

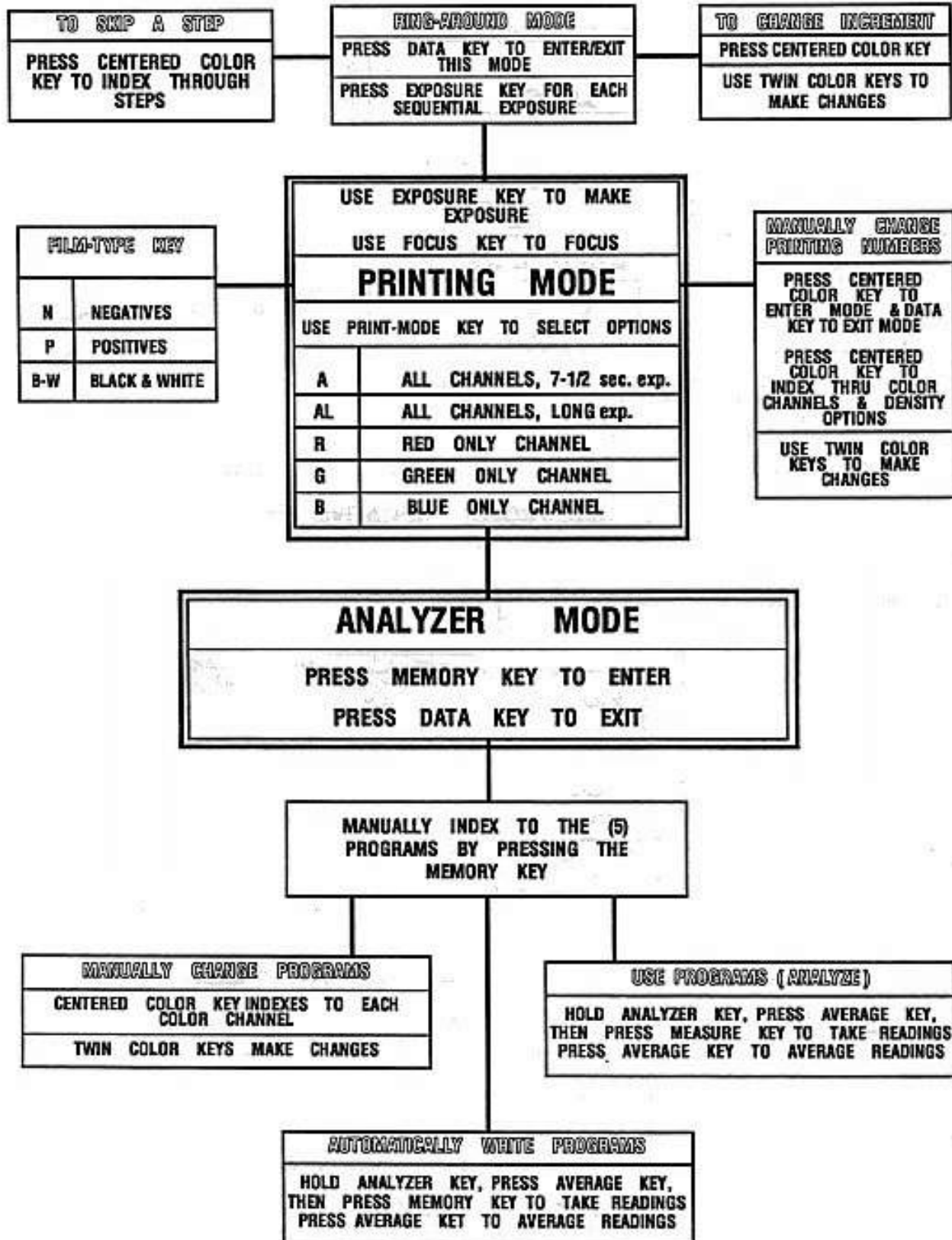
BESELER

45A COLOR HEAD

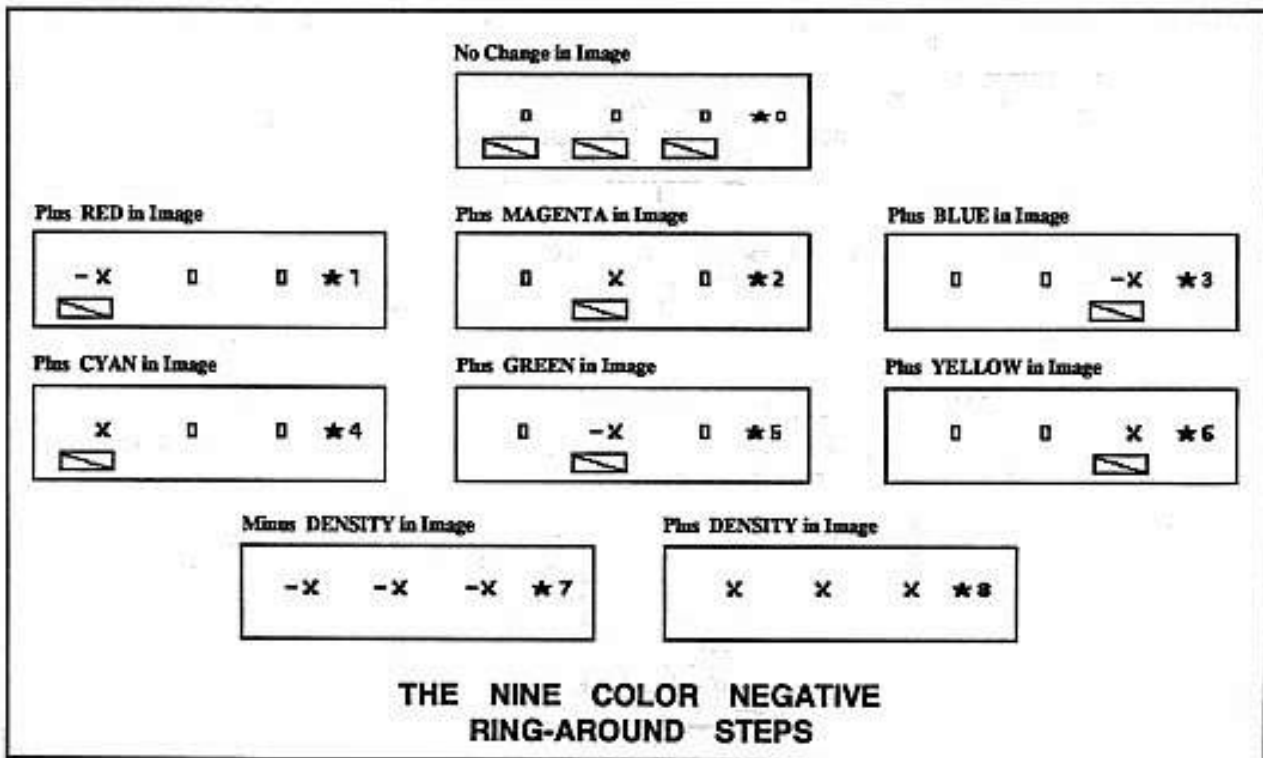
instruction manual



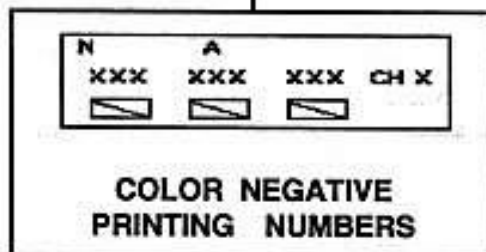
BESELER 45A OPERATIONAL DIAGRAM



The Various Types Of Displays That Appear In The B45A LCD

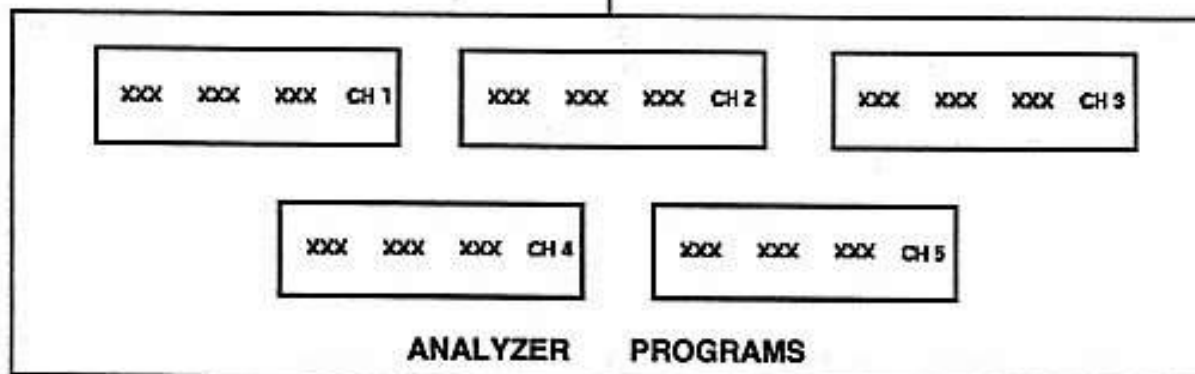


NOTE: Each Ring-Around Step indicates what action is being taken on the Printing Numbers that are on-line (and the result on the color in the print)



NOTE: Printing Numbers are always displayed with little triangular boxes under them, as well as the Program Channel Number which is on-line & ready for use

NOTE: Program Numbers always appear alone, except for their Memory Channel Number



OWNER'S MANUAL

Beseler 45A Color Head



CHAPTER OM-A

SAFETY PRECAUTIONS

The "Safeguards" statement reproduced below is in accordance with Underwriters Laboratories "Standard for Safety, UL 122, Photographic Equipment."

IMPORTANT SAFETY INSTRUCTIONS

When using your photographic equipment, basic safety precautions should always be followed, including the following:

1. Read and understand all instructions before using.
2. Close supervision is necessary when any appliance is used by or near children. Do not leave appliance unattended while in use.
3. Care must be taken as burns can occur from touching hot parts.
4. Do not operate appliance with a damaged cord or if the appliance has been dropped or damaged—until it has been examined by a qualified serviceman.
5. Position the cord so that it will not be tripped over, pulled, or contact hot surfaces.
6. If an extension cord is necessary, a cord with a current rating at least equal to that of the appliance should be used. Cords rated for less amperage than the appliance may overheat.
7. Always unplug appliance from electrical outlet before cleaning and servicing and when not in use. Never yank cord to pull plug from outlet. Grasp plug and pull to disconnect.
8. Let appliance cool completely before putting away. Loop cord loosely around appliance when storing.
9. To reduce the risk of electric shock, do not immerse this appliance in water or other liquids.
10. To avoid electric shock hazard, do not disassemble this appliance, but take it to a qualified serviceman when some service or repair work is required. Incorrect reassembly can cause electric shock when the appliance is used subsequently.
11. The use of an accessory attachment not recommended by the manufacturer may cause a risk of fire, electric shock, or injury to persons.
12. Connect this appliance to a grounded outlet.
13. Disconnect this unit from its source of supply before replacing the projection lamp.

DO NOT OPEN THE CONTROL BOX

There are no user-serviceable parts inside.
**LETHAL HIGH VOLTAGE EXISTS
INSIDE THE CONTROL BOX AND
INSIDE THE COLOR HEAD**

**THE "HEAD" HAS BEEN DESIGNED SO THAT
THERE IS NO OPERATOR DANGER WHEN
FOLLOWING THE PROCEDURES FOR
REPLACING THE FOCUS AND EXPOSURE TUBES
OR WHEN CHANGING THE DIFFUSION
CHAMBERS FROM THE 4x5 MODEL TO THE
35mm MODEL.**

**TAKE CARE THAT THE CABLES BETWEEN
THE CONTROL BOX AND THE "HEAD"
DO NOT BECOME TANGLED AND DAMAGED
WHEN RAISING OR LOWERING THE ENLARGER**
One of these cables is a fiber-optic cable that can be permanently damaged if it is bent sharply, creased, or pinched.

**IT IS NORMAL FOR THE COOLING FINS ON THE
"HEAD" TO BE WARM WHEN BEING USED. THEY
SHOULD NOT BECOME *HOT***

If the cooling fins become so hot that it is uncomfortable to keep your finger tips on them **DISCONTINUE USE UNTIL THE FINS HAVE COOLED** (see Technical Reference Manual, Chapter TR-L, "Color Head Operating Temperature" for more details).

**IT IS NORMAL FOR THE CONTROL BOX TO BE
WARM ON THE REAR-BOTTOM AT ALL TIMES
EVEN WHEN THE POWER SWITCH HAS BEEN
TURNED "OFF". IT SHOULD NEVER BECOME
HOT (see Technical Reference Manual, Chapter TR-L,
"Controller Operating Temperature" for more details).**

SAVE THESE INSTRUCTIONS

Copyrighted Underwriters Laboratories, "Standard for Safety, UL 122, Photographic Equipment"

OWNER'S MANUAL

CONTENTS

CHAPTER	TITLE	PAGE
OM-A	SAFETY PRECAUTIONS	Page OM-A-1
OM-B	CONTENTS	Page OM-B-2
OM-C	INTRODUCTION	Page OM-C-3
OM-D	INSTALLATION INSTRUCTIONS	Page OM-D-7
OM-E	FAST START	Page OM-E-10
OM-F	GENERAL INFORMATION - PRINTING WITH THE 45A	Page OM-F-13
OM-G	GENERAL OPERATIONAL INFORMATION	Page OM-G-20
OM-H	WARRANTY AND SERVICE INFORMATION	Page OM-H-26
OM-I	SPECIFICATIONS	Page OM-I-28
INDEX		Page 41

CHAPTER OM-C

INTRODUCTION

Congratulations on your purchase of the Beseler 45A Enlarger Light Source. This precision light source represents the state-of-the-art in microcomputer applications to the darkroom.

Incorporating pulsed Xenon flashtubes and selective color filters, the Beseler 45A operates at high frequencies, sequentially exposing the RED, GREEN and BLUE layers of color emulsions. On-board sensors simultaneously monitor light output and update the system to produce consistent results, print after print.

Total system performance is optimized through separation of the basic components into two modules - a compact, light weight, convection-cooled Illumination Assembly (Color Head) and a microprocessor based, Controller providing keyed input and Liquid Crystal Display (LCD) read-out. Multi-colored LCD indicators, in conjunction with keyboard command of functions, offer a degree of image control and flexibility never before possible.

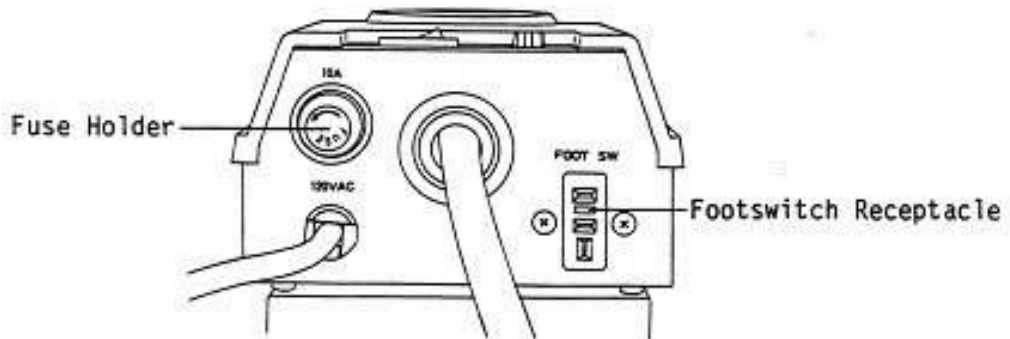
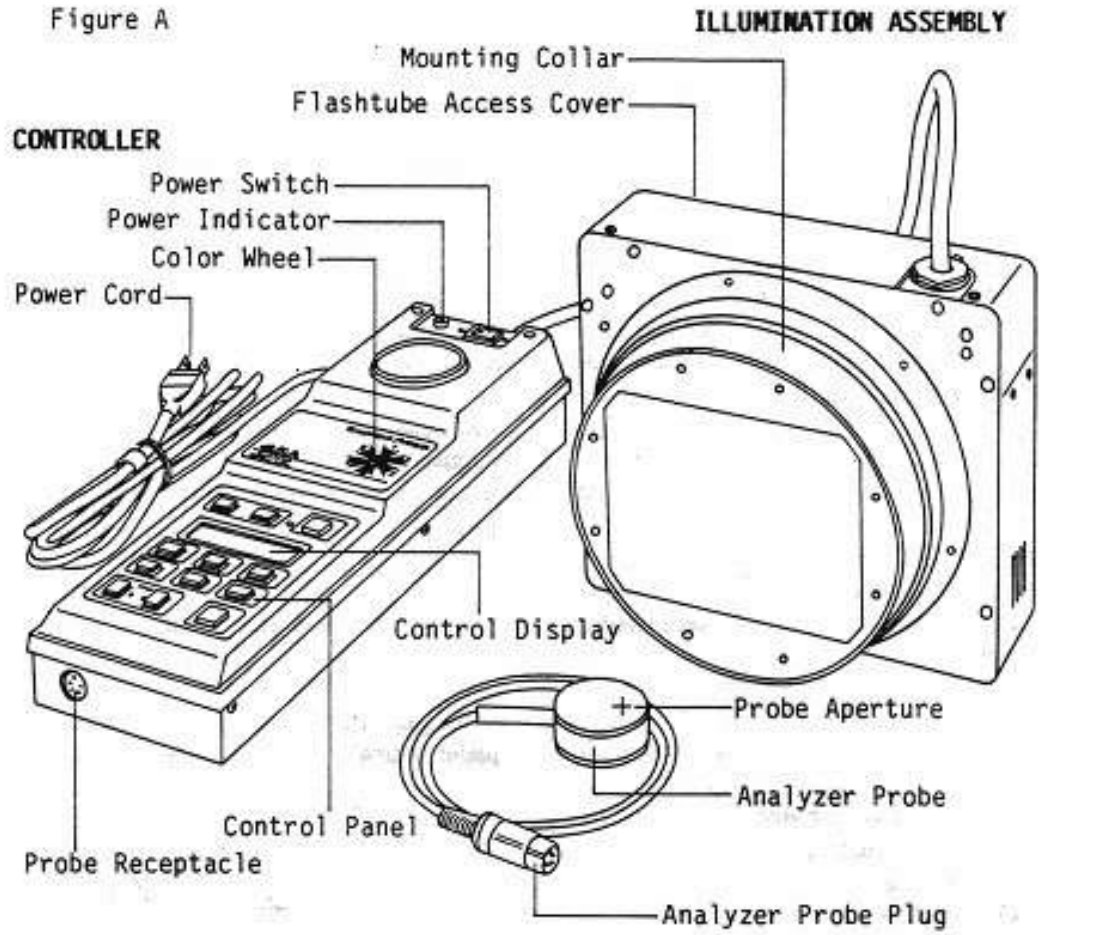
Simplified programming and automatic self-setting analysis functions offer operational speed that is unmatched.

Additional convenience features include five non-volatile memory channels, fifteen-point multi-measurement averaging circuitry and a programmable color exposure ring-around sequence that automatically directs you to the perfect print.

The Beseler 45A is simple to operate. However, because it is so advanced and so different from earlier printing systems, we strongly recommend that you thoroughly read the instruction manual to fully acquaint yourself with the system and learn to take advantage of its many capabilities.

This Owner's Manual has been divided into several sections that are intended to help make it easy for you to find the specific information that you need. Consult the CONTENTS in the front of the manual for specific chapters that you're interested in reading. Consult the INDEX in the back of this manual for locating references to specific words, procedures or subjects.

PRINCIPAL PARTS AND CONTROLS



PRINCIPAL PARTS AND CONTROLS

- THE CONTROLLER**
- 1) **POWER SWITCH**
Turns main power on or off; even when off, memory receives power.
 - 2) **PRINT-MODE SELECTOR KEY**
Press to select print mode: A (All colors), AL (All colors-Long exposure), R(Red), G(Green), B(Blue)
 - 3) **FILM-TYPE SELECTOR KEY**
Press to select type of film to be used: N(color Negative), P(color Positive), or B-W(Black-and-White)
 - 4) **MEMORY KEY**
Press to select memory channel 1 - 5 and display reference color data in memory. Press with ANALYZE key to memorize reference color data.
 - 5) **DATA/RING-AROUND KEY**
Press to select "DATA" or "RING-AROUND" mode. In "DATA" mode, right side of display shows channel; "DATA" mode should be set for all operations except when making a ring-around test print. In the "RING-AROUND" mode, "*" plus a number (0 - 8) appears in right side of display. This mode is used to help determine correct color balance and exposure for a color print, or correct contrast and exposure for a black-and-white print. Also, press this key to clear flashtube replacement indicator.
 - 6) **TWIN COLOR ADJUSTING KEYS**
In "DATA", "MEMORY" or "RING-AROUND" mode, press to adjust data on the display. These keys allow for increasing or decreasing the amount of light that is produced by the color tubes when the exposure is made. They also can be used to manually adjust a PROGRAM that is stored on one of the five memory channels, or to manually enter a PROGRAM onto one of the memory channels.
- 7) COLOR WHEEL**
Indicates color adjusted for each step during ring-around mode; shows complementary colors opposite each other.
- 8) RE-SET BUTTON**
Use the tip of a ball-point pen to press the RE-SET button. Pressing the RE-SET button will sometimes "clear" logic circuits that become "frozen" when tubes mis-fire, when radio-frequency noise has occurred or when other errors occur. Pressing will cause a loss of all data that is being held in memory; such as PROGRAMS and PRINTING numbers.
- 9) FOCUS LIGHT KEY**
Press to turn focus light on or off. Focus light goes off automatically one minute after being turned on or after the test key is pressed.
- 10) DISPLAY**
This is the Liquid Crystal Display (LCD)
- 11) ANALYZE KEY**
Press with MEMORY key to memorize reference data. Press with MEASURE key to obtain new exposure data. Press with AVERAGE key to begin memorizing up to 15 measurements for averaging.
- 12) MEASURE KEY**
Press with ANALYZE key to obtain exposure data.
- 13) AVERAGE KEY**
Press with ANALYZE key to begin entering up to 15 spot measurements to determine average exposure data or reference color data; press AVERAGE key again after entering measurements to obtain average on display.
- 14) CENTERED COLOR KEY**
In the "DATA" mode, press to select color channel or density channel to be adjusted. In the "RING-AROUND" mode, press to select step number; adjustment data for each step will be displayed.
- 15) EXPOSURE KEY**
Press to start exposure. Press again to interrupt and hold exposure in progress. Press once more to resume exposure.

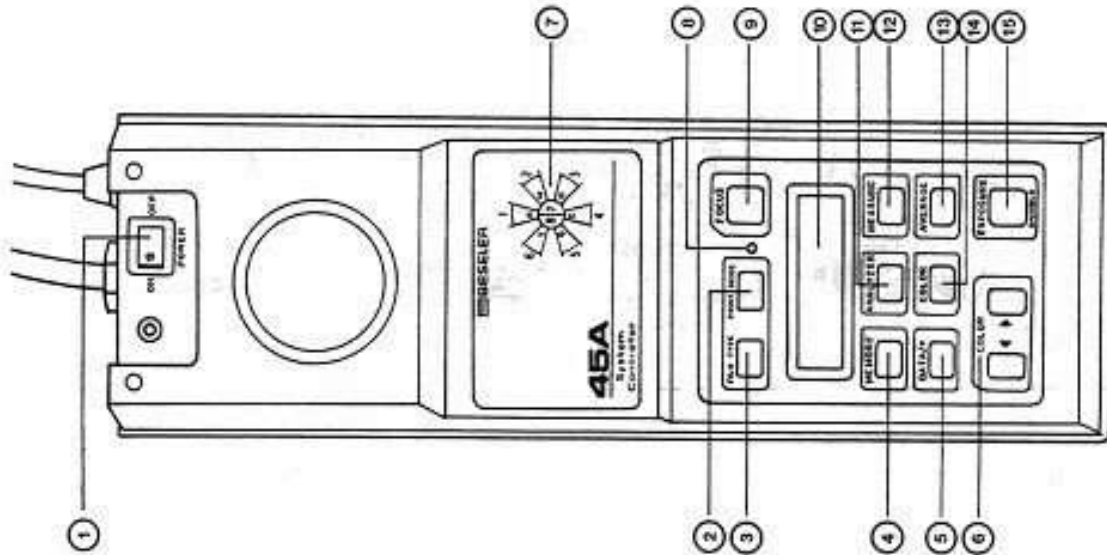
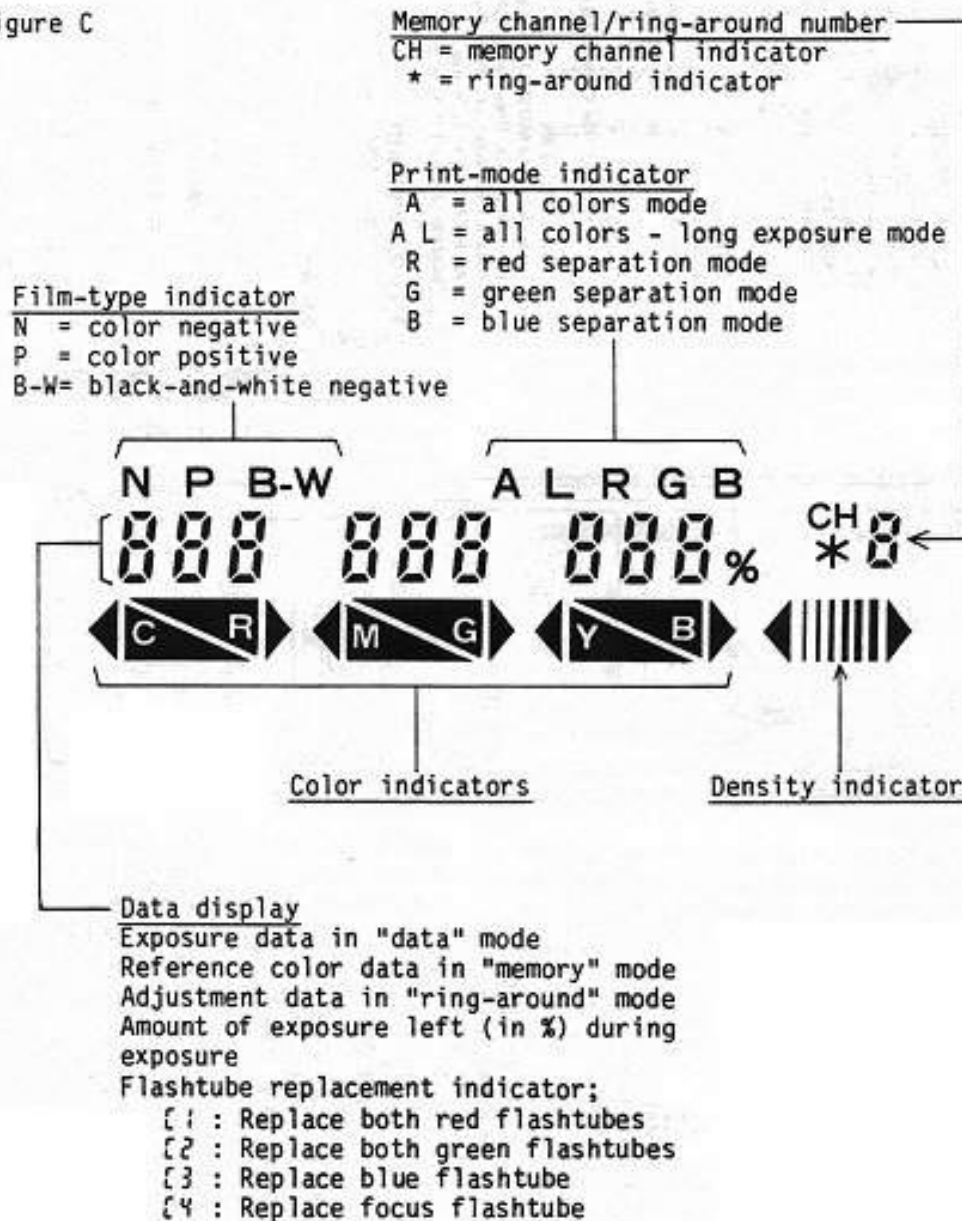


Figure B



PRINCIPAL PARTS AND CONTROLS

Figure C



CHAPTER OM-D

INSTALLATION INSTRUCTIONS

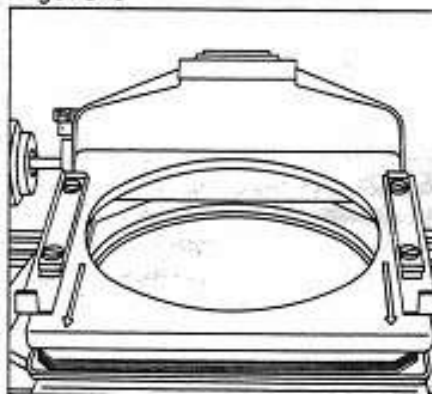
INSTALLATION ON A BESELER 45 SERIES ENLARGER

1. If your enlarger is equipped with a Resistrol accessory, unplug it, as it cannot be used in conjunction with the Beseler 45A.

2. Unplug the Condenser lamphouse power cord and remove the lamphouse/condenser assembly by pulling forward on the support stage latches (see Figure D) and lifting the assembly clear of the enlarger. Store the assembly in a safe, dust-free place.

3. Place the Beseler 45A Illumination Assembly on the enlarger so that the mounting collar slides into the opening in the support stage.

Figure D



4) Once the Beseler 45A Illumination Assembly is sitting squarely on the enlarger, lock it in place by pushing back on the latches.

5) The electronic circuitry in the Beseler 45A is, internally, voltage stabilized. The power cord can be plugged into the convenience outlet on the enlarger motor box or directly to a suitable grounded wall outlet of the proper voltage. A separate, dedicated power circuit is not necessary.

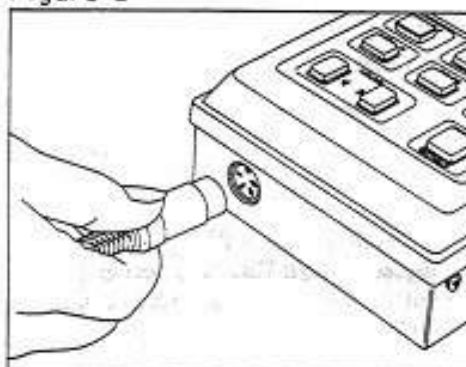
The electronic circuitry in the Beseler 45A is filtered, internally, against radio frequency (RF) noise that might be on the main power line. However, since the unit is vulnerable to losing its memory from RF

noise, you should be alert to the potential for this occurrence. If memory loss begins to occur, your unit may need additional noise filtration. This can be easily provided by any one of the various noise filters sold for use with home computers. Do not confuse "noise filtration" with "surge protection". While all noise filters provide surge protection, surge protectors, by themselves, never provide noise filtration.

6) The connecting cable between the Beseler 45A Illumination Assembly and the Controller should be arranged so that the enlarger can travel through its complete range unrestricted. This cable contains a fiber optic light guide which can be permanently damaged if it is bent sharply or otherwise crushed or "kinked".

7) Insert the Analyzer Probe Plug into the receptacle on the front of the Controller. See Figure E.

Figure E



8) If an optional footswitch (Beseler Catalog #8179) is being used, it should be plugged into the special three-pin socket on the back of the Controller. Once installed, the footswitch duplicates the function of the EXPOSURE key, and can be used interchangeably with the key.

9) Beseler 45 Series enlargers that were originally sold with condenser lamphouses have a Negative Size Scale attached to the right-rear of the lower jaw of the upper bellows assembly. This scale is useful when working with the condenser lamphouse and

various negative formats. The Negative Size Scale is now packed with the condenser head, which is sold separately.

The Beseler 45A Illumination Assembly is a diffusion light source. In order to maintain even illumination edge to edge on the negative, the illuminating surface must be as close to the negative stage as possible.

In the case of the Beseler 45M Series enlargers, opening the upper bellows causes the negative stage to move lower towards the easel, and away from the light source.

In the case of the Beseler 45V Series enlarger, opening the upper bellows causes the light source to move upward away from the negative stage, leaving the negative stage stationary.

In both instances it is necessary to move the light source as close to the negative stage as possible to assure even, uniform coverage of the full 4x5 area of the negative stage. If the light source is not in the correct position a decrease in light output will be noticeable, as well as, vignetting of the corners of the 4x5 negative area.

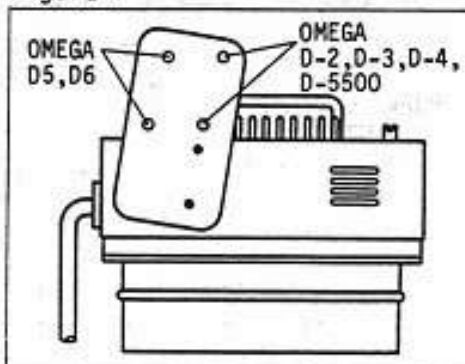
INSTALLATION ON AN OMEGA D-SERIES ENLARGER

1. Remove the two screws from each side of the Beseler 45A Illumination Assembly.

2. Insert the screws through the two lower holes in the Adapter Brackets (included) and thread them into the sides of the Beseler 45A Illumination Assembly. Do not tighten them completely.

NOTE: The Adapter Brackets should be oriented with the group of four holes facing up and the two lower holes towards the front.

Figure F



3. If you are replacing a condenser head on your Omega, attach the Beseler 45A to the lifting levers using the four knurled screws plus the supplied washers and hex nuts. The washers are positioned on the outside of the brackets and the nuts on the inside. Omega D2, D3 and D4 levers attach to the forward pair of vertical mounting holes; D5 and D6 levers attach to the rear pair.

4. If you are replacing a colorhead on your Omega D2, D3, D5 or D6, you will require a Mounting Lever Kit (Omega Catalog #429-110, order directly from Omega International Inc., 1900 Hanover Pike, Hampstead, MD 21074, 301-374-6766. Follow the instructions and attach the Beseler 45A in place of the condenser head.

NOTE: The D5 lifting lever should not be confined by the lever guard.

5. After the head is properly mounted and aligned, tighten the four screws holding the Adapter Brackets to the Beseler 45A Illumination Assembly.

6. Read "Installation on a Beseler 45 Series Enlarger", paragraphs 5., 6., 7., and 8. above. They apply to this type of installation also.

INSTALLATION ON OTHER ENLARGERS

1. The Beseler 45A Illumination Assembly can be successfully mounted on a Beseler 23C enlarger. Order Catalog #8273, Custom Adapter Kit and follow the directions. Use of the 35mm Mixing Chamber is not

recommended when the Beseler 45A has been mounted on the 23C enlarger.

2. It is possible that the Beseler 45A Illumination Assembly can be successfully mounted on other brands of enlargers, however there are no other Adapter Kits available at this time.

3. Read "Installation on a Beseler 45 Series Enlarger", paragraphs 5., 6., 7., and 8. above. They apply to these types of installation also.

INITIAL SETUP

Once the Beseler 45A is plugged into line voltage, its memory backup is energized. The backup system prevents loss of program data that might be stored in one of the five memory channels as well as the current printing data, in the event of any power line interruption. The backup system will prevent the loss of this data for up to several weeks.

When ever the unit is switched "on" the printing data that was last used will, again, be displayed in the LCD. If the system display does not illuminate within ten seconds of the first time it is turned on, then press the reset button. This button is between the PRINT MODE and FOCUS keys and is recessed so that a pen or other pointed object must be used when pressing it.

CAUTION: Pressing the re-set button will cause a loss of all data presently stored in memory.

If the flashtube replacement indicator is displayed (C1, C2, C3, or C4 in the center of the LCD), press the DATA/* key to clear the display after replacement of the corresponding flashtube.

The Beseler 45A should be left plugged in at all times.

NOTE: Due to the backup system and the general operating characteristics of the unit, the bottom of the Controller will be warm to the touch at all times, even when the power switch has been turned "off", since there will always be a trickle of power left "on" to supply the backup system. This is perfectly normal operation.

CHAPTER OM-E

FAST START

PRINTING COLOR NEGATIVES

ENTER PROPER CONTROLLER SETTINGS

1) POWER Switch "ON"

2) Use FILM TYPE key and PRINT MODE key to select "N" (for color Negative) and "A" (for All colors, normal mode) in LCD

3) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "100"

4) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "085"

5) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "050"

6) The LCD will then look like this*:



ADJUST ENLARGER MAGNIFICATION

1) Adjust magnification, and select the appropriate lens for approximately an 8x10 image from what ever negative format that you are using. For example, if you are using a 35mm negative, use a 50mm lens, and raise the enlarger head as needed. Set the lens for f-5.6.

2) Use the FOCUS key to turn the focus light "on" and "off", so that you can focus and compose the image on the easel.

MAKE EXPOSURE

1) Place a sheet of un-exposed color negative (Type EP-2 or RA-4) printing paper in the easel.

2) Use the key labeled EXPOSURE to make the exposure.

3) Process the exposed paper.

DENSITY ADJUSTMENT

1) Examine the print. If it is too DARK, reduce the amount of all three color channels equally. If it is too LIGHT, increase the amount of all three color channels equally. 15 units added to all three color channels will INCREASE the density by 1/2 f-stop.

COLOR ADJUSTMENT

If the Overall Color Balance Is:	Correction Needed
Too RED	INCREASE RED
Too GREEN	INCREASE GREEN
Too BLUE	INCREASE BLUE
Too CYAN	DECREASE RED
Too MAGENTA	DECREASE GREEN
Too YELLOW	DECREASE BLUE

* These are rough starting-point settings. They should not be considered to be valid by more than +/- 20cc. Emulsion batches and brands, chemistry batches and brands and technique of processing all impact on these settings. See the TECHNICAL REFERENCE MANUAL for greater detail and additional starting-point settings.

PRINTING COLOR SLIDES

ENTER PROPER CONTROLLER SETTINGS

1) POWER Switch "ON"

2) Use FILM TYPE key and PRINT MODE key to select "P" (for Positive) and "A" (for All colors, normal mode) in LCD

3) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "050"

4) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "090"

5) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "080"

6) The LCD will then look like this*:



ADJUST ENLARGER MAGNIFICATION

1) Adjust magnification, and select the appropriate lens for approximately an 8x10 image from what ever negative format that you are using. For example, if you are using a 35mm negative, use a 50mm lens, and raise the enlarger head as needed. Set the lens for f-5.6.

2) Use the FOCUS key to turn the focus light "on" and "off", so that you can focus and compose the image on the easel.

MAKE EXPOSURE

1) Place a sheet of un-exposed color positive (Type "R") printing paper in the easel.

2) Use the key labeled EXPOSURE to make the exposure.

3) Process the exposed paper.

DENSITY ADJUSTMENT

1) Examine the print. If it is too DARK, increase the amount of all three color channels equally. If it is too LIGHT, reduce the amount of all three color channels equally. 15 units added to all three color channels will REDUCE the density by 1/2 f-stop.

COLOR ADJUSTMENT

If the Overall Color Balance is:	Correction Needed
Too RED	DECREASE RED
Too GREEN	DECREASE GREEN
Too BLUE	DECREASE BLUE
Too CYAN	INCREASE RED
Too MAGENTA	INCREASE GREEN
Too YELLOW	INCREASE BLUE

* These are rough starting-point settings. They should not be considered to be valid by more than +/- 20cc. Emulsion batches and brands, chemistry batches and brands and technique of processing all impact on these settings. See the TECHNICAL REFERENCE MANUAL for greater detail and additional starting-point settings.

PRINTING B&W NEGATIVES

ENTER PROPER CONTROLLER SETTINGS

- 1) POWER Switch "ON"
- 2) Use FILM TYPE key and PRINT MODE key to select "BW" (for Black & White negative) and "A" (for All colors, normal mode) in LCD
- 3) The first color channel will not be illuminated. The LCD will look something like this:



- 4) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "100"

- 5) Use centered, blue-colored key labeled COLOR to select



Use twin, blue-colored keys labeled COLOR to enter "100"

- 6) The LCD will then look like this*:



* These are rough starting-point settings. They should not be considered to be valid by more than +/- 20cc. Emulsion batches and brands, chemistry batches and brands and technique of processing all impact on these settings. See the TECHNICAL REFERENCE MANUAL for greater detail and additional starting-point settings.

ADJUST ENLARGER MAGNIFICATION

1) Adjust magnification, and select the appropriate lens for approximately an 8x10 image from what ever negative format that you are using. For example, if you are using a 35mm negative, use a 50mm lens, and raise the enlarger head as needed. Set the lens for f-5.6.

2) Use the FOCUS key to turn the focus light "on" and "off", so that you can focus and compose the image on the easel.

MAKE EXPOSURE

1) Place a sheet of un-exposed black & white printing paper in the easel.

2) Use the key labeled EXPOSURE to make the exposure.

3) Process the exposed paper.

DENSITY ADJUSTMENT

1) Examine the print. If it is too DARK, reduce the amount of both GREEN & BLUE equally. If it is too LIGHT, increase the amount of both GREEN & BLUE equally. 15 units added to BOTH color channels will INCREASE the density by 1/2 f-stop.

CONTRAST ADJUSTMENT

GRADED PAPERS

1) Examine the print. If it is too low in contrast, select a higher grade of paper. If it is too high in contrast, select a lower grade of paper.

VARIABLE CONTRAST PAPERS

If the Overall Contrast is:	Correction Needed
Too HIGH	DECREASE BLUE and/or INCREASE GREEN
Too LOW	DECREASE GREEN and/or INCREASE BLUE

CHAPTER OM-F

GENERAL INFORMATION

PRINTING WITH THE BESELER 45A

Beseler 45A CALIBRATION

The Beseler 45A has been calibrated to match the units of measurement that are used by Kodak for their Wratten Filters. This system of calibration makes it easy for the operator to make color and density corrections, since the Beseler 45A's calibration is compatible with the technical information published by Kodak and other manufacturers using the same standards.

COLOR:

1 unit on any channel = 1 CC of color

COLOR DENSITY:

30 units on each of all 3 channels = 1 f-stop

B&W DENSITY:

30 units on both GREEN & BLUE channels = 1 f-stop

ADDITIVE COLOR PRINTING IN GENERAL

GENERAL INFORMATION

The Beseler 45A is an "additive" enlarger. That means that it creates three specific colors of light; RED, GREEN and BLUE. Some amount of all three colors must be present in order for a full color image to be created. All current color emulsions - positive and negative - film and paper - from all known manufacturers - can be successfully exposed with the Beseler 45A.

Each of the three colors is individually controlled by keying into the CONTROLLER the exact AMOUNT of each color that you want.

All color printing papers are sensitive to all colors. Therefore, although certain, special, safe lights can be used in certain circumstances, it is best to handle color printing papers in total darkness to be sure of not fogging the paper.

COLOR BALANCE

The "color balance" of a printed image is controlled by the RELATIONSHIP of the three, additive colors. All three colors MUST BE USED to produce a full color image. The numbers that are displayed in the Liquid Crystal Display (LCD) of the CONTROLLER indicate the AMOUNT of each color that will be created when the exposure is made.

In general photographic terms:

There are three "additive" colors:
RED GREEN BLUE

There are three "subtractive" colors:
CYAN MAGENTA YELLOW

In color photography the three additive colors and the three subtractive colors work together as "pairs" The pairs are said to be "complimentary."

- › RED & CYAN are complimentary
- › GREEN & MAGENTA are complimentary
- › BLUE & YELLOW are complimentary

When ever you make a change in one color of an image, you AUTOMATICALLY make an equal and opposite change in the pair's other, complimentary, color in the image. For example, if you INCREASE RED in an image, then CYAN is DECREASED by an equal amount. If you DECREASE RED in an image, then CYAN is INCREASED by an equal amount. For purposes of learning color printing you can assume that the other colors are not affected - only the pair of colors that you have changed are directly affected.

The numbers that are displayed in the LCD should be thought of as representing the, additive color - not its subtractive counterpart.

For example, think of the first number in the display as "the red number". While it is true that any change in this number does have an effect on the cyan color in the

image, do not think of it as "the cyan number". It is truly a measurement of the red colored light that the unit produces. The unit does not and can not produce cyan colored light.

The LCD is laid out in such a way as to clearly indicate just what these pairs of colors are doing. The number for each color channel that is displayed in the LCD indicates how much of that particular ADDITIVE color will be produced during the exposure.

If an equal amount of all three colors is created - by having equal numbers displayed in each of the three channels - then the color of the resulting white light will be somewhere around the equivalent of 3400°K. That's the same color of light that is produced by quartz-halogen bulbs, before it is filtered, in other enlargers. It is the color standard that is manufactured into most of our color printing papers.

PRINTING SLIDES OR TRANSPARENCIES

When you print slides onto color positive paper, you will want to INCREASE the amount of a given color (RED, GREEN, BLUE) in order to cause an INCREASE of that same color in the printed image. Remember the AMOUNT of ADDITIVE color that the Beseler 45A will produce is indicated by how large the number is that shows in the LCD. There are never any numbers displayed that indicate the amount of subtractive color that is being created, because the unit does not create those colors.

PRINTING COLOR NEGATIVES

DENSITY CONTROL

When printing color negatives, the proper density level is usually established first, then the proper color balance is established.

Most enlargers use a "timer" to control the length of time that the light source is turned "on". The timer then becomes the main instrument for controlling the density of the print.

The Beseler 45A controls the density of the print in a different manner. It does not use a conventional timer. Instead, the Beseler 45A attempts to produce all exposures, of all magnitudes, in approximately 7-1/2 seconds. By making all exposures the same length of time, the phenomena known as "reciprocity failure*" is kept to a minimum.

As the Beseler 45A is "asked" to produce exposures of larger and larger magnitude, it finally reaches a point where its computer can no longer produce the total exposure in 7-1/2 seconds. From that point on, the actual time required for it to produce the exposure will gradually increase in relation to the actual magnitude of the exposure being produced. This entire matter can be generally ignored. The exceptions are covered in some detail in the TECHNICAL REFERENCE MANUAL.

Density control, with the Beseler 45A, should not be thought of in terms of the length of time of the exposure. Rather, density control should be thought of in terms of how much light should be delivered to the printing paper.

The "density" of a printed image is controlled by the AMOUNT of the three, additive, colors that you use. All three colors MUST BE USED to produce a full color image. The numbers that are displayed in the LCD of the CONTROLLER indicate the AMOUNT of each color that will be created when the exposure is made.

By adding to - or subtracting from - all three color channels, an EQUAL amount of units of color, you will make a change in ONLY the density of the image. In the DATA mode you can use the centered, blue-colored key labeled COLOR to index into the DENSITY channel (as indicated by the Density Indicator in the far right of the LCD), which then allows you to raise or lower the numbers of all three color channels simultaneously, by pressing one of the two blue-colored keys labeled COLOR.

When 30 units of DENSITY are added to or subtracted from the DENSITY channel, all three color channels are simultaneously changed. A 30 unit change in density represents a one f-stop change in exposure. The Beseler 45A Controller allows precise control of density to 1/30th of an f-stop. If critical exposure control is

* Reciprocity Failure: The "Law of Reciprocity" simply means that you can reciprocate, or compensate, for a change in one exposure control with a change in the other. That is, you can trade off shutter speeds, or time, for aperture settings and vice versa. "Reciprocity Failure" is when the results of such trading do not remain equal which will occur under extremes of time adjustments - very long or very short exposure times. In color printing, "reciprocity failure" is said to have occurred when one or more dye layers reacts disproportionately to such exposure changes resulting in color balance shifting.

required, it is recommended that the Beseler 45A DENSITY mode be used, in place of the lens aperture.

This form of density control holds true for all types of printing with the Beseler 45A - B&W, color positive, color negative, slide duping, internegatives, etc.

For example -

These settings represent an arbitrary amount of a random color:

150-125-100

To make a one f-stop change in 150-125-100, you would either add or subtract 30 units from all three color channels by using the DENSITY channel.

If you added 30 units to 150-125-100, you'd get:

180-155-130

which would be MORE light output but, of the SAME color.

If you subtracted 30 units from 150-125-100, you'd get:

120- 95- 70

which would be LESS light output but, of the SAME color.

If you are printing slides onto color positive paper, ADDING 30 units to all three color channels will REDUCE the density of the printed image and make it LIGHTER by one f-stop.

If you are printing color negatives onto color negative paper, SUBTRACTING 30 units from all three color channels will REDUCE the density of the printed image and make it LIGHTER by one f-stop.

Density control could also be accomplished by OPENING or CLOSING the enlarger lens by one f-stop. However, the f-stop clicks of most enlarger lenses are not calibrated as precisely as the Beseler 45A. Therefore, there might be some slight differences produced by the two techniques. It is recommended that you set your enlarger lens at some moderately open

position - about one f-stop DOWN from its wide open position - and make all of your density corrections with the electronic color controls of the CONTROLLER.

COLOR CONTROL

When you print color negatives onto color negative paper, you will want to DECREASE the amount of a given color (RED, GREEN, BLUE) in order to cause an INCREASE of that same color in the printed image. Remember the AMOUNT of ADDITIVE color that the Beseler 45A will produce is indicated by how large the number is that shows in the LCD. There are never any numbers displayed that indicate the amount of subtractive color that is being created, because the unit does not create those colors.

COLOR NEGATIVE PRINTING COLOR CONTROL	
IF PRINT IS TOO:	CHANGE COLOR CHANNEL:
RED	INCREASE RED OUTPUT
GREEN	INCREASE GREEN OUTPUT
BLUE	INCREASE BLUE OUTPUT
CYAN	REDUCE RED OUTPUT
MAGENTA	REDUCE GREEN OUTPUT
YELLOW	REDUCE BLUE OUTPUT

COLOR CONTRAST CONTROL

When printing color negatives, the contrast of the finished print is commonly controlled by selecting the correct contrast grade of color negative printing paper. Most manufacturers of color negative printing paper offer two or three contrast grades.

The contrast of the image that is recorded onto the color negative is commonly controlled by both the lighting and the selection of the specific type of color negative film that is used.

While there are other, somewhat obscure, techniques of manipulating the contrast in both the paper and the negative, such techniques are beyond the scope of this manual.

PRINTING B&W GRADED CONTRAST PAPER

GENERAL INFORMATION

Graded B&W printing papers are manufactured in several contrast grades that can be selected to match the contrast level of the negative that is being printed. By selecting the correct grade of paper for a given negative, a near-normal contrast level can be created in the finished print, even though the negative might have had a non-normal (too high or too low) contrast level.

CONTRAST CONTROL

When using "graded" B&W printing paper, the contrast of the image is controlled by which "grade" of paper you select to use. Some, further, contrast control can be provided by the selection of developer that you use, the level of dilution or concentration, the development technique, and the temperature of the solution.

Graded B&W papers are sensitive to the colder (blue) portion of the color spectrum. Almost all B&W graded papers are blind to red colored light. Therefore, a "red safe light" can be used.

The Beseler 45A has a B&W mode in which the RED color channel is turned off, since it really isn't needed. While you can use all three color channels when exposing B&W papers, switching to the B&W mode will help to extend the life of the tubes in the RED channel, and perhaps, make it a little easier for you to learn and understand the techniques of B&W printing.

You must be in the B&W mode if you wish to use the B&W ring-around feature of the CONTROLLER. However, when printing onto graded paper, the B&W ring-around feature of the Beseler 45A has no application, since changing the color of light that is being used will not have any effect on the contrast of the image.

Equal amounts of both the GREEN and BLUE channels should always be used when printing onto graded B&W papers.

DENSITY CONTROL

Most enlargers use a "timer" to control the length of time that the light source is turned "on". The timer then becomes the main instrument for controlling the density of the print.

The Beseler 45A controls the density of the print in a different manner. It does not use a conventional timer. Instead, the Beseler 45A attempts to produce all exposures, of all magnitudes, in approximately 7-1/2 seconds. By making all exposures the same length of time, the phenomena known as "reciprocity failure*" is kept to a minimum.

As the Beseler 45A is "asked" to produce exposures of larger and larger magnitude, it finally reaches a point where its computer can no longer produce the total exposure in 7-1/2 seconds. From that point on, the actual time required for it to produce the exposure will gradually increase in relation to the actual magnitude of the exposure being produced. This entire matter can be generally ignored. The exceptions are covered in some detail in the TECHNICAL REFERENCE section of this manual.

Density control, with the Beseler 45A, should not be thought of in terms of the length of time of the exposure. Rather, density control should be thought of in terms of how much light should be delivered to the printing paper.

When printing onto graded B&W papers, the density of the image can be controlled by how much light strikes the paper. The larger the numbers are in the LCD, the more light that is produced. The more light that strikes the enlarging paper, the darker (denser) the image will be.

By adding to - or subtracting from - both the GREEN and BLUE color channels, an EQUAL amount of units of color, you will make a change in ONLY the density of the image. In the DATA mode you can use the centered, blue-colored key labeled COLOR to index into the DENSITY channel (as indicated by the Density Indicator in the far right of the LCD), which then allows you to raise or lower the numbers of both the BLUE and GREEN color channels simultaneously, by pressing one of the two blue-colored keys labeled COLOR.

When 30 units of DENSITY are added to or subtracted from the DENSITY channel, both the GREEN and

Reciprocity Failure See explanation in footnote on OM-F, Page 14

BLUE color channels are simultaneously changed. A 30 unit change in density represents a one f-stop change in exposure. The Beseler 45A Controller allows precise control of density to 1/30th of an f-stop. If critical exposure control is required, it is recommended that the Beseler 45A DENSITY mode be used, in place of the lens aperture.

For example -

These settings represent an arbitrary and equal amount of GREEN & BLUE light:

(B&W Mode) 100-100

To make a one f-stop change in 100-100, you would either add or subtract 30 units from/to both color channels.

If you added 30 units to 100-100, you'd get:

(B&W Mode) 130-130

which would be MORE light output but, of the SAME color.

If you subtracted 30 units from 100-100, you'd get:

(B&W Mode) 70- 70

which would be LESS light output but, of the SAME color.

Density control could also be accomplished by OPENING or CLOSING the enlarger lens by one f-stop. However, the f-stop clicks of most enlarger lenses are not calibrated as precisely as the Beseler 45A. Therefore, there might be some slight differences produced by the two techniques. It is recommended that you set your enlarger lens at some moderately open position - about one f-stop DOWN from its wide open position - and make all of your density corrections with the electronic color controls of the CONTROLLER.

PRINTING B&W **VARIABLE CONTRAST PAPER**

GENERAL INFORMATION

Variable contrast B&W printing papers are manufactured with two different emulsion layers. One layer is sensitive to GREEN colored light and the other layer is sensitive to BLUE colored light. By adjusting the AMOUNT of one color of light relative to the other color, the contrast of the finished B&W image can be adjusted. Different brands of variable contrast papers have slightly different responses to specific amounts of GREEN and BLUE light.

CONTRAST CONTROL

When using "variable contrast" B&W printing paper, the contrast of the image is controlled largely by the color of light that is used to expose the paper. Some, further, contrast control can be provided by the selection of developer that you use, the level of dilution or concentration, the development technique, and the temperature of the solutions.

The RELATIONSHIP of GREEN to BLUE colored light establishes the contrast of the image. INCREASING the amount of GREEN light, relative to the BLUE light, will LOWER the contrast of the image. INCREASING the amount of BLUE light relative to the GREEN light will INCREASE the contrast of the image.

Depending on the specific brand of variable contrast paper (and to a lesser extent, the brand/technique of development used), EQUAL amounts of both GREEN and BLUE colored light will generally produce a near-normal contrast grade from a near-normal B&W negative.

Kodak identifies a "normal" contrast grade as Grade #2. They further establish as "standard" contrast grades, the 1/2 steps between numbered grades. Most brands of variable contrast paper are capable of creating a range of contrast levels from "0" through "5". This concept of grade identification is the same as that which is used for "graded" papers.

You must be in the B&W mode if you wish to use the B&W ring-around feature of the Controller. The B&W

ring-around feature of the Controller will create a series of contrast steps that is useful in determining the exact contrast level that you will want to use in printing a particular image.

The contrast steps that are created by the B&W ring-around mode are pre-programmed in 1/2 contrast grade increments, based on the general standards of the Kodak system of measurement and the general performance of Kodak papers, developers and Kodak-recommended development techniques.

By using the GREEN and BLUE color controls it is possible to adjust the contrast of an image to about 1/30th of a full contrast grade. That is a very precision amount of fine contrast control.

DENSITY CONTROL

See: DENSITY CONTROL for PRINTING B&W GRADED CONTRAST PAPER earlier in this chapter.

B&W PRINTS FROM COLOR NEGATIVES

GENERAL INFORMATION

B&W panchromatic paper is a special printing paper that is made for producing B&W prints from color negatives. It is sold by several companies under their various brand names. Kodak makes several versions of it under the general brand name of Panalure. Oriental makes it under their brand name of Seagull Panchromatic.

This, special, paper is sensitive to the full color spectrum and is generally handled in total darkness. When using the Beseler 45A to print onto it, you should use near-equal amounts of all three colors.

CONTRAST CONTROL

The contrast of the image is largely fixed by the exposure that was used to create the color negative. If the color negative was over exposed, the resulting panchromatic print will be high in contrast. If the color negative was under exposed, the panchromatic print will be low in contrast.

Since panchromatic paper is developed in standard B&W chemicals, just like any other B&W paper, it is possible to provide some, minor, contrast control by the selection of developer that you use, the level of dilution or concentration, the development technique, and the temperature of the solution that you use.

By adjusting the amount of specific additive colors that you use to make the exposure, you can further adjust the contrast of those, specific, colors in the finished B&W print. The "rules" for doing this are the same as those used with color filters over a camera lens when shooting B&W film.

If you want to lighten the B&W shade of gray of a given color in the B&W print, use a lot of that same color when exposing panchromatic paper. If you want to darken the B&W shade of gray of a given color in the B&W print, use much less of that same color when exposing panchromatic paper.

For example, if the following settings were used to make a panchromatic portrait print (150-150-150) and you decided that you wanted to DARKEN the shade of gray that the person's red-colored lips appeared as, you might try making the print with much less RED colored light. You would REDUCE the amount of the RED channel, and then, in order to keep the density of the print the same, you would add the amount that you removed from the red channel to the green and blue channels. If you reduced the red channel by 50 units, you would add 25 units to each of the green and blue channels. Your new settings would be: 100-175-175. If you are going to use this kind of a technique to alter the contrast of specific shades of gray in your panchromatic prints, you will need to make changes of very large magnitude. A change of 30% (as in the example given above) might be considered as a small amount of change. A 60% change might be thought of as a moderate amount of change. A 100% change might be thought of as a substantial amount of change.

DENSITY CONTROL

Most enlargers use a "timer" to control the length of time that the light source is turned "on". The timer then becomes the main instrument for controlling the density of the print.

The Beseler 45A controls the density of the print in a different manner. It does not use a conventional timer. Instead, the Beseler 45A attempts to produce all exposures, of all magnitudes, in approximately 7-1/2 seconds. By making all exposures the same length of time, the phenomena known as "reciprocity failure*" is kept to a minimum.

As the Beseler 45A is "asked" to produce exposures of larger and larger magnitude, it finally reaches a point where its computer can no longer produce the total exposure in 7-1/2 seconds. From that point on, the actual time required for it to produce the exposure will gradually increase in relation to the actual magnitude of the exposure being produced. This entire matter can be generally ignored. The exceptions are covered in some detail in the TECHNICAL REFERENCE MANUAL.

Density control, with the Beseler 45A, should not be thought of in terms of the length of time of the exposure. Rather, density control should be thought of in terms of how much light should be delivered to the printing paper.

The "density" of a printed image is controlled by the AMOUNT of the three, additive, colors that you use. All three colors MUST BE USED to produce a full color image. The numbers that are displayed in the LCD of the CONTROLLER indicate the AMOUNT of each color that will be created when the exposure is made.

By adding to - or subtracting from - all three color channels, an EQUAL amount of units of color, you will make a change in ONLY the density of the image. In the DATA mode you can use the centered, blue-colored key labeled COLOR to index into the DENSITY channel (as indicated by the Density Indicator in the far right of the LCD), which then allows you to raise or lower the numbers of all three color channels simultaneously, by pressing one of the two blue-colored keys labeled COLOR.

When 30 units of DENSITY are added to or subtracted from the DENSITY channel, all three color channels are simultaneously changed. A 30 unit change in density

represents a one f-stop change in exposure. The Beseler 45A Controller allows precise control of density to 1/30th of an f-stop. If critical exposure control is required, it is recommended that the Beseler 45A DENSITY mode be used, in place of the lens aperture.

This form of density control holds true for all types of printing with the Beseler 45A - B&W, color positive, color negative, slide duping, internegatives, etc.

For example -

These settings represent an arbitrary setting that might be used for printing onto panchromatic paper:

100-100-100

To make a one f-stop change in 100-100-100 you would use the DENSITY channel to either add or subtract 30 units from all three color channels.

If you added 30 units to 100-100-100, you'd get:

130-130-130

which would be MORE light output but, of the SAME color.

If you subtracted 30 units from 100-100-100, you'd get:

70- 70- 70

which would be LESS light output but, of the SAME color.

If you are printing color negatives onto panchromatic printing paper, SUBTRACTING 30 units from all three color channels will REDUCE the density of the printed image and make it LIGHTER by one f-stop.

Density control could also be accomplished by OPENING or CLOSING the enlarger lens by one f-stop. However, the f-stop clicks of most enlarger lenses are not calibrated as precisely as the Beseler 45A. Therefore, there might be some slight differences produced by the two techniques. It is recommended that you set your enlarger lens at some moderately open position - about one f-stop DOWN from its wide open position - and make all of your density corrections with the electronic color controls of the CONTROLLER.

Reciprocity Failure See explanation in footnote on OM-F, Page 14

CHAPTER OM-G

GENERAL OPERATIONAL INFORMATION

THE CONTROLLER

The Controller is a small, micro-computer that controls all the functions of the Beseler 45A. Through the Controller you can "control" both the amount and color of light that is produced. The Controller then attempts to deliver the required amount of light in an exposure of approximately 7-1/2 seconds. When very large quantities of light are required, the Controller will take longer to make the exposure.

The Controller is pre-programmed to provide an AMOUNT of light and a COLOR of light in units that are approximately equal to the standards used by Kodak in their Wratten Filters. That is, one unit of a given color on the Beseler 45A is approximately equal to one Color Compensating (CC) or Color Printing (CP) unit in Kodak's Wratten Filters.

The Controller can display three types of information in its LCD. One type of information is "printing data":

N
100
C R
A
85
M G
50
Y B
CH 1
|||||

Another type of information is a "program" that has been stored in memory:

175 125 60 CH 1

While these two sets of data can generally look very similar - they are usually three numbers of three digits each - they serve totally different purposes and MUST NOT be confused. It is important for you to learn just exactly which type of data you are observing in the LCD.

The third type of information is displayed during the use of the ring-around feature when the data for a particular step of the ring-around series is displayed. Below are the 9 steps of the color ring-around series:

THE COLOR RING-AROUND

N 0 0^A 0 * 0

N - 5 0^A 0 * 1

N 0 5^A 0 * 2

N 0 0^A - 5 * 3

N 5 0^A 0 * 4

N 0 - 5^A 0 * 5

N 0 0^A 5 * 6

N - 5 - 5^A - 5 * 7
|||||▶

N 5 5^A 5 * 8
◀|||||

The printing data numbers displayed in the Controller's LCD represent the AMOUNT of each color that the unit will produce during the exposure. Printing Data or "printing numbers" are always displayed with little colored rectangular boxes displayed under them.

Program Data or "program numbers" NEVER have the little colored rectangular boxes displayed under them. The Beseler 45A produces light of ADDITIVE colors; RED, GREEN and BLUE. The printing numbers tell how MUCH of these three colors will be produced during the exposure. The Beseler 45A cannot produce subtractive colors; CYAN, MAGENTA or YELLOW. Therefore, there are NEVER any numbers displayed that tell anything about those colors. See Chapter OM-F, GENERAL INFORMATION - PRINTING WITH THE Beseler 45A.

You can manually change the printing numbers to any value between "0" and "255" for each of the three colors.

The Controller also displays the program numbers that have been stored in the five memory channels. While program numbers are usually automatically created and placed into storage on one of the memory channels by the Analyzer, you can manually change the program data if you want to.

THE PRINT MODE KEY

The Controller displays the status of the particular mode in which it is operating. It can operate in one of five Print Modes (controlled by the Print Mode key):

- "A" for All colors, Normal exposure
- "AL" for All colors, Long exposure
- "R" for RED only, Long exposure
- "G" for GREEN only, Long exposure
- "B" for BLUE only, Long exposure

In the "A" mode, the Controller will attempt to make all exposures last for about 7-1/2 seconds. By adjusting all exposures for a common time duration, most of the effects of reciprocity failure are eliminated. However, as you "ask" the Controller to deliver larger and larger amounts of light, a point is eventually reached where the Controller can no longer make the exposure occur in only 7-1/2 seconds. At this point, the Controller compensates and allows the exposure to take whatever amount of time that is necessary for the particular amount of light that you have requested. This compensating occurs when the printing data in the LCD is around 160-160-160. From about that point onward, the length of time for the exposure will gradually increase to a maximum time of about a minute and a half when the printing data is set to 255-255-255.

In the "A" mode, the Controller displays, in the LCD, the percentage of the total exposure - that remains to be delivered - in a count-down manner during the actual exposure. You can interrupt the exposure count-down by

pressing, the EXPOSURE key. Pressing the EXPOSURE key again will allow the exposure to continue. Since the exposure is being displayed to you in terms of the percentage that is yet to be performed, it is fairly easy to perform dodging and burning-in or other image manipulation with some degree of precision and repeatability.

In the "AL" mode, the Controller makes no attempt to control the length of time of the exposure at all. The total time of a given exposure is totally dependent on just exactly how much quantity of light that has been requested. In the "AL" mode the Controller does divide the total exposure into 10% increments and pauses at each increment for about one second before continuing. This pausing and count-down feature provides the information and opportunity to perform image manipulation with some degree of precision and repeatability.

In the "R", "G" & "B" mode only the appropriate colored exposure tube(s) will fire. Like in the "AL" mode, the total exposure for each color is divided into 10% increments. The Controller pauses for about one second as it reaches each 10% increment before proceeding. These modes are useful for exposing color separation negatives like those used in dye transfer printing.

THE FILM TYPE KEY

The Controller allows you to specify just exactly what type of film you are using. There are three possible choices. The FILM TYPE key controls the settings. The options are:

"N" for Negative film - usually this means color negative film being printed onto color negative printing paper. However, it is also used for printing color negatives onto B&W panchromatic paper.

"P" for Positive film - this is used for printing slides and transparencies onto positive printing paper. This setting causes the color ring-around and the two COLOR keys to perform in the opposite manner from the way they perform in the "N" mode.

"BW" for Black & White film - this is the mode for printing B&W negatives onto B&W graded or variable contrast papers. In this mode, the RED color tubes are turned "off" since they are not needed.

THE EXPOSURE KEY

When you press the EXPOSURE key and start the exposure, the Controller quickly calculates how many times it will have to fire each of the color's tubes and at what voltage levels in order to create the quantity of light that you've requested, and deliver it in 7-1/2 seconds. The Controller then starts delivering the firing voltages to the tubes. As each tube is fired, a tiny portion of the light is sent back to the Controller via a special fiber optic cable where the Controller evaluates it to determine if everything is proceeding properly. If a given tube is getting old and weak, the Controller may have to fire it a few more times in order to obtain from it the proper amount of light.

This feed-back circuit is part of the way in which the Beseler 45A is capable of delivering such outstanding precision and repeatability.

THE COLOR RING-AROUND

The Controller contains a special set of permanent instructions that allows it to produce a sequential series of nine exposures called a color ring-around. In the color printing mode this ring-around is a valuable tool used for determining proper color balance. The first of the nine images is identified as Image #0. It is made from some "starting point" settings. The starting point settings could have been created by the Analyzer or they could have been keyed in manually.

Building on the starting point settings, the Controller will then proceed to produce six additional images - each one being made from the starting point settings with a different color added to it:

In the COLOR Ring-Around Mode:

Image #0 equals the Starting Point Settings.
Image #1 will have the color RED added to it.
Image #2 will have the color MAGENTA added to it.
Image #3 will have the color BLUE added to it.
Image #4 will have the color CYAN added to it.
Image #5 will have the color GREEN added to it.
Image #6 will have the color YELLOW added to it.
Image #7 will be a LIGHTER density option of Image #0
Image #8 will be a DARKER density option of Image #0

In each case, the AMOUNT of the color that is added to the image can be set by the operator to any value between "0" and "32" units. Finally, the Controller creates two density variations of the color settings used in the starting point, Image #0.

The amount of density change will be the same increment as that which was used for the color changes. For example, if 10 units of change was selected for use in the color changes, then the density options will change by having 10 units added to, or subtracted from all three channels. Such a 10 unit amount of change is equal to 1/3 of an f-stop. 30 units added to or subtracted from all three color channels would equal one full f-stop of density change. This type of calibration makes it possible to control the density of a printed image to within 1/30th of an f-stop. The color can be controlled to the nearest one CC of color.

THE B&W RING-AROUND

The Controller produces a similar ring-around in the B&W Mode. The B&W ring-around mode changes the amount of GREEN and BLUE light to create various contrast grades in variable contrast paper. All nine steps of the B&W ring around create various contrast grades, but at the same density level.

Depending on the exact brand of variable contrast paper and the exact developer and development techniques and temperature that are used, near-equal amounts of both GREEN and BLUE light will produce an image of near-normal contrast from a B&W negative of near-normal contrast. Kodak identifies near-normal contrast as contrast Grade #2.

If more GREEN light is used compared to the amount of BLUE light that's used, the image will be LOWER in contrast.

If more BLUE light is used compared to the amount of GREEN light that's used, the image will be HIGHER in contrast.

The B&W ring-around produces a series of B&W contrast grades by changing the relationship of GREEN and BLUE light based on the starting point settings that are used. Unlike the color ring-around, the operator cannot select the increment of change that is used in the B&W ring-around.

The actual increment of change that occurs is shown below. Due to the many variables in B&W printing these ring-around steps should NOT be thought of as representing specific B&W paper contrast grades. They are simply a range of arbitrary changes.

In the B&W Ring-Around Mode:

- Image #0 = +60 GREEN -20 BLUE
(lower in contrast than Image #1)
- Image #1 = +45 GREEN -15 BLUE
(lower in contrast than Image #2)
- Image #2 = +30 GREEN -10 BLUE
(lower in contrast than Image #3)
- Image #3 = +15 GREEN -05 BLUE
(lower in contrast than Image #4)
- Image #4 = 00 GREEN 00 BLUE
Starting Point Settings
- Image #5 = -15 GREEN +05 BLUE
(higher in contrast than Image #4)
- Image #6 = -30 GREEN +10 BLUE
(higher in contrast than Image #5)
- Image #7 = -45 GREEN +15 BLUE
(higher in contrast than Image #6)
- Image #8 = -60 GREEN +20 BLUE
(higher in contrast than Image #7)

THE ANALYZER

The Beseler 45A has a color analyzer built into it in such a way that the Analyzer can create printing numbers and place them "on-line" and ready to use - all automatically. The Analyzer is a powerful feature of the Beseler 45A. However, the Beseler 45A can be used totally independent of the Analyzer.

The Analyzer has five memory channels into which it can store and hold programs. The Analyzer must have a program with which to "work". The program tells the Analyzer what a particular color should look like. The Analyzer then uses that information to determine what printing settings should be used in order to re-produce that same color.

The Analyzer is capable of automatically creating a program - and storing it in one of the five memory channels - that it can subsequently use to analyze an unknown negative. In practice, you first create a

"perfect" print by trial and error or by using the ring-around feature for a multiple series of tests. Then using the printing settings that ultimately produced the "perfect" print, the Analyzer's sensor is placed in the area of a specific color and the ANALYZE key is pressed and held while the MEMORY key is momentarily pressed. This causes the analyzer to "remember" the particular color by recording it as a "program" and placing the program in one of the five memory channels. If a previously created program was already in the memory channel, it will be over written by the new program and permanently lost. The operator can select which of the five memory channels that the new program should be stored in. Programs can - and should - be written down and "saved" as a back-up to accidentally losing them out of the Controller's memory.

The Program records not only the specific color, but the specific density of the color. Therefore, when the Program is later used to analyze an unknown negative, both the color and the density will be established simultaneously. That data is then automatically translated into printing settings and placed "on-line" in the Controller, ready to use.

In theory, once a program is created for a particular color, the Analyzer should be able to re-create that color from any color negative. However, it doesn't work quite that way, because the Analyzer's sensor is a little bit blind to some of the colors that the paper's emulsion can "see". Each different brand of color negative film has a slightly different color in its D-MIN* orange mask. These different colored masks pass slightly different combinations of colors to the printing paper. A program that works with one brand of film (and the stray colors passed by its orange mask) won't quite work with another brand of film whose orange mask passes a slightly different combination of colors... some of which the Analyzer's sensor is blind to and therefore isn't able to know they are there and need to be corrected for.

As a result, programs that are created with a particular brand of film will not work - exactly - with another brand of film. They will be close... just not perfect.

* D-MIN stands for "Density, Minimum amount". This is the clear, edge-area of film, or any other area that is equally clear of image data or fog.

Multiple ANALYZER Readings

The Analyzer is capable of allowing you to take up to a total of fifteen different, specific readings, and then averaging them together to create a single set of printing numbers. This is useful as a technique of nullifying human judgement error in deciding just exactly where in an image to take a particular reading.

Further, you can take these fifteen different readings by using any combinations of the five programs that can be stored in the five memory channels. For example, you can use a "flesh tone" program and take a few readings of a person's skin tones, then switch to a "white highlight" program and take a few more readings of something colored white... like a white shirt, and finally switch to an "18% gray" program and take a few readings of a gray card that might be in the image. The analyzer can then average all of these readings together to produce a single set of printing numbers.

Integrated ANALYZER Readings

The image beam can be integrated by placing a Beseler Analyzing Light Integrator Filter, Cat. #8163, under the lens. The resulting, integrated image can then be analyzed. This technique is useful when working with certain types of images - like scenics - that don't lend themselves to taking spot readings. However, you should be extremely careful when creating integrated programs and using them to analyze integrated images.

In theory, if you integrated an image that contains an equal amount of all the colors in equal amounts of their densities, the resulting beam of illumination will be 18% gray color in color. However, few images really contain equal amounts of all the colors.

For example, if you integrated an image of a girl wearing a red dress, standing in front of a red barn, you will NOT get 18% gray! You'll get some shade of RED!

The density of the integrated beam of light on the easel is not uniform. It is much lighter (brighter) in the center than it is out on the edges. As a result, the analyzer will produce vastly different results depending on just where, in the integrated beam, the readings are taken. For consistency, you should always take readings in the center of the beam of illumination that falls on the easel.

ANALYZER'S Sensitivity Range

The Analyzer is extremely sensitive. However, the range of illumination level in which the Analyzer can work is somewhat limited. If the Analyzer's sensor receives too much or too little light, it will be unable to process the data, and will display an "E" (for Error) in the LCD.

The Analyzer's sensor is 3mm in diameter. That size allows you to take very precise, exact readings. However, because the sensor is so small, it becomes vulnerable to the whims of exactly where in the image it is placed when a reading is taken. Imagine trying to take a reading on the highlights of a white shirt in a portrait. Placed in one location, the 3mm diameter sensor might read a wrinkle (dark density level). Moved ever so slightly to one side, the sensor might now be only half way across the same wrinkle with a totally different result! By using the averaging feature, and taking several different readings, most of these "selection" problems can be dealt with.

The Analyzer's sensor is also sensitive enough to respond to light that might be reflected off of your finger tips if you hold the probe wrong. Such reflected light would produce totally erroneous results.

The COLOR HEAD

The glass filters that establish the RED, GREEN and BLUE colors are made from extremely brittle glass. They break easily. When exposures are made, the flash tubes give off a certain amount of heat. Some of that heat warms up the filters. When glass heats up it expands in physical size... a little. To prevent the filters from expanding and breaking themselves, they are intentionally mounted loosely in their fixture. If you shake the fixture slightly, the filters will rattle a little.

When exposures are made, a certain amount of static electrical charge is created. This charge causes air bourn dust particles to be attracted to the filters, building up a film of dirt on them. If the dirt isn't removed periodically, it can absorb infrared (IR) energy, causing the glass to heat unevenly resulting in the glass filter cracking. See the TECHNICAL REFERENCE MANUAL, Chapter TR-J, Maintenance, The Color Head, for more details.

When one of the exposure tubes begins to wear out it will take longer for it to deliver its assigned amount of

output. This can be observed by watching the count-down in the LCD during the exposure. The weak tube will lag behind the others and will be several seconds completing its output after the other tubes have finished and shut off. The Color Head can continue to be used, until the tube actually fails to fire, without resulting in damage. However, as the tube gets weaker and weaker, there will be a certain aggravation factor in waiting on it to finish. You may want to replace it before it actually fails. It can usually be easily identified by opening the Color Head, removing the filter assembly and observing the tubes. The "bad" tube will be excessively darkened on its ends compared to the others.

When the focus tube fires it will produce a certain rhythmic sound and high speed pulsing pattern that you will quickly come to recognize as normal operation. However, when the focus tube becomes weak, it will start out normally and in a few seconds quickly change to an erratic sputtering type of performance. As with the exposure tubes, you can continue to use the focus tube until it fails, or you can choose to replace it when the "aggravation factor" becomes great enough.

When an exposure a tube becomes so weak that it requires more than 5% longer than the other tubes to complete its exposure, the Beseler 45A will shut itself down, and indicate in its LCD which color channel has a bad tube that should be changed. The Beseler 45A will also shut itself down when the focus tube becomes excessively weak. The codes that are displayed in the LCD are as follows:

CODE IN THE LCD	MEANING
CH 1	(2) RED Color Tubes
CH 2	(2) GREEN Color Tubes
CH 3	(1) BLUE Color Tube
CH 4	(1) Exposure Tube

When exposures are made the flash tubes give off certain amounts of heat that are somewhat proportional to the size (amount) of the exposure. This heat is dissipated by the convection cooling fins on the top of the color head. None of this heat ever reaches the negative stage, but it does cause the operating temperature of the flash tubes to vary somewhat depending on a given operator's printing techniques.

Unfortunately, Xenon flash tubes give off slightly less light when they are hot than they do when they are

cooler. They also wear out faster if they are operated hotter rather than cooler. The 45A has some special electrical circuitry that attempts to compensate for the temperature build-up in order to eliminate color shifts that might result from the temperature variations.

Most of the time, these temperature compensating circuits work very well. However, it is possible to operate the unit in such a manner that the temperature build-up will cause a given tube to fire a little erratically. When this happens, a slight color shift can occur in the print's image. If you find that such unexplainable color shifts are occasionally occurring, you might want to consider either changing your printing habits so as to allow more time for the heat to be dissipated, or providing some sort of supplemental cooling such as forced air. Generally speaking, when using the enlarger the cooling fins should be expected to be warm to the touch. However, if they become really hot, you should be alert to possible color shifts and shortened tube life.

The plastic diffuser of the color head that is positioned just above the negative stage should be kept particularly clean. It is so close to the negative that if small particles of dirt cling to it, they could become visible in the finished image since the lens will bring them into near-focus along with the image in the negative.

The color head is supplied with a 4x5 inch light diffusing chamber. If you find that you are working mostly with 35mm images, you might want to order the accessory 35mm Diffusion Chamber (Catalog #8299). It will provide an additional 1.3 f-stops of light output by condensing the total output into the smaller 35mm area. However, the 35mm Diffusion Chamber cannot be used with the Beseler 35mm Negatrans since the Negatrans positions the negative slightly further away than a glassless negative carrier does. This slight distance differential results in the corners of the image being slightly vignetted with the 35mm Negatrans. Both the medium format Negatrans (Catalog #8082) and the 35mm Negatrans (Catalog #8081) work very well with the 4x5 Diffusion Chamber.

CHAPTER OM-H

WARRANTY & SERVICE INFORMATION

THE WARRANTY

(Applicable in U.S.A.; outside U.S.A. see Local Distributor)

Charles Beseler Company, Inc., Linden, New Jersey warrants its products (with the exception of lamps), to the original purchaser only, to be free from defects in materials and workman-ship for a period of one (1) year from the date of purchase.

This Warranty does not apply to our products which show evidence of accidental damage, misuse or abuse by you. The Warranty also does not apply to our products which are defective or damaged by tampering or attempted repair by an agent unauthorized by Beseler.

Beseler exclusively limits this Warranty to repair or replace (at Beseler's option) the defective part of its product. If you decide to send our product to our authorized repair outlet, you must insure the product and prepay all transportation expenses. Beseler will not be liable for damages caused in the course of shipping the product to you. You must allow at least six (6) weeks for correction of the defect.

ANY IMPLIED WARRANTIES OF FITNESS FOR USE, OR MERCHANTABILITY, THAT MAY BE CREATED BY OPERATION OF LAW ARE LIMITED TO THE ONE (1) YEAR WARRANTY PERIOD.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

NO LIABILITY IS ASSUMED FOR EXPENSES OR DAMAGES RESULTING FROM INTERRUPTION IN OPERATION OF EQUIPMENT, DAMAGE TO FILM OR PAPER, OR FOR INCIDENTAL, DIRECT OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

In the event there is any defect in materials and workmanship of our product you may contact our Customer Service Department at Charles Beseler Company, Inc., 1600 Lower Road, Linden, New Jersey 07036-6514. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state. You may also have implied warranty rights. In the event of a problem with warranty service or performance, you may be able to go to a Small Claims Court, a State Court, or a Federal District Court.

IMPORTANT:

THIS WARRANTY SHALL NOT BE VALID AND BESELER SHALL NOT BE BOUND BY THIS WARRANTY IF OUR PRODUCT IS NOT OPERATED IN ACCORDANCE WITH BESELER'S WRITTEN INSTRUCTIONS.

You must prove the date of purchase by providing a sales receipt indicating that you are the original purchaser.

OBTAINING REPAIR SERVICE

IMPORTANT!

KEEP YOUR SALES RECEIPT

SERVICE INFORMATION

(Applicable in the U.S.A.; outside the U.S.A. see your Local Distributor)

If your equipment fails to perform as expected, and you suspect that it may be faulty, you may call the Beseler Technical Service department and discuss the nature of the problem with one of our Technical Service Representatives. Call:

**CHARLES BESELER COMPANY
TECHNICAL SERVICE REPRESENTATIVE
908-862-7999
Monday through Friday
9:00am - 4:00pm EST/EDT**

OBTAINING OUT-OF-WARRANTY SERVICE:

PACK the product in the original packaging material, if at all possible, to protect it in transit.

ENCLOSE complete information showing your name, address and telephone number, what is wrong with the equipment, and return shipping address. Tape the information to the equipment to be sure it does not get thrown out with the packing material. Most return shipments are made via United Parcel Service which will require a street address or telephone number since UPS cannot deliver to a Post Office Box number. If your return address is unknown to UPS, your telephone number will help them to find you.

ADDRESS the package to:

**BESELER SERVICE MANAGER
CHARLES BESELER COMPANY
1600 Lower Road
Linden, NJ 07036-6514**

PREPAY FREIGHT CHARGE AND INSURE the package against damage or loss in transit. Return shipping charges will be added to the repair cost if your equipment is not under warranty. If the equipment is damaged in shipment when it is returned to you, be sure to **SAVE ALL PACKAGING MATERIALS** and contact the shipping carrier **AT ONCE**. Under the law, it will be necessary for **YOU** to file a claim with the shipping carrier for the damages.

ESTIMATES: We will gladly provide estimates upon request. There is a flat estimate charge of \$20.00 payable in advance. The estimate charge will be credited towards the cost of the repair. No work will be undertaken or billed until written approval of the estimate is received.

CHARGES: Your local Beseler dealer has a list of current price ranges to service Beseler photographic equipment. Any repair likely to exceed the maximum recommended service price will be estimated and held for your approval before work is begun.

PAYMENT: Your check for \$20.00 must accompany your request for an estimate; alternatively, you may charge your VISA or MASTERCARD account. Repairs must be paid in full prior to return to the owner. Personal checks or VISA/MASTERCARD charge accepted. If you wish to pay with charge card, please give the full account number and the expiration date.

OBSOLETE EQUIPMENT: Beseler reserves the right to refuse to repair equipment that has been discontinued for five (5) years.

IN-WARRANTY SERVICE: There is no charge for service performed during the warranty period. **PROOF OF PURCHASE** is **REQUIRED** for warranty service and must be enclosed with the return. Terms of the warranty are explained above. See the above information concerning **PACKING, ENCLOSING** needed information, **ADDRESSING** the shipment, and **PREPAYING FREIGHT** as it would apply to service performed under the warranty.

CHAPTER OM-I

SPECIFICATIONS

LINE VOLTAGE:	Catalog #8289, 117VAC +/- 10%, 60 Hz. Catalog #8290, 230VAC +/- 10%, 50 Hz.
ELECTRONICS:	Internally stabilized, solid state, microprocessor based
ILLUMINATION:	Six Pulsed Xenon Flash Tubes (1) Focus Flashtube, Catalog #8126 (5) Exposure Flashtubes, Catalog #8125
FILTRATION:	RED: Catalog #MC-1827-5804 GREEN: Blue Filter #1: Catalog #MC-1827-5806 Yellow Filter: Catalog #MC-1827-5805 BLUE: Blue Filter #2: Catalog #MC-1827-5807
ILLUMINATION FORMAT:	Supplied with 4x5 Diffusion Chamber Optional 35mm Diffusion Chamber, Catalog #8299
COOLING:	Convection
ANALYZATION:	Automatic self-setting
MEMORY:	Capacitor power-storage system for maintaining memory during power-outage Five memory channels for Analyzer Programs
PROBE:	Low profile, cosine corrected with 3mm aperture
DIMENSIONS:	Illumination Assembly: 200 x 224 x 147mm (7.9 x 8.8 x 5.8 in.) Controller: 114 x 356 x 76mm (4.5 x 14 x 3 in.)
CORD LENGTH:	Head/Controller Cable: 180cm (71 in.) Probe Cable: 90cm (35 in.) Power Cable: 240cm (95 in.)
WEIGHT:	6.6kg (14.5 lbs.)
SHIPPING DIMENSIONS:	470 x 430 x 210cm (18.5 x 17 x 8.3 in.)
SHIPPING WEIGHT:	8.2kg (18 lbs.)

Specifications subject to change without notice.

TECHNICAL REFERENCE MANUAL

Beseler 45A Color Head



TECHNICAL REFERENCE MANUAL

CONTENTS

CHAPTER	TITLE	PAGE
TR-A	CONTENTS	Page TR-A-1
TR-B	GENERAL ENLARGER USE	Page TR-B-2
TR-C	GENERAL USE OF THE CONTROLLER	Page TR-C-5
TR-D	GENERAL USE OF THE ANALYZER	Page TR-D-11
TR-E	COLOR NEGATIVE PRINTING	Page TR-E-16
TR-F	COLOR POSITIVE PRINTING	Page TR-F-18
TR-G	GRADED B&W PRINTING	Page TR-G-20
TR-H	VARIABLE CONTRAST B&W PRINTING	Page TR-H-21
TR-I	B&W PRINTS FROM COLOR NEGATIVES	Page TR-I-24
TR-J	MAINTENANCE	Page TR-J-26
TR-K	ACCESSORIES	Page TR-K-31
TR-L	TROUBLE SHOOTING	Page TR-L-35
INDEX		Page 41

CHAPTER TR-B

GENERAL USE OF THE ENLARGER

MAGNIFICATION CONTROL

The size of the print (magnification) is controlled by three things:

1) The size of the negative

The Beseler 45A Color Head provides "diffuser-type" light for negatives up to and including 4x5 inches. See the manual for your specific enlarger model for a listing of the various negative carriers that might be available.

Most Beseler 4x5 enlarger accessories are interchangeable. However, there is one exception. The Beseler 35mm Negatrans[®] Carrier, Catalog No. 8081, is incompatible with the Beseler 45A Color Head 35mm Diffusion Chamber, Catalog No. 8299. The 35mm Negatrans[®] causes the negative to be positioned too far from the light source, resulting in the corners of the image being slightly vignetted.

The 35mm Diffusion Chamber is compatible with all other Beseler negative carriers that are 35mm format or smaller.

The 35mm Negatrans[®] is compatible with the 4x5 Diffusion Chamber that is included with the Beseler 45A when it is shipped.

2) The focal length of the lens

The lens that you use must be of a long enough focal length to provide adequate coverage of the negative that is being used.

If the lens focal length is longer than the recommended length, it will mean that you will have to raise the enlarger's head higher to produce the same size image that a shorter lens would have produced at a lower position. This, in turn, will require that more light must be produced by the flashtubes, which will shorten their operational life.

As a rule-of-thumb, the focal length of the lens that you use cannot be shorter than the length of the diagonal measurement of the negative that you are using. Most lens focal lengths are measured in millimeters, so if you measure your negative diagonal, be sure to measure it in

millimeters, also.

An exception to this rule-of-thumb are lenses that have been specially designed to cover large format negatives over short focal length distances. These are called "wide angle" lenses. A good example of such a lens is the Beseler-HD APO 240mm, f9.0-f64 Wide-Field Apochromatic Lens, Catalog No. 8645. This lens has been designed for use with the Beseler 810 cold-light head, Catalog No. 8265. It provides full coverage for an 8x10 size negative, but allows you to work with the enlarger's head much lower to the easel than a so-called "normal" 330mm 8x10 lens would.

Recommended Focal Length Lenses

<u>Film Size</u>	<u>Minimum Focal Length</u>	<u>Beseler Cat. No.</u>
110-126	38mm	#8638
135 mm	50mm	#8640 or #8670
6x6 cm	75mm	#8641, #8680 or #8650
6x4.5 cm	75mm	#8641, #8680 or #8650
6x7 cm	90mm	#8682
6x9 cm	105mm	#8642 or #8684
4x5 in	135mm	#8643, #8686, or #8644
8x10 in	330mm	#8645

3) The elevation of the enlarger head

All printing should be done with the enlarger head as close to the material being exposed as is consistent with the magnification needed and the focal length of lens that can be used.

As the enlarger head is raised higher and higher, focusing, alignment, and mounting-stability all become more critical. If the nature of your work requires large-size magnification printing, you must insure that your enlarger receives the most critical of focusing, alignment, and mounting rigidity.

Because of the orange-colored mask in color negatives, the illumination level of projected images is too low for there to be enough light to adequately stimulate the

cones in the retina of our eyes. Therefore, it is impractical to try to focus color negatives without the aid of optical focusing devices called "grain focusers". This is particularly true for the Beseler 45A Color Head, since the focus flashtube is not nearly as bright as the focusing light found in other types of enlargers.

LENS f-STOP SETTINGS

Most enlarger lenses will perform to their optimum optical quality if they are stopped down about (1) to (2) f-stops from their wide open position.

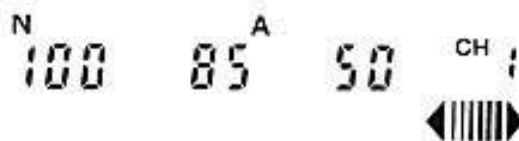
Generally, such a setting will provide adequate depth-of-field so that if the paper doesn't lie perfectly flat, the image will still be in focus.

Stopping the lens down more than what is needed in order to arrive at its optimum optical performance only **INCREASES** the amount of light that has to be created by the flashtubes, which in turn shortens their life and increases the amount of heat being generated.

Anything that causes the flash tubes to put out (1) f-stop **MORE** light than they otherwise would have to, will cut their operational life in half. One f-stop **MORE** light is **DOUBLE** the previous amount of light.

The Beseler 45A Color Head provides for electronically controlling the density of the image, digitally, to 1/30 f-stop. Both the lens aperture and the Beseler 45A Controller can be used for density control. If precise control of the density is required, the use of the Controller is recommended.

To change density with the Controller press the centered, blue-colored key labeled **COLOR** until the density mark



appears in the LCD. Next use the twin, blue-colored keys labeled **COLOR** to make the print lighter or darker. The Controller automatically compensates for the filtration factors, and adjusts all three color channels simultaneously.

When using the Controller (instead of the lens aperture) for controlling density, you might want to leave the lens

aperture set to a "click stop" setting, so that if it becomes necessary to change the lens aperture, it can be changed in full, one f-stop "click" increments, which will equate to the Beseler 45A's Controller settings (30 units of change on each of all three color channels equals one (1) f-stop of density change). This allows printing data settings and analyzer data to be easily modified with exact precision when changes are necessary.

USE OF NEGATIVE CARRIERS

Negative carriers, or film carriers, are designed to position the negative on the optical center-line of the lens. Beseler negative carriers can be rotated in the enlarger to change the vertical-horizontal presentation of the image on the easel. This can be particularly helpful when working with large easels that cannot be easily rotated 90 degrees.

The negative carrier masks the edges of the negative so that the enlarger's light can only pass through the negative. If an excessive amount of light is allowed to pass around the edges of a negative, it can cause both optical problems (called **flair**) and printing problems (called **fog**). Flair will tend to lower the contrast of the image. Fog in the image is caused by excessive "raw" light reflecting back from surfaces around the easel and "fogging" the printing paper.

While some negatives are so thin or have so much curl that they must be handled in "glass-type" negative carriers, it is best to use "glassless" negative carriers when ever possible. Sandwiching a negative between two pieces of glass only creates **FOUR** additional surfaces that can attract dust particles.

Beseler Glassless Rotating Film Carriers

Beseler Cat. No.	Film Size
8304	35mm, (24mm x36mm)
8302	35mm, (25mm x37mm)
8305	2"x2" Mounted Slides
8308	127 Roll Film (1-5/8"x1-5/8")
8334	645 Roll Film (1-5/8"x2-1/4")
8312	6x6 Roll Film (2-1/4"x2-1/4")
8328	6x7 Roll Film (2-1/4"x2-3/4")
8314	6x9 Roll Film (2-1/4"x3-1/4")
8321	4x5 Pack Film
8322	4x5 Sheet Film

The use of glass-type negative carriers opens the opportunity for Newton rings to occur. If you must use a glass-type carrier, and you have Newton rings, try DRYING the negative with the heat of a hair dryer. By using heat to drive the tiny amount of residual moisture out of the emulsion, the tendency to produce Newton rings will be greatly reduced.

Beseler has two glass-type negative carriers. Both are 4x5 in size.

**Universal Film Carrier with Standard Glass,
Cat. #8342**

**Universal Film Carrier with Anti-Newton Glass,
Cat. #8343**

Beseler also has an anti-Newton spray that can be very helpful.

Anti-Newton Spray, 200ml, Cat. #3201-12

The Beseler NEGATRANS[®] film carrier is available for both 35mm and 120/220 film. Individual negatives or complete rolls are transported through the Negatrans[®] carrier via a patented drive mechanism, preventing finger prints or scratches from occurring.

The 35mm Negatrans[®] includes a built-in mask for half-frames 35, as well as, standard 35mm format. A built-in window allows the user to view the exposure number on the easel when desired. It can be used with both 120 and 220 films.

The 120 Negatrans[®] features a pressure plate to insure that the film remains flat during the exposure. Built-in masking allows 6x6 and 6x7 formats to be used. An optional 6x4.5 mask is available.

35mm Negatrans[®] Carrier, Cat. #8081

120 Negatrans[®] Carrier, Cat. #8062

645 Pressure Plate Accessory, Cat. #8092

The Beseler Negaflat[®] carrier is a unique negative carrier that safely stretches the film and holds it flat under controlled tension without glass. It is designed for both 4x5 Pack and 4x5 Sheet film.

Negaflat[®], Cat. #8340

CHAPTER TR-C

GENERAL USE OF THE CONTROLLER

GENERAL INFORMATION

Study the images on Pages 4, 5 & 6 of the OWNER'S MANUAL, and become familiar with the Controller's keys and their functions. The keys of the Controller allow you to tell the Controller what you want it to do. Just like the controls on a digital wrist watch, some of the Controller's keys have to be used in a certain sequence in order for you to have access to certain types of data that you may want to change.

The Controller provides the control functions for not only the normal operation of the Color Head, but also for operating the full-featured color analyzer that is built in. The Analyzer and the Color Head Controller are built "together" so that they can work "together". However, the Color Head can be totally controlled manually from the Controller's keys. You can choose to use the Analyzer when it can be of help, or you can choose to do things manually.

Additionally, the Controller is pre-programmed to be able to produce a sequential series of exposures - each having a slightly different color setting - that can be used to help establish proper color balance. This feature is called a "ring-around". It's a very powerful feature of the Besler 45A.

While the Controller can hold in its memory up to five (5) different PROGRAMS and allow you to switch back and forth among them when analyzing, the Controller can only hold one (1) set of PRINTING numbers in its memory. When ever any numbers are displayed in the Liquid Crystal Display (LCD) they are either one of the five (5) PROGRAMS or they are the one (1) set of PRINTING numbers or they are steps in the ring-around mode. The PRINTING numbers are retained in memory (along with the PROGRAM numbers) when the Controller is switched "OFF".

UNDERSTANDING THE RING-AROUND FEATURE

THE COLOR RING-AROUND FOR NEGATIVE PRINTING

A ring-around is a series of sequential exposures that are automatically created by the Controller. In the color ring-arounds, each sequential exposure is a slightly different color from the starting-point color. A ring-around allows you to quickly and easily see a variety of color balance options in order to help you determine the most optimum choice. You can select the increment of change for the color ring-around steps.

In the "A" or "AL" mode, you can adjust the increment of color change that will occur during the ring-around. You can set the increment from 1 to 32 units of color. When printing a ring-around, you must also "tell" the Controller what PRINTING NUMBERS that you want it to use as a "starting point" for the ring-around. To do this, first press the centered blue-colored key labeled COLOR. Then press the DATA key to index to each of the three color channels. As each of the three color channels is selected, you can change the numbers for that channel by using the twin blue-colored keys labeled COLOR. With experience, you can use the Analyzer to establish the starting-point printing numbers and automatically give this information to the Controller.

To help you better understand what each of the ring-around exposures represents let's assume that you have set the Controller to the following PRINTING NUMBERS:

150-135-100

(TYPICAL PRINTING NUMBERS FOR COLOR NEGATIVE PRINTING ONTO COLOR NEGATIVE EP-3-type PRINTING PAPER)

With the Controller indexed into the DATA mode (by pressing the DATA key), and the FILM-TYPE set for "N" (Negative printing) and the PRINT-MODE set to "A" (All colors) and 5cc set for the increment of change, the Controller will then produce a ring-around by creating the following exposures, in this sequence, each time you pressed the EXPOSURE key:

EXAMPLE OF A COLOR RING-AROUND EXPOSURE SEQUENCE

Starting Point	Exposure #0	150-135-100	Starting Point
	Exposure #1	145-135-100	
	Exposure #2	150-140-100	
	Exposure #3	150-135-95	
	Exposure #4	155-135-100	
	Exposure #5	150-130-100	
	Exposure #6	150-135-105	
	Exposure #7	145-130-95	
	Exposure #8	155-140-105	

Notice that those same exposures could be represented with a chart that showed whether or not a given channel had the increment of change **ADDED** to it or **SUBTRACTED** from it. Such a chart showing only the symbols of **ADDITION**, **SUBTRACTION**, or **"0"** for

Exposure #0	0	0	0	Starting-Point Settings
Exposure #1	-	0	0	increases RED in the image
Exposure #2	0	+	0	increases MAGENTA in the image
Exposure #3	0	0	-	increases BLUE in the image
Exposure #4	+	0	0	increases CYAN in the image
Exposure #5	0	-	0	increases GREEN in the image
Exposure #6	0	0	+	increases YELLOW in the image
Exposure #7	-	-	-	decreases DENSITY in the image
Exposure #8	+	+	+	increases DENSITY in the image

Study the above chart. Notice that Exposure #0 is always the starting-point. Exposures #1 through #6 are each a different color option. The options are: **RED**, **CYAN**, **GREEN**, **MAGENTA**, **BLUE** and **YELLOW**. Exposures #7 and #8 are **DENSITY** options around the starting-point. In Exposures #7 & #8 the color remains what ever it is in the starting-point, but the **DENSITY** changes... less light is produced in Exposure #7, and more light is produced in Exposure #8.

THE COLOR RING-AROUND FOR SLIDE PRINTING

With the Controller indexed into the **DATA** mode (by pressing the **DATA** key), and the **FILM-TYPE** set for **"P"** (Positive printing) and the **PRINT-MODE** set to **"A"** (All colors) and **5cc** set for the increment of change, the Controller will then produce a ring-around by creating the following exposures, in this sequence, each time you pressed the **EXPOSURE** key:

Exposure #0	0	0	0	Starting-Point Settings
Exposure #1	+	0	0	increases RED in the image
Exposure #2	0	-	0	increases MAGENTA in the image
Exposure #3	0	0	+	increases BLUE in the image
Exposure #4	-	0	0	increases CYAN in the image
Exposure #5	0	+	0	increases GREEN in the image
Exposure #6	0	0	-	increases YELLOW in the image
Exposure #7	-	-	-	decreases DENSITY in the image
Exposure #8	+	+	+	increases DENSITY in the image

You should become familiar with the use of the ring-around. It is a powerful feature of the 45A and can be of great help in establishing proper color balance for unknown negatives.

THE RING-AROUND FEATURE FOR B&W PRINTING

The Controller can also produce a series of pre-programmed sequential exposures to aid in **B&W** printing onto variable contrast printing papers. In the **B&W** mode, this ring-around creates a series of **CONTRAST** options around a starting point.

To help you better understand what each of the B&W ring-around exposures represents let's assume that you have set the Controller to the "B-W" (Black & White printing) mode and have entered the following PRINTING NUMBERS:

100-100

(TYPICAL PRINTING NUMBERS FOR B&W CONTRAST GRADE #2 PRINTING ONTO VARIABLE CONTRAST PRINTING PAPER)

With the Controller indexed into the DATA mode (by pressing the DATA key), and the FILM-TYPE set for "B-W" (Black & white printing) and the PRINT-MODE set to "A" (All colors), the Controller will then produce a "contrast" ring-around by creating the following exposures, in this sequence, each time you pressed the EXPOSURE key:

Exposure #0 160- 80
Exposure #1 145- 85
Exposure #2 130- 90
Exposure #3 115- 95
Exposure #4 100-100
Exposure #5 85-105
Exposure #6 70-110
Exposure #7 55-115
Exposure #8 40-120

Notice that those same exposures could be represented with a chart that showed whether or not a given channel had the increment of change ADDED to it or SUBTRACTED from it. Such a chart showing only the symbols of ADDITION, SUBTRACTION, or "0" for "no change" would look like the chart in the next column.

NOTE: Some ring-around-steps call for large increments of change, such as 60cc. If your starting point data - on a given channel - is less than the increment of change that the Controller attempts to make, the ring-around procedure will fail, and the unit will shut "OFF". Since you cannot change the increment of change in the B&W ring-around, your only other option is to change the starting-point settings and re-do the ring-around test.

Each exposure step in the ring-around adds or subtracts the indicated increment of color units to/from the indicated color channel. You cannot change the increment like you can in the color ring-around. In the B&W ring-around, the increment of change is

THE B&W RING-AROUND MODE

The actual increment of change that occurs is shown below. Due to the many variables in B&W printing these ring-around steps should NOT be thought of as representing specific B&W paper contrast grades. They are simply a range of arbitrary changes.

Image #0 = +60 GREEN -20 BLUE
(lower in contrast than Image #1)

Image #1 = +45 GREEN -15 BLUE
(lower in contrast than Image #2)

Image #2 = +30 GREEN -10 BLUE
(lower in contrast than Image #3)

Image #3 = +15 GREEN -05 BLUE
(lower in contrast than Image #4)

*Image #4 = 00 GREEN 00 BLUE
Starting Point Settings

Image #5 = -15 GREEN +05 BLUE
(higher in contrast than Image #4)

Image #6 = -30 GREEN +10 BLUE
(higher in contrast than Image #5)

Image #7 = -45 GREEN +15 BLUE
(higher in contrast than Image #6)

Image #8 = -60 GREEN +20 BLUE
(higher in contrast than Image #7)

* Notice that the Starting-Point Settings appear in Image #4 when using the B&W ring-around.

NOTE: Some ring-around-steps call for large increments of change, such as 60cc. If your Starting-Point Settings - on a given channel - are less than the increment of change that the Controller attempts to make, the ring-around procedure will fail, and the unit will shut "OFF". Since you cannot change the increment-of-change in the B&W ring-around (as you can in the COLOR ring-around mode), your only other option is to change the starting-point settings and re-do the ring-around test.

CHANGING THE COLOR

There are three colors produced by the Color Head:

RED - GREEN - BLUE

Unlike a subtractive, dichroic enlarger where the CYAN control is seldom used because it would produce "neutral density", in the 45A all three colors MUST be used in order to create a full color image.

There are three, photographic, color pairs that we are concerned with:

RED & CYAN GREEN & MAGENTA BLUE & YELLOW

Each of these pairs acts as a tetter totter - if one color of the pair is INCREASED, the other color is automatically DECREASED and by the same amount. The 45A Color Head does not produce CYAN, MAGENTA, or YELLOW light. It creates a full color image by producing ONLY RED, GREEN and BLUE colored light.

However, if the amount of, say, RED light is increased or decreased it causes CYAN color in the printed image to increase or decrease due to the tetter totter effect... increasing RED in the image reduces CYAN in the image; reducing RED in the image increases CYAN in the image.

In photographic printing we are concerned with both the COLOR of light and the AMOUNT of light that is used to make the exposure.

The COLOR of light that the Color Head creates with its RED, GREEN and BLUE channels is a factor of the RELATIONSHIP of the AMOUNTS of light given off by each of the three color channels.

The AMOUNT of light given off by any one particular color channel is indicated by the SIZE of the NUMBER displayed in the LCD.

For example, the following settings represent a typical "color" and "amount" of output that might be used for printing color negatives:

150-135-100

Changing any one color channel number will change the TOTAL color of the light that will be used to make the exposure. Changing ALL THREE color channel numbers by the SAME AMOUNT will NOT change the COLOR of the output, but it will change the AMOUNT of the output which will result in a change in the print's DENSITY.

When the 45A is used for printing B&W negatives, the RED color channel is switched "off" since B&W papers are "blind" to RED colored light. Even though the RED color channel is switched "off" in the B&W mode, the RED color tube will still sporadically fire a little. This is normal operation and can be ignored.

On the Controller there are two, matching, blue-colored keys identified as COLOR (adjusting) keys. They are used to manually change the settings for each of the color channels. One key will INCREASE the setting, and the other key will DECREASE the setting. When the Controller is switched between its "N" and "P" mode the (increase/decrease) effect of these two COLOR keys is reversed. In order for the Controller to "know" which color channel that you want to change with the keys, you first have to switch the Controller into a "mode" where it can handle and process your instructions.

By pressing the DATA key, you can switch the Controller into and out of a mode where it can accept your input for changing the amount of color that any given channel will produce.

When the DATA key has switched the Controller into the "data" mode, the Controller is then able to receive your input. Once in the "data" mode, you can then further switch the Controller to each of the three color channels and, also, to a fourth position that allows you to change ALL THREE color channels simultaneously. This switching about between color channels is done with the single, centered key, that is also labeled COLOR.

Pressing the single, centered COLOR key will sequentially index the Controller through the three color channels and the fourth position - to the far right-hand edge of the Liquid Crystal Display (LCD) - that allows all three color channels to be changed up or down simultaneously.

All color changes that you choose to manually enter are entered with these keys. You can also use these keys to manually make changes in the programs that the Analyzer will create and store on the five memory

channels. Manually making successful program changes requires a fair amount of experience, and is not recommended for beginners. These keys are also used to adjust the increment of change that the Controller will use if you ask it to produce a series of pre-programmed exposures called a color "ring-around".

There are two types of data that can be displayed in the LCD.

Type 1. PRINTING DATA

Type 2. PROGRAM DATA

It is **IMPORTANT** for you to learn the difference, since they both are a series of three-digit numbers, and will tend to be confused by the inexperienced.

The Analyzer can be used to create **PRINTING NUMBERS** from **PROGRAM NUMBERS**. Also, the **ANALYZER** can be used to create **PROGRAM NUMBERS** from **PRINTING NUMBERS**. It is important to clearly understand these differences so that you to be able to fully utilize the powerful features of the Analyzer.

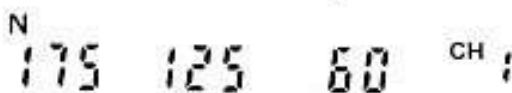
Additionally, there are other codes that are displayed in the LCD to help you to know which of the various performance modes the unit is in. See the illustrations in Chapter OM-C INTRODUCTION of this manual.

PRINTING DATA (or **PRINTING NUMBERS**) will always have the little colored triangles displayed under them. See the image below:



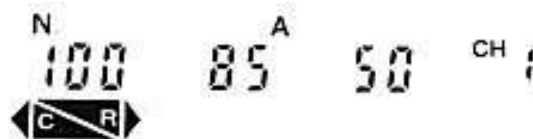
PRINTING NUMBERS

PROGRAM DATA (or **PROGRAM NUMBERS**) will **NEVER** have the little colored triangles under them. See the image below:



PROGRAM NUMBERS

When you are in the proper mode to make a manual change in the **PRINTING NUMBER** of a given color channel, the LCD will look like this:



RED CHANNEL CAN NOW BE CHANGED

Pressing the centered **COLOR** key will cause the display to index to the next color channel and to look like this:



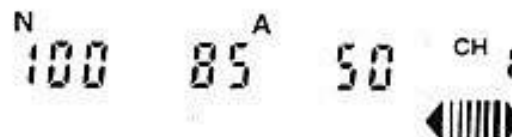
GREEN CHANNEL CAN NOW BE CHANGED

Pressing the centered **COLOR** key again will cause the display to index to the next color channel and to look like this:



BLUE CHANNEL CAN NOW BE CHANGED

Pressing the centered **COLOR** key again will cause the display to index to the final position which allows all three color channels to be changed simultaneously. The display will look like this:



ALL COLOR CHANNELS CAN NOW BE CHANGED SIMULTANEOUSLY

Pressing the centered **COLOR** key again will start the sequence all over again. To exit this "manual changing mode", press the **DATA** key. The display will return to this:



PRINTING NUMBERS, READY TO MAKE AN EXPOSURE

(This is the normal "stand-by" mode of the Controller)

CHANGING THE DENSITY

The DENSITY of the print is controlled by how much light strikes the printing paper and for how long. With subtractive dichroic enlargers a TIMER is used to control the length of time for the exposure. Additionally, the exposure could be further controlled by adjusting the f-stop setting on the enlarger's lens.

With the 45A, you can still use the f-stop setting on the enlarger's lens to control the DENSITY of the print. However, it is suggested that in order to reduce the number of variables, and to IMPROVE the AMOUNT of precision for controlling the exposure, you should set your lens to approximately one (1) f-stop down (closed) from its wide open position, and LEAVE IT THERE. MAKE ALL OF YOUR DENSITY ADJUSTMENTS WITH THE ELECTRONIC CONTROLS OF THE 45A.

The electronic digital controls of the 45A allow you to adjust the density in 1/30th f-stop increments. That is much more precise control than what is possible with the lens aperture.

THE CONTROLLER'S "A" MODE

In the "A" (All colors) mode, the Controller attempts to force all exposures to occur in about 7-1/2 seconds. This is done to eliminate the effects of reciprocity failure in printing emulsions, and their resulting color and speed shifts.

To a great extent, the Controller is successful in its attempts to adjust all exposures to occur in a 7-1/2 second time period. However, as you "ask" the Controller to deliver larger and larger amounts of light output (by the PRINTING NUMBERS that you use), a point is eventually reached where the Controller can no longer force very LARGE exposures to occur within the 7-1/2 second time period. At that point, the Controller gives up even trying, and allows each larger and larger exposure to take what ever time that becomes necessary for the light to be produced.

Therefore, from very small exposures up to a certain point, the exposure will take about 7-1/2 seconds. From that point on, the time of the exposure will vary with the output that has been requested.

This varying amount of time can, under some circumstances, result in color shifts between a test image printed at a SMALL magnification and a subsequent production print made at a very LARGE magnification.

THE CONTROLLER'S "AL" MODE

The Controller's "AL" mode produces the exposure by dividing it into 10% increments and pausing momentarily between each 10% increment that it produces. There is no attempt made to control the total time of the exposure. Small exposures, calling for small amounts of light, take less time to complete than larger exposures, calling for larger amounts of light.

Since the Controller pauses momentarily at each 10% increment of the total exposure, it is easy to make exposure changes - such as dodging or burning-in - with great precision. However, it should be noted that any color balance or density testing that has been done in the "A" mode will not apply to exposures later made in the "AL" mode. There is too much total TIME differences between the two modes for the same color settings to produce equal results in the finished print.

If you intend to use the "AL" mode, be sure that you do your color balance and density testing in the "AL" mode. Using the same techniques that you would use in the "A" mode, you can WRITE and use PROGRAMS that will work in the "AL" mode.

However, since exposures take considerably longer in the "AL" mode, you may want to use it only for special circumstances that require exposure manipulation utilizing the "AL" mode's special features.

CALIBRATION OF THE 45A DENSITY & COLOR

For most of your printing, you will control the density of the print by adjusting the SIZE of the NUMBERS displayed in the LCD. The larger the SIZE of the number, the more light that will be created.

If you are printing color or B&W negatives onto negative printing paper, INCREASING the light output will produce a DENSER print.

If you are printing slides onto positive printing paper, INCREASING the light output will produce a LIGHTER print.

COLOR:

1 unit on any channel = 1 CC of color

COLOR DENSITY:

30 units on each of all 3 channels = 1 f-stop

B&W DENSITY:

30 units on both GREEN & BLUE channels = 1 f-stop

CHAPTER TR-D

GENERAL USE OF THE ANALYZER

GENERAL INFORMATION

The Analyzer should be thought of as a separate accessory that just happens to be contained in the same housing with the Controller. It can be used to create PRINTING NUMBERS (from a PROGRAM applied to an unknown negative). When it is used to create PRINTING NUMBERS it automatically places them "on-line" ready to use for an exposure. Any existing PRINTING NUMBERS that might have been "on-line" will be erased and replaced with the new numbers. This is called ANALYZING a negative (or MEASURING a negative). It is done with the MEASURE key.

While the Controller can hold in its memory up to five (5) different PROGRAMS and allow you to switch back and forth among them when analyzing, the Controller can only hold one (1) set of PRINTING numbers in its memory. When ever any numbers are displayed in the Liquid Crystal Display (LCD) they are either one of the five (5) PROGRAMS or they are the one (1) set of PRINTING numbers. The PRINTING numbers are retained in memory (along with the PROGRAM numbers) when the Controller is switched "OFF".

The Analyzer's sensor is 3mm in diameter. That is small enough to allow you to take very precise, spot readings. If you want to take integrated readings, then you must integrate the image beam by using the Beseler Light Integrator, Cat. #8163, and placing it into position under the lens.

The purpose of the Integrator is to blend all the colors in the image beam into a single color that can then be used by the ANALYZER. In theory, if an image contains an equal amount of all the colors with an equal amount of all the various density levels, it will become 18% GRAY in color when integrated. However, very few images will work that way. For example, consider what would happen if you integrated a picture of a girl wearing a red dress and standing in front of a red barn. Obviously, the result will NOT be GRAY!

Some technicians successfully use the integrated concept by creating special, integrated programs that work with their special negatives. For example, a group of scenic pictures that were all taken with an approximately equal amount of blue sky and green trees could be integrated to form a color that would be approximately the same for

all of the pictures. In such a case, an integrated program could be WRITTEN from one of the negatives, that would successfully work with the other negatives. However, if the ratio of blue sky to green trees changed for a particular negative, then the integrated PROGRAM would NOT work with that particular negative.

The Analyzer can be used to create PROGRAM NUMBERS from PRINTING NUMBERS (and the negative that the PRINTING NUMBERS "work" with). When the ANALYZER is used to create a PROGRAM it automatically places the PROGRAM in one of its five (5) memory channels for storage. Any existing PROGRAM that might have been stored in that same memory channel will be erased and replaced with the new PROGRAM. You can select the memory channel where you want the new PROGRAM to be stored. Creating a PROGRAM is called MEMORIZING a negative, or more precisely, MEMORIZING a particular COLOR in a negative. It is done with the MEMORY key.

The Analyzer will allow you to take up to fifteen (15) different readings and then AVERAGE them together. This feature tends to improve the accuracy of the Analyzer's performance. The AVERAGING feature can be used whether you are MEMORIZING (the MEMORY key) or MEASURING (the MEASURE key).

If you are ANALYZING (MEASURING, using the MEASURE key), you have to be using a PROGRAM and comparing the information recorded in the PROGRAM with the unknown negative. You can have up to five (5) programs available to switch between when you are ANALYZING. You can take separate readings with all five (5) of them and then AVERAGE the readings together. This is a powerful feature of the Analyzer and greatly improves its performance.

You can write down the PROGRAMS that you use and manually key them into one of the memory channels. It is recommended that you always have your programs written down somewhere in case they are ever accidentally erased from their memory channel.

It is not realistic for you to try to create PROGRAMS manually, but you CAN tweak your programs manually. First, use the Analyzer in its MEMORY mode and let it create the PROGRAM automatically. Then, if

experience, when using the PROGRAM, indicates that it is not producing the exact color balance or density that you want, you can index to the PROGRAM and make some changes in it. If you make a 1cc change in a PROGRAM color channel, it will result in about a 2cc change in PRINTING settings that the PROGRAM will create when used. So, if the PROGRAM is producing too much RED colored light, you can REDUCE the size of the RED channel number. Reduce it by 1cc for every 2cc that you want the PRINTING settings to be reduced by.

The ANALYZER's sensor has a relatively narrow range of illumination intensity in which it can work. If the illumination level, falling on the sensor, is too much or too little the sensor's circuits can't handle it, and the sensor will display an "E" (for Error) in the appropriate color channel. If you get an "E" while using the ANALYZER, try opening or closing the lens aperture by one, full f-stop.

While the ANALYZER's sensor has a relatively narrow range of illumination in which it can work, it is extremely sensitive within that range. Care should be taken that you do not hold the probe in such a manner that light from the Color Head can reflect off of your fingers and effect the reading that you're taking.

CREATING A PROGRAM

In order to create a PROGRAM, you first have to arrive at a set of PRINTING numbers that produce a perfect print, properly color balanced and with proper density. This is usually done by trial and error and/or in conjunction with the Controller's ring-around feature.

Once "good" PRINTING NUMBERS are determined for a particular negative, you can then use the Analyzer and MEMORIZE certain, specific colors in the negative. The Analyzer automatically creates a PROGRAM for each of the colors that you MEMORIZE, and stores the PROGRAM in one of the five (5) memory channels.

The Analyzer allows you to take up to fifteen (15) different readings or "samplings" of the color for which you want to create a PROGRAM. The Analyzer will then average all of those readings together into one, final PROGRAM, and store the PROGRAM in what ever memory channel that you have selected.

The best kind of PROGRAMS are created from the

"diffused highlight" areas of the image (the darker areas in the projected negative). A diffused highlight is that area of an image where the natural color has received so much light during the exposure of the negative that its density level has been raised to the point where it is almost - BUT NOT QUITE - washed out to white. It will be some pale, pastel tone value.

If your PROGRAM was WRITTEN for a diffused highlight, then when you use it, you will not only be establishing the correct COLOR for the unknown negative, you will also be establishing the proper DENSITY level for it.

Try to take readings in areas where there is smooth, texture-free color. Coarse texture will tend to produce inconsistent readings. Do not try to take readings in areas of "spectral highlight" - such as the glare produced from bright sunshine reflecting off of an automobile fender. While this is certainly a dark area in the negative, it can be several f-stops denser than a "diffused highlight" area of the negative and, as such, is not suitable for use in establishing the proper density/printing level of the image.

One of the most universally useful type of programs is a program written for a WHITE, DIFFUSED HIGHLIGHT. The color WHITE occurs naturally in a great many photographic images. There are white shirts, white dresses, white table cloths, white houses, white clouds, white chickens, white woodwork, white paper, etc, etc. The list goes on and on. All of these white colored objects can be successfully analyzed with a white, diffused highlight program.

Programs written for specific colors - like a flesh-tone program - contain great amounts of data about their specific color, but very little data about the other colors in the spectrum. Therefore, while a flesh-tone program will do a good job of "setting" the color for the warm tones in the image, it can't do such a good job of setting the color for the cold tones in the same image.

A program written for the color WHITE, however, contains near-equal amounts of data for the entire spectrum. So, it can do a fairly good job of setting the color for the entire color spectrum in the image.

To WRITE (cause to be created) a PROGRAM with the ANALYZER:

- 1) Make sure that the correct FILM-TYPE and PRINT-MODE are set.
- 2) With the unit in the DATA mode, press the MEMORY key. This sets the unit to the MEMORY mode. Press the MEMORY key repeatedly until you recall the memory channel where you want your new PROGRAM to be stored. NOTE: Any PROGRAM that is presently stored in that channel will be erased when the new PROGRAM is placed there.
- 3) Turn "off" the room light and press the FOCUS key to turn "on" the focus light.
- 4) Press, and while holding down the ANALYZE key, momentarily press the AVERAGE key. This tells the ANALYZER to get ready for several readings that are to be averaged together. (If you DON'T press the AVERAGE key, the ANALYZER doesn't know that you want it to average the readings you are about to take. In that case, it will ignore all but the LAST reading that you take.)
- 5) Place the probe's sensor in the area that you wish to analyze and while holding down the ANALYZE key, momentarily press the MEMORY key. PROGRAM data for the reading that you have just taken will appear in the LCD.
- 6) Move the probe's sensor to a new spot and, again, while holding down the ANALYZE key, momentarily press the MEMORY key. Again, PROGRAM data for the reading that you've just taken will appear in the LCD.
- 7) Repeat step 6) for a total of up to 15 readings. After you have taken the 15th reading, the unit will refuse to take any more readings. Press the AVERAGE key and the unit will average all of the readings together and display the results in the LCD. You have now WRITTEN a PROGRAM. You can use the newly created PROGRAM to ANALYZE (take MEASUREMENT readings) an unknown negative.

USING A PROGRAM

The same technique that was used in WRITING the PROGRAM should be used in USING the PROGRAM (MEASURING with the MEASURE key). That is, given a choice, the readings should be taken in smooth-toned, non-textured areas of diffused highlights (the darker part of the negative's projected image). Try to take at least two or three spot readings and AVERAGE them together.

PROGRAMS can be used at any f-stop setting, regardless of the f-stop setting that was used when the PROGRAM was WRITTEN.

You should form the habit of placing a given type of PROGRAM always on the same channel. This will allow you to easily switch - without having to stop and think about it - to the channel containing the PROGRAM that you want to use.

To improve the accuracy of the readings, try to take readings with more than one PROGRAM, averaging ALL the readings into ONE set of DATA (PRINTING settings). In any event, you should ALWAYS plan on taking more than one reading and AVERAGING them together.

To use the AVERAGING feature of the ANALYZER and MEASURE an unknown negative:

- 1) Make sure that the correct FILM-TYPE and PRINT-MODE are set.
- 2) With the unit in the DATA mode, press the MEMORY key. This sets the unit to the MEMORY mode. Press the MEMORY key repeatedly until you recall the memory channel that contains the PROGRAM that you want to use.
- 3) Turn "off" the room light and press the FOCUS key to turn "on" the focus light.
- 4) Press, and while holding down the ANALYZE key, momentarily press the AVERAGE key. This tells the ANALYZER to get ready for several readings that are to be averaged together. (If you DON'T press the AVERAGE key, the ANALYZER doesn't know that you want it to average the readings you are about to take. In that case, it will ignore all but the LAST reading that you take.)

5) Place the probe's sensor in the area that you wish to analyze and while holding down the ANALYZE key, momentarily press the MEASURE key. PRINTING data for the reading that you have just taken will appear in the LCD.

6) Move the probe's sensor to a new spot and, again, while holding down the ANALYZE key, momentarily press the MEASURE key. Again, PRINTING data for the reading that you've just taken will appear in the LCD.

7) OPTIONAL STEP - You can press the MEMORY key and index to a new MEMORY channel. You can then continue taking spot readings with the new PROGRAM.

8) Repeat Step 6) and/or 7) for a total of up to 15 readings. After you have taken the 15th reading, the unit will refuse to take any more readings. Press the AVERAGE key and the unit will average all of the readings together and display the results in the LCD. You can now use the newly created PRINT data to make a test print or to start a ring-around test.

The 45A's Analyzer is so precise and so accurate, that with experience in its use, you'll be able to create printing numbers that will be accurate enough to use for most production printing with little, if any, further testing needed.

CHANGING FROM ONE LENS TO ANOTHER

You may want to do testing with one lens and then make the production print with a different lens. Un-matched lenses will have slightly different color characteristics. You can "translate" from one lens to another by following the same steps given below in SCALING TEST DATA UP FOR PRINTING LARGER SIZES.

SCALING TEST DATA UP FOR PRINTING LARGER SIZES

The ANALYZER can be used as a tool for scaling test data up and establishing settings to use for production printing at any magnification level. However, since the ANALYZER has a limited range of responsiveness to

various illumination levels, it isn't always possible to simply use the program that you might have used during testing to re-analyze with at the production magnification level.

For example, if you had used a WHITE HIGHLIGHT PROGRAM and successfully tested an image at a wallet-size magnification, that same PROGRAM would probably return errors ("E" in the LCD) if you tried to use it at a 16x20 size magnification.

There are many different ways of proceeding. However, the following method will work in almost all circumstances and is easy to learn. With experience, you'll learn various short cuts.

ESTABLISH GOOD PRINTING NUMBERS FOR A SMALL, TEST-SIZE IMAGE

1) Test your unknown negative at a small, wallet-size magnification. Use ANALYZER PROGRAMS, ring-around testing, etc. Be sure that you have arrived at PRINTING settings in the LCD that will produce the kind of picture that you want at the test-size magnification. Record the PRINTING settings in case you have to refer back to them.

CREATE A CONVERSION PROGRAM

2) Do not change the magnification or the lens f-stop setting from what you used to do your testing.

3) Replace your negative with a piece of un-exposed (but developed) color negative film. (Without SOMETHING in the negative carrier the light level would be too bright for any further use of the ANALYZER).

4) Press the DATA key, and then using the MEMORY key, index to a MEMORY CHANNEL where you can create a new PROGRAM.

5) Press the FOCUS key to turn "ON" the focus light.

6) Place the analyzer probe in the center of the light beam being projected on the easel.

7) Hold down the ANALYZE key and momentarily press the MEMORY key.

8) PROGRAM numbers will appear in the

LCD. You have just WRITTEN a PROGRAM for the settings that you used to produce your test print.

- 9) Replace your negative in the enlarger.

CHANGE ENLARGER TO NEW PRINTING MAGNIFICATION

10) Change the enlarger to your NEW, production magnification, and re-focus. You may also change the lens and or its f-stop setting at this time.

USE CONVERSION PROGRAM TO GET NEW PRINTING NUMBERS

11) Remove the negative and replace the SAME piece of un-exposed (but developed) film.

12) Be sure that you are still in the same MEMORY CHANNEL where the new PROGRAM, that you just wrote, is stored.

13) Press the FOCUS key to turn "ON" the focus light.

14) Place the analyzer probe in the center of the light beam being projected on the easel.

15) Hold down the ANALYZE key and momentarily press the MEASURE key.

16) PRINTING numbers will appear in the LCD. You have just created PRINTING settings that you can use to make your production print.

FINE-TUNING THE PRINTING NUMBERS CREATED BY THE CONVERSION PROGRAM

17) **OPTIONAL STEP:** Sometimes, this technique will result in PRINTING numbers that are "off" by a few cc-units of color. In most cases the error is so slight that it can be ignored. However, if you want to check (and correct) for the error, first - make a note of the RED channel reading that you got in Step #16, above. Then press the DATA key. Next use the centered COLOR key to index through the three color channels to the DENSITY-setting position (in the far right of the LCD). Once in the DENSITY-changing mode, you can (raise or) lower the density of all three color channels, simultaneously, by pressing the RIGHT-hand COLOR key. Lower the PRINTING settings until the RED channel number equals the RED channel number that you used when making your previous tests (Step #1, above). Observe the other two channel numbers. They will probably be "off" a few cc-units. If they are, using

the centered COLOR key, index to the channel that is "off" and correct the setting to match the original setting that you used to do your testing. When all three channel settings match your original test settings (from Step #1, above), index back to the DENSITY-changing mode, and RAISE the DENSITY level of all three channels back up until the RED channel number matches the RED channel number that you recorded earlier (the production setting that you obtained from Step #16, above).

This **OPTIONAL STEP** can also be used if you received errors ("E" in the LCD) when you ANALYZED the piece of un-exposed (but developed) film at the production magnification. (Sometimes errors will occur on the BLUE color channel.)

18) Replace your negative in the enlarger, and make your production print.

CHAPTER TR-E

COLOR NEGATIVE PRINTING

GENERAL INFORMATION

Obtain an easel that will produce 8-9 wallet-sized images on a single 8x10 size sheet of paper.

Always determine the approximately correct density level first, and then adjust the color balance. The density can be fine-tuned while performing the final, fine-tuning of the color balance.

Always do your testing at a small size magnification and later scale the test data up to produce the production-size print.

Be sure that the Controller is set for FILM-TYPE "N" and PRINT-MODE "A". The LCD should look like this:



ADJUSTING THE DENSITY

In the absence of an ANALYZER PROGRAM that could be used, make a test sheet by doing a series of density steps. Manually adjust the PRINTING settings for each sequential step. Make the density steps in 10-15cc increments.

In the absence of better data, use the following PRINTING settings as a starting point for density testing:

50-35-0

INCREASING all three color channels by the SAME amount will INCREASE the DENSITY of the print without changing the COLOR BALANCE of the print.

INCREASING all three color channels by 10 units on each channel will result in an INCREASE in the print's DENSITY of 1/3 f-stop.

ADJUSTING THE COLOR BALANCE

Once the correct density level is established, evaluate the image and ask yourself, "What color is there too much of?"

There are three, photographic, color pairs that we are concerned with:

RED & CYAN

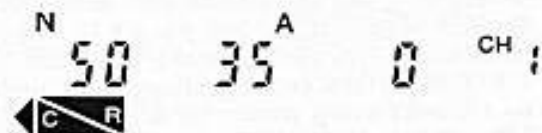
GREEN & MAGENTA

BLUE & YELLOW

Each of these pairs acts as a tetter totter - if one color of the pair is INCREASED, the other color is automatically DECREASED and by the same amount.

If, for example, the test image has too much RED, than the RED in the image has to DECREASE and/or the CYAN has to INCREASE.

The Beseler 45A Liquid Crystal Display (LCD) has been engineered in such a way as to make it easy to learn how to make color corrections. Under each color channel number there are two little colored triangles with arrow heads. For example, under the RED channel there is a triangle marked with a "R" (for RED) and one marked with a "C" (for CYAN). The arrow heads point to the COLOR key (left or right) that should be used to INCREASE the indicated color. The "C" arrow head and triangle points to the left COLOR key. The "R" arrow head and triangle points to the right COLOR key.



In our example, if you wanted to INCREASE the CYAN, you would then use the LEFT COLOR key to make the change. Conversely, to INCREASE the RED, you would use the right COLOR key, since the "R" triangle and arrow head points to the right.

You should always think in terms of identifying what color that dominates the image, and then you'll know that the color's PAIR (see the listed PAIRS above) has to be **INCREASED** in order to "neutralize" the excessive color.

For purposes of learning additive color balancing, consider that one of the six "photographic" colors will always dominate. Rarely will two of the six colors be equally dominate. If you adjust for the **MOST** dominate color, any remaining color that is "out of place" will then show up, and it can be dealt with subsequently.

For purposes of making changes in color balance settings, use the following guide:

20-30cc of change - VERY LARGE CHANGE

10-20cc of change - MODERATE CHANGE

5-10cc of change - SMALL CHANGE

0-5cc of change - CRITICAL, FINE-TUNING

When making color balance ring-arounds, use 10-15cc increments for **COARSE** testing, and 5cc for fine-tuning testing. Keep in mind that the human eye has great difficulty in performing accurate color judgments of increments greater than 10-15cc.

By going to the LCD, the little arrow heads will point to the proper **COLOR** key to use in order to cause an **INCREASE** for the color they represent.

Do not select an increment of change (for the ring-around) that will be **LARGER** than the **SMALLEST** color channel setting in your starting point data. If you do, the Controller will stop when it gets to that point in producing the ring-around series and refuse to continue. You might mistake the condition for an equipment failure.

COLOR ADJUSTMENT FOR COLOR NEGATIVE PRINTING

If the Overall Color Balance Is:	Correction Needed
Too RED	INCREASE RED
Too GREEN	INCREASE GREEN
Too BLUE	INCREASE BLUE
Too CYAN	DECREASE RED
Too MAGENTA	DECREASE GREEN
Too YELLOW	DECREASE BLUE

COLOR CONTRAST CONTROL

When printing color negatives the contrast of the finished print is commonly controlled by selecting the correct grade of color negative printing paper. Most manufacturers of color negative paper offer two or three contrast grades.

The contrast of the image that is recorded onto the color negative is commonly controlled by both the lighting and the selection of the specific type of color negative film that is used.

While there are other, somewhat obscure, techniques of manipulating the contrast in both the paper and the negative, such techniques are beyond the scope of this manual.

CHAPTER TR-F

COLOR POSITIVE PRINTING

GENERAL INFORMATION

Obtain an easel that will produce 8-9 wallet-sized images on a single 8x10 size sheet of paper.

Always determine the approximately correct density level first, and then adjust the color balance. The density can be fine-tuned while performing the final, fine-tuning of the color balance.

Always do your testing at a small size magnification and later scale the test data up to produce the production-size print.

Be sure that the Controller is set for FILM-TYPE "P" and PRINT-MODE "A". The LCD should look like this:



ADJUSTING THE DENSITY

In the absence of an ANALYZER PROGRAM that could be used, make a test sheet by doing a series of density steps. Manually adjust the PRINTING settings for each sequential step. Make the density steps in 10-15cc increments.

In the absence of better data, use the following PRINTING settings as a starting point for density testing:

0-30-20

INCREASING all three color channels by the SAME amount will DECREASE the DENSITY of the print without changing the COLOR BALANCE of the print.

INCREASING all three color channels by 15 units on each channel will result in an DECREASE in the print's DENSITY of 1/2 f-stop.

ADJUSTING THE COLOR BALANCE

Once the correct density level is established, evaluate the image and ask yourself, "What color is there too much of?"

There are three, photographic, color pairs that we are concerned with:

RED & CYAN

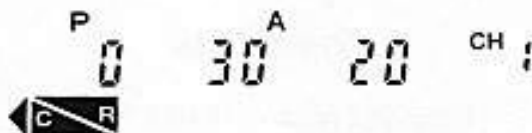
GREEN & MAGENTA

BLUE & YELLOW

Each of these pairs acts as a tetter totter - if one color of the pair is INCREASED, the other color is automatically DECREASED and by the same amount.

If, for example, the test image has too much RED, than the RED in the image has to DECREASE and/or the CYAN has to INCREASE.

The Beseler 45A Liquid Crystal Display (LCD) has been engineered in such a way as to make it easy to learn how to make color corrections. Under each color channel number there are two little colored triangles with arrow heads. For example, under the RED channel there is a triangle marked with a "R" (for RED) and one marked with a "C" (for CYAN). The arrow heads point to the COLOR key (left or right) that should be used to INCREASE the indicated color. The "C" arrow head and triangle points to the left COLOR key. The "R" arrow head and triangle points to the right COLOR key.



In our example, if you wanted to INCREASE the CYAN, you would then use the LEFT COLOR key to make the change. Conversely, to INCREASE the RED, you would use the right COLOR key, since the "R" triangle and arrow head points to the right.

You should always think in terms of identifying what color that dominates the image, and then you'll know that the color's PAIR (see the listed PAIRS above) has to be INCREASED in order to "neutralize" the excessive color.

For purposes of learning additive color balancing, consider that one of the six "photographic" colors will always dominate. Rarely will two of the six colors be equally dominate. If you adjust for the MOST dominate color, any remaining color that is "out of place" will then show up, and it can be dealt with subsequently.

For purposes of making changes in color balance settings, use the following guide:

30-40cc of change - VERY LARGE CHANGE

20-30cc of change - MODERATE CHANGE

10-20cc of change - SMALL CHANGE

0-10cc of change - CRITICAL, FINE-TUNING

When making color balance ring-arounds, use 15-20cc increments for COARSE testing, and 5cc for fine-tuning testing. You should be aware that when printing slides, there is a phenomenon that causes the image to appear to need large increments of color change in order to cause any effect. As you get the color more properly adjusted to the correct balance point, the image appears to respond to much smaller increments of change. Keep in mind that the human eye has great difficulty in performing accurate color judgments of increments greater than 10-15cc.

By going to the LCD, the little arrow heads will point to the proper COLOR key to use in order to cause an INCREASE for the color they represent.

Do not select an increment of change (for the ring-around) that will be LARGER than the SMALLEST color channel setting in your starting point data. If you do, the Controller will stop when it gets to that point in producing the ring-around series and refuse to continue. You might mistake the condition for an equipment failure.

COLOR ADJUSTMENT FOR COLOR POSITIVE PRINTING

If the Overall Color Balance Is:	Correction Needed
Too RED	DECREASE RED
Too GREEN	DECREASE GREEN
Too BLUE	DECREASE BLUE
Too CYAN	INCREASE RED
Too MAGENTA	INCREASE GREEN
Too YELLOW	INCREASE BLUE

COLOR CONTRAST CONTROL

When printing color slides, the contrast of the finished print is commonly controlled by a technique referred to as "contrast control masking".

Other techniques include "flashing" the print and printing on special positive papers that have lower contrast characteristics.

The details of these techniques are beyond the scope of this manual.

CHAPTER TR-G

GRADED B&W PRINTING

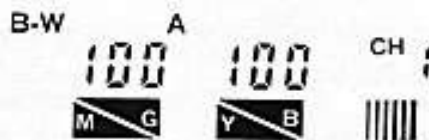
GENERAL INFORMATION

Obtain an easel that will produce 8-9 wallet-sized images on a single 8x10 size sheet of paper.

Always determine the approximately correct density level first, and then evaluate the test print to determine if the correct grade of paper has been used.

Always do your testing at a small size magnification and later scale the test data up to produce the production-size print.

Be sure that the Controller is set for FILM-TYPE "B-W" and PRINT-MODE "A".



When printing onto graded B&W paper, use equal amounts of both GREEN and BLUE light.

ADJUSTING THE DENSITY

In the absence of an ANALYZER PROGRAM that could be used, make a test sheet by doing a series of density steps. Manually adjust the PRINTING settings for each sequential step. Make the density steps in 10-15cc increments.

INCREASING both GREEN and BLUE color channels by the SAME amount will INCREASE the DENSITY of the print.

INCREASING both GREEN and BLUE color channels by 10 units on each channel will result in an INCREASE in the print's DENSITY of 1/3 f-stop; 15 units = 1/2 f-stop; 30 units = 1 f-stop.

Each different paper-grade of contrast has a slightly different sensitivity, or "speed" in its emulsion. The lower grades are faster than the higher grades. Therefore, the lower grades will require less exposure than the higher grades.

ADJUSTING THE CONTRAST

If the contrast level of the image isn't acceptable, you will have to select a different grade of printing paper and start over.

If the contrast of your test image is too high, you will need to select a LOWER grade of printing paper. If the contrast of your test image is too LOW, you will need to select a HIGHER grade of printing paper.

CHAPTER TR-H

VARIABLE CONTRAST B&W PRINTING

GENERAL INFORMATION

Obtain an easel that will produce 8-9 wallet-sized images on a single 8x10 size sheet of paper.

Always determine the approximately correct density level first, and then evaluate the test print to determine if the correct contrast level has been achieved.

Always do your testing at a small size magnification and later scale the test data up to produce the production-size print.

Be sure that the Controller is set for FILM-TYPE "B-W" and PRINT-MODE "A". The LCD should look like this:



While there are several techniques of printing onto variable contrast paper, a simple, easy-to-learn technique is as follows:

1) Evaluate your B&W negative. Decide if your negative is: normal density; very dense; or very thin.

2) Go to the chart below (in the ADJUSTING CONTRAST section) and select the Beseler 45A Color Head PRINTING settings that are recommended for your type of negative.

3) Use those settings as a starting point and manually produce a series of density steps by INCREASING the GREEN and BLUE channel settings for each subsequent exposure. To increase both color channels simultaneously, press the DATA key. Then momentarily press the center COLOR key to index the Controller through each of the color channels to the density-changing mode indicated by the symbol in the far right-hand edge of the Liquid Crystal Display (LCD).

4) Use the left-hand (of the two) COLOR keys to raise all the color channel setting numbers simultaneously.

5) Make 8-9 wallet-size test exposures, by repeating step 4) and increasing the density on each subsequent step.

6) Evaluate your test images. Select the best density and determine if it is of an acceptable contrast level.

7) If it is NOT acceptable, change the mixture of GREEN and BLUE light, and re-do the test.

8) OPTIONAL STEP: Switch to the B&W ring-around mode by pressing the DATA key. Using the settings that produced the best density level, proceed with making a "contrast ring-around".

9) Evaluate the contrast-ring-around and select the best image. The settings that produced that image can be further tweaked in accordance with procedures given below in ADJUSTING THE DENSITY and ADJUSTING THE CONTRAST.

The chart on Page 22 can be used to determine what changes each step in the contrast-ring-around makes in the starting-point settings.

Each exposure step in the ring-around adds or subtracts the indicated increment of color units to/from the indicated color channel. You cannot change the increment like you can in the color ring-around. In the B&W ring-around, the increment of change is permanently fixed.

ADJUSTING THE DENSITY

INCREASING both GREEN and BLUE color channels by the SAME amount will INCREASE the DENSITY of the print without changing the CONTRAST of the print.

INCREASING both GREEN and BLUE color channels by 10 units on each channel will result in an INCREASE in the print's DENSITY of 1/3 f-stop; 15 units = 1/2 f-stop; 30 units = 1 f-stop.

ADJUSTING THE CONTRAST

With all brands of variable contrast printing paper the contrast of the image can be adjusted by controlling the mixture of GREEN and BLUE light that is used.

INCREASING the GREEN light, relative to the BLUE light, will LOWER the contrast.

INCREASING the BLUE light, relative to the GREEN light, will INCREASE the contrast.

Each different brand of variable contrast printing paper has a slightly different range of performance, and a slightly different response to GREEN and BLUE light. Each different brand of paper responds slightly different to different brands of developers, their various concentrations, and the various development techniques (such as time, temperature and/or agitation) that can be used. Further, manufacturers change the characteristics of their papers and developers from time to time. Therefore, it isn't practical to try and present specific printing settings for the Beseler 45A and claim that they

The actual increment of change that occurs is shown below. Due to the many variables in B&W printing these ring-around steps should NOT be thought of as representing specific B&W paper contrast grades. They are simply a range of arbitrary changes.

THE B&W RING-AROUND MODE

Image #0 = +60 GREEN -20 BLUE (lower in contrast than Image #1)

Image #1 = +45 GREEN -15 BLUE (lower in contrast than Image #2)

Image #2 = +30 GREEN -10 BLUE (lower in contrast than Image #3)

Image #3 = +15 GREEN -05 BLUE (lower in contrast than Image #4)

*** Image #4 = 00 GREEN 00 BLUE STARTING POINT SETTINGS**

Image #5 = -15 GREEN +05 BLUE (higher in contrast than Image#4)

Image #6 = -30 GREEN +10 BLUE (higher in contrast than Image#5)

Image #7 = -45 GREEN +15 BLUE (higher in contrast than Image#6)

Image #8 = -60 GREEN +20 BLUE (higher in contrast than Image#7)

* Notice that the starting-point data appears in Image #4 when using the B&W ring-around.

NOTE: Some ring-around-steps call for large increments of change, such as 60cc. If your starting point data - on a given channel - is less than the increment of change that the Controller attempts to make, the ring-around procedure will fail, and the unit will shut "OFF". Since you cannot change the increment-of-change in the B&W ring-around (as you can in the COLOR ring-around mode), your only other option is to change the starting-point settings and re-do the ring-around test.

will always create specific grade levels of contrast.

The following table offers printing settings that should be considered to be "general purpose data" to help you get started in the right direction. You should modify this data based on your experience with your own, specific, variables to the above listed possibilities.

By mixing GREEN and BLUE light, a certain COLOR of light is produced that causes a certain response in the paper's emulsion. The settings in the table are for the LOWEST DENSITY of each of the specific COLORS (or mixtures) of light. The actual settings that you use for making a particular print will be some HIGHER DENSITY level of those settings given in the table below.

B&W CONTRAST GRADES

APPROXIMATE 45A SETTINGS	APPROXIMATE KODAK CONTRAST GRADE	NEGATIVE TYPE
160-000	-	VERY DENSE
140-000	-	
120-000	-	
100-000	-	
080-000	-	
060-000	0	
055-000	1/2	
040-000	1	
020-000	1-1/2	
000-000	2	NORMAL
000-035	2-1/2	
000-060	3	
000-080	3-1/2	
000-120	4	
000-140	4-1/2	
000-180	5	VERY THIN

**INCREASE GREEN TO LOWER CONTRAST
INCREASE BLUE TO RAISE CONTRAST**

NOTE: The "Contrast Grade Numbers" given above are for general reference purposes ONLY, and should NOT be considered to be highly accurate. There are too many variables, such as brand of printing paper, brand of developer, temperature and agitation of development, etc. in order to produce an accurate table of "Contrast Grade Numbers".

CHAPTER TR-I

B&W PRINTS FROM COLOR NEGATIVES

GENERAL INFORMATION

Several companies currently make a special B&W printing paper that is sensitive to all colors of light. These papers are referred to as panchromatic papers. They are made specifically to produce high-quality B&W prints from color negatives. They can be processed in regular B&W paper chemicals using standard B&W paper processing techniques.

Obtain an easel that will produce 8-9 wallet-sized images on a single 8x10 size sheet of paper.

Always determine the approximately correct density level first. While you can manipulate the contrast level of individual colors of the image, it is not possible for you to control the over-all contrast of the image during regular printing. That contrast - what ever it is - is "fixed" at the time the exposure is made on the camera.

Always do your testing at a small size magnification and later scale the test data up to produce the production-size print.

Be sure that the Controller is set for FILM-TYPE "N" and PRINT-MODE "A".



You SHOULD use all three color channels for printing onto panchromatic paper. And, unlike other B&W printing paper, panchromatic paper must be treated like color paper and handled in total darkness, or used with a safe light that is "safe" with color papers.

ADJUSTING THE DENSITY

When printing onto panchromatic with the Beseler 45A, always use equal amounts of all three color channels to make the exposure. If you do not use equal amounts of

all three color channels, it will cause a "distortion" in the way the various colors will be rendered into shades of gray. Such distortion can be intentionally used as a tool for changing the shade of gray that some colors create. See ADJUSTING THE CONTRAST, below.

In the absence of an ANALYZER PROGRAM that could be used, make a test sheet by doing a series of density steps. Manually adjust the PRINTING settings for each sequential step. Make the density steps in 10-15cc increments.

In the absence of better data, use the following PRINTING settings as a starting point for density testing:

000-000-000

INCREASING all three color channels by the SAME amount will INCREASE the DENSITY of the print.

INCREASING all three color channels by 10 units on each color channel will result in an INCREASE in the print's DENSITY of 1/3 f-stop.

ADJUSTING THE CONTRAST

The over-all contrast of the image is "fixed" at the time the film is exposed on the camera. Over exposed negatives will print HIGH in contrast. Under exposed negatives will print LOW in contrast.

However, it is possible to adjust the contrast of an individual color in the image. Or, said another way, it is possible to adjust the shade of gray at which an individual color will print. The technique is to follow the same "rules" that apply to using colored filters over the camera lens while exposing B&W film.

For example, if you have shot a portrait on color negative film, and then have to make a B&W print - sometimes the person's lips will turn out to be such a pale shade of gray that they almost "disappear" into the other skin tones. The goal, then, is to darken the lips

(INCREASE the contrast) in the B&W print. Since the lips are a shade of RED, the lips will appear DARKER if you REDUCE the amount of RED colored light that you use to make the exposure onto the panchromatic paper. To REDUCE the amount of RED colored light, REDUCE the size of the number displayed in the LCD for the RED color channel.

You will have to make a reduction of the color by a relatively LARGE amount. Try using 40 or 50 units LESS. You will have to INCREASE the other two channels slightly to maintain the proper DENSITY level. As a rule of thumb, if you REDUCED the RED channel by 40 units, ADD 20 units to each the other two channels.

There are three, photographic, color pairs that we are concerned with:

RED & CYAN

GREEN & MAGENTA

BLUE & YELLOW

Each of these pairs acts as a tetter totter - if one color of the pair is INCREASED, the other color is automatically DECREASED and by the same amount.

If, for example, you wanted to INCREASE (darken) the shade of gray that a CYAN colored object was producing, you would have to INCREASE the RED channel number, thus INCREASING the amount of RED colored light that the Beseler 45A would produce. See the Chart below.

To LIGHTEN the shade of gray for dark green foliage, and thus increase the amount of visible detail, you would DECREASE the mount of GREEN colored light that the Beseler 45A would produce. See the Chart below.

Making a color change of 10-20cc will cause a small shift in the shade of gray. Making a color change of 30-50cc will cause a moderate shift. Making a color change of 60-80cc will cause a large shift.

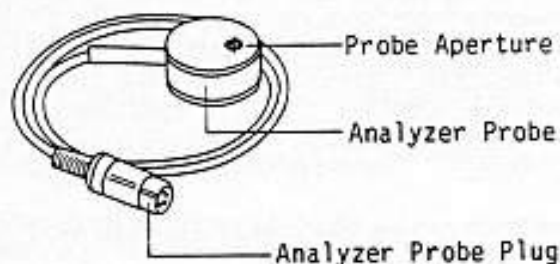
If you intend to do this type of contrast manipulation, it will be helpful to have a color print of the negative for reference.

CHANGING CONTRAST OF SELECTED COLORS IN PANALURE PRINTING		
ORIGINAL IMAGE COLOR	TO LIGHTEN THE SHADE OF GRAY	TO DARKEN THE SHADE OF GRAY
RED GREEN BLUE	INCREASE RED INCREASE GREEN INCREASE BLUE	DECREASE RED DECREASE GREEN DECREASE BLUE
CYAN MAGENTA YELLOW	DECREASE RED DECREASE GREEN DECREASE BLUE	INCREASE RED INCREASE GREEN INCREASE BLUE

CHAPTER TR-J MAINTENANCE

THE FIBER OPTIC CABLE

The Color Head is permanently connected to the Controller housing by a large cable that contains the fiber optic feed-back cable as well as some other electrical cables. The fiber optic cable carries signals from the flashtubes to the Controller's computer. Care should be taken that this cable does not get stretched, pinched, creased, or otherwise sharply bent. Be sure that the cable is free to move as the enlarger head is raised or lowered, and that it is positioned so that it cannot become wedged or sheared against the frame of the enlarger. Damage sustained by this cable will require factory repair, and may not be covered by your warranty.



THE CONTROLLER

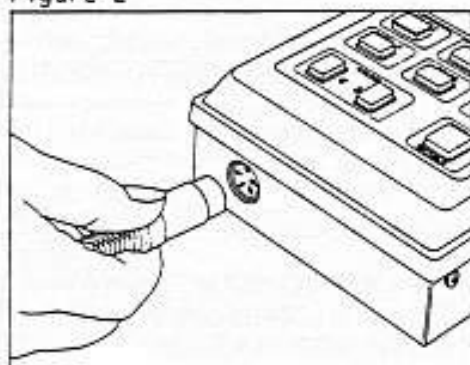
THE ANALYZER PROBE

The Analyzer Probe is connected to the Controller with an electrical cable. It is NOT a fiber optic cable. It should be left plugged into the Controller at all times when the equipment is in use. If the equipment is being transported or being put into long term storage, then the Probe can be un-plugged from the Controller.

MEMORY PROTECTION OF PROGRAMS

The Controller contains special capacitors that hold a charge for several weeks which will supply power to maintain the Programs that are stored in Memory. Since these are capacitors, and not batteries, they will not wear out and fail with age.

Figure E



Although the unit's Memory can be maintained for several weeks in the event that it is un-plugged or if there is a power failure, it should be left plugged in when not in use.

When plugged in, even though the main OFF-ON switch has been set to "OFF", there is still a small trickle of power being applied to the circuits to maintain the unit's Memory. This power causes the bottom of the Controller to be slightly warm to the touch. This is a normal condition.

The Probe's sensor is the tiny, 3mm diameter, "spot" on the edge of the Probe. The sensor requires no special attention, and does NOT need to be shielded from bright room lights or daylight. The Probe can be cleaned with a cloth dampened in water or lens cleaner. Do NOT apply liquids DIRECTLY to the Probe. Avoid excessive cleaning of the sensor. Its surface is basically plastic which could become clouded with excessive rubbing which, in turn, would reduce its light transmitting ability.

THE COLOR HEAD

CHANGING EXPOSURE & FOCUSING TUBES

Replacement Exposure & Focusing Tubes are available from Beseler or from your local authorized Beseler dealer. The part numbers are:

EXPOSURE FLASHTUBE: Catalog No. 8125

FOCUS FLASHTUBE: Catalog No. 8126

The color head contains several Xenon flash tubes. One tube is used to create light for focusing and composing. The other tubes are used to produce the three, additive colors RED, GREEN and BLUE. The focus tube is slightly longer than the exposure tubes and cannot be interchanged with them. All of the exposure tubes are identical and interchangeable. The color of light is established by a special glass filter that is positioned so that 100% of the tube's output must pass through the filter. Therefore the ONLY color of light that is given off is that which is established by the filter... regardless of the age of the flash tube.

There are two flash tubes used for both the RED and the GREEN colors. Only one flash tube is used to produce BLUE light. The two tubes in each of the RED and GREEN channels work together in such a way that they must be fairly closely matched - electrically. When one of the pair finally wears out, both tubes must be replaced, since replacing only the burnt out tube would result in an electrical mis-match between the new tube and the partially used tube.

The glass filters that establish the RED, GREEN and BLUE colors are made from extremely brittle glass. They break easily. When exposures are made, the flash tubes give off a certain amount of heat. Some of that heat warms up the filters. When glass heats up it expands in physical size... a little. To prevent the filters from expanding and breaking themselves, they are intentionally mounted loosely in their fixture. If you shake the fixture slightly, the filters will rattle a little.

When exposures are made, a certain amount of static electrical charge is created. This charge causes air born dust particles to be attracted to the filters, building up a film of dirt on them. If the dirt isn't removed periodically, it can absorb infrared (IR) energy, causing the glass to heat unevenly resulting in the glass filter cracking.

When one of the exposure tubes begins to wear out it will take longer for it to deliver its assigned amount of output. This can be observed by watching the count-down in the LCD during the exposure. The weak tube will lag behind the others and will be several seconds completing its output after the other tubes have finished and shut off. The Color Head can continue to be used, until the tube actually fails to fire, without resulting in damage. However, as the tube gets weaker and weaker, there will be a certain aggravation factor in waiting on it to finish. You may want to replace it before it actually fails. It can usually be easily identified by

opening the Color Head, removing the filter assembly and observing the tubes. The "bad" tube will be excessively darkened on its ends compared to the others.

When the focus tube fires it will produce a certain rhythmic sound and high speed pulsing pattern that you will quickly come to recognize as normal operation. However, when the focus tube becomes weak, it will start out normally and in a few seconds quickly change to an erratic sputtering type of performance. As with the exposure tubes, you can continue to use the focus tube until it fails, or you can choose to replace it when the "aggravation factor" becomes great enough.

When an exposure tube becomes so weak that it requires more than 5% longer than the other tubes to complete its exposure, the B45A will shut itself down, and indicate in its LCD which color channel has a bad tube that should be changed. The B45A will also shut itself down when the focus tube becomes excessively weak. The codes that are displayed in the LCD are as follows:

CODE IN THE LCD	MEANING
CH 1	(2) RED Color Tubes
CH 2	(2) GREEN Color Tubes
CH 3	(1) BLUE Color Tube
CH 4	(1) Exposure Tube

When exposures are made, the flash tubes give off certain amounts of heat that are somewhat proportional to the size (amount) of the exposure. This heat is dissipated by the convection cooling fins on the top of the color head. None of this heat ever reaches the negative stage, but it does cause the operating temperature of the flash tubes to vary somewhat depending on a given operator's printing techniques.

Unfortunately, Xenon flash tubes give off slightly less light when they are hot than they do when they are cooler. They also wear out faster if they are operated hotter rather than cooler. The 45A has some special electrical circuitry that attempts to compensate for the temperature build-up in order to eliminate color shifts that might result from the temperature variations.

Most of the time, these temperature compensating circuits work very well. However, it is possible to operate the unit in such a manner that the temperature

build-up will cause a given tube to fire a little erratically. When this happens, a slight color shift can occur in the print's image. If you find that such unexplainable color shifts are occasionally occurring, you might want to consider either changing your printing habits so as to allow more time for the heat to be dissipated, or providing some sort of supplemental cooling such as forced air. Generally speaking, when using the enlarger the cooling fins should be expected to be warm to the touch. However, if they become really hot, you should be alert to possible color shifts and shortened tube life.

The plastic diffuser of the color head that is positioned just above the negative stage should be kept particularly clean. It is so close to the negative that if small particles of dirt cling to it, they could become visible in the finished image since the lens will bring them into near-focus along with the image in the negative.

The color head is supplied with a 4x5 inch light diffusing chamber. If you find that you are working mostly with 35mm images, you might want to order the accessory 35mm Diffusion Chamber (Catalog #8299). It will provide an additional 1.3 f-stops of light output by condensing the total output into the smaller 35mm area. However, the 35mm Diffusion Chamber cannot be used with the Beseler 35mm Negatrans since the Negatrans positions the negative slightly further away than a glassless negative carrier does. This slight distance differential results in the corners of the image being slightly vignetted with the 35mm Negatrans. Both the medium format Negatrans (Catalog #8082) and the 35mm Negatrans (Catalog #8081) work very well with the 4x5 Diffusion Chamber.

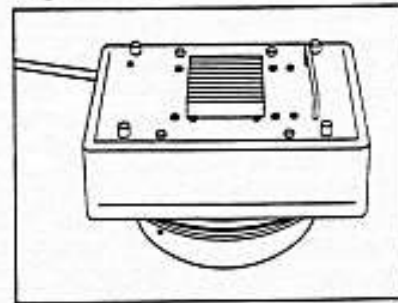
Sometimes an exposure tube will experience a total failure without any noticeable warning that it was getting weak. Tubes, like household light bulbs, fail in un-predictable ways, and for un-predictable reasons.

If you suspect that there is a bad tube, or if you just want to check the tubes proceed as follows:

- 1) Turn "OFF" the power switch and disconnect the power cord.

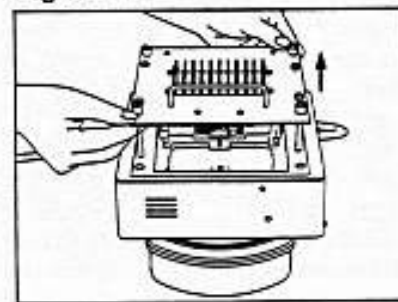
- 2) Unscrew the four knurled thumb-screws on the top of the Head by turning them clockwise. Pull straight up using the chrome-plated handle. You will need to tug slightly so that the internal electrical connector will separate. The Illumination Assembly will then lift straight up on the guide-rods and will come free of the Color Head body. See Figure G.

Figure G



- 3) Place it on a flat surface - preferably covered with a soft cloth such as a towel - so that the Filter Assembly (the colored filters) faces upward. See Figure K.

Figure K



- 4) Remove the Filter Assembly by loosening the four screws used to hold it over the exposure flashtubes (See dashed circles in Figure K). **DO NOT LOSE THE FOUR LITTLE SCREWS.** If you are working on a soft towel, the little screws are less likely to roll away and get lost.

- 5) **DO NOT TOUCH THE COLORED GLASS FILTERS WITH YOUR FINGERS.** It will only cause a grease deposit from your fingertips that will have to be cleaned off. If fingerprints are left on the glass filters, the acids in the fingerprint will etch into the glass surface.

- 6) Visually observe the tubes. As tubes begin to wear out they turn dark on their ends, just like household fluorescent tubes. Generally, the **DARKEST** tubes are the oldest and weakest... and should be replaced. However, it is possible for even new tubes to fail

Sometimes a tiny, nearly invisible, hairline crack can develop around the metal end-cap which will cause a loss of internal gas pressure, resulting in total tube failure. If you are in doubt, exchange questionable tube(s) with new ones and see if that solves the problem.

7) When ever a tube fails in either the RED or the GREEN channel, it will be necessary to replace BOTH tubes in that channel with new tubes. The tubes in those channels must be of near-equal "age" in order to "work" in the electronic circuit that fires them.

TO REPLACE THE FOCUS TUBE:

1) Loosen the screw on the terminal plate of the focus tube and detach the wire. **DO NOT LOSE THE SCREW.**

2) Pull the focus tube's wire free of the clip on the side of the focus flashtube bracket.

3) Remove the old focus tube from the tube holder as shown in Figure L, and insert a new one. Make sure the wire attachment point on the newly installed tube faces upward - See Figure M.

Figure L

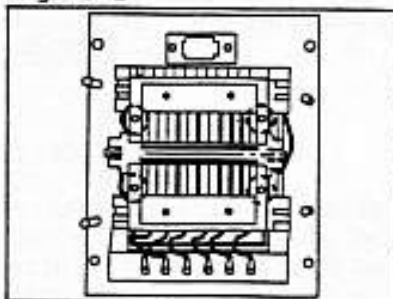
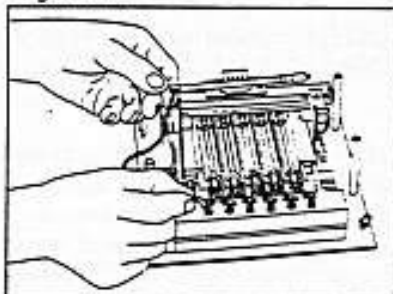


Figure M



HANDLE FLASHTUBES ONLY BY THEIR METAL ENDS AVOID TOUCHING THE GLASS

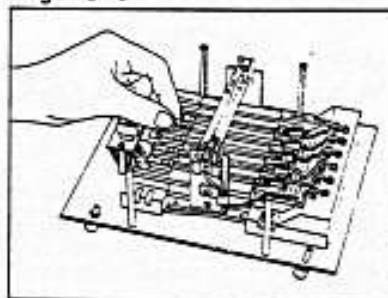
Pass the new tube's wire through the clip and attach the free end to the terminal plate with the screw. Be sure to tuck the tube's wire into the alignment guide just as it was.

TO REPLACE THE EXPOSURE TUBE:

1) Loosen the screw on the terminal plate of the exposure tube(s) to be replaced and detach the wire(s).

2) Remove the old exposure tube(s) from the tube holder(s) and insert the new tube(s). Make sure the wire attachment point on the newly installed tube(s) faces upward - See Figure O.

Figure O



HANDLE FLASHTUBES ONLY BY THEIR METAL ENDS AVOID TOUCHING THE GLASS

3) Attach the free end of the new tube's wire to the terminal plate with the screw. Be sure to tuck the tube's wire into the alignment guide just as it was.

4) Check the colored glass filters for dirt. If they have accumulated a "scum" of air-bourn dust particles, be sure to clean the filters before replacing them. See **CLEANING THE COLOR FILTERS** below for cleaning technique and handling warnings. If too much dirt builds up on the filters, it will absorb infrared energy during exposures and cause the filters to become excessively hot. This could cause the filters to crack, which would require replacement. Since you normally won't have the Illumination Assembly opened very often (except to replace a flashtube), it becomes a good time to routinely clean the filters.

TO RE-ASSEMBLE:

1) Reposition the Filter Assembly over the exposure flashtubes and secure it with the four screws that you removed earlier.

2) Holding the Illumination Assembly in your hands, and using the chrome-plated handle on the top, align the four chrome-plated guide-rods of the Illumination Assemble with their respective openings in the Color Head body and replace the Illumination Assembly in the Color Head. You may need to press downward a bit to engage the electrical connector.

3) Tighten the four knurled thumb-screws on the top of the Illumination Assemble. You only need to make them "finger tight".

THE RE-SET BUTTON

If the unit still functions improperly, using the tip of a ball point pen, press the RESET BUTTON located between the PRINT MODE and FOCUS keys. This button is recessed to avoid accidentally pressing it. Pressing it will usually cause a loss of all data that was held in Memory. If unit still functions improperly, see the TECHNICAL REFERENCE MANUAL, Chapter TR-L, TROUBLE SHOOTING or contact the Beseler Technical Service Department, 1-800-678-TECH (800-678-8324).

CLEANING THE COLOR FILTERS

1) When ever you have occasion to open the Illumination Assembly and replace flashtubes, it is a good idea to take the time to inspect and, if needed, clean the colored glass filters. If they have accumulated a "scum" of air-bourn dust particles, be sure to clean the filters before replacing them. If too much dirt builds up on the filters, it will absorb infrared energy during exposures and cause the filters to become excessively hot. This could cause the filters to crack, which would require replacement.

2) Use standard lens cleaner or common rubbing alcohol (isopropyl alcohol) and lens tissue (or cotton swabs).

3) BE EXTREMELY CAREFUL AND GENTLE WHILE HANDLING THE GLASS FILTER ASSEMBLY. DO NOT REMOVE THE INDIVIDUAL

FILTERS FROM THE ASSEMBLY - it isn't necessary to clean them, and there is too much chance of breaking them.

4) The glass filters are VERY BRITTLE. THEY WILL BREAK EASILY. Due to manufacturing specifications, requiring a narrow wave-length frequency of filtration, THEY ARE VERY EXPENSIVE TO REPLACE.

5) The glass filters are intentionally mounted LOOSE in the assembly. They SHOULD rattle slightly if you gently shake the assembly.

6) When cleaning the filters, do not press excessively hard in the middle, or you might break them. THEY ARE DELICATE. YOUR WARRANTY DOES NOT COVER ACCIDENTAL BREAKAGE.

CHAPTER TR-K ACCESSORIES

THE FOOT SWITCH

A foot switch is available for the Illumination Assembly that will start and stop the exposure. It acts like the EXPOSE key on the Controller. It plugs into the back of the Controller.

FOOT SWITCH, Catalog No. 8179

THE 35mm DIFFUSION CHAMBER

35mm DIFFUSION CHAMBER, Catalog No. 8299

The Beseler 45A Illumination Assembly is shipped with a 4x5 Diffusion Chamber already installed. It will provide adequate illumination, for almost all photographic processes, for all format sizes up to and including 4x5.

A second Diffusion Chamber, #8299, is available for those technicians working with 35mm (or smaller) formats. It condenses all of the available illumination into the 35mm format area.

The #8299 35mm diffusion Chamber cannot be used with the #8081 Beseler 35mm Negatrans Carrier, because the Negatrans Carrier positions the negative too far away from the Chamber's illumination surface, resulting in a loss of uniform illumination in the image's corners. It can be used with all other 35mm (or smaller format) negative carriers, including the #8305 carrier for mounted slides.

The #8299 35mm Diffusion Chamber cannot be used when the Beseler 45A Illumination Assembly has been mounted on some older Beseler 23II-XL enlargers due to a mis-alignment of the optical axis.

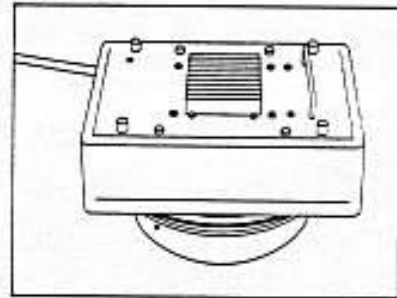
The 35mm Diffusion Chamber adds approximately 1.3 f-stops of illumination to the work area.

TO INSTALL THE 35mm DIFFUSION CHAMBER:

1) Turn "OFF" the power switch and disconnect the power cord.

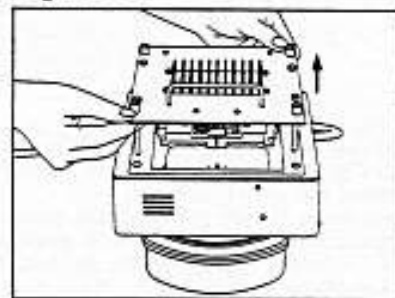
2) Remove the entire Illumination Assembly (See Figure F) from the enlarger and place it on a flat surface with the Illumination Assembly facing up. Do not rest the unit on surfaces that might scratch or damage the diffuser plate. It's a good idea to lay out a clean soft cloth or towel to place the unit on.

Figure F



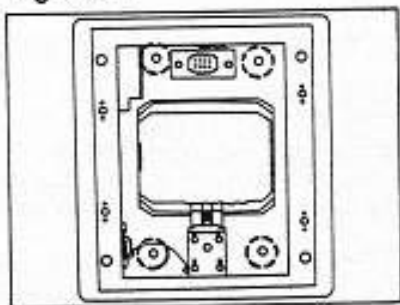
3) Loosen the four knurled thumbscrews on the top of the Illumination Assembly by turning them counterclockwise. With one hand steadying the Illumination Assembly assembly, use the chrome plated handle on the top to pull the Illumination Assembly up and out of the Illumination Assembly. You will need to tug slightly so that the internal electrical connector will separate. The Illumination Assembly will then lift straight up on the guide-rods and will come free of the Illumination Assembly. See Figure G.

Figure G



4) Using a Phillips (crosspoint-type) screwdriver, loosen the four screws (See dashed circles in Figure H) securing the 4x5 mixing chamber to the Illumination Assembly Housing.

Figure H



5) Separate the chamber from the Illumination Assembly housing by sliding the release pin back as shown (See Figure I) and lifting the upper body of the Illumination Assembly off of the 4x5 Diffusion Chamber. See Figure J.

Figure I

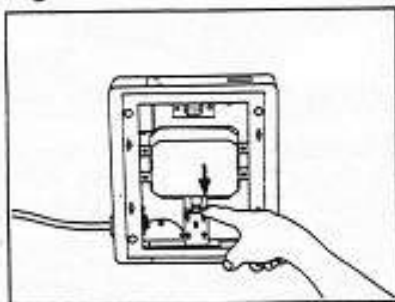
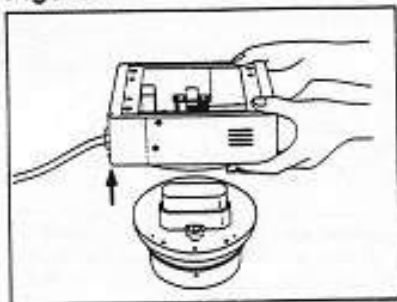


Figure J



6) Holding the release pin back, position the upper body of the Illumination Assembly over the 35mm Diffusion Chamber, then let the release pin slide closed. Re-insert the screws provided with the 35mm diffusion Chamber and tighten them.

7) Align and attach the Illumination Assembly back into the Illumination Assembly body, and tighten the four knurled thumb-screws. They only need to be "finger tight". This step is the reverse of Step 3) above.

8) Re-install the Illumination Assembly on the enlarger. This step is the reverse of Step 2) above.

OTHER USER-REPLACEABLE PARTS

THE COLOR FILTERS

The colored glass filters are very brittle and must be handled with extreme care. The GREEN filter actually consists of a BLUE and a YELLOW colored filter sandwiched together. Replacement filters can be ordered from Beseler or any authorized Beseler dealer.

RED FILTER:
Catalog No. MC-1827-5804

BLUE FILTER:
Blue Filter #2, Catalog No. MC-1827-5807

GREEN FILTER:
Blue Filter #1, Catalog No. MC-1827-5806
Yellow Filter, Catalog No. MC-1827-5805

When replacing a color filter, be sure that you re-assemble the filter holder so that each filter is just a little loose in the mounting. The loose mounting is necessary to allow room for thermal expansion during normal operation.

THE FILTER HOLDER ASSEMBLY

The Filter Holder Assembly can be ordered from Beseler or any authorized Beseler dealer. It should not normally become necessary to obtain a replacement Filter Holder Assembly. However, some technicians, doing extensive B&W work prefer to have a separate assembly containing nothing but BLUE and/or GREEN filters.

Such a separate assembly can be quickly installed when needed and provides for increased power output by converting the RED channel to a color of light that can be utilized by B&W papers. The catalog numbers given below are for the components that make up the complete assembly, less the filters (listed above). The screws listed are the VERY TINY Phillips screws that hold the phenolic retaining pieces (FILTER HOLDER "B") in position... which, in turn hold the glass filters in position. The four larger screws that hold the entire assembly to the Illumination Assembly are not listed.

FILTER PLATE HOLDER,
Catalog No. MC-8445-2315 (1) needed

FILTER HOLDER "B",
Catalog No. MC-8445-2317 (2) needed

FILTER CONNECTING PLATE,
Catalog No. MC-8445-2316 (2) needed

SCREWS,
Catalog No. MC-9612-2070-07 (4) needed

THE EXPOSURE & FOCUS TUBES

The Exposure and Focus flashtubes can be ordered from any authorized Beseler dealer. See the TECHNICAL REFERENCE MANUAL, Chapter TR-J, MAINTENANCE, (sub-section) THE COLOR HEAD for installation instructions.

EXPOSURE FLASHTUBE,
Catalog No. 8125

FOCUS FLASHTUBE,
Catalog No. 8126

GLASSLESS ROTATING FILM CARRIERS

- #8304 For 35mm (24mm x36mm) Film
- #8302 For 35mm Full Format (25mm x37mm) Film
- #8305 For 35mm Mounted Slides
- #8334 For 6cm x 4.5cm (1-5/8"x2-1/4") Film
- #8312 For 6cm x 6cm (2-1/4"x2-1/4") Film
- #8328 For 6cm x 7cm (2-1/4"x2-3/4") Film
- #8314 For 6cm x 9cm (2-1/4"x3-1/4") Film
- #8322 For 4"x5" Sheet Film

GLASS ROTATING FILM CARRIERS

- #8342 Universal, 4x5, Film Carrier with Standard Glass
- #8343 Universal, 4x5, Film Carrier with Anti-Newton Glass

OTHER ACCESSORIES

- #8129 Dust Cover for 45M Series Enlargers
- #8040 Red Safety Filter
- #8163 Analyzing Light Integrator Filter

BESLER ENLARGING LENSES

- #8640 Beseler-HD 50mm, f2.8-f16 for 35mm format - use lens board #8021
- #8641 Beseler-HD 80mm, f4.0-f22 for 6x6 format - use lensboard #8032
- #8642 Beseler-HD 105mm, f5.6-f32 for 6x7 format - use lensboard #8032
- #8643 Beseler-HD 135mm, f5.6-f32 for 4x5 format - use lensboard #8029
- #8644 Beseler-HD 150mm, f5.6-f32 for 4x5 format - use lensboard #8037
- #8645 Beseler-HD 240mm, f9-f64 for 8x10 format - use lensboard #8037
- #8670 Beslar 50mm, f3.5-f16 for 35mm format - use lensboard #8021
- #8680 Beslar 75mm, f3.5-f22 for 6x6 format - use lensboard #8023
- #8682 Beslar 90mm, f4.5-f22 for 6x7 format - use lensboard #8023
- #8684 Beslar 105mm, f4.5-f22 for 6x9 format - use lensboard #8029
- #8686 Beslar 135mm, f5.6-f22 for 4x5 format - use lensboard #8029

If you are using lenses other than Beseler lenses, consult your Beseler Dealer for adaptors, lens mounts, lens boards, jam nuts, etc.

The use of glass-type negative carriers opens the opportunity for Newton rings to occur. If you must use a glass-type carrier, and you have Newton rings, try DRYING the negative with the heat of a hair dryer. By using heat to drive the tiny amount of residual moisture out of the emulsion, the tendency to produce Newton rings will be greatly reduced.

Beseler also has an anti-Newton spray that can be very helpful.

Anti-Newton Spray, 200ml, Cat. #3201-12

The Beseler NEGATRANS[®] film carrier is available for both 35mm and 120/220 film. Individual negatives or complete rolls are transported through the Negatrans[®] carrier via a patented drive mechanism, preventing finger prints or scratches from occurring.

The 35mm Negatrans[®] includes a built-in mask for half-frames 35, as well as, standard 35mm format. A built-in window allows the user to view the exposure number on the easel when desired. It can be used with both 120 and 220 films.

The 120 Negatrans[®] features a pressure plate to insure that the film remains flat during the exposure. Built-in masking allows 6x6 and 6x7 formats to be used. An optional 6x4.5 mask is available.

35mm Negatrans[®] Carrier, Cat. #8081

120 Negatrans[®] Carrier, Cat. #8062

645 Pressure Plate Accessory, Cat. #8092

The Beseler Negaflat[®] carrier is a unique negative carrier that safely stretches the film and holds it flat under controlled tension without glass. It is designed for both 4x5 Pack and 4x5 Sheet film.

Negaflat[®], Cat. #8340

CHAPTER TR-L

TROUBLE SHOOTING

CHATTERING NOISE INSIDE OF CONTROLLER

Inside of the Controller there is a relay that switches power on & off. If the power line cord is not making positive contact in the wall socket, it is possible for this relay to chatter.

Be sure that the power line cord is plugged into the wall outlet in a proper manner and is making proper electrical contact.

COLOR HEAD OPERATING TEMPERATURE

When the flashtubes are fired for either focusing or for making an exposure, there is heat generated. In normal operation this heat is dissipated by convection from the cooling fins on top of the Color Head. It is normal for these fins to be warm to the touch during operation.

Depending on how much light output is requested for a given exposure, and depending on how many exposures are made in a given amount of time, determines how much heat will be generated. Only so much heat can be dissipated by the cooling fins in a given amount of time. It is possible to "work" the Color Head so much that the heat will build up until the cooling fins are very hot to the touch.

When the flashtubes get hot it is possible that they may fire in an erratic, unpredictable manner for which the Controller will not be able to compensate. This will result in unexpected color shifts in the print. This is especially true for flashtubes that have quite a few hours of use on them. Also, operating the flashtubes at excessively high temperatures will shorten their overall life expectancy.

It is suggested that you occasionally reach up and touch the cooling fins. If they are warm to the touch, that is normal. If, however, they become so hot that you don't feel comfortable keeping your finger tips on them, they are too hot, and further operation should be suspended until they cool.

While it is possible to operate the Color Head at very high production rates, supplemental cooling must then be provided to dissipate the heat that will be generated. Supplemental cooling will also tend to lengthen flashtube life. Supplemental cooling is best provided by directing forced air across the cooling fins. Depending on your particular needs, there are numerous ways this can be accomplished.

The Chart below offers an indication of how many prints can be made without risk of overheating, and the cool-down time that should be allowed.

When ever unexpected color balance shifts occur in prints, your FIRST suspicion should ALWAYS be that

CONTINUOUS EXPOSURE LIMITS - WITHOUT SUPPLEMENTAL COOLING			
FILTRATION DATA	PERMISSIBLE NUMBER OF CONTINUOUS EXPOSURES		
	"A" MODE	"AL", "R", "G" & "B" MODE	WAIT
190-225	18	9	5 min.
130-189	19-27	10-18	5 min.
90-129	28-54	19-36	5 min.
Less than 90	55-120	37-100	5 min.

Arranging to blow air across the light source cooling fins will increase the permissible number of continuous exposures.

you have inadvertently, and unknowingly done something to cause them. Your **SECOND** suspicion should be the quality of your chemistry or other related processing matters such as (carry-over) contamination, mixing, temperature control, agitation control, etc. Only after all other possibilities have been ruled out should you consider that color shifts might be coming from the Beseler 45A Color Head. If color shifts are coming from the Beseler 45A Color Head, the possible causes, in the order of their probability are: Faulty (nearly exhausted) Exposure Flashtubes; Color Head over heating; Power line noise; Controller over heating; faulty electronic circuitry (which will require factory repair).

CONTROLLER OPERATING TEMPERATURE

Inside the Controller's housing is a power transformer that steps the 110 VAC line power down to the very low voltages that are used by the computer circuits. This low voltage remains "on", even when the power switch is "off", to maintain the computer's memory. There is various other circuitry associated with the units internal power supply that also produce some residual heat. As a result, it is normal for the bottom of the Controller's housing to be slightly warm to the touch.

In normal operation, it should not be necessary to provide any supplemental cooling for the Controller. However, the Controller is, basically, a computer. And, as such, it's circuits will preform erratically if they become over heated. If you are using your unit in heavy production printing, and have found it necessary to provide supplemental cooling for the Color Head, you might be approaching a point where the unit can be building up excessive heat inside the Controller's housing.

While there is no danger of such heat causing damage to the circuits, there have been reported cases where the heat build-up was suspected of causing erratic circuit performance that resulted in color balance shifts in the prints. If you are providing supplemental cooling for the Color Head, and are still getting unexplainable color balance shifts in the prints, you should explore the possibility that the Controller might be over heating.

A first-step in providing some cooling to the Controller might be to set the housing on something that would raise it off the counter and allow more air to circulate UNDER the housing. If further cooling proves to be

necessary, you will have to arrange to direct forced air across the bottom of the housing.

When ever unexpected color balance shifts occur in prints, your **FIRST** suspicion should **ALWAYS** be that you have inadvertently, and unknowingly done something to cause them. Your **SECOND** suspicion should be the quality of your chemistry or other related processing matters such as (carry-over) contamination, mixing, temperature control, agitation control, etc. Only after all other possibilities have been ruled out should you consider that color shifts might be coming from the Beseler 45A Color Head. If color shifts are coming from the Beseler 45A Color Head, the possible causes, in the order of their probability are: Faulty (nearly exhausted) Exposure Flashtubes; Color Head over heating; Power line noise; Controller over heating; faulty electronic circuitry (which will require factory repair).

EXPOSURE KEY WILL NOT START THE EXPOSURE

Usually this means that a flashtube (focus or exposure) has failed. Observe the LCD for the indication that shows which color channel has the faulty flashtube. Open the Color Head and inspect the flashtubes. Replace the **DARKEST** tube(s) in accordance with instructions in Chapter TR-J, **MAINTENANCE**. Pay particular attention to the section of Chapter TR-J that describes faulty flashtubes that might look new, and how to identify them.

EXPOSURE STARTED BUT NOT COMPLETED

Usually this means that an exposure flashtube has failed part way through the exposure. Observe the LCD for the indication that shows which color channel has the faulty flashtube. Open the Color Head and inspect the flashtubes. Replace the **DARKEST** tube(s) in accordance with instructions in Chapter TR-J, **MAINTENANCE**. Pay particular attention to the section of Chapter TR-J that describes faulty flashtubes that might look new, and how to identify them.

RING-AROUND STARTED BUT NOT COMPLETED

Usually this means that you have set the increment of change - for the ring-around - to a value that exceeds one of the three color channel settings in the original starting-point data. If you have, the Controller will stop when it gets to that place in the ring-around series. To correct the problem, change either the increment of change for the ring-around series and re-do the ring-around test. Or change the color channel setting that is smaller than the increment of ring-around-change, and re-do the ring-around test.

IRREGULAR STROBING PATTERN DURING EXPOSURE

Erratic or irregular firing of the exposure flashtubes is an indication that one or more of the exposure flashtubes is nearly exhausted and will soon need to be replaced. The color channel containing the weak tube(s) can easily be identified by observing the Liquid Crystal Display (LCD) during the exposure. The color channel that lags behind the other two during the exposure, and continues to flash for a few seconds after the other two have completed their task and shut off, is the channel containing the weak tube(s).

You can continue to operate the Color Head until either the tube(s) fail completely or until the weak tube(s) start to produce color balance shifts in your prints that the Controller will be unable to compensate for.

Replace the DARKEST tube(s) in accordance with instructions in Chapter TR-J, MAINTENANCE. Pay particular attention to the section of Chapter TR-J that describes faulty flashtubes that might look new, and how to identify them.

IRREGULAR STROBING PATTERN DURING FOCUSING

Erratic or irregular firing of the focus flashtube is an indication that the focus flashtube is nearly exhausted and will soon need to be replaced. You can continue to operate the Color Head until the focus flashtube fails completely, or until it becomes excessively annoying.

Replace the focus flashtube in accordance with instructions in Chapter TR-J, MAINTENANCE. Pay particular attention to the section of Chapter TR-J that describes faulty flashtubes that might look new, and how to identify them.

NO RESPONSE TO POWER "ON"

Check to be sure that the unit is plugged into a "live" power outlet.

Check the unit's fuse located on the back end of the Controller's housing. Be sure to use a proper replacement fuse:

110/120 VAC model uses a 10 amp fast-blow fuse

220/230 VAC model uses a 5 amp slow-blow fuse

Try pressing the re-set button. This button is between the PRINT MODE and FOCUS keys and is recessed so that a pen or other pointed object must be used when pressing it. CAUTION: All data stored in memory will be lost.

POWER LINE NOISE FILTRATION

Your Beseler 45A Color Head has built-in filtration against common power line "noise". However, it is always possible that you are located in an area where there is some unusual noise (frequency) on the power line that requires additional filtration.

Excessive power line noise usually results in:

- Un-expected loss of the unit's memory
- Momentarily blanking out of the LCD
- Un-expected color balance shifts in the prints

If you suspect that you have power line noise problems, you can install any of the commonly available, broad-band power line filters that are manufactured for use with home computers. Do not mistakenly use a "surge protector". All power line "noise filters" have surge protection built-in. Surge protectors do not have noise filtration built-in.

POWER LINE VOLTAGE REGULATION

Your Beseler 45A Color Head has built-in voltage regulation. There should be no need for further regulation. Any type of voltage regulation that **REDUCES** the line voltage below 110 VAC will cause the unit to malfunction.

ADJUSTING ILLUMINATION BRIGHTNESS OF THE LIQUID CRYSTAL DISPLAY

It is not possible to "adjust" the illumination level of the LCD. However, you should be aware that some photographic emulsions are extremely sensitive and could be fogged by excessive exposure to even the tiniest amount of illumination. You should always test your working environment for possible fog hazards by partially masking a piece of photographic emulsion (paper or film) and then deliberately exposing it to the various potential opportunities for fogging. Remember, both **TIME** (of the exposure) and **DISTANCE** (from the source) play a critical part in whether or not fog will occur. Your test should duplicate your expected normal activity plus a safety margin.

Since the LCD gives off a slightly **GREEN** colored light, any fog produced by it would appear to be **MAGENTA** colored in color negative printing paper, or **GREEN** colored in positive printing paper.

TUBE FAILURE INDICATION

The LCD contains an indicator to signal which color channel contains a flashtube that has failed. This is particularly helpful in identifying a faulty tube that has failed due to a hairline crack resulting in a loss of internal gas pressure. Such a faulty tube might not have the usual blackened ends, and can appear to be new.

CODE IN THE LCD	MEANING
CH 1	(2) RED Tubes
CH 2	(2) GREEN Tubes
CH 3	(1) BLUE Tube
CH 4	(1) Exposure Tube

LCD WILL NOT ILLUMINATE

Check to be sure that the unit is plugged into a "live" power outlet.

Check the unit's fuse located on the back end of the Controller's housing. Be sure to use a proper replacement fuse:

110/120 VAC model uses a 10 amp fast-blow fuse

220/230 VAC model uses a 6 amp slow-blow fuse

Press the re-set button located on the Controller between the **PRINT MODE** and **FOCUS** keys.

THE POWER FUSE

Check the unit's fuse located on the back end of the Controller's housing. Be sure to use a proper replacement fuse:

110/120 VAC model uses a 10 amp fast-blow fuse

220/230 VAC model uses a 6 amp slow-blow fuse

THE RE-SET BUTTON

Located on the Controller, between the **PRINT MODE** and **FOCUS** keys, is a tiny "re-set" button. This button is recessed to avoid accidentally pressing it. You can use the tip of a ball-point pen to press it.

When pressed, the re-set button will cause a re-setting of the Controller's circuits, which will sometimes clear the digital circuitry if it becomes "frozen" due to operational difficulties.

Pressing the re-set button will usually result in a loss of all data that has been held in memory.

UNEXPLAINED COLOR SHIFTS IN PRINTS

The **MOST PROBABLE** cause for unexplained color balance shifts in prints is that you, the operator, has inadvertently, and un-knowingly, done **SOMETHING** which has **CAUSED** the color shift - such as placing the **WRONG** settings into the Controller.

Other possible causes of color shifts in their order of probability are as follows:

- 1) Chemistry/processing difficulties
- 2) Switching from the "A" mode to the "AL" mode without compensating
- 3) Dodging & Burning-in in the "A" mode.
- 4) Changing emulsion batches of printing paper
- 5) Applying an analyzer program created with one BRAND of film to a DIFFERENT brand of film. See Chapter TR-D, GENERAL USE OF THE ANALYZER for further details.
- 6) Nearly exhausted exposure flashtube(s)
- 7) Over heated Color Head
- 8) Power line noise
- 9) Controller over heating
- 10) Faulty electronic circuitry (which will require factory repair).

SMOKE, SPARKS, or SMELL

If you observe smoke or sparks coming from any part of the unit, or if you smell anything that smells like over heated electrical components, discontinue use at once and disconnect unit from power. There is a MAJOR problem that will probably require factory repair.

There are no user-repairable components inside of the Controller housing. DO NOT OPEN THE CONTROLLER HOUSING. Opening the Controller's housing may void your warranty. There is LETHAL high voltage inside the Controller housing as well as on the flashtubes in the Color Head.

OTHER OCCURRENCES

It is not possible to damage the Beseler 45A Color Head by pressing the "wrong" keys or by operating any of the keys in the "wrong" sequence.

It IS possible to cause damage by over heating the unit.

The most likely "damage" will be the pre-mature exhaustion of the flashtubes. However, as with all electronic instruments, continued overheating puts the circuits at risk.

There have been reported cases of "off-the-air" radio-frequency noise causing intermittent problems similar to power line noise. Such radio frequency noise has emanated from such things as VERY nearby:

- 1) High tension power lines
- 2) Commercial Radio/Television transmitting towers
- 3) Electric arc welding
- 4) CB radio transmitters
- 5) Business/police/taxi radio transmitters
- 6) Cellular/portable telephones

If you suspect that such sources of radio-frequency noise are causing a problem, you should first install a broad-band power line noise filter such as those that are commonly used with personal computers.

If the source of the noise is truly air-bourn (not coming in on the power line), then a power line filter will not be effective. The only way to shield against air-bourn radio frequency noise is to create a "Faraday Cage" around the computer. The metal housing of the lower half of the Controller tends to act as a Faraday Cage, but for such action to be even partly effective, the Controller MUST be plugged into an outlet that contains a proper earth-ground. And, of course, the upper half of the Controller housing is only plastic, which is "transparent" to air-bourn radio frequency noise.

Outlets are sometimes cross-wired and sometimes the earth-ground is not properly connected. While the Beseler 45A Color Head, as well as most electrical appliances, would appear to operate normally from an improperly wired outlet, the lack of proper grounding would partially negate noise protection for the Beseler 45A.

A simple, inexpensive outlet circuit tester can be obtained from hardware stores and used by laymen to evaluate the grounding of the outlet. Actual corrections to improperly wired wall outlets should only be attempted by a qualified electrician. Wall outlets contain LETHAL voltage.

BESELER 45A TROUBLE SHOOTING GUIDE

The Beseler 45A Illumination Assembly is an extremely sophisticated device. However, due to its solid state design and freedom from moving parts there are very few things that can cause improper operation of the system. Should you experience a problem with operation, the first thing to do is refer to this manual, checking in the section that is most relevant to the operation in progress and try to identify an operator procedural error. If after checking the procedure there still appears to be a problem, refer to the chart below and/or this entire chapter.

PROBLEM	SOLUTION
Power Indicator Light does not turn on with power switch	<ol style="list-style-type: none"> 1. Check and, if necessary, replace fuse. 110VAC Model uses 10A Fast blow type. 220VAC Model uses 6A Slow blow type. 2. Check AC line voltage.
Memory loss or erratic operation	<ol style="list-style-type: none"> 1. Irregularities on AC line. Install AC line broad-band noise filter capable of handling 750 watt operation.
Power Indicator Light turns on but LCD Panel does not illuminate	<ol style="list-style-type: none"> 1. Press re-set button. 2. If condition continues, install AC line broad-band noise filter capable of handling 750 watt operation.
Inconsistent exposures - color balance shifts	<ol style="list-style-type: none"> 1. User must make compensation in color settings if switching between A and AL modes. 2. Check and, if necessary, replace exposure tube(s). 3. Allow more cool-down time between exposures or use forced air cooling across cooling fins. 4. Install AC line broad-band noise filter capable of handling 750 watt operation.
Exposure times slowing down	<ol style="list-style-type: none"> 1. Replace exposure tube(s) in color channel that is slowing down.
System will not expose	<ol style="list-style-type: none"> 1. All color channels have not counted down completely: Press DATA* key to reset. 2. In ring-around mode, step value exceeds the amount of change that is possible, based on starting-point exposure data. Change data or skip over the ring-around step.
During exposure, LCD Panel blanks out momentarily, then system resets	<ol style="list-style-type: none"> 1. Identify blackened flash tube(s) and replace.

BESELER 45A MANUAL

INDEX

105mm Lens	TR-B, 2	B&W Contrast Grades	TR-H, 23
105mm Lens	TR-K, 33	B&W Graded Printing	TR-G, 20
120/220 Negatrans	TR-B, 4	B&W Prints From Color Negs	TR-I, 24
120/220 Negatrans Carrier	TR-K, 34	B&W Ring-Around	OM-G, 22
135mm Lens	TR-B, 2	B&W Ring-Around	TR-C, 6
135mm Lens	TR-K, 33	B&W Ring-Around Mode	TR-H, 22
150mm Lens	TR-K, 33	B&W VC Printing	TR-H, 21
240mm Lens	TR-B, 2	Beseler 23C Enlarger	OM-D, 8
240mm Lens	TR-K, 33	Beseler 45A Calibration	OM-F, 13
330mm Lens	TR-B, 2	Beseler-HD Lenses	TR-K, 33
35mm Diff. Cham. Installing	TR-K, 31	Beslar Lenses	TR-K, 33
35mm Diffusion Chamber	OM-G, 25	Blue Filter	TR-K, 32
35mm Diffusion Chamber	TR-B, 2	Button, Re-Set	TR-J, 30
35mm Diffusion Chamber	TR-K, 31	Button, Re-Set	TR-L, 38
35mm Negatrans	OM-G, 25	Cable, Fiber Optic	TR-J, 26
35mm Negatrans	TR-B, 2	Calibration of 45A	TR-C, 10
35mm Negatrans	TR-B, 4	Carrier, 120/220 Negatrans	TR-K, 34
35mm Negatrans Carrier	TR-K, 34	Carrier, 35mm Negatrans	TR-K, 34
38mm Lens	TR-B, 2	Carrier, Negaflat 4x5	TR-K, 34
45A Calibration	TR-C, 10	Changing Density	TR-C, 10
50mm Lens	TR-B, 2	Changing Flash Tubes	TR-J, 26
50mm Lens	TR-K, 33	Changing Lenses	TR-D, 14
75mm Lens	TR-B, 2	Changing The Color	TR-C, 8
75mm Lens	TR-K, 33	Chattering Noise	TR-L, 35
80mm Lens	TR-K, 33	CH-1 to 4 LCD Code	OM-G, 25
90mm Lens	TR-B, 2	Cleaning Color Filters	TR-J, 30
90mm Lens	TR-K, 33	Color Balance	OM-F, 13
Accessories	TR-K, 31	Color Balance, Adjusting	TR-E, 16
Adaptor Brackets	OM-D, 8	Color Balance, Adjusting	TR-F, 18
Additive Color Printing	OM-F, 13	Color Contrast Control	OM-F, 15
Adjusting Color Balance	TR-E, 16	Color Contrast Control	TR-E, 17
Adjusting Color Density	TR-E, 16	Color Contrast Control	TR-F, 19
Adjusting VC B&W Contrast	TR-H, 22	Color Control	OM-F, 15
Analyze Key	OM-G, 23	Color Density, Adjusting	TR-E, 16
Analyzer	OM-G, 23	Color Density, Adjusting	TR-F, 18
Analyzer Probe	TR-J, 26	Color Filters, Cleaning	TR-J, 30
Analyzer Programs	TR-D, 11	Color Filters, Replacing	TR-K, 32
Analyzer Readings, Integrated	OM-G, 24	Color Head	OM-G, 24
Analyzer Readings, Multiple	OM-G, 24	Color Negative Printing	TR-E, 16
Analyzer's Sensitivity Range	OM-G, 24	Color Positive Printing	TR-F, 18
Analyzer's Sensor	OM-G, 24	Color Ring-Around	OM-G, 20
Analyzer, Use Of	TR-D, 11	Color Ring-Around	OM-G, 22
Anti-Newton Glass	TR-B, 4	Color Ring-Around	TR-C, 5
Anti-Newton Spray	TR-B, 4	Color Shifts In Prints	TR-L, 38
Anti-Newton Spray	TR-K, 34	Color, Changing	TR-C, 8
APO 240mm Lens	TR-B, 2	Contents, Owner's Manual	OM-B, 2
Assembly, Filter Holder	TR-K, 32	Contents, Technical Ref.	TR-A, 1
Average Key	TR-D, 11	Continuous Exposure Limits	TR-L, 35

Contrast Control, Color	TR-E, 17	Focus Tube	TR-J, 26
Contrast Control, Panalure	TR-I, 25	Focus Tube	TR-K, 33
Contrast Grades, B&W	TR-H, 23	Focus Tube, Replacing	TR-J, 29
Contrast, Adjusting B&W VC	TR-H, 22	Foot Switch	TR-K, 31
Control, Magnification	TR-B, 2	Fuse, Power	TR-L, 38
Control, Variable Contrast	TR-H, 22	f-stop Settings	TR-B, 3
Controller	OM-G, 20	General Information	OM-F, 13
Controller's "A" Mode	TR-C, 10	General Operation	OM-G, 20
Controller's "AL" Mode	TR-C, 10	Glass Film Carriers	TR-K, 33
Controller, Use Of	TR-C, 5	Glass Filters, RGB	OM-G, 24
Controls	OM-C, 4	Glass, Anti-Newton	TR-B, 4
Conversion Program	TR-D, 14	Glassless Film Carriers	TR-B, 3
Cover, Dust	TR-K, 33	Glassless Film Carriers	TR-K, 33
Creating A Program	TR-D, 12	Glass-Type Film Carriers	TR-B, 4
Data, Scaling	TR-D, 14	Graded B&W Paper	OM-F, 16
Density, Changing	TR-C, 10	Graded B&W Printing	TR-G, 20
Diffusion Chamber, 35mm	TR-K, 31	Green Filter	TR-K, 32
Diffusion Chamber, 35mm	OM-G, 25	Initial Setup	OM-D, 9
Diffusion Chamber, 35mm	TR-B, 2	Installation Instructions	OM-D, 7
Dimensions	OM-I, 28	Installing 35mm Diff. Cham.	TR-K, 31
D-MIN	OM-G, 23	Integrated Analyzer Readings	OM-G, 24
Dust Cover	TR-K, 33	Integrator filter, Light	TR-K, 33
Enlarging Lenses	TR-K, 33	Introduction	OM-C, 3
Exposure Key	OM-G, 22	Irrregular Strobng	TR-L, 37
Exposure Tube	TR-J, 26	Key, Analyze	OM-G, 23
Exposure Tube	TR-K, 33	Key, Average	TR-D, 11
Exposure Tube, Replacing	TR-J, 29	Key, Film Type	OM-G, 21
Failure Indication, Tube	TR-L, 38	Key, Measure	TR-D, 11
Fast Start	OM-E, 10	Key, Memory	OM-G, 23
Fiber Optic Cable	TR-J, 26	Key, Memory	TR-D, 11
Film Carriers, Glass	TR-B, 4	Key, Print Mode	OM-G, 21
Film Carriers, Glass	TR-K, 33	LCD Code CH-1 to 4	OM-G, 25
Film Carriers, Glassless	TR-B, 3	Lens Focal Lengths	TR-B, 2
Film Carriers, Glassless	TR-K, 33	Lens, 105mm	TR-B, 2
Film Carriers, Universal	TR-B, 4	Lens, 105mm	TR-K, 33
Film Type Key	OM-G, 21	Lens, 135mm	TR-B, 2
Film Type, "N"	OM-G, 21	Lens, 135mm	TR-K, 33
Film Type, "P"	OM-G, 21	Lens, 150mm	TR-K, 33
Film Type, "BW"	OM-G, 21	Lens, 240mm	TR-B, 2
Filter Holder Assembly	TR-K, 32	Lens, 240mm	TR-K, 33
Filter, Blue	TR-K, 32	Lens, 330mm	TR-B, 2
Filter, Green	TR-K, 32	Lens, 38mm	TR-B, 2
Filter, Light Integrator	TR-K, 33	Lens, 50mm	TR-B, 2
Filter, Red	TR-K, 32	Lens, 50mm	TR-K, 33
Filter, Red Safety	TR-K, 33	Lens, 75mm	TR-K, 33
Filter, Yellow	TR-K, 32	Lens, 75mm	TR-B, 2
Filters, Cleaning Color	TR-J, 30	Lens, 80mm	TR-K, 33
Filters, Glass	OM-G, 24	Lens, 90mm	TR-B, 2
Filters, RGB	OM-G, 24	Lens, 90mm	TR-K, 33
Filtration, Noise	TR-L, 37	Lens, APO 240mm	TR-B, 2
Flash Tubes, Changing	TR-J, 26	Lenses, Beseler-HD	TR-K, 33
Focal Length, Lens	TR-B, 2	Lenses, Beslar	TR-K, 33

Lenses, Changing	TR-D, 14	Printing Color Slides	OM-E, 11
Lenses, Enlarging	TR-K, 33	Printing Color Slides	OM-F, 14
Light Integrator Filter	TR-K, 33	Printing Data	OM-G, 20
Limits, Continuous Exposure	TR-L, 35	Printing Numbers	OM-G, 20
Line Voltage	OM-I, 28	Printing, B&W VC	TR-H, 21
Magnification Control	TR-B, 2	Printing, Color Negative	TR-E, 16
Maintenance	TR-J, 26	Printing, Color Positive	TR-F, 18
Measure Key	TR-D, 11	Printing, Graded B&W	TR-G, 20
Memory Key	OM-G, 23	Printing, Panalure	TR-I, 24
Memory Key	TR-D, 11	Printing, Panchromatic (B&W)	TR-I, 24
Memory Protection	TR-J, 26	Probe, Analyzer	TR-J, 26
Mounting Lever Kit	OM-D, 8	Program Data	OM-G, 20
Multiple Analyzer Readings	OM-G, 24	Program Numbers	OM-G, 20
Negaflat Carrier, 4x5	TR-K, 34	Program, Conversion	TR-D, 14
Negative Carriers, Use Of	TR-B, 3	Program, Creating A	TR-D, 12
Negatrans, 120/220	TR-B, 4	Program, Using A	TR-D, 13
Negatrans, 35mm	OM-G, 25	Programs, Analyzer	TR-D, 11
Negatrans, 35mm	TR-B, 2	Reciprocity Failure	OM-F, 14
Negatrans, 35mm	TR-B, 4	Red Filter	TR-K, 32
Noise Filtration	TR-L, 37	Red Safety Filter	TR-K, 33
Noise, Chattering	TR-L, 35	Regulation, Voltage	TR-L, 38
Noise, Power Line	TR-L, 37	Repair Service	OM-H, 26
OMEGA D-Series	OM-D, 8	Replacing Color Filters	TR-K, 32
Operating Temperature	TR-L, 35	Replacing Exposure Tube	TR-J, 29
Out-Of-Warranty Service	OM-H, 27	Replacing Focus Tube	TR-J, 29
Panalure Contrast Control	TR-I, 25	Re-Set Button	TR-J, 30
Panalure Paper	OM-F, 18	Re-Set Button	TR-L, 38
Panalure Printing	TR-I, 24	RGB Filter Part Numbers	OM-I, 28
Panchromatic (B&W) Printing	TR-I, 24	RGB Glass Filters	OM-G, 24
Panchromatic Paper	OM-F, 18	Ring-Around Feature	TR-C, 5
Paper, B&W	OM-F, 16	Ring-Around Mode, B&W	TR-H, 22
Paper, Graded Contrast	OM-F, 16	Ring-Around Mode, B&W	OM-G, 22
Paper, Panchromatic B&W	OM-F, 17	Ring-Around, B&W	TR-C, 6
Paper, Variable Contrast	OM-F, 17	Ring-Around, Color	OM-G, 22
Power Fuse	TR-L, 38	Ring-Around, Color	TR-C, 5
Power Line Noise	TR-L, 37	Safety Precautions	OM-A, 1
Principal Parts	OM-C, 4	Scaling Test Data	TR-D, 14
Print Mode Key	OM-G, 21	Sensitivity Range, Analyzer	OM-G, 24
Print Mode, "A"	OM-G, 21	Sensor, Analyzer	OM-G, 24
Print Mode, "A"	TR-C, 10	Service Information	OM-H, 26
Print Mode, "AL"	OM-G, 21	Service, Out-Of-Warranty	OM-H, 27
Print Mode, "AL"	TR-C, 10	Service, Warranty	OM-H, 26
Print Mode, "B"	OM-G, 21	Settings, f-stop	TR-B, 3
Print Mode, "G"	OM-G, 21	Specifications	OM-I, 28
Print Mode, "R"	OM-G, 21	Spray, Anti-Newton	TR-B, 4
Printing B&W Graded Paper	OM-F, 16	Spray, Anti-Newton	TR-K, 34
Printing B&W Negatives	OM-E, 12	Strobing, Irregular	TR-L, 37
Printing B&W Negatives	OM-F, 16	Switch, Foot	TR-K, 31
Printing B&W Panalure	OM-F, 18	Temperature, Operating	TR-L, 35
Printing B&W Variable Paper	OM-F, 17	Test Data, Scaling	TR-D, 14
Printing Color Negatives	OM-E, 10	Trouble Shooting	TR-L, 35
Printing Color Negatives	OM-F, 14	Trouble Shooting Guide	TR-L, 40

Guide, Trouble Shooting	TR-L, 40
Tube Failure Indication	TR-L, 38
Tube, Exposure	TR-J, 26
Tube, Exposure	TR-K, 33
Tube, Exposure	TR-K, 33
Tube, Focus	TR-J, 26
Universal Film Carrier	TR-B, 4
Use Of Analyzer	TR-D, 11
Use Of Controller	TR-C, 5
Use Of Negative Carriers	TR-B, 3
Using A Program	TR-D, 13
Variable Contrast Control	TR-H, 22
Variable Contrast Paper	OM-F, 16
VC B&W Contrast, Adjusting	TR-H, 22
VC B&W Printing	TR-H, 21
Voltage Regulation	TR-L, 38
Warranty	OM-H, 26
Warranty Service	OM-H, 26
Weight	OM-I, 28
Xenon Flash Tube Part Numbers	OM-I, 28
Yellow Filter	TR-K, 32

LIMITED ONE YEAR WARRANTY

(Applicable in U.S.A., outside U.S.A. see local distributor)

Charles Beseler Company warrants its products (with the exception of lamps), to the original purchaser only, to be free from defects in materials and workmanship for a period of one (1) year from the date of purchase.

This Warranty does not apply to our products which show evidence of accidental damage, misuse or abuse by you. The Warranty also does not apply to our products which are defective or damaged by tampering or attempted repair by an unauthorized Beseler agent.

Beseler exclusively limits this Warranty to repair or replace (at Beseler's option) the defective part of its product. If you decide to send our product to our authorized repair outlet, you must insure the product and prepay all transportation expenses. Beseler will not be liable for damages caused in the course of shipping the product to you. You must allow at least six (6) weeks for correction of the defect.

ANY IMPLIED WARRANTIES OF FITNESS FOR USE, OR MERCHANTABILITY, THAT MAY BE CREATED BY OPERATION OF LAW ARE LIMITED TO THE ONE (1) YEAR WARRANTY PERIOD.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

NO LIABILITY IS ASSUMED FOR EXPENSES OR DAMAGES RESULTING FROM INTERRUPTION IN

OPERATION OF EQUIPMENT, DAMAGE TO FILM OR PAPER, OR FOR INCIDENTAL, DIRECT OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

In the event there is any defect in materials and workmanship of our product you may contact our Customer Service Department at Charles Beseler Company, 1600 Lower Road, Linden, N.J. 07036. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state. You may also have implied warranty rights. In the event of a problem with warranty service or performance, you may be able to go to a Small Claims Court, a State Court, or a Federal District Court.

IMPORTANT:

THIS WARRANTY SHALL NOT BE VALID AND BESELER SHALL NOT BE BOUND BY THIS WARRANTY IF OUR PRODUCT IS NOT OPERATED IN ACCORDANCE WITH BESELER'S WRITTEN INSTRUCTIONS.

You must prove the date of purchase by producing a sales receipt indicating that you are the original purchaser.

**IMPORTANT! KEEP THIS INFORMATION HANDY
FOR FUTURE REFERENCE
KEEP YOUR SALES RECEIPT!**

SERVICE INFORMATION:

(Applicable in U.S.A., Outside U.S.A. See Local Distributor)

Should you need service for your BESELER photographic equipment after the warranty has expired, please follow these steps:

PACK the product in the original packaging material to protect it in transit.

ENCLOSE complete information showing your name and address, what is wrong with the equipment, and the return shipping address. Tape the information to the equipment to be sure it does not get thrown out with the packing material.

ADDRESS the package to BESELER SERVICE MANAGER, 1600 Lower Road, Linden, N.J. 07036.

PREPAY FREIGHT CHARGE AND INSURE the package against damage or loss in transit.

ESTIMATES. We will gladly provide estimates upon request. There is a flat estimate charge of \$20.00 payable in advance. The estimate charge will be credited towards the cost of the repair. No work will be undertaken or billed until written approval of the estimate is received.

CHARGES. Your local Beseler dealer has a list of current price ranges to service Beseler photographic equipment. Any repair likely to exceed the maximum recommended service price will be estimated and held for your approval before work is begun.

PAYMENT. Your check for \$20.00 must accompany your request for an estimate, alternatively, you may charge your VISA or MASTER CHARGE account. Repairs must be paid in full prior to return to owner. Personal checks or VISA/MASTER CHARGE accepted. (If you pay by VISA or MASTER CHARGE, please give the account number and expiration date.)

OBsolete EQUIPMENT. Beseler reserves the right to refuse to repair equipment that has been discontinued for five (5) years.

IN-WARRANTY SERVICE. There is no charge for service performed during the warranty period. PROOF OF PURCHASE is required for warranty service and must be enclosed with the return. Terms of the warranty are explained above.

BESELER

Charles Beseler Company
1600 Lower Road, Linden, N.J. 07036