

THE COLORSTAR 3000

**COLOR & EXPOSURE ANALYZER
DIGITAL ENLARGER TIMER**

USERS MANUAL

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[Revision 4.0]

[Cat #66041]



Colorstar 3000

Color Analyzer

Users Manual

Thank you for purchasing the Colorstar 3000. We are confident that you will be pleased with the product. Please take the time to read this instruction manual in its entirety.

Please keep the machine dry, especially the probe. Also, protect the Colorstar 3000 from excessive heat sources.

This revision of the manual includes procedure "Flow Charts" at the end as well as a topical index on page 31. The flow charts are referenced at the beginning of each procedural description so you can both read the instruction and review the procedure graphically. Flow chart references are bracketed and bold **[Procedure Flow Chart Page "X"]**.

If you find that you cannot understand a point about the Colorstar 3000, need repair or service, or simply want to discuss the machine, please call or write to:

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Manufactured in the Netherlands for Jobo by Lici Photometric Industries.

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Part 1. Set-up & Description

1. Connect Power Cord, Enlarger, and Probe

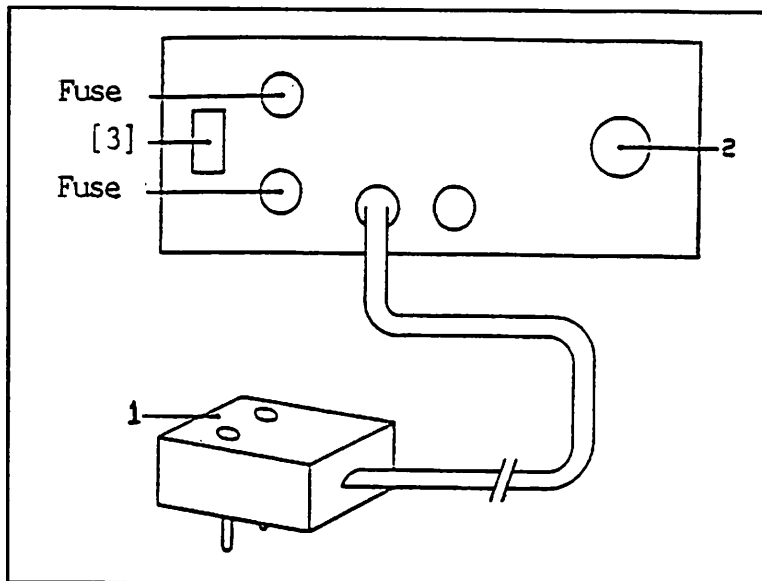
Connect the enlarger's grounded timer plug into the Colorstar 3000's piggyback plug [1]. Then attach the sensor's (or probe's) plug [2].

2. On/Off Switch

The main power switch is located on the back of the Colorstar [3]. Immediately after turning the Colorstar on the enlarger lamp and Colorstar facelights illuminate momentarily.

3. Fuses

A 100mA and a 6.3 AT fuse are included.



Rear panel & power cord (220v shown)

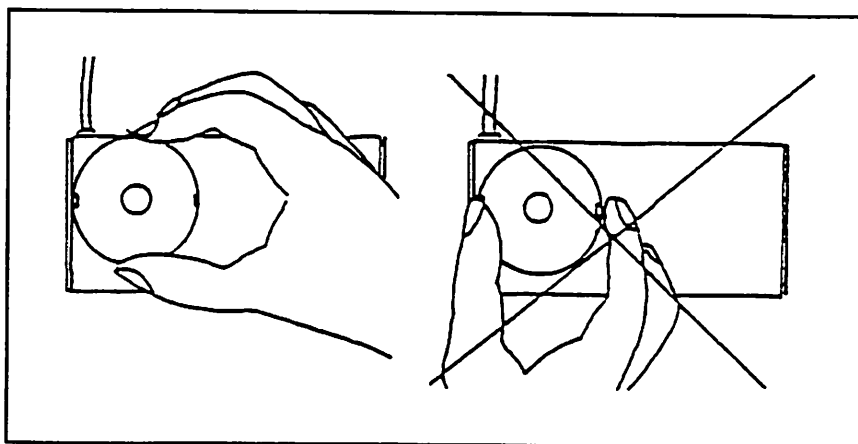
4. Memory

The Colorstar 3000 has built-in program storage memory for up to 8 programs. It has 8 different correction factors for paper slope which must be set according to the paper type you will be using. Refer to page 6 for more information on Slope.

The machine also has the ability to correct all eight programs using its Master Channel. This allows you to correct for changes in the chemicals from aging or oxidation. For more information on this feature refer to page 14.

5. Probe Covers

Pay special attention when changing probe covers so you do not break the lock tabs. When removing the clear spot or 57mm partial integrated probe covers, squeeze the probe cover, as shown in the diagram, to expand the lock tabs, then lift. For additional information on the probe covers please refer to page 23.



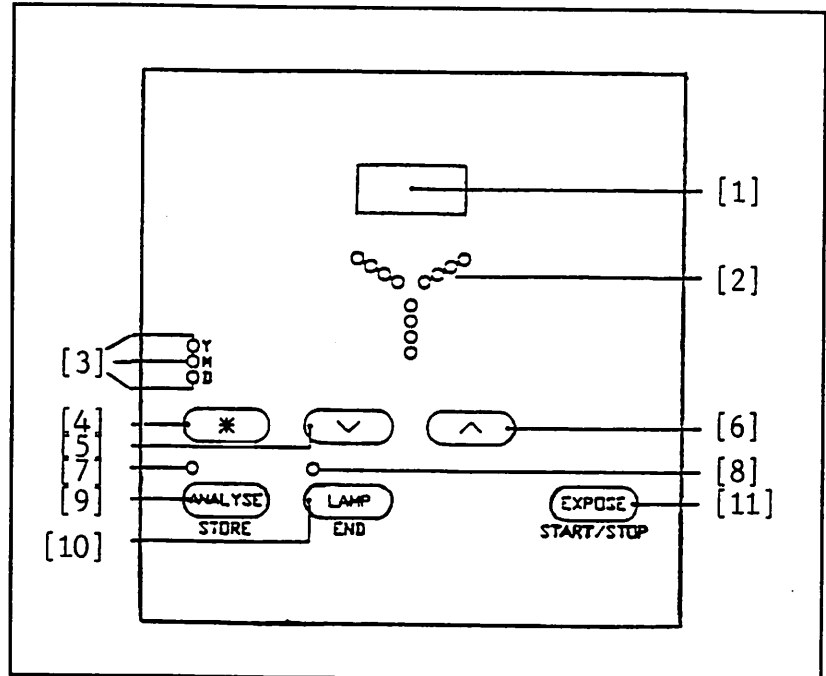
To remove, carefully squeeze probe cover so lock tabs expand

Part 2. The Control Panel

[1] Multifunction digital display. In normal operation, this displays exposure time. In other modes it displays information such as densities, paper types, slope corrections, and probe calibration factors.

[2] Central color light emitting diode arrays (the "colorstar") of yellow, magenta, and cyan colors. The centermost LED indicates 1cc filtration, each subsequent LED indicates an additional 4cc's.

[3] Y,M,D indicator LED's. These LED's indicate which channel's program number is being read while in Program mode or which color layer is being read while in Densitometer mode.



Front Control Panel, Colorstar 3000

[4] The * Key is a multifunction key used in combination with other keys to access various modes. These will be explained later in the instruction manual. When you are instructed to press *-ANALYZE for instance it means to press and hold the * key while pressing the ANALYZE key, then release both. (It is the same as a "Control" key on a computer). The * key also functions as a switch for the audible countdown timer. To engage the audible tone during exposures, simply touch the * key *during* the exposure. To discontinue the audible countdown tone, touch the * again during exposure.

[5] DOWN key. [6] UP key.

[7] The ANALYZE LED indicates the ANALYZE key is engaged. When averaging (reading more than one spot), this LED flashes.

[8] The LAMP LED indicates the LAMP key is engaged.

[9] The ANALYZE key's main function is to simply engage the analyzer. When the ANALYZE key is pressed, the enlarger lamp comes on, the probe is activated, the Colorstar's LED's illuminate indicating required filtration, and the digital display indicates exposure time. It also functions as the Store key when in other modes

[10] The LAMP key's main function is to turn the enlarger lamp on and off. It also serves as the End key when in modes other than ANALYZE.

[11] The Expose key's main function is to turn the enlarger lamp on for the amount of time indicated in the digital display and turn it off precisely after that time. The exposure can be interrupted and resumed any number of times by toggling this key. The exposure can also be canceled by pressing Expose during the exposure to interrupt the exposure, then press End (LAMP) to cancel the remaining exposure time. The original exposure time is always returned to the display at the end of an exposure.

Part 3. Operation Procedures

The Colorstar 3000 is a very versatile color and exposure analyzer and digital enlarger timer. Please read the following operational instructions thoroughly and keep this manual as a reference guide. The sequence of functions and their descriptions is intended to educate so you will *understand* the machine and thereby use it to its greatest capacity.

Note: Do not hold or press any key while turning the power switch off.

1. Probe Initialization: Check Calibration [Procedure Flow Chart Page 26]

You should verify that the probe's calibration numbers are properly entered into your Colorstar 3000. This procedure is required only when you change probes. This section describes the procedure.

- a. Turn the power switch off. Press and hold the ANALYZE key and turn the power switch on. The figure "1" is displayed.
- b. Press the * key once. The display now shows the first of 5 calibration numbers which are recorded on the underside of the probe itself. If the first number does not match the number displayed in the Colorstar use the UP and/or DOWN keys to match the probe's number.
- c. Press the * key again. The digit 2 appears in the display. Press the * key again, the second calibration number appears in the Colorstar display. Proceed as above verifying all 5 calibration numbers.
- d. You may continuously press the * key to review the calibration numbers. When you are confident they are correct, press the LAMP/END key to save the settings and exit the initialization mode.

2. Setting The Paper Type and Slope Correction Factor [Procedure Flow Chart Page 26]

The Colorstar needs to "know" what type of paper it is programmed for; color negative, color positive, or black & white. It also needs to know if the paper requires a correction factor for reciprocity failure, or slope. Follow this procedure to set the correct factor.

- a. Switch the power off. Then, while holding the * key, turn the power back on. Now, the paper type and slope correction factor appear in the Colorstar's digital display. The following options are available to choose from:

Display Letter	Paper Type Selected
"n."	Color print from negative
"p."	Color print from positive (slide)
"b."	Black & White printing

Using the DOWN key, select the option to match the paper type you will program for.

- b. Next, select the slope correction factor required for the brand of paper you are using. 00 is linear, or no slope correction. 05 to 35 in steps of 05 are the available correction factors. Refer to the chart below for the paper you are using. If your paper is not listed, use n.00 for color negative printing, p.30 for color slide printing, and for black & white use b.00.

Paper	Setting
Ektacolor Ultra RA-4	n.00
Agfacolor 8	n.00
Fujicolor 03	n.00
Ektacolor Plus	n.05
Duraflex	n.05
Konica SR	n.10
Konica EX	n.10
Ilfochrome A2	p.30
Variable Contrast B/W Papers	b.00

When you are finished setting the paper type and slope correction factor, press LAMP/END to save the settings.

3. Determining The Slope Correction

You can use the Colorstar 3000 to determine the Slope correction factor for any paper using the reference densitometer function. Please read the sections on automatic programming, reference densitometer, and setting slope correction factor for background information, see pages 6, 8, and 11.

You will make from one to eight sets of two teststrips exposed for 5 and 30 seconds each using different slope correction factors to compare for variations. One set of the two strips will match very well, the others will not. The slope correction factor used in the matched set is the appropriate slope correction factor to use for this paper for the exposure time range used.

You must first program (or have programmed) the Colorstar to neutral density grey, see page 11.

Set the slope correction factor to ".00" as a starting point. Using the grey negative (or slide), analyze the negative, set the lens aperture to achieve a 5 second exposure, and exposure the teststrip. Then, make another teststrip setting the aperture to achieve a 30 second exposure. Process and dry both strips. If they match in color and density then ".00" (which is actually no correction, or linear) is the appropriate slope correction factor to use for this paper with the exposure time range of 5 to 30 seconds. If they do not match, then set the slope correction factor to ".05", the next higher step, and make another set of teststrips as above. Continue making teststrip sets using the next higher slope correction factor until you have a matched set. Use the slope correction factor which produced the closest color/density match for this paper and this exposure time range.

4. Channel Selection [Procedure Flow Chart Page 27]

There are 8 different program channels to choose from. The slope correction factor and paper type you select effect all 8 program channels equally. You must be sure to set the slope correction factor for the paper you are using. Keeping a lab journal of all channel paper types and slope correction factors is helpful.

To select a program channel, press the * key once. The display now shows the channel number in use. To change the channel, press the UP or DOWN key. The display will read ch.1 through ch.8 as you scroll through them pressing the UP or DOWN key. The channels can be used for different subjects, different paper emulsions (providing they have the same slope characteristics), and for different probe covers; 4mm spot, 9mm spot, or 57mm diffusion spot. When finished selecting a channel, press the LAMP/END key to save any changes and exit the mode.

5. Program Channels & Their Values [Procedure Flow Chart Page 27]

Pressing the * key once displays the current program channel. By pressing the UP or DOWN key you can scroll through the channels. While in any channel, you can press the * key multiple times to see the program calibration numbers and other information which is special to that particular channel. (For information on the calibration procedure, refer to pages 10, 11, 13).

Each channel contains program calibration numbers (values) for yellow, magenta, and density, which together determine the color balance and exposure time for a given paper, based on the target color and density. It is important to record the various channel program calibration numbers in a log or journal for future reference. Read the following procedure to access and record the information in each program channel.

Press the * key once to display the program channel number, twice to display the Yellow program (calibration) number, three times to display the Magenta program number, four times to display the Density program number, five times to display the paper type and slope correction factor, six times to display Master Channel Yellow program number (designated as "A50" where the 50 can be adjusted between 0 and 99), seven times displays the Master Channel Magenta program number, eight times displays the Master Channel Density program number, and nine times returns to ready (or dimmed) mode. You can exit this mode at any point by pressing the LAMP/END key.

While in any of the steps above, you can change any of the calibration numbers by pressing the UP or DOWN key. If you want to put in a program you had previously recorded in your lab journal, for a particular target color or paper, you can do so in this way. The only exception is the paper type (* 5 times), this can only be changed while in the Paper Type Selection mode as described on page 6 above.

Note: Changing the yellow channel program number causes a corresponding change in filtration required when analyzing. For example, increasing the yellow program number by 1 increases the filtration requirement by 1cc. Changing the density value by 1 increases the corresponding exposure by approximately 2.5%, increasing the value by 4 increases exposure by 10%, increasing the value by 30 points effectively doubles exposure time, and increasing the density value by 100 increases exposure 10 times. All channel values are densitometric (logarithmic). The yellow and magenta program channels control cyan when used together.

6. Cosine Correction With The Probe

Whenever you use either the 9mm or 4mm spot probe cover, you should be sure that the probe faces directly at the light source, this is also called correcting "cosine". Cosine correction is accomplished by placing the probe's sensor cell at a right angle to the light source, or the enlarger. (It is important to ensure the light accurately enters the sensor). Use the clear probe cover with a hole in the top, which, when the enlarger lamp is on creates a circular shadow on the flat part of the probe. By rotating the probe on its base and tilting it toward the enlarger lens, you can adjust the location of the circular shadow so it is centered around the probe's sensor cell. When the shadow "ring" is evenly centered around the sensor, the sensor cell is at a right angle to the enlarger lens and cosine is corrected.

7. Probe Temperature Check [Procedure Flow Chart Page 29]

You can check the temperature of the probe by pressing the * and EXPOSE keys together. The display now shows the actual internal temperature of the probe. For proper function, the probe's temperature should be within 2° Celsius of the room's temperature. If it is higher than 2°C of room temperature, the probe may be improperly initialized or defective. If so, verify that the probe's calibration values match those in the Colorstar, refer to page 6 for information on initializing the probe.

8. Reference Densitometer Function [Procedure Flow Chart Page 28]

The Colorstar 3000 can function as a reference densitometer to read relative densities of film or paper. To use this function, simply press and hold the * key while pressing the ANALYZE key. The display will now read log densities. This feature is helpful when you desire to match a certain color from an older print or simply want to record processing controls. It is also used in conjunction with the Automatic Programming feature, the Master Channel Programming feature, and other basic Colorstar functions. These are explained in detail later in this manual.

In order to determine relative density for film, place the film in the enlarger, move the probe to the lightest area of the projected image (or move the film in the carrier so you can see the base area of the film between frames) and press ANALYZE again. This zeros the display, or sets the reference zero. In this case the Colorstar has eliminated the film's plastic base and the dye layer's fog level. Now, you set the film back into place in the carrier and proceed to read the densities of any area projected.

To read densities, place the probe under the area you desire to measure, let's say a person's face. The display shows the overall density (relative to the film's base plus fog), press the * key to scroll through Yellow, Magenta, and Cyan (both yellow and magenta indicator LEDs light up). You can continuously scroll through the Y-M-D Log densities by pressing the * key.

To read a print, remove any negative from the enlarger, set the filters to zero (or engage the white light lever), remove the probe's cover, place the print over the probe's cell so the lightest part of the print covers the cell, press * and ANALYZE to enter Densitometer mode, press ANALYZE again to set the zero reference point, then, move the print so the desired subject is over the probe's cell. Next, scroll through the log densities by pressing the * key. The LED indicator lights show you what is currently displayed, as described above for film.

To exit the Densitometer Mode, press the LAMP/END key three times.

9. "Nulling" The Colorstar

Often in this manual the term "null or nulling" is used. This is defined as extinguishing the Colorstar's three arrays of color LED's. To do so, press the ANALYZE key and turn the enlarger filters until the Colorstar's LEDs are extinguished.

10. Automatic LAMP Shut-Off

The Colorstar 3000 has a built-in lamp shut-off timer. If you mistakenly leave the LAMP or ANALYZE key pressed, the unit will automatically turn it off within 10 minutes.

11. Keeping A Lab Journal

In order to maintain adequate record of the many program factors of the Colorstar 3000, it is recommended you keep a lab journal with the following information for each channel you program:

Channel number; calibration numbers for Yellow, Magenta, and Density (Y-M-D); paper type and slope correction factor; master channel calibration numbers for Y-M-D; paper brand & emulsion number; chemical used; probe cover; subject color and density.

Part 4. Programming

It is helpful to understand that the Colorstar is, at the most basic level, a comparison device. Once you program it to a particular color, the Colorstar will compare what it reads or "sees" in the sensor to the color it was programmed for and guide you in setting the enlarger filters to produce that color. So, if you programmed to grey but read a skin tone, the Colorstar will attempt to make the skin tone grey, and all the other colors would be equally off balance in the print. Therefore, when you program, be sure to remember or write in your log journal, what color a particular channel was programmed for. The Colorstar will also match the density of what it reads to what it was programmed to produce. So, if you programmed a neutral density but read an area of a print that's darker than neutral, the Colorstar will make the whole print lighter. Therefore, when using the Colorstar to set the color balance and exposure time for a negative (or slide) be sure you read areas that match the color and density of the program. This procedure is the same for either slides or negatives.

Separate programs are required for different target colors, probe covers, paper batches, and paper types.

Programming the Colorstar 3000 is very easy. There are two methods, both described in detail below.

It is imperative that you set the proper paper type and slope correction factor for the paper you are using prior to programming. Refer to page 6 for information on setting paper type and slope correction factor.

1. Using A "Known Negative" [Procedure Flow Chart Page 29]

After determining the correct filtration and exposure for a given negative by trial and error, you can program the Colorstar to any color/density on the image. This procedure is described below.

- a. Using the negative you just printed 'perfectly', set enlarger filters, aperture, and enlargement height as they were to produce that print.
- b. Select the channel you desire to program by pressing the * key once, then using the UP or DOWN key to select the channel. Press LAMP to return to ready mode. Place the Colorstar probe on the baseboard, under the lens.
- c. Press ANALYZE and move the probe so its sensor (cell) is in the color area you wish to program i.e. skin tone or grey. Be sure the cosine is corrected by centering the shadow ring around the probe's cell.
- d. Press and hold down the * key then the DOWN (hold it down as well) then touch the UP key and release it - you will hear a beep and see the LED's go out, then release the * and DOWN keys. The central color star nulls automatically (the program values are automatically changed to balance the central star on this color). If some LED's remain lit or flicker then press the three keys again in the same sequence to null the LED's.
- e. Next, using the UP or DOWN key, change the digital time display to match the time you actually exposed this "perfect print" for.
- f. Press LAMP/END key (three times) to save changes and exit the mode.
- g. To record the program numbers for future use, "scroll through" the program numbers by pressing the * key and record the Y-M-D program numbers as they appear in the display.

2. Automatic Programming Without Making A Perfect Print First

The Colorstar 3000 is designed to automatically program itself to neutral density grey using the grey color negative (slide or b/w) which is included with the machine. When you initially set the unit up and proceed to program using this method you should be aware that it may take from 4 to 8 strips before the Colorstar balances its program and produces that perfect grey. Don't let this disturb you. The number of strips required simply relates to how far away the starting program calibration is from the goal.

Replacement grey test films (color negative, slide, and B/W) are available from Jobo or a Jobo dealer.

To proceed with programming, follow these instructions. (Programming for reversal printing is virtually identical to the following procedure the only exception is that in order to produce a white on the paper you will need to over expose part of the test strip. This is described below.)

Prepare test strips

- a. In total darkness, cut several 1" x 8" strips using the paper you are programming with and store them with the paper (in your papersafe or the paper box). If your processor requires larger size test strips, then cut several to the minimum size required for your processor.

Set the Colorstar's starting point

- b. Place the grey negative into your enlarger and set the filters to 60 Yellow, 60 Magenta, 00 Cyan; adjust the enlargement height to project approximately 8x10" image area; set the lens to f8. (Or, if you know that a different filtration and f-stop setting will produce a better grey on your system, then use those settings.)
- c. Turn the room lights out and press ANALYZE. Place the probe in the center of the image area on the baseboard, correct cosine, then press and hold down the following keys in this order: * _ DOWN _ UP, release all three after the beep.
- d. Using the UP or DOWN key, adjust the digital time display to read 5.0.
- e. Last, press the LAMP/END key three times.
- f. Record the channel's new Y-M-D program numbers on your log sheet.

Skip lines 'g.' through 'j.' and go directly to 'k.' now. You will return to line 'g.' later.

Analyze and expose a teststrip

- g. Place the 9mm spot probe cover on the probe. Place the probe directly under the lens, on the baseboard. (See page 23 for probe cover details).
- h. Insert the grey color negative (visually, it appears brownish in color) into the enlarger, press ANALYZE. Correct cosine. (Be sure the room lights are off here, too).
- i. Null the Colorstar's central LEDs by turning the enlarger filters.
- j. Adjust the enlarger's lens aperture so the Colorstar display reads 5.0 seconds. If some LED's light up again, adjust the enlarger filters to null them. Also, reset lens if needed to maintain 5.0 seconds exposure. When all LED's are out and the display reads 5.0, press LAMP/END (the enlarger lamp will remain on). Position your block (used to cover half the teststrip) in the projected image area so that the part of the teststrip to be exposed will be located in the center of the image. Press LAMP/END again

to turn the enlarger lamp off.

- k. With the room lights out, place one of the teststrips directly under the lens on the baseboard. Cover half of the strip. (To cover the strip, use a block of opaque plastic or a piece of smooth wood).
- l. Press EXPOSE.

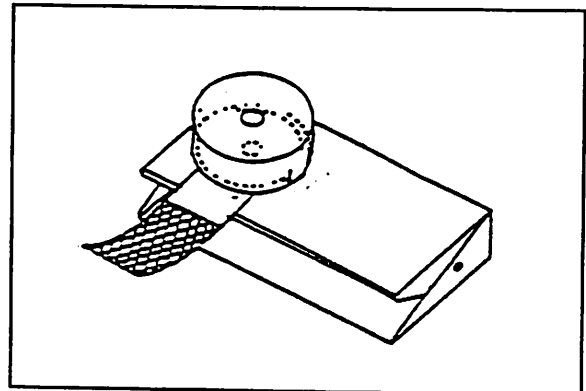
NOTE: To produce white in a reversal print (from slide) the paper must be properly overexposed. (Do this by rotating the strip so the side you just exposed is protected under the block, or use a second strip. Make the exposure using your enlarger with white light and a wide open aperture for 30 seconds.)

- m. Process and dry the strip. When dry, the strip will be half white and half colored.

Next, you will use the Colorstar 3000 as a reference densitometer to check the densities of the three colors to determine if they match the target grey which would be 0.55 (0.45 for reversal prints) for overall density, yellow, magenta, and cyan. Proceed as follows. [Procedure Flow Chart Page 28]

Read the densities of the teststrip

- n. Remove the negative from the enlarger carrier, set the filters to zero (engage the white light lever), and open the lens to full aperture.
- o. Place the probe directly under the enlarger lens on the baseboard, press * and ANALYZE together, (be sure to hold * while you press ANALYZE to access Densitometer Mode), correct cosine.
- p. Holding the probe so it does not move, insert the processed strip between the probe cell and the probe cover so the white part of the strip covers the cell.
- q. Press ANALYZE once more. This sets the reference point to zero on the white part of the strip.
- r. While holding the probe securely, slide the colored part of the teststrip over the cell. You can now read the relative log densities of the three color layers of the teststrip as follows.
- s. Overall density in LogD now appears in the display and the Density indicator LED flashes. Press the * key to read the yellow layer's log density (the yellow indicator LED flashes), press the * key again to read the magenta layer's log density, and * again to read the cyan layer's log density. Record these density numbers on your log sheet. (You may press the * key repeatedly to 'scroll' through or review the strip's density numbers.)



Insert the teststrip between diffusor and probe

If the D-Y-M-YM densities are within 0.01 of the 0.55 target (0.45 for slides) then the current program is correct and you can quit programming now. If not, then proceed with the following steps.

Automatically adjust (improve) the channel's program numbers

- t. With the colored part of the teststrip over the cell press the * key again (the display shows "ch.r" which stands for "Channel reprogram").

- u. Press both the UP and DOWN keys at the same time - you will hear a beep. (This changes the Colorstar's program numbers to 'improve' the program over the one which produced the current teststrip.)
- v. Press LAMP/END (3 times) to save the changes and exit the mode.
- w. Turn room lights back on. Record the channel's new Y-M-D program numbers on your log sheet.
- x. Disengage the white light lever, replace the grey negative (slide) in the carrier.
- y. Repeat this procedure beginning with line g. above.

After successfully completing this procedure you are ready to continue programming other channels or use the analyzer to measure unknown negatives (or slides if you programmed for reversal prints).

3. Subsequent Channel Programming [Procedure Flow Chart Page 29]

Once you have the Colorstar 3000 programmed to neutral grey, you can use the analyzer to set the filtration and exposure time for an unknown negative containing a grey patch and then, since the filtration and exposure are set and correct, program other channels for different target colors/densities in that negative. (It is helpful, though not required, to have a negative that contains a skin tone and a Jobo Color Control Card (part #6817) or a Macbeth Color Checker so you have easily recognized colors to program). To set up programs for different colors, follow this procedure.

Place your negative (slide) containing a grey card into the enlarger carrier, measure the grey and null the Colorstar's LED's. Adjust the lens aperture so the exposure time you desire appears in the display. Press LAMP/END twice to return to ready (dimmed) mode.

Now, the filter pack and exposure time are set to produce a 'perfect print'. Select any probe cover you desire, 4mm, 9mm, or 57mm partial integrated and select the desired channel number.

To change probe covers please refer to page 23 for details on changing probe covers. We recommend using one of the two spot probe covers, 9mm or 4mm for the most accurate means of measuring.

To switch channels, simply press the * key so the display reads "ch.1". While that is displayed, select any new channel you desire to program for this batch of paper by pressing either the UP or DOWN key. Pressing the LAMP key takes you out of this mode, but if you 'scroll' through the channel information, by pressing the * key, you will see the calibration numbers, master channel calibration numbers, paper type and slope correction factor, then it will exit the mode the 8th time you press it.

Press ANALYZE and place the probe into the area you wish to program, i.e. skin tone. Correct the cosine (center the shadow ring around the probe cell).

Press and hold the * key while pressing the UP AND DOWN keys, together. (This automatically adjusts the program calibration numbers for this channel to null the Colorstar's LED's).

Last, using the UP and/or DOWN keys, adjust the exposure time (in the display) to match the time you set on the grey. If the LED's flicker, press the * UP and DOWN keys again to re-null them. Then, press the LAMP/END key (3 times) to save the changes and exit the mode.

The new channel is now programmed to the color/density of the area you read while programming. Make a record in your lab journal of the program's parameters.

4. The "Master Channel"

One of the most helpful features of the Colorstar 3000 is the Master Channel. Perhaps the simplest way to describe the function of this channel is by illustrating its relationship to the program channels themselves. By pressing the * key six times, you can see the Master Channel numbers, they all start with the setting "A50", (A for ALL, 50 is the variable number).

	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7	Ch.8
Yellow Program Calibration Number	100	200	300	400	600	500	475	448
Magenta Program Calibration Number	200	300	400	500	500	400	365	532
Density Program Calibration Number	300	400	500	600	400	300	482	522
Paper Type & Slope	n.00							
Yellow Master Channel Number	50							
Magenta Master Channel Number	50							
Density Master Channel Number	50							
Yellow Combined Value	150	250	350	450	650	550	525	498
Magenta Combined Value	250	350	450	550	550	450	415	582
Density Combined Value	350	450	550	650	450	350	532	572

The Master Channel's yellow, magenta, and density values have a smaller range of 0 to 99 each. They are always preset to the middle of the range, 50, at the factory, so they can be adjusted equally in both directions, higher and lower. So, when your chemicals change you can easily adjust all eight channels by making and reading one (or two) teststrips. There are two ways to utilize the Master Channel feature of the Colorstar 3000, manually or automatically using teststrips and the grey neg/slide/b&w.

5. Master Channel, Manual Programming

The Master Channel should be used to correct all eight programs when the chemicals change causing a variation in color balance and/or print density. One way to use this feature is manually. In order to successfully recalibrate the Colorstar manually, the operator must have a 'developed eye' for seeing color faults changes in prints. In other words, if the operator sees a print the Colorstar produced and was able to visually see that it was, say 4cc's too magenta, then s/he could simply adjust the Master Channel calibration number for magenta and correct the change for all programs.

The steps in the procedure follow:

- Press the * key 6 times to reach the Master Channel for yellow. The display will show "A50" and the yellow indicator LED will flash. You can now adjust the value by pressing the UP or DOWN key. Remember that a one point change in the color value equals an approximate 1 cc change in indicated balance on the Colorstar. (Yellow and magenta together equal cyan). Once you have changed the calibration number as desired, either press the * key to advance to the next step or LAMP/END to exit the mode and save the changes.
- You can toggle between the Master Channel colors by pressing the * key 6, 7, or 8 times. The 6th time you press the * key the yellow Master Channel calibration number appears, the 7th time shows the magenta number, and the 8th time the density number. These calibration numbers may be reviewed or checked at any time. To exit this mode, simply press the * key a 9th time or press LAMP/END.

Note: the Master Channel's calibration numbers have the same effect on filtration requirements as the program values, that is, 1 point change equals 1cc change for color balance using yellow and magenta. The density calibration numbers effect the exposure time as described in the note found on page 8.

- c. After adjustment, press the * key again or press the LAMP/END key to save the changes and exit the mode.

6. Master Channel, Automatic Programming [Procedure Flow Chart Page 28]

In order to optimize use of the Master Channel, we recommend you make tests daily to maintain close control over the print process. Doing so will ensure that you maintain accurate programs each day making adjustments based on the chemical status, which is the most likely to change of all the processing variables. The Colorstar 3000 provides a very convenient method of program testing and maintenance. Follow the procedure described below.

Note: This procedure is virtually identical to "Automatic Programming Without Making a Perfect Print First" described on page 11. The only difference is that instead of recalibrating one channel "ch.r" you recalibrate the Master Channel "a.r".

- a. Make a teststrip from the grey negative as described earlier in this manual, process and dry it. Insert it into the probe using the 9mm spot cover and the plastic diffusor attached.
- b. Read the densities of the three colors and overall density by pressing the * key four times. If they do not match the target densities of 0.55 (0.45 for reversal prints), then press the * key a 5th and 6th time. The display will read "a.r" which indicates the Master Channel (the "a" stands for All, the "r" stands for Reprogram).
- c. Then, to automatically reprogram the Master channel, press the UP and DOWN keys *at the same time*.
- d. Press the LAMP/END key (3 times) to save the changes to the Master Channel calibration numbers and exit the mode.
- e. Now, verify that the new program provided adequate adjustment to produce a neutral grey print by making another teststrip (follow these instructions starting at "a.")

Part 5. Making Prints

1. Basic Analyzing

After programming the Colorstar to a target color and density, you are ready to start using it to determine filtration and exposure for unknown negatives. Following are instructions for basic analyzing.

- a. Install the probe cover used in the program channel selected, 4mm spot, 9mm spot, or 57mm partial diffusion spot. (Refer to your log journal).
- b. Place the unknown negative into the enlarger carrier.
- c. Press ANALYZE
- d. Place the probe in the image area that matches the targeted (or programmed) color/density. For example, if you programmed for skin tone, place the probe on a skin tone in the projected image.
- e. Correct the cosine (if using the clear spot probe cover) by centering the probe's sensor cell within the projected shadow ring.
- f. The Colorstar's central LEDs will light up in one or two arrays. If the yellow is lit, increase yellow filtration until the yellow LEDs are out. If magenta LEDs are lit, increase magenta filtration until they are out. If cyan (green) LEDs are lit, reduce both yellow and magenta filtration together. Experiment with the enlarger filters to get used to balancing the colors using the Colorstar as your guide. At first it will take a while to null out all of the LED's, but as you get used to do this it will take less and less time.
- g. When all LEDs are nulled, the color is balanced. Correct exposure time is displayed in the digital display. It is recommended to standardize on the exposure time used when you calibrated the channel. This eliminates the chance for reciprocity failure. To change the exposure time, simply adjust the lens aperture until the desired exposure time appears in the display. If any LED's light up after adjusting the lens, re-null them using the enlarger filters.
- h. Press LAMP/END to disengage the ANALYZE mode. Set the probe aside. The enlarger lamp remains on so you can adjust the focus or finalize composition.
- i. Press LAMP/END again to turn the enlarger lamp off and dim the facelights of the Colorstar.
- j. Place the unexposed paper onto the easel or baseboard and press EXPOSE. The Colorstar will begin the exposure. To engage the audible countdown timer, press the * key during the exposure. (If you want to turn the audible timer off, press the * key again during exposure).
- k. Process and dry the print.

2. Analyzing with the Averaging Feature

With most color analyzers you analyze one spot on the image which matches the programmed color and density, the Colorstar 3000 allows you to read and average up to 8 spots. Averaging several spot readings provides a more accurate reading. When using averaging the color and density of the readings are averaged. You can take the readings using white light (no filters) and a wide open lens. The procedure follows.

- a. Press ANALYZE and place the probe in the first spot to be read.

- b. Press ANALYZE again. A beep signals that this point has been read and stored. The LED indicator above the ANALYZE key begins flashing. You can now place the probe in the second spot to be read.
- c. Press ANALYZE again, the beep signals this spot is also stored. You can proceed with this method to take up to 8 readings. You will know when you've reached 8 because the beep will cease after 8 readings. (Overshooting the number of readings will not adversely effect the previous readings).
- d. You can take 2 to 8 readings and average them. After taking the last reading, leave the probe in that position and null the Colorstar by turning the enlarger's filters.
- e. Set the enlarger lens aperture to achieve the exposure time you desire. (All times indicated in the display will be correct). Then, press the LAMP/END key to save the settings. The enlarger lamp remains on for final focussing, etc.
- f. Press LAMP/END a second time to turn the enlarger lamp off.
- g. Place the unexposed paper onto the easel or baseboard and press EXPOSE. The Colorstar will begin the exposure. To engage the audible countdown timer, press the * key during the exposure. (If you want to turn the audible timer off, press the * key again during exposure).
- h. Process and dry the print.

3. "Reference" Analyzing

There are times when the enlarger's light output is not sufficient for the Colorstar 3000, such as when you make very large prints or when the negative is very dense. You will know that the situation is beyond the Colorstar 3000's range when, while analyzing, the LED's begin to blink or flash, indicating that the light is too low for proper color reading. To determine proper filtration and exposure for these printing situations, use the "Reference" method of analyzing as described below.

- a. Place the negative into the enlarger carrier, press ANALYZE, open the lens fully, engage the white light lever, or set filters to 0-0-0. (If the LED's still blink or flash, move the probe close to the lens).
- b. Press ANALYZE again to store this reading. If desired, you can average several readings. Leave the probe at the last point.
- c. Remove the *negative from the carrier*. Press both the UP and DOWN keys together to store the reference measurement. A double beep signals confirmation.
- d. If you had to move the probe closer to the lens to stop the LED's from blinking or flashing, place the probe into position where the paper will be exposed. Otherwise, leave the probe where it was at the last point.
- e. Turning the enlarger filters, null the LED's of the Colorstar. Set an appropriate aperture to obtain an adequate exposure time. (All times displayed are correct, but you should have at least a 5 second minimum time).
- f. Press the LAMP/END key to store the readings.
- g. Replace the negative into the carrier, place your paper for exposure and press EXPOSE.

- h. Process and dry the print.

<p>Note: Color balance characteristics of most papers vary with exposure time changes. Therefore, you may need to program the Colorstar for longer exposure times.</p>
--

4. Exposure Interrupt and Resume

Exposures may be interrupted, resumed, interrupted, resumed, or canceled. Simply press EXPOSE to begin an exposure, press it again to interrupt it. If you desire to cancel an exposure, interrupt the exposure by pressing EXPOSE, then press LAMP/END to cancel it.

5. Audible Countdown Timer

The audible countdown timer (a beep at one second intervals) can be switched on and off by pressing the * key *during* an exposure. (Touching the * key during exposure does not effect the exposure time).

Part 6. Black & White

The Colorstar 3000 is designed to perform exceptionally well in B/W printing. The standard color probe functions well, however, the optional Density Probe (#316331) is specifically made for use with variable contrast papers. For more information on the Density Probe refer to page 20.

1. Select B/W Paper Type

Set the paper type to b. and the slope to 00. (See page 6 for details).

Note: the central LED's will not light up in ANALYZE mode while the black & white paper type is selected. By pressing the * key you can "scroll" through the channel number, density value of the current channel, paper type (b.00), and the Master Channel's density number (initially set at A50).

2. Calibrating With a Known Negative

If you have a negative for which you know the proper exposure time, you can use the following method to quickly program the Colorstar.

- a. Insert the negative into the enlarger carrier, set the height and lens aperture to the "perfect" settings.

Note: For variable contrast paper only: If you are using the optional Density Probe, use contrast filters. If you are using the standard (color) probe, use the white light lever on your enlarger (or set filters to 0).

- b. Press ANALYZE and place the probe on target area.
- c. Press and hold the * key while pressing the UP and DOWN keys at the same time.
- d. Next, using the UP and DOWN keys, set the proper exposure time in the display.
- e. Press the LAMP/END key, before moving the probe, to save the program and exit the mode.

Now, by pressing the * key twice, you can read the density channel value and write it in your lab journal for later reference. Also, manually increasing or decreasing the density value results in higher or lower exposure times when analyzing. (Refer to the note on page 8 about the effects of changing the density value).

3. Paper Grade Determination

The spot probe can be used to determine the contrast range in the negative so you can determine the proper paper grade to use. Follow these instructions.

- a. Press * and ANALYZE together. This accesses the densitometer mode.
- b. Place the probe in the lightest part of the projected image where there is still detail visible.
- c. Press ANALYZE (STORE). The display now reads 0.00.
- d. Now, place the probe in the darkest area of the image where detail is visible.
- e. The display now shows the contrast of the negative. In order to determine which paper grade is called for, press the DOWN key. The display now shows the paper grade to use. (The contrast grade will be displayed in steps of 0.5 from grade 0 to 5).

4. Variable Contrast & The Density Probe.

The Density Probe (#316331) reads the exposure time directly for any contrast filter pack using either a regular color head or a variable contrast module.

The standard color probe does not function this way. It requires that you take readings with the enlarger's white light lever engaged, then to enter the filter packs afterward. A special filter package or VC module is necessary to ensure constant exposure time for all paper grades.

5. B/W Measuring Methods.

You can use the same probe covers as with color, 4mm and 9mm spot, 57mm partial diffused spot, and full integration. Averaging can also be utilized. A Density Probe Easel is also available.

6. B/W Program Maintenance

Using the black & white grey test negative provided with the Colorstar, you can use the automatic reprogram feature to maintain accurate programs. This procedure works best with paper grade 3. Refer to the section on Automatic programming for procedural details, see page 11, 13.

Part 7. Miscellaneous

1. Optional Probes and Accessories

The Colorstar 3000 includes the standard color probe, which can be used for virtually all processes. There are optional specialized probes available.

- a. The Density probe is designed to measure exposure time only. It is more sensitive and specially designed for use with variable contrast papers.
- b. Easel probes are another option. They incorporate fiberoptic cells placed evenly across the easel's surface. These probes can save time by reducing the number of measurements required. Their sensitivity and accuracy are also optimized.
- c. The standard spot probe comes with a sheet of plastic diffusion material specially formed to fit under the clear probe cover. This is a very important addition to the spot probe cover. It diffuses the light entering the cell providing a better reading and it reduces cosine effect. It should be used whenever the clear spot cover is in place.
- d. Also included with the Colorstar is a 4mm disc which fits under the clear spot probe cover, effectively reducing the spot size. This is for reading small areas with greater accuracy. The spot diffusion disc should remain on the clear probe cover when the 4mm disc is used.

2. Troubleshooting

Below is a short list of possible problems and how to address them.

- a. Blinking or flashing LED's in the central star indicates that the volume of light is not sufficient to correctly measure color balance. Open the lens aperture or reduce the enlargement height to read color balance. Then close lens or raise enlarger, respectively, and set exposure time (letting the LED's blink).
- b. The display reads "O.FL". This indicates that the exposure time exceeds 999 seconds or the Log Density exceeds 9.99.
- c. The display reads "-.-". This indicates that the density (light intensity) is less than 0.99 Log D.
- d. The display reads " E". This indicates an equipment error. The unit requires repair. Please call 313-995-4192 extension 159 for instructions on obtaining repair services.
- e. The display and panel lights do not function.
 - 1) Verify that the main power cord is connected.
 - 2) Verify that the Colorstar's voltage matches the power supplied. Voltage label located on rear panel of Colorstar.
 - 3) Check the two fuses. If one or both have blown, replace them. They are also labelled on the rear panel of the Colorstar.
- f. The enlarger lamp does not function when ANALYZE or LAMP is pressed.
 - 1) Verify the enlarger lamp is good by connecting the enlarger directly to electrical outlet. If it still does not work, replace the lamp or seek repair.
 - 2) Check the bottom fuse (6.3 AT). If it is blown, replace it.
 - 3) Check the power cord and plug.

g. The central color "star" LED's do not light up in ANALYZE mode.

- 1) Verify that the probe cord is properly inserted into the Colorstar.
- 2) Press the * key 5 times and verify you have a paper type other than "b.--" selected.
- 3) Get the probe cord and plug checked for broken wires.

h. After nulling the star, the LED's change. They are not constant.

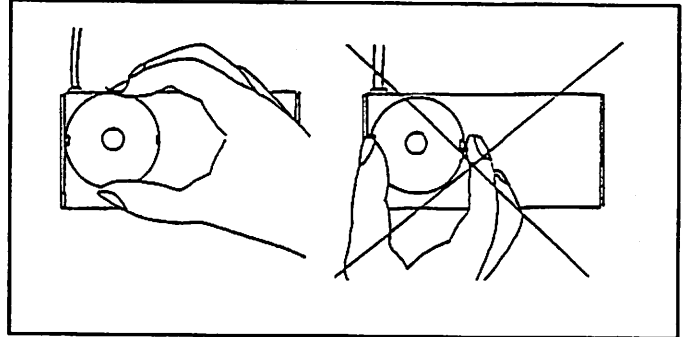
- 1) Test this with the following procedure:

Place the grey negative in the carrier. Press ANALYZE and open the lens fully. Null the LED's by turning the enlarger filters. Now, close the lens aperture one stop at a time. (One LED may light up, but in general, the balance should remain fairly constant throughout the range). The end of the range is indicated by blinking or flashing LED's.

If the LED's change significantly, the probe is either defective or needs recalibration. Call for service (see section above for telephone number and extension).

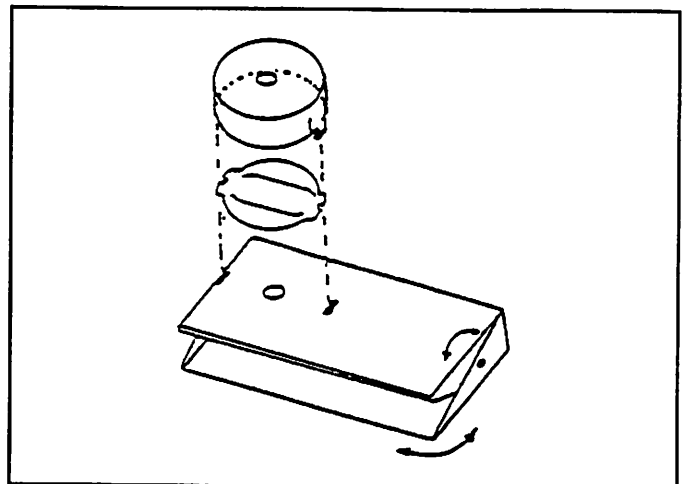
3. Probe Covers & Accessories

There are three different probe covers to choose from, 4mm spot disc (#16116), 9mm clear spot cover (#6343) always used with spot diffusor (#6344), and 57mm partial integrated spot (#81151). When changing covers, be careful to follow the procedure outlined on page ? and illustrated here.

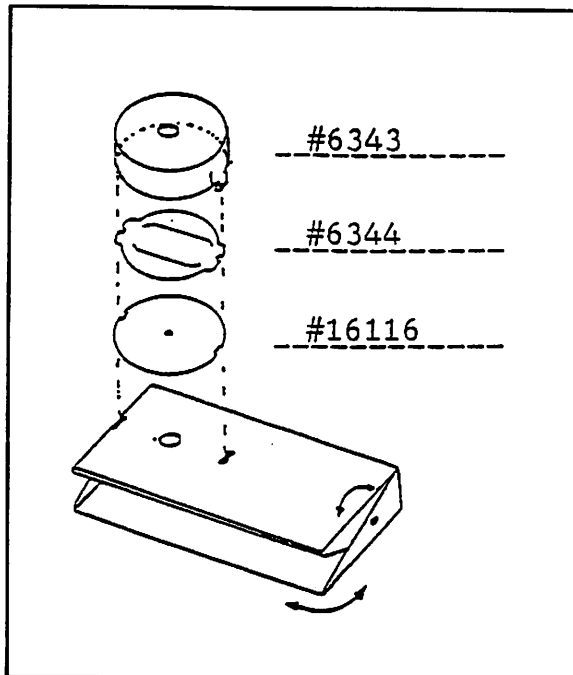


Changing Probe Covers

To install the 9mm spot, carefully remove the existing probe cover. Place the diffusion disc between the metal probe and the clear plastic probe cover, snap it into place on the probe cover. Then, carefully place the probe cover, with diffusion disc attached, onto the probe itself as illustrated.



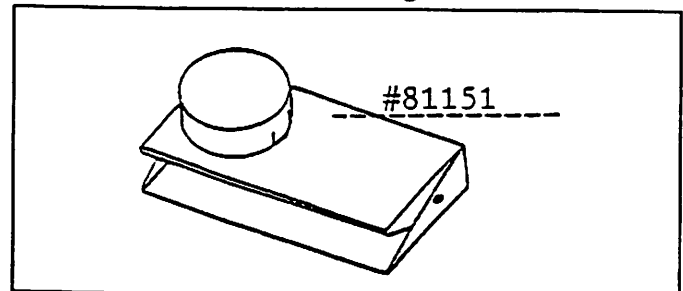
Configuration for 9mm Spot



Configuration for 4mm Spot

For smaller print sizes and the ability to take precise readings, use the 4mm spot. Refer to the illustration. Be sure the 4mm spot disc is placed so the white side faces the enlarger and the black side is down (facing the probe).

The 57mm partial diffusion cover is useful for measuring larger areas, particularly when programmed for neutral and reading scenics or other areas where the small spot does not cover enough area. See below.



57mm Partial Diffusion Probe Cover

4. Warranty

The Colorstar 3000 comes with a one-year limited warranty. Please read the conditions on the enclosed warranty card for details.

Part 8. Specifications

Probes	Uses, Specifications
Standard Color Probe	Use for color or black & white. 4mm, 9mm, 57mm partial integrated. Optional: 1mm "Pencil Probe" for slide duplicating
Optional Probes	Density Probe used for B/W variable contrast papers. Probe easels for color or B/W.
Colorstar 3000 Functions	Specifications
Averaging	Measures up to 8 spots and automatically averages them for both exposure time and color balance.
Reference Measuring	The Colorstar measures and memorizes negative characteristics, then measures light output without the negative in place. Use for very large prints.
Densitometer Function	Range: - 0.99 to 9.99 Log Density and Log yellow, magenta, cyan. Utilizes enlarger as light source. Reference numbers are accurate, but not normal densitometer types.
B/W Paper Grade Determination	Indicates needed paper grade in steps of 0.5 ranging from 0 to 5.
Probe Temperature Reading	Displays probe's internal temperature in steps of approximately 0.3° C.
Paper Type Selection	Color negative, color slide, and black & white processes.
Slope Correction	Correction factors from .00 to .35 in steps of .05. This adjusts the Log exposure multiplier between 1.00 and 1.35.
Program Channels	Eight.
Program Value Range (Yellow, Magenta, & Density)	0 to 999 (9.99 Log). Each channel has the same range.
Master Correction Value Range (Yellow, Magenta & Density)	0 to 99 (preset to middle of range, 50 to maximize adjustment range both higher and lower). Affects all eight program channels equally.
Programming From "Known Neg"	Automatically sets program values to null the LED's while probe sensor is reading the properly balanced target color density of a "known negative".
Automatic Programming & Re-Programming	Automatically recalibrates Y-M-D values after reading grey teststrips. Used for calibrating individual channels and/or the Master Channel.
Colorstar LED display	4 LED's per array, 3 arrays of yellow, magenta, and cyan. The first LED indicates color balance within 1cc, each additional LED indicates additional 4cc's.
Timer Specifications	
Exposure Timer	Exposure time range: 0.00 to 999 seconds. Count-down display and audible beep. Exposures may be interrupted and resumed or canceled.
Auto Shut-off	After 10 minutes, the enlarger lamp will automatically shut off.
Electrical Specifications	
Circuit and Memory	Micro-controller with EPROM chip.
Internal panel illumination	Yellow 580nm. Illumination intensity is dimmed when enlarger switched off.
Main Voltage	100 to 120 volts AC, 60 Hz.
Switching Capacity	Maximum 6 Amps. (700 VA at 117 volts)
Fuses	100 Ma and 6.3 A (slow); 5x20mm.
Power Consumption	6 VA.
Dimensions	
Keyboard	6.1" x 6.1", height at rear of wedge 2.5", at front of wedge 0.5".
Spot Probe	3" x 6.1" x 0.9"
Cord Lengths	Probe cord: approximately 6'. Power cord: approximately 8'.

Part 9. Quick Start Instructions

If you desire to begin using the Colorstar 3000 immediately for color printing from negatives, follow these instructions. But, please read the entire instruction book to learn all of the outstanding features of the machine.

To do this.

Info found on page:

Set paper type and slope correction factor page 6

Program the Colorstar using a negative which just printed "perfectly" page 10

- OTHERWISE -

Program the Colorstar automatically using grey negative included page 11, 13

If you desire to program to another color than grey page 11, 13

How to analyze a new, unknown negative page 16

How to average several spot readings for more accurate balance page 16

Making an exposure page 16

To turn the audible countdown time on and off page 18

Procedure "Flow Chart"		
Starting Point	Key Stroke(s) or Action	Result
Check Probe Calibration		
Power off	ANALYZE _ Power on	number 1
	*	calibration number (match it to bottom of probe #1)
	*	number 2
	*	calibration number
	*	number 3
	*	calibration number
	*	number 4
	*	calibration number
	*	number 5
	*	calibration number
	LAMP/END	stores changes, exits mode (returns to ready mode)
Set Paper Type and Slope Correction Factor		
Power off	* _ Power on	Current paper type and slope correction factor displayed
	DOWN	scrolls through paper types: p. n. b.
	UP	scrolls through available slope correction factors: 05, 10, 15, 20, 25, 30, 35
	LAMP/END	Saves changes, returns to ready mode

Procedure "Flow Chart"		
Starting Point	Key Stroke(s) or Action	Result
Channel Selection		
Ready	*	Displays current channel number: 1 through 8
	UP or DOWN	scrolls through channels; stop on any channel
	*	displays yellow calibration number (UP or DOWN key changes calibration number)
	*	displays magenta calibration number (UP or DOWN key changes calibration number)
	*	displays density calibration number (UP or DOWN key changes calibration number)
	*	displays paper type and slope correction factor
	*	displays Master Channel yellow calibration number (UP or DOWN key changes calibration number)
	*	displays Master Channel magenta calibration number (UP or DOWN key changes calibration number)
	*	displays Master Channel density calibration number (UP or DOWN key changes calibration number)
	* - OR - LAMP/END	selects last channel displayed and returns to ready mode (press LAMP/END anytime in this sequence to exit)

Procedure "Flow Chart"		
Starting Point	Key Stroke(s) or Action	Result
Reference Densitometer, Automatic Programming, and Master Channel Programming Modes		
Ready	* _ ANALYZE	Reference densitometer mode
	ANALYZE	sets reference point to zero: (move probe to desired area on film or print) Display reads overall density in LogD: density indicator LED begins flashing
	*	display reads yellow in LogD: yellow indicator LED begins flashing
	*	display reads magenta in LogD: magenta indicator LED begins flashing
	*	display reads cyan in LogD: yellow & magenta indicator LEDs begin flashing
	*	display shows "ch.r" or Channel Reprogram. (Pressing UP and DOWN keys together resets <u>channel</u> calibration numbers based on area measured - only use this when using Automatic Programming sequence)
	*	display shows "a.r" or All Reprogram. (Pressing UP and DOWN keys together resets <u>Master Channel</u> calibration numbers based on area measured - only use this when using Master Channel Automatic Programming sequence)
	You may review the density readings by continually pressing the * key. The indicator LEDs show which color (or overall density) is displayed.	
	LAMP/END	exit densitometer mode, returns to ANALYZE mode
	LAMP/END	exit ANALYZE mode, remains in LAMP mode
	LAMP/END	exit LAMP mode (enlarger lamp turns off)

Procedure "Flow Chart"		
Starting Point	Key Stroke(s) or Action	Result
Program Using Known Negative (Or Slide)		
Ready	<p>First, make a perfectly color balanced print from your negative. Be sure the enlarger filters, aperture, and height are set as for the perfect print.</p> <p>[If you have programmed using the grey neg and Automatic Programming, then you can use that channel to calibrate another channel using the same paper but a different subject, first use the programmed channel to determine the correct filtration on your target neg measuring grey, set exposure, then select a different channel and proceed with this sequence]</p>	
	ANALYZE	analyze function engaged, the 'star' LED's indicate needed filtration, or color imbalance (at this point, the Colorstar program is incorrect - the next steps correct it)
	Place the probe in the target area (the color and density you want to program for, i.e. skin tone, neutral grey, etc.).	
	* _ UP _ DOWN	resets this channel's calibration numbers to null the 'star' while reading the target color (do not move the probe)
	UP or DOWN	adjust the exposure time in the display to match the exposure time of the 'perfect' print
	LAMP/END (x3)	saves changes, returns to ready mode
Probe Temperature Check		
Ready	* _ EXPOSE	internal temperature of probe displayed in °Celsius

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[Revision 4.0]

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