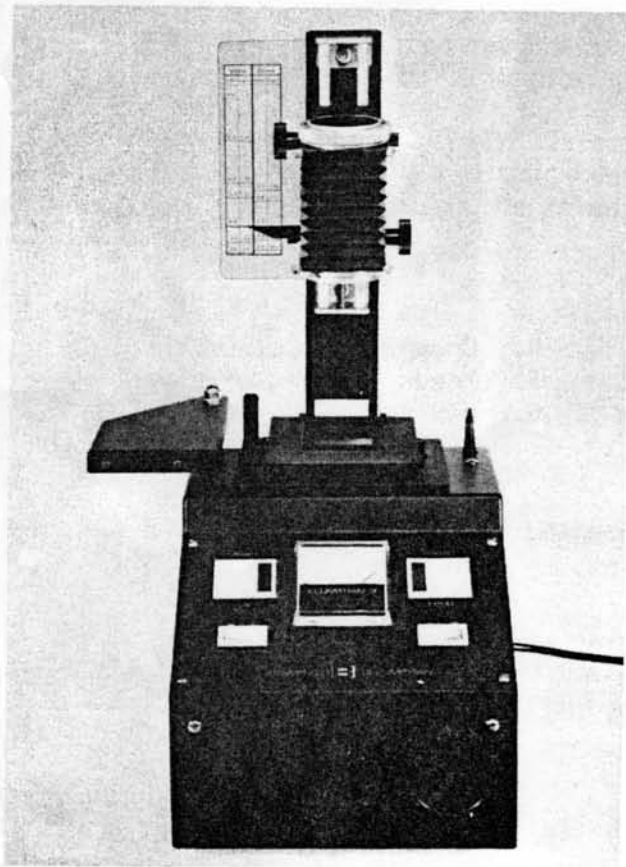


BOWENS ILLUMITRAN-3 ILLUMITRAN-3C

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.



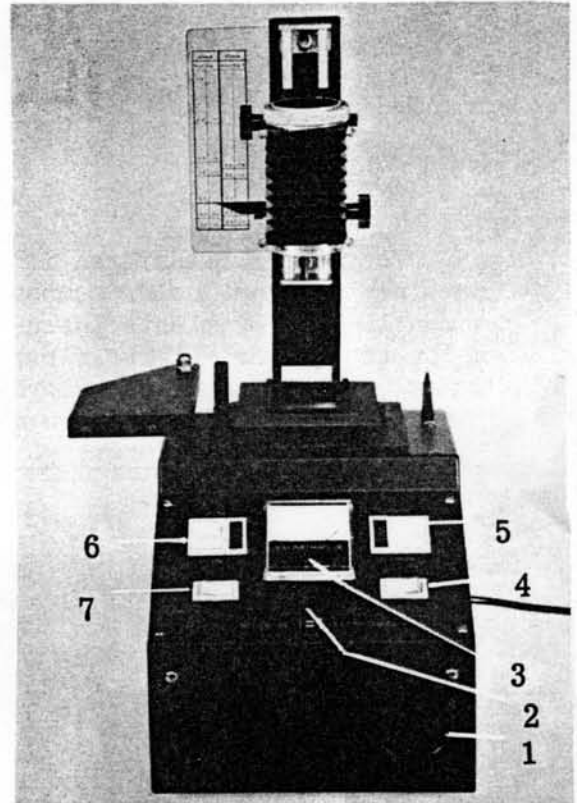
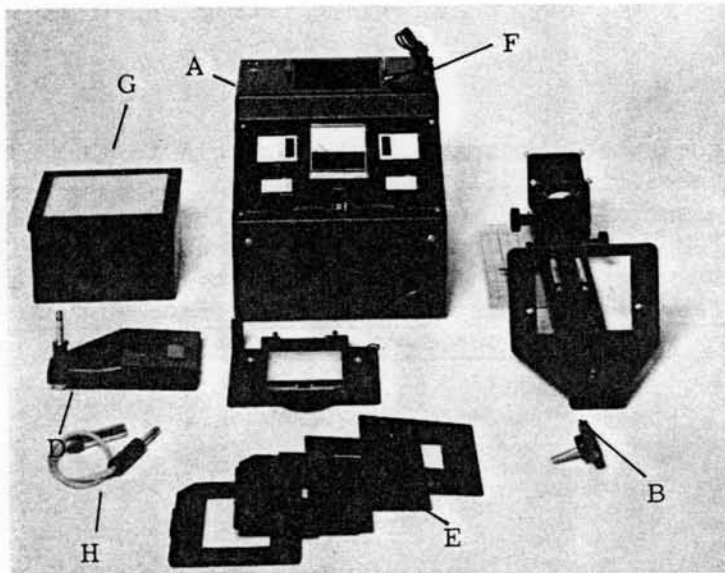
BOGEN PHOTO CORP.

100 So. Van Brunt Street P.O. Box 448
ENGLEWOOD, NEW JERSEY 07631

Telephones: (201) 568-7771 (N.J.);
(212) 695-8166 (N.Y.)

I. DESCRIPTION OF MAJOR ASSEMBLIES, ILLUMITRAN 3

The Illumitran 3 is furnished with the following components illustrated in Photos 1 and 2 below:



A. Base Unit

- 1. Intensity Control
- 2. Trimmer
- 3. Meter Zero set

- 4. Open Flash Switch
- 5. Focus/Expose Switch
- 6. Power On/Off Switch
- 7. Flash Intensity Range Switch

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

C. Basic Holder

D. Meter Probe Cell

E. Holder and masks for transparencies up to $2\frac{1}{4}$ x $2\text{-}3/4$ ".

F. Synchronization cord.

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).

How The Illumitran Works

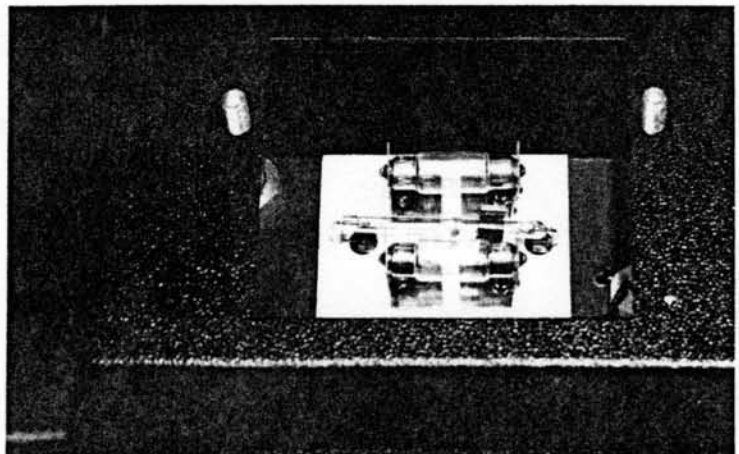
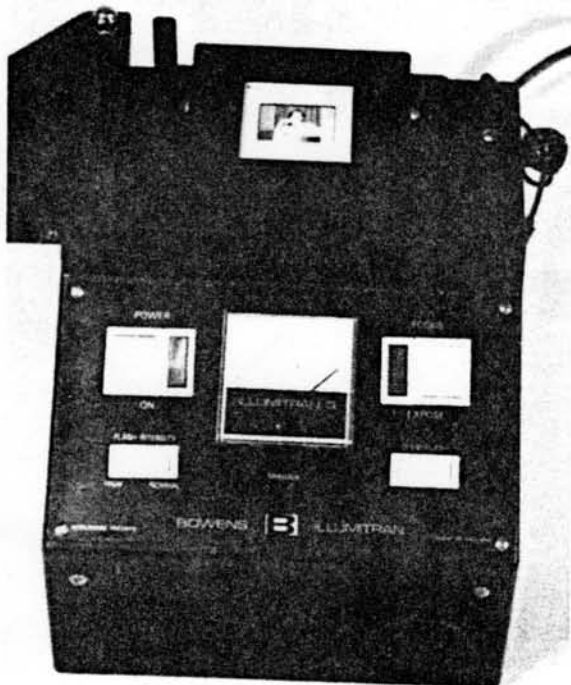
The flash unit of the Illumitran and the metering system are designed to be used together, both for determining exposure and for maintaining consistent results when making color corrections.

The flashtube and the modelling lamps (which activate the meter) are mounted on a movable platform which can be raised and lowered by means of the Intensity Control (A.1) The lamps and flashtube, since they are in a common plane with respect to the slide to be copied and to the Meter Probe behave in the same manner. Bringing both closer to the slide to be copied by raising the platform produces more light; lowering the platform reduces the amount reaching the transparency stage..

The metering system functions as an analog computer in that when the Meter Probe Cell (D) is in place over the original slide to be copied and the Focus/Expose Switch (A.5) is in the "Focus" position, the meter reads the amount of light transmitted through the original from the modelling lamps.

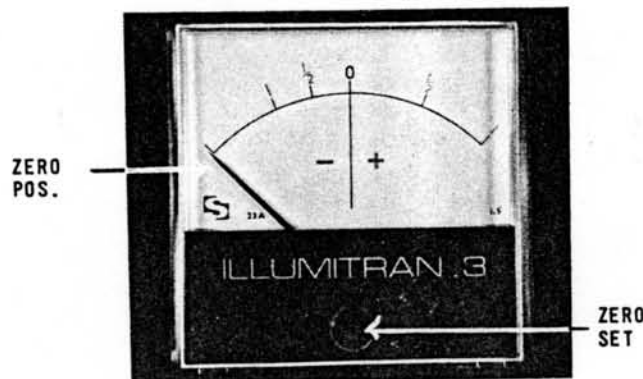
One additional element completes the system, and that is the Trimmer (A.2). The trimmer is simply a potentiometer which controls the amount of the current generated in the Meter Probe Cell which reaches the meter movement. It has no effect on actual exposure since it does not change the position of the platform; its function is to match the intensity of the modelling lamps to the known information about flash-tube light output which has been previously determined during the calibration procedure (which is described in a later portion of this manual).

The flashtube retains essentially the same output throughout its life, whereas the modelling lamps, since they are tungsten lamps, will exhibit a drop in light output as they age. Adjustment of the trimmer compensates for this aging of the modelling lamps.



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 opposite 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 Illumi-tran 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 to 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 to be used, then attached to the bellows unit by means of the two knurled locking screws to be found at each end of the bellows. If you are using a camera lens with automatic diaphragming, be sure that the 'Auto-Manual' switch on the lens barrel is set to the "Manual" position. If you are using an enlarging lens, such as the Bogen W.A. 60mm or Schneider Componon, the best procedure is to insert the lens adapter into the bellows, screw in the lens, and then adjust the position of the adapter so that the markings on the lens diaphragm ring can be seen from the front of the unit.
- 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 oversized 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.
- E. Before plugging the meter into the socket provided for it on top of the base unit, turn on the power and allow the Illumi-tran 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) until it does. It should be standard procedure to check the position of the zero set every time the Illumi-tran is used by unplugging the cell and noting the position of the pointer.



III. INITIAL CALIBRATION PROCEDURE - ILLUMITRAN 3 and ILLUMITRAN 3C

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. If you have the Contrast Control mounted, it should be disconnected for this initial calibration.
- B. Select a good original 35mm transparency of average density and contrast which can be retained as a standard. It is best to use an original made on the type of film you most commonly use since reproduction does vary somewhat with the type of originals copied because of differences in infra red transmission of processed color slides. If critical matching of colors is required it is best to use a standard transparency featuring two colors whose reproduction you are most concerned with. Alternatively, a standard transparency such as that furnished with Eastman Kodak Cat. No. 120 2019 (Internegative Test Kit) can be used.
- C. Place the standard transparency in the transparency holder. Make sure that the opal glass provided is in place at the bottom of the filter drawer and that the protective paper backing has been removed from it. If you are using a daylight balanced color film such as Kodachrome 25, place a 1A (skylight) filter in the filter drawer. If you are using a tungsten balanced duplicating film such as Kodak 5071, we recommend the following as a starting filter pack: 2B (Ultra violet), + 20 Cyan + 100 Yellow. Set the switch A.5 to the *Focus* position.
- D. 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).
- E. Make sure camera shutter is set to proper speed (the fastest which will allow "X" synch for focal plane shutters; 1/50th sec. for between the lens shutter). Plug in the shutter synchronizing lead to the "X" synch terminals of the camera.
- F. There are two intensity controls on the Illumitran. The Flash Intensity Switch (A7) is intended to set the unit up for a particular type of film. The "Normal" position should be used for films of ASA ratings of 16 or higher, such as Kodachrome 25 or Ektachrome 64. The "High" position is intended for use with the slower (E.I. 8) duplicating films such as Kodak 5071. (See Section VIII regarding film choices). The Intensity Control Knob (A1) is used in conjunction with the meter in order to balance exposures. For initial calibration adjust the knob until the red dot on it lines up with the matching spot on the front of the base unit.
- G. Swing the photo-cell over the transparency.
- H. 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. (The trimmer is recessed to avoid inadvertent movement. Use a small screwdriver or pencil to adjust.)

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 setting 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 of at least 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.
- J. 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. With Kodak 5071 (Switch A7 in "High" position), and the proper filtration, best exposure will be around f6.8 or f8.
- K. 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.)

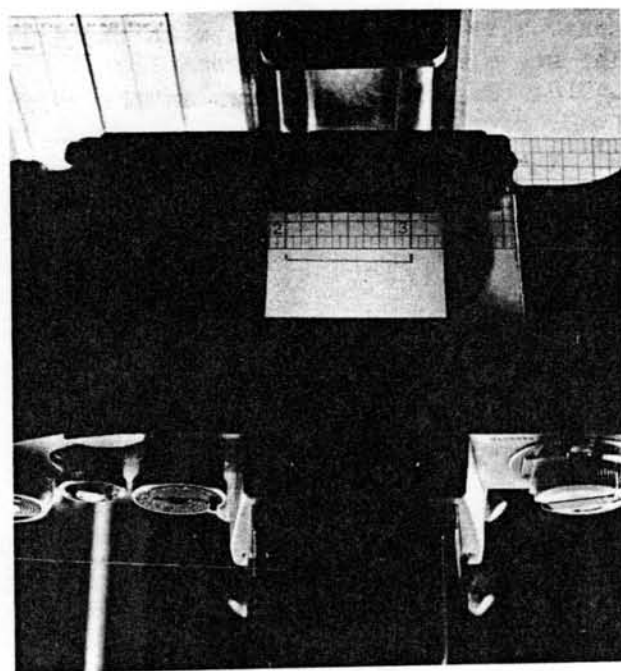
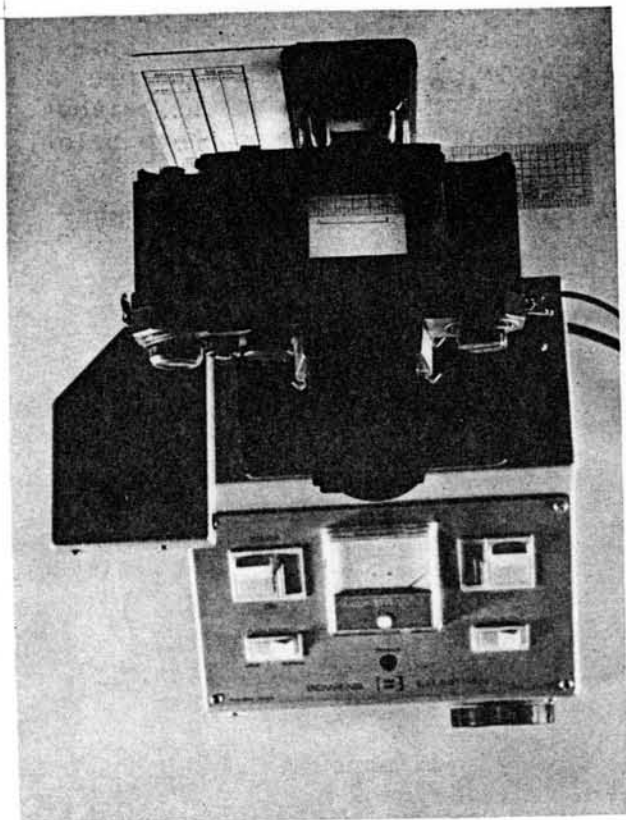
IV. DETERMINING IMAGE/SUBJECT RATIOS

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 60mm nominal focal length. It can be used by extrapolation for lenses of 50mm and 55mm focal length, and the exposure corrections for the 60mm scale can be used for 58mm lenses. Settings for other focal lengths can be marked on the scale with soft pencil.

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.

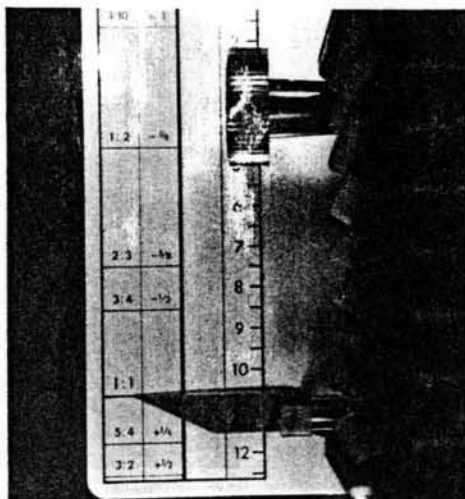
The following is a simple procedure which can be used both to determine image/subject ratios and which will also provide information as to the actual area covered by the camera viewfinder system compared to the area of the film plane opening (many SLR cameras do not actually show in the viewfinder the 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 tracing paper or tissue. One should be cut to 2 x 2 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 useful.



2. Draw with fine pencil a line 1 inch long with graduations each quarter inch along the center line on the 2 x 2 tracing paper 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. Set Function Switch (A5) to FOCUS, and open up the lens to its widest aperture.
5. Place the second piece of tracing paper 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 tracing paper, adjust the front and rear standards of the bellows assembly so that the image of the line as viewed on the tracing paper 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 note 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 (larger opening) or the intensity control must be rotated to produce a plus change in exposure. Negative signs means 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.

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.

OPERATING INSTRUCTIONS

A. 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. Make sure the Flash Intensity Switch is on the proper setting for the film you are using.

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 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. *The Contrast Control Unit cannot be used in conjunction with the 4 x 5 Illuminating Unit.*

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 60mm 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 times 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.

$$2. E = \left(\frac{1}{S} + 1\right)^2$$

Where E = exposure factor, 1 = 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, and 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.

B. 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 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 2½ stops. These corrections can be made either by changing the lens setting or using the intensity control.

VII. CHOOSING A LENS

A lens suitable for slide duplicating must be corrected so that it projects a flat field with even illumination. Since most standard camera lenses are computed to produce optimum results at medium focal distances, their performance at the close working distances involved in slide duplication is not ideal. While usable results may be obtained, there will generally be a fall-off in sharpness at the corners of the image due to curvature of the projected field of focus, and most of the faster normal lenses will exhibit considerable diffraction effect resulting in a loss of sharpness over the entire image when stopped down to very small apertures.

We have found that most of the 'macro' lenses designed for close up work, in focal lengths ranging from 55mm up, are excellent for slide duplication and these can be used with the Illumitran 3. However, most of the mountings for these lenses are too deep to permit them to be used with the Contrast Control Unit because of mechanical interference with the optical deflector which is necessary to the operation of the CCU.

Therefore, we recommend the use of a good quality enlarging lens, preferably of 60mm focal length, as an all around lens for the Illumitran. Three which we have found satisfactory are the Bogen W.A. 60mm f4.0 (catalog no. 1791), the Schneider Componon 60mm f5.6 (cat. no. 0180) and the Rodenstock Rodagon 60mm f5.6. All three of these lenses can be obtained with a 39mm screw thread (Leica) mount which fits the catalog no. 0161 lens adapter for the Illumitran bellows.

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 mounting an enlarging lens, first insert the adapter ring in the bellows, then screw in the lens. By loosening slightly the knurled locking screws after the lens is mounted, you can rotate the mount so that the aperture markings can be conveniently viewed from your working position.

If you are using a camera 'macro' lens, be sure that the supplemental extension tube supplied with some of these lenses is removed and that the helical focusing mount of the lens is set to infinity. This will give you maximum flexibility in using your bellows and insure that the calibration of the magnification pointer will stay the same. Note: If the camera lens has an automatic diaphragm feature make sure that the 'auto-manual' switch on the lens barrel is set to 'manual'.

The best lens aperture for maximum sharpness and optimum correction of residual aberrations is generally around 2 stops below maximum aperture; i.e. for an f4.0 lens around f8. It is preferable to adjust exposure by means of ND filters when using faster films rather than to stop down below f11 as might otherwise be necessary.

VIII. CONSIDERATIONS IN CHOOSING FILMS FOR DUPLICATION

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.

While most films balanced for daylight or tungsten 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.

Daylight Films

Generally speaking, within the range of products available from any given manufacturer, sharpness decreases as film speed goes up. Contrast may also increase. The best film to use, therefore, for retaining maximum sharpness would be the slowest in any manufacturer's conventional film range. (This does not apply to films made specifically for duplicating, since other factors come into consideration.) For short runs, where no special processing is available, the best all around film we have found is Kodachrome 25. Ektachrome 64 or the various equivalents from other manufacturers should only be used in conjunction with either contrast control unit or if it is possible to obtain custom processing so as to reduce film speed and contrast by reducing first development time. This is a procedure with which most custom processing laboratories are familiar.

Important Note About Kodak Ektachrome Slide Duplicating 5071 (Process E-6)

As users of 5071 already know, Kodak has made a number of changes in this film. Both the color balance and the exposure duration characteristics have varied from time to time.

Recently we received an announcement that starting with emulsions numbered 608 or higher, 5071 packed in 36 exposure cassettes would be optimized for short duration exposures consistent with the output of electronic flash light sources.

We have obtained a batch of this film and our tests indicate that a starting filter pack of 2B + 05 Cyan + 110 Yellow at a lens setting of f8, with the Intensity Range Switch set at 'High', will put you very close to a final filter pack.

Each box carries exposure correction factors (similar to those used on Ektacolor printing paper) which are intended as an aid to adjusting filtration to compensate for slight differences in balance, from batch to batch. The particular emulsion we tested was marked:

+05C 0Y +0.5*

When testing a new emulsion batch, the recommended procedure is to subtract the corrections from your filter pack for your last batch, and add algebraically those of the new batch. For example, if your box of film is marked +10C -10Y you would proceed as follows:

Last Filter Pack:	+ 05C	+ 110Y
Subtract Original Correction:	- 05C	0Y
	<u>0C</u>	<u>+ 110Y</u>
Add New Correction:	+ 10C	- 10Y
New Starting Filter Pack:	10C	+ 100Y
(The 2B filter, of course, should always be used)		

*The last factor is an exposure factor intended for fractional second corrections with commercial printers. If it is marked '+' try increments of one quarter stop increase in exposure. If it is negative, decrease exposure in quarter stop increments.

It is important to remember that only the 36 exposure cassettes are optimized for short exposures. The long rolls, which are intended for commercial duplicators are optimized for long exposure times.

We continue to recommend that 20 roll packages be purchased and refrigerated per Kodak's instructions (55°F (13°C) or lower) until used.

Intermediate Negatives

The principle of operation on which the Illumitran works in making duplicates of transparencies can be applied equally to produce intermediate negatives (*internegs*) of transparencies for printing on paper.

Notwithstanding some of the mumbo-jumbo we've seen about requirements for special interneg films and special exposure techniques, people have been successfully making internegatives with the Illumitran and regular color negative film for years. We recently explored this problem, using the same test transparency described in the discussion of type 5071 film above, which is a handy check because it comes with a type R print made from it as a reference standard. We did our experiments on a "worst case" basis, i.e. we had the film processed at a Kodak lab and then sent the negatives to a commercial finisher for printing. The results were as good as the 'calibration' print supplied by Kodak, and we dare say we can make a better print than either with the same internegatives.

You can use either Vericolor Professional type S or Kodacolor II. We prefer the former because it seems to produce an internegative with less contrast. For VPS a filter pack consisting of CP2B (U.V. correction) and a 1A (skylight) is suggested. If you do your own printing, you might want to add a 5R filter to avoid having to use cyan filters in your enlarger.

If you are making 1:1 internegatives, a lens setting of f22 is called for. Since this small a diaphragm setting is not available on many lenses, and in any case it is not usually a sharp aperture with multi-element lenses, we suggest you add a Kodak Wratten No. 96 0.60 Neutral Density Filter (25% transmission) to your filter pack and expose at f11.

We carried exposure over a range of 1½ stops, and all the negatives were printable. We therefore suggest an exposure test at ± ½ stop from nominal to pick the type of negative you prefer to print.

Since there are two optical steps involved in obtaining a print from a slide by means of internegatives, there is some loss of sharpness. This can be minimized when you are planning to make larger prints by using a film size for the internegative intermediate between the slide size and the final print. Many custom labs use a 4 x 5 internegative to produce 16 x 20 prints.

We feel a good 120 size roll film internegative, especially if made with VPS film will do quite well. The same setup used for making enlarged transparencies with the Illumitran (large format camera mounted on a copy stand above the Illumitran base) will serve for this. Don't forget, however, that an exposure compensation is required for the increase in magnification from 1:1.

Correction and Filtration

An original slide may be considered of poor color balance, and an improved duplicate may be obtained by using color filters. If a slide is too blue, for example in the case of a landscape exposed under a blue skylight without clouds, a yellowish or brownish filter will improve matters. An ordinary Skylight filter will correct slight coldness (as it would have done in the original scene), while a Wratten 81 or 81A will add more warmth. Even an original exposed accidentally to the wrong illumination, as in the case of daylight film with tungsten light, or artificial light type film exposed to daylight, may be improved somewhat by using a light balancing filter. Bluish filters add coolness, brownish filters add warmth. The exposure increase factor is automatically compensated by the Illumitran when the filters are placed in the filter drawer (not over the lens).

Wratten Light Balancing Filters

To Make Cooler	To Make Warmer	Exposure Increase in Stops
82		1/3
82A		1/3
82B		2/3
82C		2/3
	81	1/3
	81A	1/3
	81B	1/3
	81C	1/3
	81EF	2/3

Different lenses transmit images of cooler or warmer tone, according to the types of glass elements and the coatings employed. Some lenses may be improved by adding a UV or Skylight filter, though this will not be necessary where a warm (brownish) light balancing filter is being used. Due to individual preferences, no definite advice can be given on filtration, but a very few tests will show the individual operator whether he considers filtration desirable. To correct lens coldness one of the Kodak CC yellow filters may be used. CC05Y and CC10Y, the two lowest densities, will certainly suffice for this purpose.

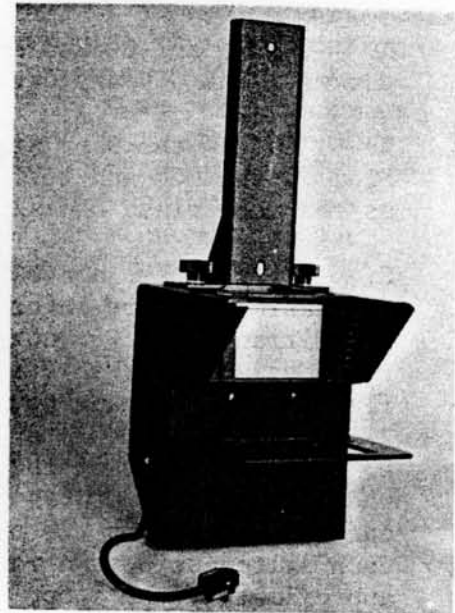
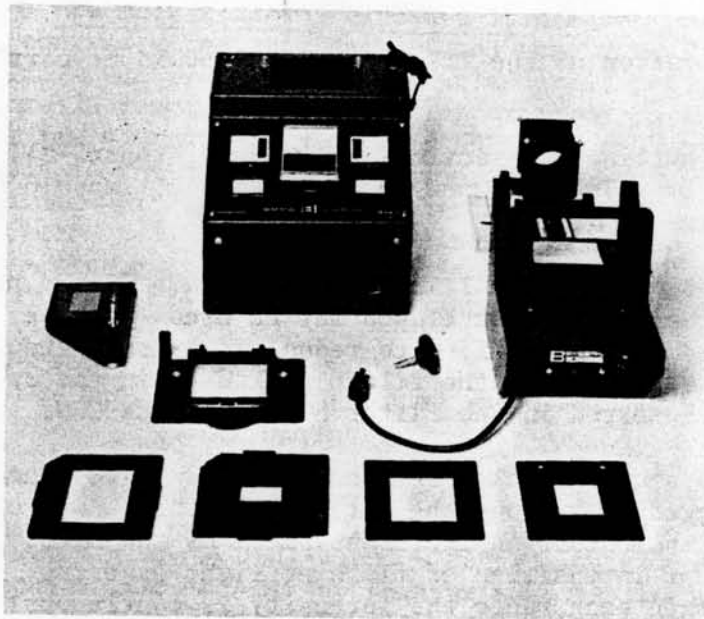
It should be remembered that filtration cannot put back color that is totally absent from an original slide, as in the case of over-exposed highlights. Reducing the aperture or giving intentional under-exposure by offsetting the needle on the meter scale will add further density to a duplicate over your re-elected exposure level, but using a color filter will simply add in all-over cast of that color.

CONTRAST CONTROL UNIT

How the Bowens CCU Works.

Exposure to a small percentage of non-image forming light (flashing) has long been known to increase film sensitivity in the shadow areas in particular and to lower contrast by degradation of highlights.

The Bowens CCU is a separate electronic flash unit, powered by and synchronized with the Illumitran so that it produces in the image/subject light path a simultaneous exposure which is a predetermined percentage of the main flash power of the Illumitran. There are three switch controlled ranges each increasing total light output of the CCU by approximately one full stop. Within each range, output of the CCU can be varied continuously over a range of 7 nominal intensities. Thus effects can be held to repeatable results.



ASSEMBLY INSTRUCTIONS

When purchased as a complete unit with the Illumitran (Illumitran 3-C) the CCU is supplied with the bellows already mounted. When purchased as a separate unit to be used with an existing Illumitran, the bellows from the original Illumitran is transferred to the support unit of the CCU. This is accomplished by unscrewing the two large pan head screws on the back of the bellows support. A new magnification scale is supplied with the CCU and this, together with the bellows, should be mounted on the CCU, using the same large screws.

In fitting the bellows to the new support unit, note that the clamp plate and scale are between the bellows brackets and column, not behind as on the original column. The pointer may require slight bending forward to prevent it from running on the face of the scale.

There are two glass plates supplied with the CCU. One is a spare.

In assembling the Illumitran 3-C follow steps outlined in Sec. II (page 4) except that the CCU is mounted over the two studs on the top of the base unit (A) and then the basic Holder (C) is put in place before fastening the locking nuts. The large knob supplied fastens the CCU to the rear of the base unit.

The glass plate should be carefully cleaned and inserted in the 45° slot in the CCU.

CALIBRATION

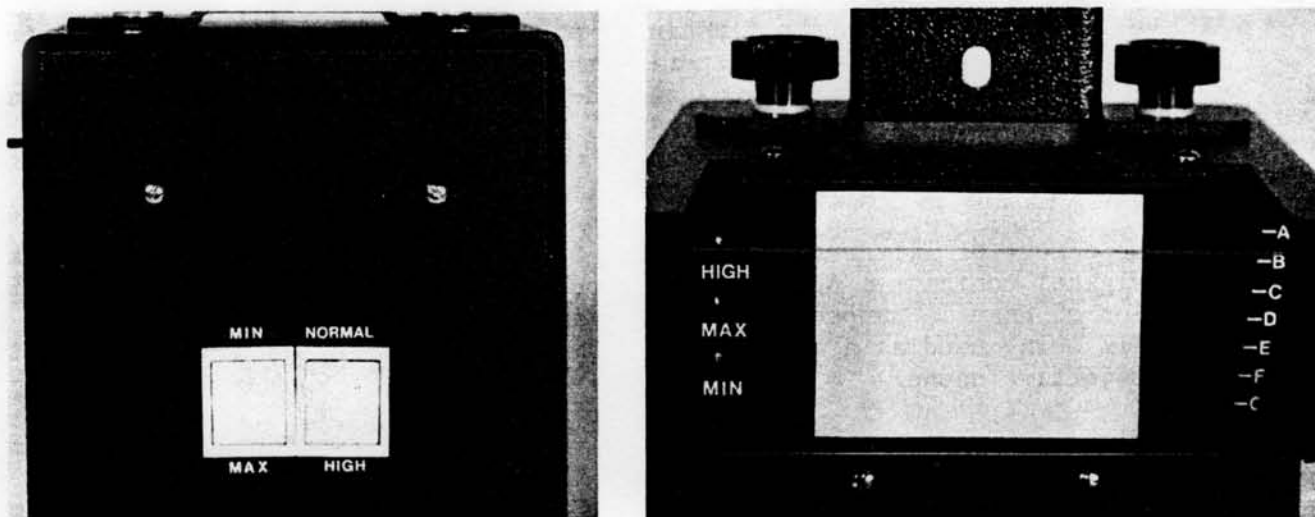
A. Basic set-up and calibration of the Illumitran 3-C should be carried out with the CCU unplugged.

B. Follow the same steps outlined in sections III and IV, (pps 5-8). Plug in the CCU and test it by using the Open Flash Button. It should flash as the main flash unit is fired.

C. If you have already calibrated your Illumitran, the same filter packs and basic exposure information you have developed may be used with the Illumitran 3-C. For normal duplication, i.e. to reduce contrast without introducing color shifts, a duplicate of the filter pack used in the main flash should be made up and inserted in the filter holder of the CCU.

D. On the rear of the CCU are two rocker switches and a knurled thumb wheel. When the CCU is plugged in and on, the settings of these controls can be observed on the neon indicators on the front panel of the unit. Each switch selects a range of intensities of flashing light covering approximately one stop. Within each range the intensity is continuously variable by means of the knurled thumb wheel, and for easy reference the settings of the wheel are represented by the letters "G" through "A". The least amount of flashing exposure possible is obtained by setting the 'Min-Max' switch to 'Min', the 'Normal-High' switch to 'Normal' and the thumb wheel to position "G". At this setting only the pointer indicator for the thumb wheel will be illuminated as will the lower neon of the three on the left, labelled 'Min'.

E. The mid position of each range is obtained by setting the thumb wheel to the "D" position, which is approximately ½ stop more flashing light than "G" and ½ stop less than "A". Setting the 'Min-Max' switch to the 'Max' position increases the light output by a full stop over the previous setting and this is indicated by the second neon, over the marking 'Max'. Setting the 'Normal-High' switch to 'High' also boosts power by one stop.



F. How much flashing exposure is needed? This depends on two factors: how contrasty the original is, and what film is being used as a duplicating medium. Our tests indicate that a normal contrast original copied on Kodachrome 25 requires more flashing exposure than does the same original copied on a low contrast film such as 5071. Specifically, we found that the best copies of the standard Ektachrome transparency (Kodak Cat. No. 120 2019) were obtained with Kodachrome 25 when both the 'Max' and 'High' switches were activated and the thumb wheel indicator was at "E". These were based on subjective visual observation and all the copies ranging from 'Max' - "B" to 'High-Max' - "E" were pleasing.

Conversely, the best result with 5071 was obtained with only the 'Min' indicator activated and the thumb wheel set to "B" or "C".

A simple calibration run can be made by taking an average transparency, setting the Illumitran to produce a normal duplicate, and then re-copying it in a series of exposures starting with the lowest setting ('Min' - "G") and working up to 'Max-High' - "A" in individual steps. (Remember when switching ranges that the pointer must be set back to the "G" position to maintain a continuous increase in flashing exposure.) Saving this calibration roll for comparison will facilitate selecting proper settings for problem slides. For example, a degree of flashing which would "wash out" a normal contrast original may in fact be needed for one which is extremely contrasty.

G. An Interesting Additional Application:

Just as it is necessary to match the filtration of the CCU to the main flash in order to avoid introducing color crossovers, deliberate mismatching can aid in curing 'problem' slides which exhibit these crossovers. The effect of the flashing exposure is observed mainly in the shadow areas of copy slides. Therefore, it is possible to compensate, for example, for blue shadows in a landscape scene by adding a small amount of orange or

yellow filtration to the flashing exposure only. (Normally, if you attempt to correct this fault by filtering the slide while copying it, you will find that you have introduced an undesirable cast to the highlight areas.)

Again, we have found that different copy films react differently to this technique. More filtration is required for Kodachrome than for 5071.

The effect of filter changes in the CCU is most readily observed when the original contains a neutral gray card since this will give a better indication of what is happening in the individual color forming layers of the film being used as a duplicating medium than will copies made of a strictly subjective scene.

In experimenting it is important to remember that two factors will control how much of an effect is obtained: the amount of flashing exposure and the saturation of the filters used. For maximum color effect with minimum reduction of contrast, high saturation values (30-40CC, for example) should be coupled with low settings of the CCU, and vice versa.

ROUTINE MAINTENANCE - ILLUMITRAN 3 AND ILLUMITRAN 3-C

The Illumitran is guaranteed for a period of one year from date of purchase, and should be returned to us 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, (catalog No. 0191).

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 wait five minutes 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 synchronizing 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 preceded by intermittent firing.

To replace the tube proceed 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 \$30.00 (catalog No. 0190).