COLOR STAR 3000
COLOR ANALYSER

USERS MANUAL

JOBO

CONTENTS

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COLOR STAR 3000

STEP-BY-STEP INSTRUCTIONS

1. When unpacking, please check if all items are present:

```
Items normally included in delivery:
3100 Colorstar 3000 keyboard
 173 Carrying case
 174 This instruction book
 211 Grey test negatives/slides (35mm)
 600 Colorstar spot probe
 104 Probe diffuser
 106 4mm spot disc
 151 Clear spot probe cover
 152 Diffuser for spot probe cover
 155 Sheet of diffusion material 7x7cm
 196 Daylight reducer for spot probe
 199 Mounting strip for daylight reducer
     Guarantee card.
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2. Check the mains voltage. Connect the power cord, the enlarger, and the probe. (see par. 1). Switch on.
3. Check the temperature indication (see par. 11). Press the LAMP (=END) key to return to time display.
4. Set the analyser to your paper type (see par. 7). Note: *Never* press the ✻ key or any other key while switching the power *off*. This may disturb essential data in the memory.
5. Press the ✻ key and select channel 1 with the ▲ and ▼ keys (see par.8).
6. Pressing the ✻ key 3 more times displays the Y-M-D values. The Y-M-D values of channel 1 need to be preset to approximately correct values before starting the 'CALIBRATION WITH THE GREY-TEST NEGATIVE'.
   - For automatic presetting you can use the Autoprogram method (see par. 12). This requires a negative for which the filter settings and exposure time are known (i.e. one printed just before you started to install this color analyser).
   - If you do not have a 'known negative', you can preset to approximate Y-M-D values according to the table of par. 25
7. Pressing the ✻ key again displays the paper type.
8. Pressing the ✻ key again (1,2, and 3 times) displays the Master Y-M-D values. Check if they are all set to A50

and correct them if necessary with the ▲ and ▼ keys. Then press LAMP/END.
Next, improve the calibration as follows:

CALIBRATION WITH THE GREY-TEST NEGATIVE

Use this procedure whenever you change paper, and also as a daily check on the condition of your chemicals. This enables the analyser to correct for these changes, ensuring constant print quality.

1. Make a test print as outlined in par. 14 (steps 1 to 6).
2. You can use the analyser as a densitometer to measure the testprint, see par. 13, and also steps a to d of par.14. The print should become neutral grey. This is sufficiently accurate if the LogY, LogM and LogC values are approx. 0.55 and equal to each other within 0.02.
3. If this is not the case, you should correct the Y-M-D values of channel 1, using the 'reprogram' function, see par. 14 steps A) to C).
4. Now make a new testprint, starting with step 1 above, to check the new calibration. If necessary, improve the calibration again with the 'reprogram' function.

After calibrating channel 1, you can use this to install some other channels:

To calibrate channel 4 for semi-integrated measuring:
- Do step 1 to 4 of par.14 again
- Replace the spot measuring device with the white probe diffuser.
- Select channel 4
- Do the Autoprogram function: ANALYSE/ ✻ ▼ ▲/ 5.0 seconds/ LAMP.

To calibrate channels 2 and 5 for warm tone instead of neutral:
- Insert almost the same values of channels 1 and 4, but subtract 4 points from Yellow and 2 points from Magenta. (Or 6 and 3 points, for an even warmer tone)

To calibrate channel 3 for spot measuring on flesh tone:
- Copy the values of channel 1, but subtract 12 points from Yellow and Magenta, add 9 points to the Density.

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3

The set-up sheet provides a list for your channel values. As an example, we printed the set-up of the analyser in our darkroom below. These values are subjective. You may want to change them to suit your purposes better. In any case, do not change the values for channel 1 anymore. Continue to use this channel for calibration but, after the initial calibration make the corrections only on the Master values (See par. 17). Your channel set-up, once established will remain a constant factor. The Master corrections ensure that changes in the chemicals and paper are automatically corrected for all channels.

ANALYSE AND EXPOSE

The measuring method as described below (semi-integrated with averaging) is most convenient to begin with. You should use the white diffusion cover on the probe, and select channel 5 for most subjects, since channel 4 may be too cool for many purposes.

Insert your own negative.
1. Press ANALYSE. Open the lens aperture and adjust to white light (filters at zero). Note: This is not a requirement, but it does facilitate composing, focusing and selecting your test-points.
2. Put the probe on an area where you see a mixture of colors and an average density. Avoid dominant colors and very bright or dark areas. Press ANALYSE again. A beep-signal confirms that this measurement is stored for averaging.
3. Choose another neutral or mixed area for the probe and press ANALYSE again to store it. Repeat this a few times (You can store up to 8 readings). Leave the probe at the same spot after storing your last measurement, don't move it again.
4. The Color Star display now indicates the filters that you need to use (generally Y and M). Turn the filters in again and adjust them until the LEDs of the star go out (use only 2 filters, see par. 6c and d). Adjust to the required aperture, observing a minimum exposure time of 3 seconds.
5. Press LAMP/END to end analysing. The exposure time is now stored and you can remove the probe.
6. Press LAMP again to switch the enlarger off. Put your paper down and press EXPOSE.

Try a number of relatively easy negatives this way. Compare your prints, considering the areas where you took the measurements, and how this influenced the end result. In this way you gain experience before you start using the analyser for more difficult subjects.

An example of a channel set-up

| Chan	Measuring method	test color		Y	M	D
Ch.1	Spot 6mm	Grey		595	542	534
Ch.2	Spot 6mm	Warm		589	539	534
Ch.3	Spot 6mm	Portrait		583	530	543
Ch.4	Semi-integrated	Grey		613	547	506
Ch.5	Semi-int	Warm		609	545	507
Ch.6	Semi-int	Portrait		607	541	514
Ch.7						
Ch.8						

PART 1: THE COLOR ANALYSER

1 CONNECTING

'Piggyback' power plugs (one cord):
Connect the enlarger to the plug (1).
Other power plugs (two cords): Connect
the enlarger to the trailing socket.
The probe is connected to the sensor
connector (2). At first use, or when
connecting another probe, please check
the probe set-up according to par. 27.
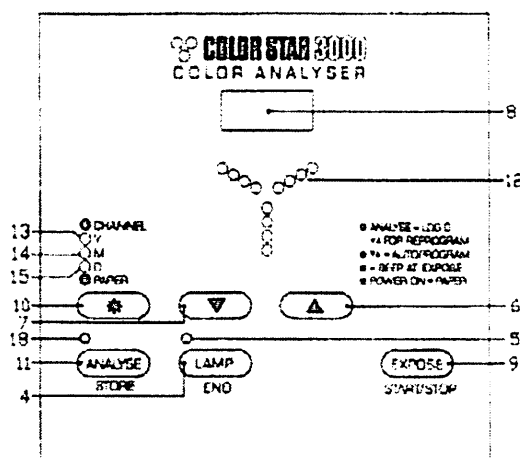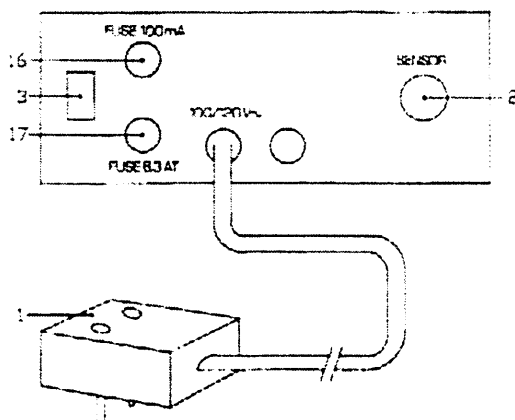
2 SWITCHING ON

The analyser is switched on with the power
switch (3) at the rear of the keyboard. The
enlarger lamp lights up for a short
moment and goes off again.

3 SWITCHING THE ENLARGER LAMP

The lamp is toggled on and off with the
LAMP key (4). The LED (5) indicates this.

AUTO LAMP-OFF: If you forget to switch
the enlarger lamp off, this is done
automatically after 5 minutes.

4 MANUAL SETTING OF EXPOSURE TIME

The exposure time as indicated by the
display (8) can be adjusted manually by
using the ▲ and ▼ keys (6) and (7). The
change continues, first slowly and then
faster if one of the keys is held down.

5 EXPOSING

a   An exposure is made, by first switching
    off the enlarger with the LAMP key (4),
    then putting the paper down, and pres-
    sing the EXPOSE key (9).
b   Exposures may be interrupted with the
    EXPOSE key (9) and resumed again.
c   On the display (8) the exposure time
    counts down. If you want to hear a
    beep signal (1x per second), you need
    to press the * key (10) once during
    count-down. It can be switched off in
    the same way.
d   The exposure may be ended, using the
    LAMP/END key (4). The original
    exposure time returns on the display.

6 ANALYSING

a   In order to analyse, place the probe on
    a selected part of the projected image,
    using the chosen probe accessory (See
    part 3 for measuring methods).
b   Before using the analyser, it should be
    programmed to the enlarging paper
    you are using. See par. 7 onwards.
c   To start analysing, press the ANALYSE
    key (11). The Color Star (12) will light
    up in one or two colors (Yellow,
    Magenta or Cyan).
d   If you see Yellow LEDs lit, the Yellow
    filter of your enlarger must be
    increased until the Yellows LEDs go
    out. If you see Magenta LEDs light up,
    do the same with the Magenta filter.
    Always use only two filters at the same
    time. If you see Cyan LEDs light up,
    then first lower the Y and M filtration.
e   If all LEDs are out, the color balance is
    correctly adjusted. The correct
    exposure time is then indicated by the
    display (8).
f   Afterwards, end analysing by pressing
    the LAMP/END key (4). This must be
    done before removing the probe.

7 SELECT PAPER TYPE

Adjust the analyser to the paper type that you are using, as follows:

- Switch the analyser off, press the * key and while holding this key down, switch the power switch (3) on again. The present paper type adjustment is now displayed. Example:

$$\boxed{\text{n.00}}$$

This is correct for color negative process. For transparency printing, select **P.30**. For black and white, select **b.00**:

- Use the ▼ key to select the process:
  n= negative (color negative process)
  p= positive (printing color slides)
  b= black and white process
- Use the ▲ key to select the slope:
  00 = linear
  05 to 35 = exposure time correction for paper reciprocity failure.

Afterwards press the LAMP/END key (4) to end the adjustment procedure.
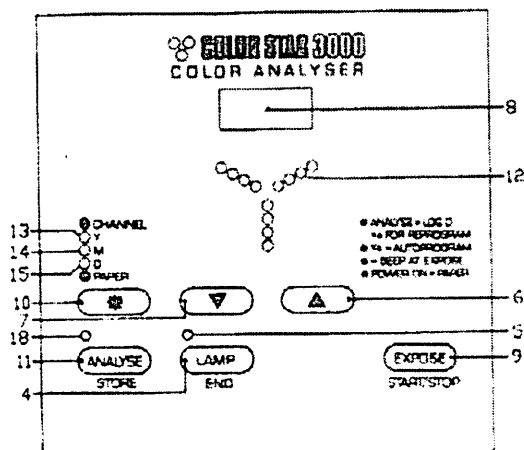
8. SELECTING A CHANNEL

Press the * key. The display indicates the paper channel in use. Example:

$$\boxed{\text{ch.8}}$$

You can use the UP/DOWN keys to change to another channel. The channels are mainly used for:
a. different measuring methods.
b. different subjects.

The **Y-M-D** channel values control the color and density. They are stored in the program memory (See par. 28 (T)).

9 CHANGING THE CHANNEL VALUES

Press the * key again. The Yellow indicator (13) will now blink and the **Yellow** channel value will be displayed, a number between 0 and 999. Example:

$$\boxed{604}$$

This value may be changed with the UP/DOWN keys. Each point increase in the Yellow value results in 1 point higher filtration when analysing.
By pressing the * key again, the Magenta indicator (14) starts blinking and the **Magenta** channel value is displayed. Increasing or decreasing this value leads to higher or lower M-filtration.

> Note: If the Yellow and/or Magenta filtration is at zero, lowering the Y- and M-program values will result in a corresponding Cyan filtration. These 2 values govern all 3 colours.

The Density indicator (15) will blink if the * key is pressed for the fourth time, and now the **Density** channel value is displayed. Increasing or decreasing the Density value with the UP/DOWN keys will result in higher or lower exposure times, when analysing.

> Increasing with 1 point corresponds to approx. 2.5%, and 4 points with 10%; 30 points results in a doubling of the exposure time, and 100 points equals ten times. All channel values are densitometric (Logarithmic).

The channel changes must be confirmed and ended with the LAMP/END key.

Apart from manual changes, the channels may also be programmed automatically, using the 'Autoprogram' or 'Reprogram' functions. See paragraphs 12 and 14.

10 PAPER TYPE INDICATION

When the * key is pressed for the fifth time, the paper type is displayed. It cannot be changed now (only as indicated in par. 7). Pressing the * key again will show the Master values, see par.17.

11 TEMPERATURE DISPLAY

The probe temperature can be displayed, by pressing the EXPOSE key (9), while holding the * key down. Example:

$$\boxed{20.6}$$

The reading should correspond to an ordinary thermometer, in Celsius, within 1 or 2 degrees. Larger differences may indicate that the probe is not properly set up, or defective. Check the set-up according to par. 28 (R).

12 CALIBRATION WITH A KNOWN NEGATIVE ('AUTOPROGRAM')

For calibration of the analyser you may use a negative for which the correct filtration and exposure time are already known, because you have recently printed it.

a. Insert the negative in the enlarger and adjust to the known filtration and aperture. Also set the enlarger height correctly.

b. Press the ANALYSE key and place the probe at an appropriate part of the projected image (See measuring methods).

c. Now press the * key (10) with one finger, and while holding it down, use two other fingers to press the UP and DOWN keys (6) and (7) together. The Color Star (12) is now balanced automatically.

d. Next, use the UP and DOWN keys to adjust the display (8) to the correct exposure time for this negative.

> You need to hold the UP or DOWN key for some time, if the display starts at O.O or O.FL.

e. Then press the LAMP/END key (4) to confirm and end the programming procedure.

Only after this step, the probe may be removed.

Note: Press the * key (10) several times now, and note the channel no., the Y-M-D values obtained, and the paper type, on a log sheet, also indicating what measuring method was used. Keeping track of these data is helpful if sudden problems arise with papers or the chemical process.

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13 DENSITY TEST

The *ANALYSE command changes your Color Analyser into a Densitometer. You can use your enlarger (set to white light) as a light source. Turn the lens fully open.
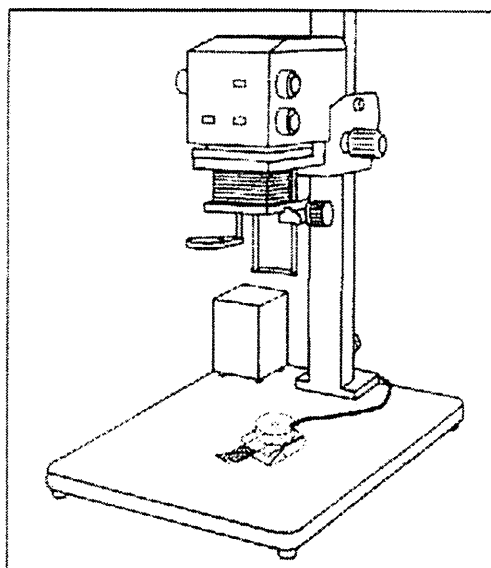
To measure the dye densities of a test strip or photo

1. Press the * key and while holding this down, press the ANALYSE key.

2. Enter the paper into the spot probe by slipping it under the spot device.

3. First position a white part of the print over the cell, and press ANALYSE to null the reading.
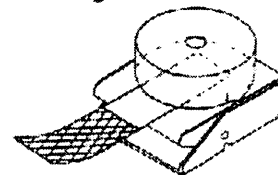
4. Then position the area to be tested over the cell, and read the display. Example:

$$\boxed{0.55}$$

The displayed value is the average density of the 3 dyes. To read the individual Yellow, Magenta, and Cyan densities, press the * key (10) several times:

```
*      read LogY    (Y-LED (13) blinks)
**     read LogM    (M-LED (14) blinks)
***    read Log C   (LEDs (13) + (14) blink)
```
The density test is ended with the LAMP/END key (4).

14 REPROGRAMMING WITH THE GREY TESTNEGATIVE

After calibrating a channel tentatively, e.g. with the Autoprogram method, you can analyse and print the grey test negative. The testprint should become neutral grey. Make a test print regularly to check the condition your paper and chemicals. Process variations may be compensated for by changing the Y-M-C channel values, either manually, according to par. 9, or automatically, using the REPROGRAM method.

Always make the test print like this:

1. Insert the grey negative in the enlarger and project it to size 8x10 inch.
2. ANALYSE with the regular spot cover on the probe, placed centrally under the enlarger lens.
3. Null the Color Star by adjusting the enlarger filters.
4. Adjust the aperture for an exposure time reading of 5 seconds.

$$\boxed{5.0}$$

End analysing with the LAMP/END key, before you take the probe away.

5. Expose a test strip centrally under the lens, partly covering it for white reference (e.g. with the probe).
6. Process the strip.

Next, do a density test on this print:

a. Insert the test strip in the device for spot reading on the probe, in such a way that the white part covers the cell.
b. Remove the negative from the enlarger and set white light on the color head, open the aperture completely.
c. Press ANALYSE while holding the * key down, and zero the display by pressing ANALYSE again.
d. Now shift the paper for the grey part to cover the cell, and read the Log Density, and also the LogY-M-C densities by pressing the * key 3 times.

The test print should be neutral grey, with approximately these readings:
LogD = LogY = LogM = LogC = 0.55
(For Slide printing process: 0.45)

If the readings are different, the analyser will correct the channel values **automatically** if you proceed as follows, leaving the testprint in the probe:

A) Press the * key again. The display reads:

$$\boxed{ch.r}$$

(for **channel reprogram**)

B) Press the ▼ and ▲ keys together.
C) Press the LAMP/END key.

You can read the new Y-M-C values and note them in a log. Make a new test print, as described, and check if it is now neutral grey. Repeat the procedure if necessary.
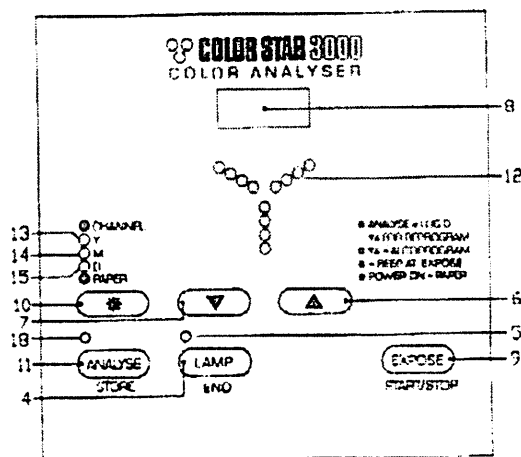
15 ANALYSING WITH AVERAGING

Normally you are analysing on 1 test point. It is also possible to analyse on an average of several points, 8 maximum. Usually 4 or 5 are sufficient. The measurements may be taken at full aperture and white light. The procedure is as follows:

a. Press ANALYSE and place the probe at the first test point.
b. Press ANALYSE again, a beep signal confirms that this test point is stored.
c. Place the probe at the next test point and press ANALYSE again.
d. After storing the last test point, leave the probe position unchanged, and null the Color Star (12) with the enlarger filters.
e. Adjust to the desired lens aperture, and press LAMP/END before removing the probe.

16 ANALYSING WITH REFERENCE

The probe signals are continuously monitored, and a warning signal is generated whenever one of the signals is too weak to produce an accurate measurement. The warning consists of intermittent flashing of the LEDs in the corresponding color of the star. If this happens, you can use the following method for analysing:

1. Press **ANALYSE**. Fully open the lens, and select white light.
2. Measure your selection with the probe.
3. Press **ANALYSE** again to **STORE** this reading.
4. Repeat steps 2 and 3 if you want to average several points (not required).
5. Remove the negative from the enlarger and put the probe in the centre of your (white light) projection.
6. Press the **UP and DOWN** keys together to store this reading as a **reference**. Leave the probe in position.
7. Now deselect the white light, and set your filters and lens aperture as usual.
8. Press LAMP/END before you remove the probe, reinsert the negative and print it.

Remark: This procedure increases your range of exposure times by a factor of 10. You may need to calibrate another channel for working at long exposure times, since most papers change in color due to reciprocity failure. See par. 25.

17 MASTER

Apart from the 8 sets of **Y-M-D channel values**, the analyser also offers **Y-M-D Master values**. These influence all channels (the analyser adds the two sets of values together). The Master is used to correct for fluctuations of the chemical process (and of the paper). The Master values are indicated by the letter **A** (for **All** Channels) and are found by pressing the * key a total of 6, 7 or 8 times. The Y, M or D indicators (13), (14) or (15) will be blinking. The Master values are initially set to 50, which is displayed as:

A50

The adjustment ranges from A00 to A99. They can be set manually with the UP and DOWN keys.

Reprogramming the Master values

After testing your grey test print (see par. 14, Reprogram) you can access the channel reprogram **(ch.r)** function by pressing the * key. Press the * key once more to display the Master reprogram indication:

a.r.

(a.r. indicating **all** channel **reprogram**). Then press the Up and DOWN keys together, and confirm with the LAMP/END key, before removing the probe. This procedure reprograms the Master (A) values.

PART 2: BLACK AND WHITE ENLARGING

18 SELECTING BLACK AND WHITE

You may use the standard color probe also for black and white measuring. It is however advisable to use the optional spot probe item No. 601, especially for variable contrast paper.

In both cases the analyser must first be set up for black and white:

a. Press the * key (10) while switching the instrument on with the power switch (3).

b. Now use the DOWN key (7) to display letter b, and the Up key (6) to display figures 00.

c. End with the LAMP/END key (4).

The Color Star (12) will not light up now, during analysis.

Pressing the * key (10) several times will now display the following:
• The channel number ch.1 to ch.8.
• The D (Density) value of this channel.
• The paper type indication b.00.
• The Master Density value A50.

19 CALIBRATING WITH A KNOWN NEGATIVE ('AUTOPROGRAM')

If you have a negative for which the right exposure time on your paper is already known, you may use this to calibrate the analyser quickly.

a. Insert the negative in the enlarger and adjust aperture and enlarger height.

b. Only for variable contrast paper: Select white light if you use the color probe, or the correct contrast filter if you use the Density Probe.

c. Press ANALYSE and place the probe on a selected part of the image (See 'measuring methods').

d. Now press the * key (10) with one finger, and while holding it down, use two other fingers to press the UP and DOWN keys (6) and (7) simultaneously.

e. Use the UP and DOWN keys to display the correct exposure time.

f. Confirm and end the procedure with the LAMP/END key, before removing the probe.

By pressing the * key twice, you can read the Density channel value, and note it for later reference. Increasing or decreasing the D-value results in higher or lower exposure times, during analysis (See also paragraph 9).

20 DETERMINATION OF PAPER GRADE

The spot probe can be used to find the contrast in the negative, in order to determine the correct paper grade. This is done as follows:

a. Press the * key (10) down, while pressing the ANALYSE key (Density test).

b. First measure the lightest part of the negative where any detail is still visible.

c. Press ANALYSE/STORE. The display now reads 0.00.

d. Now measure the darkest area, which also has any detail.

e. The display (8) now shows the contrast of the negative. In order to find which paper grade corresponds to this contrast, press the DOWN key (7). The reading is from 0 to 5, in steps of 0.5.

21 VARIABLE CONTRAST PAPER

The Density Probe No 601, directly reads the exposure time, for any contrast filter pack, either with an ordinary colour head, or with a vario-contrast module. When using the standard color probe, this is not the case. You will need to measure with white light, and afterwards enter the filters for printing. A special filter package or V.C. module is needed, ensuring constant exposure time for all grades.

22 MEASURING METHODS FOR BLACK AND WHITE

The same methods may be used as for color. E.g. semi-integrated measuring on an average area, or spot reading on a middle grey reference area. You can also average measurements and do integral measuring with a diffuser under the lens. Several Easel Probe models are available.

When doing process control with the black and white Grey Test Negative, you can use the REPROGRAM method. This works best at paper grade 3.

PART 3: PROBES AND MEASURING METHODS

23 AVAILABLE PROBES

a. The COLORSTAR 3000 is normally supplied with a color spot probe. Item No. 600. This may be used for colour negatives, slides, and black and white.

b. For exposure time measuring only, more sensitive, and also less expensive spot probes are available. Item No. 601 is specially adapted to variable contrast papers. Item No. 604 is for exposure timing of color papers.

c. Easel Probes are available for color balancing and exposure, or for exposure time only. Working with these easels saves time, and their sensitivity and measuring accuracy are optimal. They can be supplied instead of the spot probe, or additionally.

24 ANALYSING WITH THE SPOT PROBE

Several devices, for different measuring methods, can be inserted on the spot probes. Start by choosing a measuring method:

a. Spot measuring on a selected reference color (usually grey or flesh tone).

b. Semi-integrated measuring, usually on a neutral or warm-tone part of the image.

c. Integral measuring.

Attach the corresponding cover onto the probe. For integral measuring, mount the diffuser foil in the filter carrier under your enlarger lens.

Every method of measuring requires a different calibration of the analyser. You can use the 8 channels for this. We advise you to use only 1 or 2 channels to start with.

You need to calibrate only one method

When changing to another measuring method, you will need another channel. The grey negative or slide, and the Autoprogram function enable you to use the calibration of your first channel for it, as follows:

a. Analyse the grey negative with the first method. Null the Color Star with the filters, and adjust the aperture for 10.0 seconds exposure time.

b. Now insert the device for the next method, select another channel and ANALYSE again.

c. With AUTOPROGRAM (* ▼▲ / 10.0 sec / END) this channel is calibrated.

Inserting the probe attachments

Press gently while inserting as indicated. Remove in the same way.
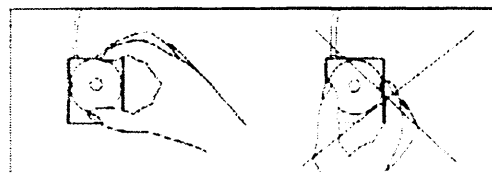
Probe cover for spot measuring
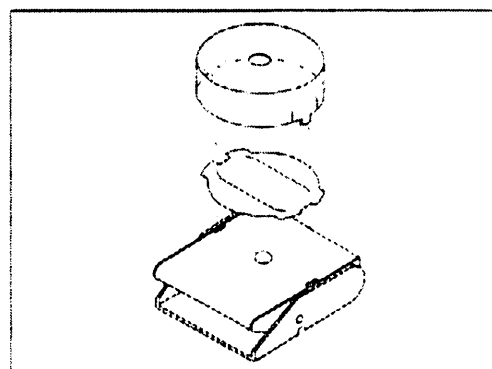
Spot measuring is used if there is a reference colour in the projected image. e.g. if a grey card was used for a reference shot.

Cosine correction:
Tilt the probe to the lens. The shadow of the opening in the transparent device should fall around the cell.

Density test on prints

The regular spot probe attachment is also used to perform densitometric measuring on test strips, as follows:

• The probe is placed in the centre of the projection on your easel.

• The negative is removed, the lens fully opened, and the filters are taken out. The enlarger now acts as a white light source.

• The test strip is inserted in the probe. Because of the high sensitivity of the probe, it can measure the print dyes through the paper. See full description on page 5.

Inserting the 4mm spot disc
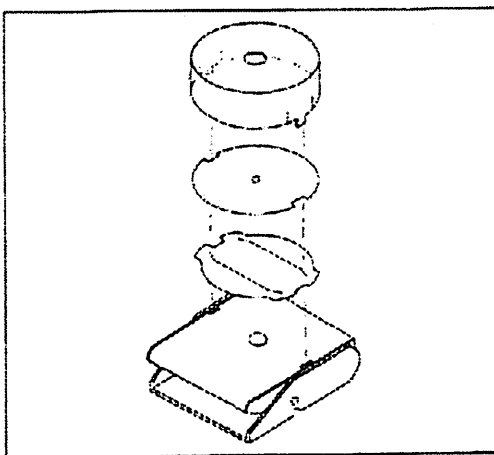
Spot measuring 4mm is not suitable for large print sizes because it reduces the sensitivity of the probe.

Probe diffuser for semi-integrated measuring

A simple and foolproof method, that is strongly recommended to begin with.
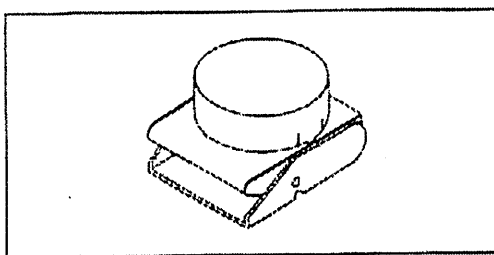
At semi-integrated measuring, select a part of the image where color and density appear to be neutral. In other words: where no dominant colors are visible. When in doubt, it is best to average several areas.

This method is suitable for most applications, and avoids some of the constraints of spot - and integral measuring.

Integral measuring

For integral measuring on the complete negative, a diffuser is used under the lens.
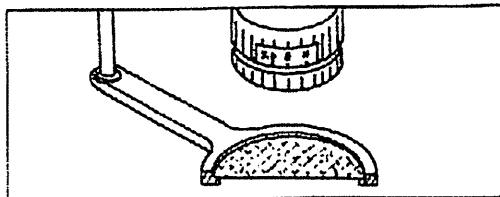
This diffuser may be cut from the supplied foil, and mounted in the redfilter holder of the enlarger. Measuring is centrally under the lens, using the same device as for spot reading. Every negative size requires a separate calibration. Negatives should be framed accurately, at full negative size. Dominant colours can have significant influence on the results.

Daylight reducer

This increases the maximum exposure limit of the spot probe. It consists of a reduction disc (Item No. 196) that fits into the probe diffuser No. 104, and is held in position with mounting strip, Item 199.
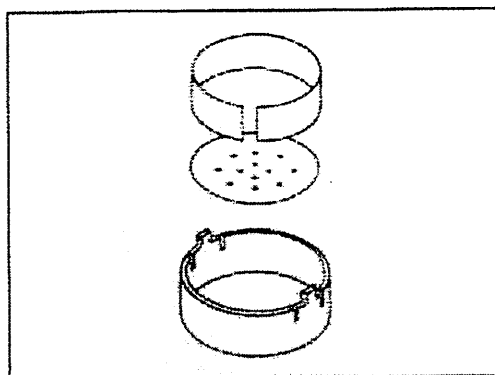
The daylight reducer is necessary for using the color spot probe outside the darkroom. It can be used in the studio or in daylight to select camera correction filters. The probe does not measure flashlight.

Optionally available:

Pencil Probe accessory

For measuring on slides and negatives mounted in slide duplicators. Can also be used on glass plates of cameras. Fibre optic cable with 1mm plastic tip. Fits all spot probes. Item No. 122.
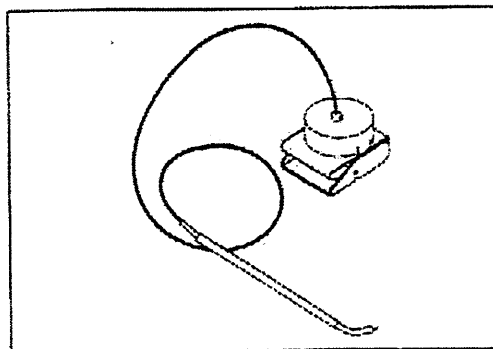
PART 4: TECHNICAL DATA

25 PAPER AND FILM

Average Y-M-D values

- If you do not have a 'known' negative for the AUTOPROGRAM method, you can use the approximate Y-M-D channel values from the table below, to make your first test print. Then use the REPROGRAM method to improve the values.
- These values apply to regular spot measuring (6mm), and are also valid for Easel Probes.
- The Master values are assumed to be at A50-A50-A50.

Paper	Type	Y	M	D
All papers for color negative process	n.00	600	550	520
Ilfochrome and other positive process papers	p.30	500	540	580
B/W, variable contrast papers	b.00			550

Reciprocity failure

The slope setting of the Colorstar 3000 corrects the exposure time for the paper reciprocity failure. There will usually be a slight color shift, due to the fact that the reciprocity failures of the Y, M and C layers of the paper are not equal. Because of this effect it is advised to stay within a limited range of exposure times, i.e. 4...10 seconds. You may calibrate another channel for printing accurately at other exposure times, i.e. 30...80 seconds. For this calibration you need to make a grey test print at 50, instead of 5 seconds.

Slope

The optimal slope setting for your paper may be slightly different from the value in the table. Usually it is not worthwhile to 'fine-tune' it, since the color shift of the paper forces you to remain within a limited range of exposure times. After calibration with the grey test negative you can check the paper failure as follows:

1. Expose a grey test print at 5 seconds exposure time, as usual.

2. Then close the lens by 2 f-stops, measure the exposure time again (approx. 20 seconds) and expose a second test strip (mark this one by ripping a corner off)
3. Develop both strips and measure the Log D (Density test) of the greys. The two prints should be approximately equal.
4. If the 20 second test is darker by more than .02, you could set the slope higher.

0.03...0.07 darker: Set slope to .05
0.08...0.12 darker: Set slope to .10

For transparencies the procedure is slightly different: Close the lens not by 2 but by 3 stops (to approx. 50 seconds exposure time). If the 50 seconds strip is darker, decrease the slope setting:
0.03...0.07 darker: Set slope to .25
0.08...0.12 darker: Set slope to .20
0.03...0.07 lighter: Set slope to .35

Beware

Changing the slope also requires that you calibrate the D-value again.

- Analyse the grey negative, with the former calibration unchanged.
- Close the lens to a reading of 5.0 seconds. Leave the probe in place.
- Enter the new slope value and analyse again. If the exposure time is not 5.0 seconds anymore, you need to correct the D-value.

Process monitoring

You can check your chemicals with control strips (pre-exposed teststrips on your paper type), available from paper manufacturers. You can do a density test on a strip developed in your chemicals, and compare this with the reference strip developed by the manufacturer. Example:
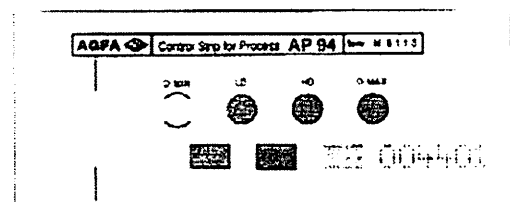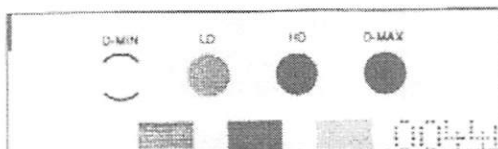
The minimum density test field gives an indication of contamination, oxidation or over-activity of the developer.
The maximum density test field may indicate developer and bleachfix errors. Low readings may indicate low developer temperature or concentration, short developing time or developer depletion.

For complete information, consult your paper and chemicals manufacturer.

Your own control strip
Manufacturer's control strips are excellent to test your chemicals, but they do not test your paper, or the combination of your present batch of paper with the chemicals you are using. The best solution is to make your own control strip for a professional check, after calibrating your paper with the grey test negative.

How to make your own control strip
1. After obtaining a perfect grey testprint, insert the grey testnegative again.
2. Analyse and adjust the lens at least 2 stops down from maximum aperture (i.e. f:8).
3. Adjust your enlarger height until the exposure time reads 5 seconds.
4. Now expose a test strip in 4 parts, each time covering the other parts and your white reference. The exposures are made with:
   a) the correct lens aperture (f:8)
   b) one stop less light (f:11)
   c) one stop more light (f:5.6)
   d) two stops more light (f:4)

After processing the strip looks like this:
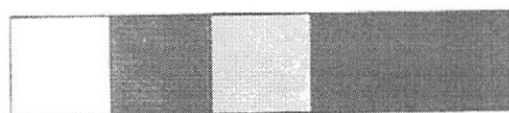
D-MIN	ND	LD	HD	D-MAX
=White	neutral	-1stop	+1stop	+2stops

When testing the densities, all greys should be neutral. The readings for LogY and LogM and LogC should be approximately equal at every step. The D-MAX test field should be near-black, with readings of approx. 1.20 or higher depending on the type of paper.

Example: A graph of a typical test result ('brownish' blacks, not enough Cyan)
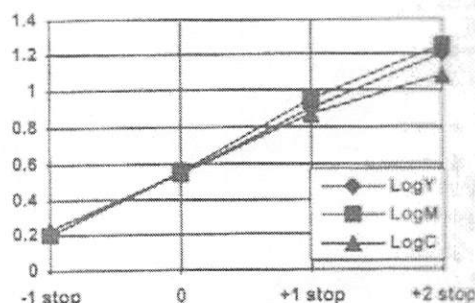
We advise to do this test with new paper and chemicals and store the test results. Repeat the test whenever you doubt your paper and chemicals, and compare the readings. Also compare the whites, to detect contamination.

Imbalances ('crossed curves') can be caused by ageing of the paper or by chemical problems. These errors cannot be eliminated by correction filtering, and lead to variations in the color balance between light and dark areas of the print.

Paper reprogram log
For various reasons it is advisable to keep track of the paper calibration values that you obtain from doing the Reprogram procedure. A large increase of the D-value (10 points or more) is a warning that your developer is becoming oxidised or depleted.

Test your studio lights
If you are shooting transparencies in a studio you may want to check the influence of the studio lights to review the need for correction filtering. We suggest that you take a reference picture of a grey card, preferably one that has steps from white to black.
1. After processing, insert it in your enlarger, (white light - lens open). Focus, and test it as follows:
2. Select POS process (p.30), and start the densitometer function (*ANALYSE)
Read the white step and null the densitometer with the ANALYSE key.

3. if the white step is not transparent, it is better to take the slide out and null on the white light.
4. Next, test the grey steps. The LogY-M-C values should be almost equal at every step, especially in the middle region.

If the LogY-M and -C values show large differences, you may consider to use camera correction filters. In order to establish the correct filters, test a grey step in the middle region, and try different filters on top of the probe, until the Y-M-C readings become equal. Then use these filters in front of your camera lens for picture taking.

Testing your film developer
Control strips for testing your film developer are available from manufacturers. After processing, they can be inserted in your enlarger for testing, and compared to the original developed by the manufacturer.

Your own film test strip
Even when shooting on color negative film, it is good practice to take one shot of a grey step card, as described above, to check your studio lights, your exposure meter, and the film development.
Insert the film in the enlarger and measure the projection with the spot probe as follows:
- For testing color negatives, Status M densitometry is required. This is obtained by setting to NEG (n.00).
- Null on an unexposed end of your film (the film mask)
- Then read the grey test fields in the test negative.

Again, for properly balanced negatives it is necessary that the LogY-M-C readings are not too different from each other. 18% grey should read approximately 0.60 (plus or minus 0.10 is acceptable). Camera correction filters may be calculated, but this is more difficult than for transparency film, since the filters work in the opposite direction. You also need to overcorrect, since negative film is 'soft'. If your light source is continuous (not flash) it is easier to check at the source, using the Colorstar 3000 as a color temperature meter.

Color temperature balancing
With the probe diffuser installed, measure with the probe towards the light source. For measuring daylight or bright studio light you need to insert the daylight reducer into the probe diffuser:
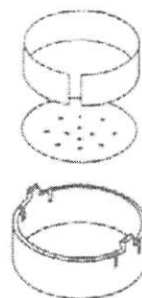
- Select POS process (**P**.30)
- Set the Y and M Master values to **A00**
- Select an unused channel and set Y to **578** and M to **564**.(for daylight film[1])
- Press ANALYSE

The Color Star now indicates which filters are required. Hold correction filters in front of the probe diffuser, increasing the filters in strength until the star is nulled.
1. If Y and M LEDs light up, use amber (yellowish) conversion filters or Y + M filters.
2. If M and C LEDs light up, use bluish conversion filters or M + C filters.

The filters that are found in this manner should be used in front of the camera lens (or the light source). Avoid using too many filters in front of the camera lens.

[1]For tungsten film 3200K:
Y=630   M=590
For tungsten film 3400K:
Y=622   M=586

26 INFLUENCE OF DARKROOM SAFELIGHT
While analysing with the color analyser you can leave the yellow safelight on, but it should be indirect, and of low intensity. With black and white measuring, you may use yellow or red safelight.

In order to check whether the safelight influences the readings, especially at long exposure times, cover the safelight momentarily while analysing, and observe whether this influences the Color Star nulling or the exposure time reading.

27 TROUBLE-SHOOTING

```
                    ┌──────────────┐              Check these
                    │ START HERE   │              procedures:
                    └──────┬───────┘
                           │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 1. Connect and switch the power on.  ├───────▶│ A, B, C, D   │
    │      Are the display and panel lights on ?│   └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 2. Press the LAMP key several times. ├───────▶│ C, E, F, T   │
    │    Does the enlarger lamp switch on and off ? │ └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 3. Press the ANALYSE key (LED 18 ON).├───────▶│ G, I, J      │
    │    Do you see Color Star LEDs lighting up ?   │ └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 4. Analyse with the probe under the enlarger.├▶│ K, L, J     │
    │    Can you null the Star LEDs with the filters ?│└──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 5. Does the exposure time on the display change├▶│ M          │
    │    with the lens aperture ?          │         └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   Yes  ┌──────────────┐
    │ 6. Are the Color Star Y, M or C LEDs blinking on├▶│ N         │
    │    and off ?                         │         └──────────────┘
    └──────────────────┬──────────────────┘
                      No │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 7. Press * EXPOSE (temperature reading)├──────▶│ R            │
    │      Is the correct temperature displayed ?   │ └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐   No   ┌──────────────┐
    │ 8. Calibrate channel 1 (see step-by-step instr.)├▶│ O, P      │
    │      Do you get a neutral grey print ?│         └──────────────┘
    └──────────────────┬──────────────────┘
                     Yes │
    ┌──────────────────────▼──────────────┐
    │ 9. Calibrate channels 4 and 5 for semi-integrated│ No ┌──────────────┐
    │    measuring grey and warm (with Autoprogram,├────▶│ H, P, Q, S │
    │    see step-by-step instructions).   │         └──────────────┘
    │    Do you get good prints of your own negatives,│
    │    using one of these channels ?     │
    └──────────────────┬──────────────────┘
                     Yes │
                    ┌──────▼────────┐
                    │ CONGRATULATIONS│
                    └───────────────┘
```

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28 TROUBLE-SHOOTING PROCEDURES

(A) NO POWER
Check if the correct mains voltage is present.

(B) BROKEN FUSE (100 mA)
Check fuse (16) and replace if broken.

(C) BROKEN FUSE (6.3 A, SLOW)
Check fuse (17) and replace if broken.

(D) POWER CORD FAILURE
Check the power cord and mains plug for loose connections or broken wires.

(E) ENLARGER CORD FAILURE
Check the enlarger cord and socket (or plug) for loose connections or broken wires. (The power and enlarger cords are combined in several versions).

(F) ENLARGER FAILURE
1. Check if the enlarger is connected and switched on.
2. Connect the enlarger directly to a power outlet to check if it works.
3. Or connect the cord of another lamp to the Colorstar socket and check if it does light up.

(G) BLACK-AND-WHITE SELECTED
Press the * key 5 times to check the paper type setting (at black/white setting **b.00** the star will not light up).

(H) NEG/POS INTERCHANGED
Press the * key 5 times to check the paper type setting:
n.00 for color negatives, or
P.30 for transparencies.

(I) PROBE NOT CONNECTING
Pull the probe cord plug out and push it in the sensor connector again.

(J) PROBE WIRES BROKEN
Have the probe cord and plug checked for broken wires. Or try another probe, if available.

(K) WHITE LIGHT SELECTED
Check if the 'white light' switch of the enlarger is in 'filter' position.

(L) Y-M VALUES OUT OF RANGE
Press the * key 2 and 3 times and check the Y and M channel values. Start with Y=600 and M= 550.
The total range is 0...999. Values below approx. 400 and above 750 can probably not be nulled by your enlarger filters.

(M) D- VALUE OUT OF RANGE
Press the * key 4 times and check the D (Density) channel value. Adjust D in between 500 and 550 for your first test.
The total range is 0...999. Values below approx. 300 will result in 0.0 exposure time. Values above approx. 800 will result in more than 999 seconds, displaying:

| O.FI | (Overflow)

(N) NOT ENOUGH LIGHT
This signal alerts that the amount of light on the probe is insufficient for accurate measuring. Open the lens wider, or choose another measuring method.

(O) PAPER CALIBRATION FAILURE
1. Fill out the form 'Setting-up your COLORSTAR 3000' , including your reprogramming results and test print density readings.
2. Mail or fax us a copy.
3. Also send the Log sheet (if used) and other data you consider relevant.
This enables us to evaluate the cause of your calibration problems.

(P) PROBE CHANNEL FAILURE
The correct operation of the probe amplifier channels can be tested as follows:
1. Analyse with the test negative, at full aperture, and null the Color Star (12) with the enlarger filters.
2. Gradually close the aperture. The first LED may light up of one or two color rows, but in general the color balance should be maintained, until the end of the range (which is indicated by LEDs blinking).
If the Color Star shows a significant change, one of the probe channels is probably defective or needs recalibration. The probe should be returned for repair. If the color balance is maintained correctly, the probe is probably not defective.

TROUBLE-SHOOTING PROCEDURES
(CONTINUED)

(Q) PROBE FILTER FAILURE

The color filter characteristics of the probe are factory tested, and errors rarely occur. However, all doubts can be eliminated by testing the quality of the color analysis as follows:

Select 4 different negatives for this test:

- Each negative must be analysed with semi-integrated measuring.
  This requires that a channel is calibrated for this method. The test also works if the calibration is not 100% accurate.
- All 4 negatives must be printed together on one sheet of 20x25 cm (print size approx. 9x12 cm).
- This sheet must be developed, without cutting it. If you want to send this sheet in for our evaluation we need to receive it in one piece.

If the sheet shows equal color balance and density for all prints (at least at the analysed areas), the probe has accurately copied the 'test' color.

This may not be the correct color. But after improving the Y-M-D (channel or master) calibration all prints will be of the same correct color and density.

However, if the 4 prints are clearly different from each other, the probe is probably at fault, and must be returned for inspection and repair. We appreciate receiving your comments and examples with the repair shipment.

(R) PROBE CALIBRATION ERRORS

The probe calibration values, indicated on a label at the bottom of each (spot or easel) probe, are entered into the analyser memory. An error in the first value results in incorrect temperature readings (with ❋ EXPOSE). Check the entries as follows and correct them if necessary:

First switch the power off.

a. Hold the ANALYSE key down, while switching the power switch (3) on. A figure 1 is displayed.
b. Press the * key (10) The display now reads the first calibration value, a number of approx. 500. It may be changed with the UP and DOWN keys.

c. Pressing the * key again displays a figure 2, and * again: the second calibration value.
d. Continue this until all 5 values are entered correctly.
e. You may rotate all numbers with the * key to check them, and then confirm and end the calibration with the LAMP/END key.

(S) DEVELOPER CONTAMINATION

Test your paper and chemicals by making a control strip. Follow the procedure 'How to make your own control strip' in paragraph 25 of the Users' Manual.
Observe if the white is not contaminated. Test if the black is not brown, and the light and dark greys do not have an opposite color shift. All this will show in the quality of your prints.
The analyser can correct for overall color shift, but it cannot bring your chemicals back to strength......

(T) MEMORY ERROR

All channel values and calibration data are stored in an EEPROM memory chip.
The data in the chip may become disrupted in rare cases. Possible causes are:

- A power cut or electrical interference, occurring while you are doing calibration steps or changing the channel.
- When, in order to change the paper type setting, one presses the ❋ key while switching the power OFF.

Press the ❋ key only while switching the power ON.
The following message is displayed if a memory error is detected:

| E | (Error)

The following data are affected:
1. The probe calibration values.
2. Calibration values of the A-D converter.
3. The paper type setting, the channel values and the master values.

Ask your distributor for assistance. The reset procedure is in the service manual. It can be executed by any technical-minded person.

29 SPECIFICATIONS OF THE COLORSTAR 3000 COLOR ANALYSER

SPOT PROBE

Spot probe for color and black and white.
For spot reading 4 and 6 mm. semi-integrated
(57 mm) and integral measuring.

ANALYSER FUNCTIONS

Averaging of test points	Averages filtration and exposure time, for a maximum of 8 test points.
Reference measuring	Memory for measuring with and without negative, in order to analyse for very large print sizes.
Densitometer range	-.99 to 9.99 Log Density and Log Y-M-C Due to technical differences, the test results are not exactly equal to other densitometers.
Paper Grade readings (for B&W)	0 to 5 in steps of 0.5.
Temperature measuring	Reads probe temperature in steps of approx. 0.3 degrees Celsius.
Paper type selection	Color negative process, color slide process and black and white.
Slope correction	.00 to .35 in steps of .05. (Adjusts the Log exposure multiplier between 1.00 and 1.35)
Program channels	8 channels + Master channel
Programming range for Y, M and Density	0 to 999 (9.99 Log). For each channel individually.
Master range for Y, M and Density	0 to 99 (Normal value = 50) Influences all channels.
Auto-program	Automatic calibration of 1 channel, using a 'known' negative.
Reprogram	Automatic recalibration of 1 channel or of the 'Master' values, using a test print of the grey negative or slide.
Color Star display	3 x 4 LEDs. The first LEDs show the colour balance within 1 cc. Each subsequent LED: + 4cc.

TIMER SPECIFICATIONS

Exposure timer	0.1 to 999 seconds. Count-down display and beeper. Interrupted exposures are possible.
Auto Lamp-off	Enlarger lamp is switched off automatically after 5 min.

ELECTRICAL SPECIFICATIONS

Mains voltage	100-120 or 200-240 Volts AC, 50-60 Hz.
Enlarger load	Max. 700 VA at 117 Volts or 1300 VA at 220 Volts
Fuses	100 mA and 6.3 A (Slow); 5 x 20 mm.
Power consumption	6 VA

DIMENSIONS

Keyboard	155 x 155 mm. Height 63 mm.
Spot probe	76 x 76 x 23 mm.
Cord lengths (approx.)	Probe cord 2 meters. Power cord 2.4 meters.

Setting-up your COLORSTAR 3000

Read the STEP-BY-STEP INSTRUCTION, and enter your data below:

- Temperature reading: _____ Your own thermometer reads: _____
- The paper that you are going to use is: _____
- The paper type selection is: n.00 / p.30 / b.00 or other: _____
- You have preset channel 1 to these values: Y _____ M _____ D _____
- Your first grey-test print reads: LogD _____ LogY _____ LogM _____ LogC _____

If this testprint is not neutral grey, use the reprogram procedure, and record your results:

| Reprogramming results in these values | | | Your next testprint reads these densities: | | | |
Y	M	D	LogD	LogY	LogM	LogC

After the initial calibration, enter the Y-M-D values below. Make future corrections in the Master channel values. When you are setting up other channels, enter the data below:

Chan-nel	Measuring method (semi-int./spot/etc.)	Neutral grey or specify:	Paper [1]	Y	M	D
Ch. 1	Spot 6mm	Grey				
Ch. 2						
Ch. 3						
Ch. 4	Semi-integrated	Grey				
Ch. 5						
Ch. 6						
Ch. 7						
Ch. 8						

- If you use only one batch of paper, you can use the Master channel to correct for paper batch *and* developer change.
- [1] If you use different batches of paper, you can set up one or more channels for each batch, and use the Master channel to correct for changes in the chemicals.

Keep track of the Master value changes on the Log sheet.

COLORSTAR 3000 Log sheet

Save 1 sheet for photocopying !

Paper (brand and type) _____ Setting (n/p/b) _____ (.00-.35) _____

No	Date	Master channel values			Density of testprint from grey-negative or slide				
		Y	M	O	LogD	LogY	LogM	LogC	Remarks
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
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25									
25									
27									
28									
29									
30									

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COLORSTAR 3000 Programming

Function	Enlarger Setting	Select Function	Execute	End
Set Paper Type		✳ Power On	Select n-p-b with ▼ Select .00 to .35 with ▲	LAMP/END
Channel Nr.		✳	Select ch. 1 ...8 with ▲ or ▼	LAMP/END
Y-M-D Channel Values		(✳)✳✳✳	Change with ▲ and ▼	LAMP/END
Paper Type indication		(✳✳✳✳)✳		LAMP/END
Y-M-D Master Values		(5✳)✳✳✳	Change with ▲ and ▼	LAMP/END

Function	Enlarger Setting	Select Function	Execute	End
Autoprogram	With 'known' negative: set filters and aperture	ANALYSE	Place probe on test point ✳ and ▲ and ▼ together Star is nulled Set exposure time with ▲ and ▼ keys	LAMP/END Before removing the probe
Make Test Print	Insert grey test negative or slide	ANALYSE	Probe centrally under lens (use appropriate device) Null star with filters Adjust aperture for 5 sec.	LAMP off Expose test strip (partly white)
Density test on Test Print	No negative White light Lens open	✳ ANALYSE	White test: ANALYSE/STORE 0.00 Read grey or colour :LogD ✳ LogY ✳ LogM ✳ LogC Neutral = approx. 0.55 (Slide print: approx. 0.45)	(Lamp/End)
Reprogram		Density test Continued	(Not replacing probe) : ✳ (= ch.r) for channel or ✳✳ (= a.r)For Master, then ▲ and ▼ keys together	LAMP/END

Function	Enlarger Setting	Select Function	Execute	End
Connect another Probe		ANALYSE/ Power On	1✳500✳2✳500✳3✳500✳ 4✳500✳5✳500 Insert values according to label on the bottom of probe using ▲ and ▼ keys	LAMP/END

COLORSTAR 3000 Operation

Function	Enlarger Setting	Select Function	Execute	End
Focus		LAMP	Lamp toggles on/off	
Set exposure time			Use ▲ and ▼ keys	
Expose		LAMP off	EXPOSE (START)	May be ended with LAMP/END
Interrupted exposure		LAMP off	EXPOSE - EXPOSE - EXPOSE (START - STOP - START)	May be ended with LAMP/END
Beeper		While exposing	Beeper on/off with ✳ key	

Function	Enlarger Setting	Select Function	Execute	End
Analysing		ANALYSE	Choose test point Null star with filters Adjust lens aperture	LAMP/END before replacing the probe
Analysing with averaging of test points	White light (an open lens is permitted)	ANALYSE	At each point: ANALYSE/STORE After storing last point: Null star with filters Adjust lens aperture	LAMP/END before replacing probe
Analysing with a reference	White light Lens open	ANALYSE	With negative: ANALYSE/STORE Without neg: ▲▼ together Null star with filters Adjust lens aperture	LAMP/END before replacing probe
Contrast and Grade	Lens may be open for a better view	✳ ANALYSE	Light area: ANALYSE/STORE Dark area: read Contrast or Grade, with the ▼ key	LAMP/END
Temperature		✳ EXPOSE	Probe temperature in °C	LAMP/END