

6. Operation

6. 1. Producing a Set of Four Screened Color Separations

6.1.1. Basic Calibration

Condition:

- Mount the exposing head for screened separations.
- Perform film linearization for screening.
- Mount the original.
- Position the original relative to the film.
- Key in the code for the reproduction scale, depending upon the scanning drum inserted. (Refer to the Table of Reproduction Scales.)
- On the operating panel, press the ➡ pushbutton (223) or ◀ (222), according to the required scanning cross-feed direction.
- Set the switch TYPE OF GRADATION (43) to SCREEN.
- Set the ORIGINAL POS / NEG switch (42) to POS 3.
- Press the POS pushbutton (91).
- Press the + pushbutton (100).
- Press the pushbutton SCANNING LIGHT SOURCE ON (101).
- Press the PICTURE pushbutton (121).
- Set the switch COLOR SEPARATION (Mixture) (34) to OFF.
- Set the TEST switch (41) to OPERATING.
- GRADATION controls in normal position, e.g.
 - MIDDLE TONES (81) to 3.5 to 4
 - HIGHLIGHT SEPARATION (88) to "5"
 - SHADOW SEPARATION (89) to "4".
- GRAY BALANCE control (74) to "0".
- Adjust the controls COLOR CORRECTION WHITE COLORS and BLACK COLORS and SELECTIVE CORRECTION according to the table.
- Set the required scanning aperture (e.g. "4").
- Set the unsharp-masking filter wheel to magenta symbol.
- When the unsharp-masking filter is changed, a white alignment should be performed. Within one color separation, the calibration should be carried out on the same spot on the drum or the original.
- Move the scanning light spot to clear glass.
- Hinge up the mirror.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).
- Set the COLOR SEPARATION 1 switch (49/1) to „Cyan“.
- Set "100" with control PICTURE ADJUSTMENT — HIGHLIGHT (62).
- Hinge down the mirror of the scanning head.
- Set "0" with control PICTURE ADJUSTMENT — SHADOW (63).
- Set the MEASURE 1 switch (48) to FILM DENSITY.
- Set the required percent dot size (e.g. 98 %) with control FILM DENSITY — SHADOW (65).
- Set the required percent dot size (e.g. 75 %) with control FILM DENSITY-SHADOW "Black" (65).
- Hinge up the mirror.
- Set the required percent dot size (e.g. 5 %) with control FILM DENSITY — HIGHLIGHT (64).

6.1.2. Picture Calibration

For picture calibration, move the scanning light spot to picture white or a neutral area of the original and to picture black. For this purpose, use the time switch for the transparency illumination lamp, pushbutton (133), and the range-of-vision enlarger, pushbutton (134).

6.1.2.1. White Alignment with Color Shift Compensation

- Move the scanning light spot to picture white on the original.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).

6.1.2.2. White Alignment without Color Shift Compensation

- Move the scanning light spot to clear glass.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).
- Move the scanning light spot to a neutral area on the original.
- Hinge up the mirror out of the light path.
- Press and detain the blue pushbutton WHITE ADJUSTMENT / WITHOUT COLOR SHIFT COMPENSATION (51).
- Set the MEASURE 1 switch (48) to position FILM DENSITY.
- Set the COLOR SEPARATION 1 switch (49/1) successively to yellow separation, magenta separation, and cyan separation. Determine the brightest channel and switch on this channel (e.g. cyan).
- With the control PICTURE ADJUSTMENT - HIGHLIGHT - Y, M, C (52) set the required film density (e.g. 6 %).
- Release the blue pushbutton WHITE ADJUSTMENT WITHOUT COLOR SHIFT COMPENSATION (51). The set values are fixed and correspond to the color differences of the original.

Attention:

The blue pushbutton (51) must not be operated any more while the four color separations are being produced.

6.1.2.3. Black Alignment

- Move the scanning light spot to the darkest area of the original.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Press and detain the UNDER-COLOR REMOVAL / ADDITION OF COLOR — OFF pushbutton (80).
- Set the COLOR SEPARATION 1 switch (49/1) successively to "Yellow", "Magenta" and "Cyan" and note the lowest value of these three color separations.
- Set "0" by means of PICTURE ADJUSTMENT — SHADOW control (63).
- Release the UNDER-COLOR REMOVAL / ADDITION OF COLOR — OFF pushbutton (80).
- Switch the COLOR SEPARATION 1 switch (49/1) to position "Black".
- Set "0" with control PICTURE ADJUSTMENT "Black" (63).

6.1.3. Modifying Color Shifts in Shadow and Highlight Areas

6.1.3.1. Modifying a Color Shift in the Highlight Area

Condition: The white alignment without color shift compensation as per chapter 6.1.2.2. must be performed.

When setting the white alignment according to the above method, the color shifts in the original are maintained. Modifications are carried out as follows:

- Move the scanning head to "picture white".
- Set the MEASURE 1 switch (48) to position FILM DENSITY.
- Set the COLOR SEPARATION 1 switch (49/1) successively to yellow, magenta, and cyan. Determine the brightest channel (e.g. yellow 20%, magenta 10%, cyan 6%).
Cyan is the brightest color channel in this example. It must not be modified any more.
- Set the COLOR SEPARATION 1 switch (49/1) to "Magenta" and adjust the desired value (e.g. 8%) by means of control PICTURE ADJUSTMENT - HIGH-LIGHT - "Magenta" (62).
- Set the COLOR SEPARATION 1 switch (49/1) to "Yellow" and set the desired value (e.g. 15%) by means of control PICTURE ADJUSTMENT - HIGH-LIGHT - "Yellow" (62).

If a modification is intended also for the brightest channel, the complete setting process as per chapter 6.1.2.2. must be performed again so that the desired value can be set.

When the color set is made, set "100" with the controls PICTURE ADJUSTMENT - HIGHLIGHT - Y, M, C (62). For this purpose, turn the controls PICTURE ADJUSTMENT - HIGHLIGHT - Y, M, C (62) to the left-hand stop (nose downwards) and then 1 turn back to the right until once again the nose points downwards.

6.1.3.2. Modifying a Color Shift in the Shadow Area

Color shifts in the shadow areas are compensated with the ADDITION OF COLOR controls. For description refer to chapter 6.1.8.2. "Addition of Color".

6.1.3.3. Switching on the Neutral Balance

- Set the TYPE OF GRADATION switch (43) to position 3, SCREEN ("contact screen") or position 5, "electronic screen".
- Set the MEASURE 1 switch (48) to position FILM DENSITY.
- Set the COLOR SEPARATION 1 switch (49/1) to position "Cyan".
- Move the scanning head to a neutral part of the picture or to a gray scale step of approx. 50%.
- Set the COLOR SEPARATION 1 switch (49/1) to position "Magenta".
- Set the desired brightening (approx. 8% to 10%) by means of the NEUTRAL BALANCE control (74).
Control position approximately between 3 and 4.

6.1.4. Setting the Color Correction.

The controls have already been pre-set as per Table 5.6. "Color Correction", in chapter 5.13. Perform the required color correction.

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Move the scanning light spot to full cyan on the original.
- Set the required percent dot size (90-100%) with control COLOR CORRECTION — BLACK COLORS "Cyan" (61). If there is no cyan in the original, the control remains on the value pre-set.
- Move the scanning light spot to pure red.
- Set the required percent dot size (e.g. 5% darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Cyan" (58).
- Set the COLOR SEPARATION switch (49) to "Magenta".

- Move the scanning light spot to full magenta.
 - Set the required percent dot size (e.g. 95%) with control COLOR CORRECTION — BLACK COLORS "Magenta" (60).
 - Move the scanning light spot to pure green.
 - Set the required percent dot size (e.g. 5% darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Magenta" (57).
 - Set the COLOR SEPARATION switch (49) to "Yellow".
 - Move the scanning light spot to full yellow.
 - Set the required percent dot size (e.g. 95%) with control COLOR CORRECTION — BLACK COLORS "Yellow" (59).
 - Move the scanning light spot to pure blue.
 - Set the required percent dot size (e.g. 5% darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Yellow" (56).
- The main correction for all separations is thus set.

6.1.5. Selective Color Correction

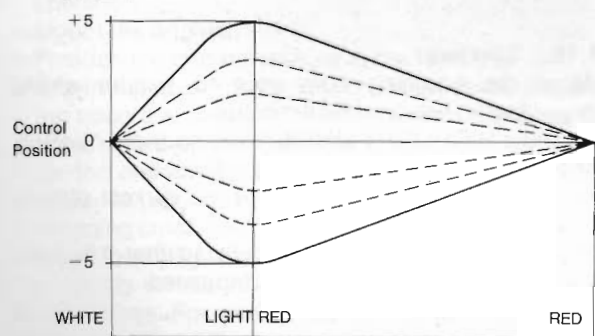
- Consecutively move the scanning light spot to each of the selective colors; check the portion of this color in the individual color separations and correct, if required.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Move the scanning light spot to full blue on the original.
- Set the required value with the selective control BLUE in the cyan separation (17).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with the selective control BLUE in the magenta separation (9).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control BLUE in the black separation (25).
- Move the scanning light spot to full cyan.
- Set the required value with the selective control CYAN in the black separation (26).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with the selective control CYAN in the magenta separation (10).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control CYAN in the yellow separation (2).
- Move the scanning light spot to full green.
- Set the required value with the selective control GREEN in the yellow separation (3).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control GREEN in the cyan separation (19).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control GREEN in the black separation (27).
- Move the scanning light spot to full yellow.
- Set the required value with the selective control YELLOW in the black separation (28).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control YELLOW in the cyan separation (20).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with the selective control YELLOW in the magenta separation (12).
- Move the scanning light spot to full red.
- Set the required value with the selective control RED in the magenta separation (13).

- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control RED in the yellow separation (5).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control RED in the black separation (29).
- Move the scanning light spot to full magenta.
- Set the required value with the selective control MAGENTA in the black separation (30).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control MAGENTA in the cyan separation (12).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control MAGENTA in the yellow separation (6).

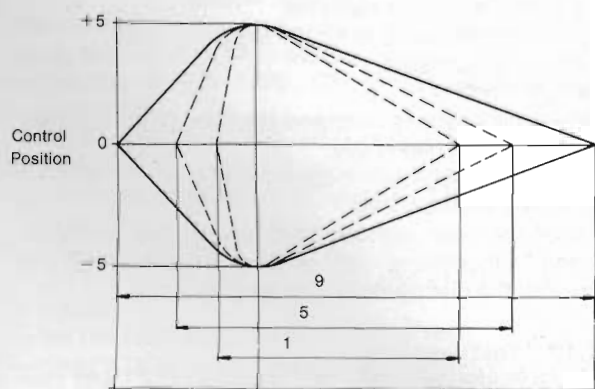
6.1.6. Light Red

If the light red tones are to be changed, the starting point between white and light red must first be determined.

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Turn all LIGHT RED controls (7, 15, and 23) to the right-hand limit.
- Move the scanning light spot to a light red tone which shall remain unchanged.
(This red tone should always be darker than the red tone to be changed.)
- Turn the STARTING POINT control (31) so that the reading changes.
- Move the scanning light spot to a light red tone which shall be changed.
- Set the required percent dot size with the LIGHT RED control for the cyan separation (23).
- Set the COLOR SEPARATION switch (49) to "Yellow".



LIGHT RED Controls (7, 15, 23)
with STARTING POINT Control at 9

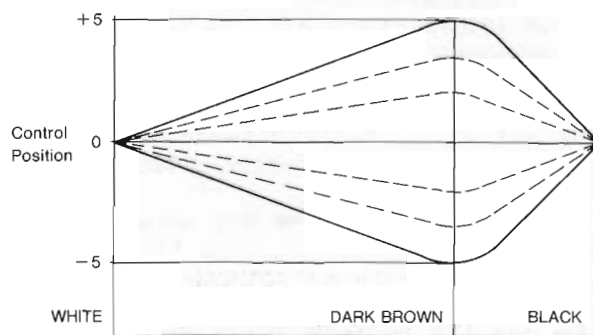


STARTING POINT Control (31) with
LIGHT RED Control at +5 or -5

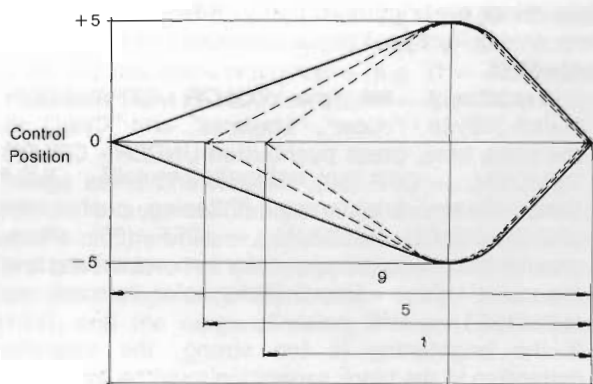
- Set the required percent dot size with the LIGHT RED control for the yellow separation (7).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required percent dot size with the LIGHT RED control for the magenta separation (15).

6.1.7. Dark Brown

If the dark brown tones are to be changed, the starting point between black and dark brown must first be determined.



DARK BROWN Controls (8, 16, 24)
with STARTING POINT Control at 9



STARTING POINT Control (32) with
DARK BROWN Control at +5 or -5

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Turn all DARK BROWN controls (8, 16, and 24) to the right-hand limit.
- Move the scanning light spot to a dark brown tone which shall remain unchanged. (This brown tone should always be lighter than the brown tone to be changed.)
- Turn the STARTING POINT control (32) so that the reading changes.
- Move the scanning light spot to a brown tone which shall be changed. (This brown tone should always be darker than the brown tone not to be changed.)
- Set the required percent dot size with the DARK BROWN control for the cyan separation (24).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required percent dot size with the DARK BROWN control for the yellow separation (8).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required percent dot size with the DARK BROWN control for the magenta separation (16).

6.1.8. Under-color Removal or Addition of Color

6.1.8.1. Under-color Removal

— Set the under-color removal, if required.

Example: 50 %

— Move the scanning light spot to the darkest picture area.

— With control UNDER-COLOR REMOVAL - STARTING POINT (73), determine the point on the gradation curve at which under-color removal is to begin:

approx. 8 in the highlight region

approx. 5 in the middle-tone region

approx. 2 in the shadow region

Start with the highlight region — if possible — to avoid flattening in the shadow area.

For standardized printing inks (e.g. European Scale), a larger percent dot size must always be set in the cyan separation than in the magenta and yellow separations.

— Set the COLOR SEPARATION switch (49) to "Cyan".

— Set the required value with control UNDER - COLOR REMOVAL "Cyan" (70).

— Set the COLOR SEPARATION switch (49) to "Magenta".

— Set the required value with control UNDER - COLOR REMOVAL "Magenta" (70).

— Set the COLOR SEPARATION switch (49) to "Yellow".

— Set the required value with control UNDER - COLOR REMOVAL "Yellow" (70).

To check whether any saturated black colors or dark brown tones are brightened up by under-color removal, the scanning light spot should be moved to the color to be checked.

— Consecutively, set the COLOR SEPARATION switch (49) to "Yellow", "Magenta", and "Cyan"; at the same time, press pushbutton UNDER - COLOR REMOVAL — OFF (80), release, and press again. Read off any brightening. (Pressing pushbutton UNDER-COLOR REMOVAL — OFF (80) short-circuits the previous under-color removal setting and the color values without under-color removal are indicated.)

If the brightening is too strong, the selective correction in the black separation must be increased or the starting point must be shifted towards the shadows. For this purpose, turn control UNDER-COLOR REMOVAL — STARTING POINT (73) towards the smaller numbers. Before exposing a black separation, adjust the selective correction to the desired setting in the black separation.

6.1.8.2. Addition of Color

— Set addition of color, if required.

— Move the scanning light spot to a black value with a color shift.

— With control ADDITION OF COLOR — STARTING POINT (79), determine the point on the gradation curve at which addition of color is to begin:

approx. 8 in the highlight region

approx. 5 in the middle-tone region

approx. 2 in the shadow region

— Set the COLOR SEPARATION switch (49) to "Cyan", "Magenta", and "Yellow".

Note the readings:

e.g. cyan	98 %
magenta	75 %
yellow	80 %

Start with the shadow region — if possible — to avoid blackening of dark colors.

For standardized printing inks (e.g. European Scale), the value for cyan is always higher than in the magenta and yellow separations.

— Set the COLOR SEPARATION switch (49) to "Magenta".

— Set the required value with control ADDITION OF COLOR "Magenta" (75) e.g. 85 %.

— Set the COLOR SEPARATION switch (49) to "Yellow".

— Set the required value with control ADDITION OF COLOR "Yellow" (75) e.g. 90 %.

— Set the COLOR SEPARATION switch (49) to "Black".

— Set the required value with control ADDITION OF COLOR "Black" (75).

If the required values cannot be obtained, the starting point must be shifted towards the highlight region. For this purpose, turn control ADDITION OF COLOR

— STARTING POINT (79) towards the larger numbers.

The effect of addition of color can be checked by means of pushbutton ADDITION OF COLOR — OFF (80), similar to under-color removal. With this pushbutton depressed, addition of color is ineffective.

6.1.9. Highlight Drop-out

— Set switch GRADATION - CATCHLIGHTS (85) to the required position.

— Set the STARTING POINT control (87) to "1".

— Set the STEEPNESS control (86) to "10".

— Move the scanning light spot to a light gray tone where steepening is to begin.

— Turn the STARTING POINT control (87) until the reading changes.

— Set the scanning light spot to picture white and set the required percent dot sizes with the STEEPNESS control (86).

6.1.10. Limiters

— Move the scanning light spot to picture white, according to the required limitation.

— Turn the HIGHLIGHT LIMITER (68) so that 1 % more than the required percentage is indicated.

— Move the scanning light spot to the darkest picture area.

— Turn the SHADOW LIMITER (69) so that 1 % less than the required percentage is indicated.

6.1.11. Start

— Check that all suction holes of the exposing drum are free from residues of adhesive tape.

— Load and insert the cassette.

— Switch on the vacuum for the exposing drum.

— Unlock the cassette.

— Mount the film.

— Move the scanning head and the mask scanning head to the picture beginning.

— Press the START pushbutton (128).

— Couple the cross-feed.

— When the mask scanning head has run over the right-hand "silhouetting" tab, press pushbutton (93) and expose the electronic gray scale (1 to 2 cm).

6.1.12. Test Exposure

— Press pushbutton ● (97 "high density") and then pushbutton ○ (98 "low density"); expose 1 cm each.

(The film is not exposed with the exposing lamp, but with a specially stabilized lamp.)

- The scanner stops by means of the limit switch or by pressing the STOP pushbutton (129).

6.1.13. Register Marks

With positive operation and silhouetting with low density, several register marks can be exposed on to the upper and lower end of a scan.

The exposure of register marks is performed after the exposure of the respective color separation, before the film is removed.

- Set the film beginning on the right-hand scale (210) below the reference mark (211).
- Turn the drum backwards and position register marks between film beginning and upper edge of the film (zero of scale) (at least 7 mm above the film beginning).
- Pull the register mark lever (216), lightly turning the drum forwards and backwards until it engages.
- Press the \oplus "register mark" pushbutton (182). (The register marks are now exposed.)
- Move the lever (216) upwards.
- Set the film end on the right-hand scale (210) below the reference mark (211).
- Keep on turning the drum, position and expose register marks in the same way between film end and the lower edge of the film (at least 7 mm below the film end).

6. 2. Producing a Set of Four Continuous-tone Color Separations

6.2.1. Basic Calibration

Condition:

- Mount the exposing head for continuous-tone separations.
- Perform film linearization for continuous-tone operation.
- Mount the original.
- Position the original relative to the film.
- Key in the code for the reproduction scale, depending upon the scanning drum inserted. (Refer to the Table of Reproduction Scales.)
- On the operating panel, press the \Rightarrow pushbutton (223) or \Leftarrow (222), according to the required scanning cross-feed direction.
- Press the POS pushbutton (91).

The density values indicated are valid for continuous-tone positives. For continuous-tone negatives (with the NEG pushbutton (92) depressed), all density values are inverted.

Example: Highlight density	1.70
Shadow density	0.30

The same applies to under-color removal, addition of color, and highlight drop-out.

- Set the switch TYPE OF GRADATION (43) to GRAVURE.
- Set the ORIGINAL POS / NEG switch (42) to POS 3.
- Press the \perp pushbutton (100).
- Press the pushbutton SCANNING LIGHT SOURCE ON (101).
- Press the PICTURE pushbutton (121).
- Set the switch COLOR SEPARATION (Mixture) (34) to OFF.
- Set the TEST switch (41) to OPERATING.
- GRADATION controls in normal position, e.g.
 - MIDDLE TONES (81) to 3.5 to 4
 - HIGHLIGHT SEPARATION (88) to "5"
 - SHADOW SEPARATION (89) to "4".

- GRAY BALANCE control (74) to "0".
- Adjust the controls COLOR CORRECTION WHITE COLORS and BLACK COLORS and SELECTIVE CORRECTION according to the table.
- Set the required scanning aperture (e.g. "4").
- Set the unsharp-masking filter wheel to magenta symbol.

When the unsharp-masking filter is changed, a white alignment should be performed. Within one color separation, the calibration should be carried out on the same spot on the drum or the original.
- Move the scanning light spot to clear glass.
- Hinge up the mirror.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).
- Set the COLOR SEPARATION 1 switch (49/1) to "Cyan".
- Set "100" with controls PICTURE ADJUSTMENT-HIGHLIGHT (62).
- Hinge down the mirror of the scanning head.
- Set "0" with control PICTURE ADJUSTMENT - SHADOW - Y, M, C (63).
- Set the MEASURE 1 switch (48) to FILM DENSITY.
- Set the required density value (e.g. $D = 1.70$) with controls FILM DENSITY — SHADOW — Y, M, C (65).
- Set the required density value (e.g. $D = 1.40$) with controls FILM DENSITY — SHADOW — BLACK (65).
- Hinge up the mirror.
- Set the required density value (e.g. $D = 0.30$) with controls FILM DENSITY — LIGHT (64).
- Set the required density value (e.g. $D = 0.15$) with controls FILM DENSITY — LIGHT — BLACK (64).

6.2.2. Picture Calibration

For the picture calibration, move the scanning light spot to picture white or a neutral area of the original and to picture black. For this purpose, use the time switch for the transparency illumination lamp, pushbutton (133), and the range-of-vision enlarger, pushbutton (134).

6.2.2.1. White Alignment with Color Shift Compensation

- Move the scanning light spot to picture white on the original.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).

6.2.2.2. White Alignment without Color Shift Compensation

- Move the scanning light spot to clear glass.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Press the white pushbutton WHITE ADJUSTMENT / WITH COLOR SHIFT COMPENSATION (50).
- Move the scanning light spot to a neutral area on the original.
- Hinge up the mirror out of the light path.

- Press and detain the blue pushbutton WHITE ADJUSTMENT / WITHOUT COLOR SHIFT COMPENSATION (51).
- Set the MEASURE 1 switch (48) to position FILM DENSITY.
- Set the COLOR SEPARATION 1 switch (49/1) successively to yellow, magenta and cyan separations, determine the brightest channel (e.g. cyan) and switch on this channel.
- With the control PICTURE ADJUSTMENT — HIGHLIGHT (52) set the desired film density (e.g. $D = 0.4$).
- Release the blue pushbutton WHITE ADJUSTMENT / WITHOUT COLOR SHIFT COMPENSATION (51).
The set values are fixed and correspond to the color differences in the original.

Attention:

The blue pushbutton must not be operated any more while the four color separations are produced.

6.2.2.3. Black Alignment

- Move the scanning light spot to the darkest area on the original.
- Hinge up the mirror out of the light path.
- Set the MEASURE 1 switch (48) to position PICTURE ADJUSTMENT.
- Switch the COLOR SEPARATION 1 switch (49/1) to position "Black".
- Set to "0" with the PICTURE ADJUSTMENT — "Black" control (63).

6.2.3. Modifying Color Shifts in the Highlight and Shadow Areas

6.2.3.1. Modifying a Color Shift in the Highlight Areas

Condition: The white alignment without color shift compensation as per chapter 6.2.2.2. must be performed.

When setting the white alignment according to the above method, the color shifts in the original are maintained. Modifications are carried out as follows:

- Set the scanning head to "picture white".
- Set the COLOR SEPARATION 1 switch (49/1) successively to positions "yellow", "magenta" and "cyan" and determine the brightest channel (e.g. yellow $D = 0.6$, magenta $D = 0.5$, cyan $D = 0.4$).
In this example, cyan is the brightest color channel which should not be modified any more.
- Switch the COLOR SEPARATION 1 switch (49/1) to "magenta" and set the desired value (e.g. $D = 0.4$) with the control PICTURE ADJUSTMENT — HIGHLIGHT "Magenta" (62).
- Switch the COLOR SEPARATION 1 switch (49/1) to "yellow" and set the desired value (e.g. $D = 0.5$) with control PICTURE ADJUSTMENT — HIGHLIGHT "Yellow" (62). If also the brightest channel is to be modified, the total setting process as per chapter 6.2.2.2. must be carried out again, in the course of which the desired value is set.
After the color set is made, set again "100" with the controls PICTURE ADJUSTMENT — HIGHLIGHT "yellow", "magenta", and "cyan". (62). For this purpose, turn controls PICTURE ADJUSTMENT — HIGHLIGHT "Yellow", "magenta", and "cyan" (62) to the left-hand stop (nose downwards) and then 1 turn back to the right until once again the nose points downwards.

6.2.3.2. Modifying a Color Shift in the Shadow Areas

Color shifts in the shadow areas are compensated with the ADDITION OF COLOR controls. For description refer to chapter 6.2.8.2. "Addition of Color".

6.2.3.3. Switching on the Neutral Balance

- Set the TYPE OF GRADATION switch (43) to position 3, SCREEN ("contact screen"), or position 5, "electronic screen".
- Set the MEASURE 1 switch (48) to position FILM DENSITY.
- Set the COLOR SEPARATION 1 switch (49/1) to position "Cyan".
- Move the scanning head to a neutral part of the picture or to a gray scale step of approx. 50 %.
- Set the COLOR SEPARATION 1 switch (49/1) to position "Magenta".
- Set the desired brightening (approx. 8 to 10 %) by means of the NEUTRAL BALANCE control (74).
Control position approximately between 3 and 4.

6.2.4. Setting the Color Correction

The controls have already been pre-set as per Table 5.6. "Color Correction", in chapter 5.13. Perform the required color correction.

- Move the scanning light spot to full cyan on the original.
- Set the required density value (e.g. $D = 1.65 - 1.70$) with control COLOR CORRECTION — BLACK COLORS "Cyan" (61). If there is no cyan in the original, the control remains on the value pre-set.
- Move the scanning light spot to pure red.
- Set the required density value (e.g. $D = 0.05$ darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Cyan" (58).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Move the scanning light spot to full magenta.
- Set the required density value (e.g. $D = 1.65 - 1.70$) with control COLOR CORRECTION — BLACK COLORS "Magenta" (60).
- Move the scanning light spot to pure green.
- Set the required density value (e.g. $D = 0.05$ darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Magenta" (57).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Move the scanning light spot to full yellow.
- Set the required density value (e.g. $D = 1.65 - 1.70$) with control COLOR CORRECTION — BLACK COLORS "Yellow" (59).
- Move the scanning light spot to pure blue.
- Set the required density value (e.g. $D = 0.05$ darker than picture white) with control COLOR CORRECTION — WHITE COLORS "Yellow" (56).

The main correction for all separations is thus set.

6.2.5. Selective Color Correction

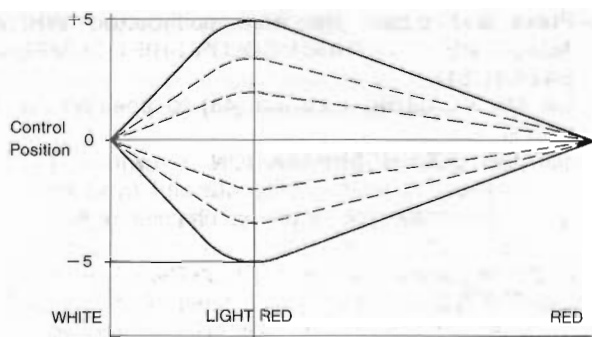
- Consecutively move the scanning light spot to each of the selective colors; check the portion of this color in the individual color separations and correct, if required.
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Move the scanning light spot to full blue on the original.
- Set the required value with the selective control BLUE in the cyan separation (17).
- Set the COLOR SEPARATION switch (49) to "Magenta".

- Set the required value with the selective control BLUE in the magenta separation (9).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control BLUE in the black separation (25).
- Move the scanning light spot to full cyan.
- Set the required value with the selective control CYAN in the black separation (26).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with the selective control CYAN in the magenta separation (10).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control CYAN in the yellow separation (2).
- Move the scanning light spot to full green.
- Set the required value with the selective control GREEN in the yellow separation (3).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control GREEN in the cyan separation (19).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control GREEN in the black separation (27).
- Move the scanning light spot to full yellow.
- Set the required value with the selective control YELLOW in the black separation (28).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control YELLOW in the cyan separation (20).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with the selective control YELLOW in the magenta separation (12).
- Move the scanning light spot to full red.
- Set the required value with the selective control RED in the magenta separation (13).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control RED in the yellow separation (5).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with the selective control RED in the black separation (29).
- Move the scanning light spot to full magenta.
- Set the required value with the selective control MAGENTA in the black separation (30).
- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with the selective control MAGENTA in the cyan separation (22).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with the selective control MAGENTA in the yellow separation (6).

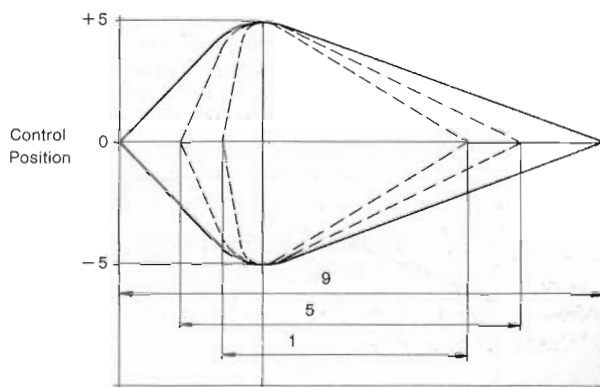
6.2.6. Light Red

If the light red tones are to be changed, the starting point between white and light red must be determined.

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set all LIGHT RED controls (7, 15, 23) to the right-hand limit.
- Move the scanning light spot to a light red tone which shall not be changed. (This red must always be lighter than the red tone which is to be changed.)
- Turn the STARTING POINT control (31) so that the reading changes.
- Move the scanning light spot to a light red tone



LIGHT RED Controls (7, 15, 23)
with STARTING POINT Control at 9



STARTING POINT Control (31) with
LIGHT RED Control at +5 or -5

which shall be changed.

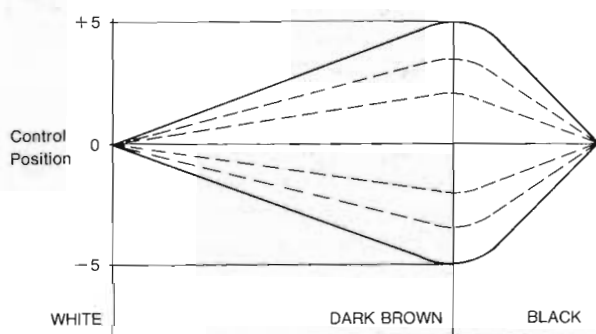
- Set the required density value with the LIGHT RED control for the cyan separation (23).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required density value with the LIGHT RED control for the yellow separation (7).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required density value with the LIGHT RED control for the magenta separation (15).

6.2.7. Dark Brown

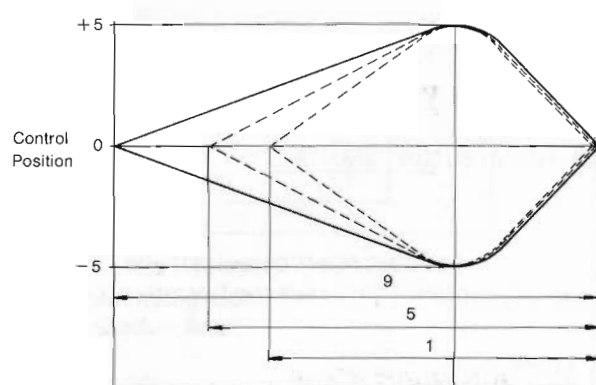
If the dark brown tones are to be changed, the starting point between black and dark brown must first be determined.

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Turn all DARK BROWN controls (8, 16, and 24) to the right-hand limit.
- Move the scanning light spot to a dark brown tone which shall remain unchanged. (This brown tone should always be lighter than the brown tone to be changed.)
- Turn the STARTING POINT control (32) so that the reading changes.
- Move the scanning light spot to a brown tone which shall be changed. (This brown tone should always be darker than the brown tone not to be changed.)
- Set the required density value with the DARK BROWN control for the cyan separation (24).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required density value with the DARK BROWN control for the yellow separation (8).

- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required density value with the DARK BROWN control for the magenta separation (16).



DARK BROWN Controls (8, 16, 24)
with STARTING POINT Control at 9



STARTING POINT Control (32) with
DARK BROWN Control at +5 or -5

6.2.8. Under-color Removal or Addition of Color

6.2.8.1. Under-color Removal

- Set the under-color removal, if required.
- Example: 50 % $\hat{=}$ density of approx. 1.0
- Move the scanning light spot to the darkest picture area.
- With control UNDER-COLOR REMOVAL — STARTING POINT (73) determine the point on the gradation curve where under-color removal is to begin:
 - approx. 8 in the highlight region
 - approx. 5 in the middle-tone region
 - approx. 2 in the shadow region

Start with the highlight region — if possible —, to avoid flattening in the shadow area.

For continuous-tone offset and letterpress separations (switch TYPE OF GRADATION 43 in OFFSET / LETTERPRESS position) and for standardized printing inks (e.g. European Scale), a higher density value must always be set in the cyan separation than in the magenta and yellow separations.

- Set the COLOR SEPARATION switch (49) to "Cyan".
- Set the required value with control UNDER-COLOR REMOVAL "Cyan" (70).
- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with control UNDER-COLOR REMOVAL "Magenta" (70).

- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with control UNDER-COLOR REMOVAL "Yellow" (70).

To check whether any saturated black colors or dark brown tones are brightened up by under-color removal, the scanning light spot should be moved to the color to be checked.

- Consecutively set the COLOR SEPARATION switch (49) to "Yellow", "Magenta", and "Cyan"; at the same time, press pushbutton UNDER-COLOR REMOVAL - OFF (80), release, and press again. Read the brightening (if any) on the meter. (Pressing pushbutton UNDER-COLOR REMOVAL — OFF (80) short-circuits the previous under-color removal setting and the color values without under-color removal are indicated.) If the brightening is too strong, the selective correction in the black separation must be increased and the starting point must be shifted towards the shadows. For this purpose, turn control UNDER-COLOR REMOVAL — STARTING POINT (73) towards the smaller numbers.

Before exposing a black separation, adjust the selective correction to the desired setting in the black separation.

6.2.8.2. Addition of Color

- Set addition of color, if required.
- Move the scanning light spot to a black value with a color shift.
- With control ADDITION OF COLOR — STARTING POINT (79) determine the point on the gradation curve where addition of color is to begin:
 - approx. 8 in the highlight region
 - approx. 5 in the middle-tone region
 - approx. 2 in the shadow region

Set the COLOR SEPARATION switch (49) to "Cyan", "Magenta", and "Yellow", consecutively.

Note the readings:

e.g.	cyan	D = 1.70
	magenta	D = 1.45
	yellow	D = 1.55

Start with the shadow region — if possible — to avoid blackening of dark colors.

- For continuous-tone offset and letterpress separations (switch TYPE OF GRADATION (43) in OFFSET / LETTERPRESS position) and for standardized printing inks (e.g. European Scale), a higher value must always be set in the cyan separation than in the magenta and yellow separations.

- Set the COLOR SEPARATION switch (49) to "Magenta".
- Set the required value with control ADDITION OF COLOR "Magenta" (75) (e.g. 1.55).
- Set the COLOR SEPARATION switch (49) to "Yellow".
- Set the required value with control ADDITION OF COLOR "Yellow" (75) (e.g. 1.60).
- Set the COLOR SEPARATION switch (49) to "Black".
- Set the required value with control ADDITION OF COLOR "Black" (75).

If the required values cannot be obtained, the starting point must be shifted towards the highlight region. For this purpose, turn control ADDITION OF COLOR — STARTING POINT (79) towards the larger numbers. — The effect of addition of color can be checked by means of pushbutton ADDITION OF COLOR — OFF (80), similar to under-color removal. With this pushbutton depressed, addition of color is ineffective.

6.2.9. Highlight Drop-out

- Set switch GRADATION - CATCHLIGHTS (85) to the required position.
- Set the STARTING POINT control (87) to "1".
- Set the STEEPNESS control (86) to "10".
- Move the scanning light spot to a light gray tone where steepening is to begin.
- Turn the STARTING POINT control (87) until the reading changes.
- Set the scanning light spot to picture white and set the required density values with the STEEPNESS control (86).

6.2.10. LIMITERS

- Move the scanning light spot to picture white, according to the required limitation.
- Turn the HIGHLIGHT LIMITER (68) so that $D = 0.02$ more than the required density value is indicated.
- Move the scanning light spot to the darkest picture area.
- Turn the SHADOW LIMITER (69) so that $D = 0.02$ less than the required density value is indicated.

6.2.11. Start

- Tape the vacuum channels at the front of the exposing compartment according to the film size to be used.

(Keep sample films of all sizes to be used at hand.)

- Load and insert the cassette.
- Switch on the vacuum for the exposing drum.
- Unlock the cassette.
- Mount the film.
- Move the scanning head and the mask scanning head to the picture beginning.
- Press the START pushbutton (128).
- Couple the cross-feed.
- When the mask scanning head has run over the right-hand "silhouetting" tab, press pushbutton (93) and expose the electronic gray scale (1 to 2 cm).

6.2.12. Test Exposure

- Press the pushbutton ● (97 "High density") and then pushbutton ○ (98 "low density"); expose 1 cm each.
(The film is not exposed with the exposing lamp, but with a specially stabilized lamp.)
- The scanner stops by means of the limit switch or by pressing the STOP pushbutton (129).

6.2.13. Exposing Register Marks

(Refer to paragraph 6.1.13.)

7. Working with the Mask Electronics

7. 1. Possible Applications

By using the control mask, the operator is able to include further operations in that of the production of the color separations:

He can simultaneously insert constant densities or he can combine two or more originals in the separations, all scales being adjustable (merging).

It is possible

- to insert lettering,
- to silhouette pictures with any contours,
- to border pictures with any color and contour.

7. 2. Component Parts of the Mask Electronics and their Method of Operation

The mask electronics comprise the control mask, the scanning device for the control mask, and the control mask electronics with the patch panel. The scanning device for the control mask, which consists of the mask drum, the mask scanning head and the control units for the electronic silhouetting, is described in chapter 2 and the signal path in chapter 4, paragraph 4.2.

The setting of the threshold values and the basic setting of the white levels for the mask scanning head are described in chapter 5, paragraphs 5.15. and 5.16.

The controls for the control electronics are described in chapter 3, paragraph 3.2.6.

It is therefore assumed here that these descriptions and the methods of operation of the different units are known, and only such additional information as is necessary for handling the mask electronics is given.

7. 3. Functions of the Control Mask and the Patch Panel

The exact positions and forms of inserted color separations and/or constant densities are specified on the control mask. The resulting areas are then filled in with various colors (black, red, blue or white). When the mask scanning head scans the control mask, a change from one color to another gives rise to electronic control commands which put through the desired exposing signals.

In addition to these control commands there is a purely electronic silhouetting command. This is brought about by the silhouetting electronics and the interaction of the tabulator tabs and the microswitches on the mask scanning head.

By means of the patch panel, Fig. 7-1, it is determined which mask color control commands or electronic silhouetting control commands are assigned to the exposing signals for picture (color separation), for D1...D4 (constant density) and for LOCAL CORR. (local tone and color correction). The following fixed programming should be borne in mind: The signal assigned to the electronic silhouetting is always transmitted with priority over the mask color control commands. The control command for a mask color is therefore blocked if the electronic silhouetting has been switched on.

The patch panel (Fig. 7-1) is constructed as follows: In the top row there are five indicator lamps, "black" (115), "red" (116), "blue" (117), "white" (118) and □ "silhouetting" (119).

The symbols and colors correspond to the mask colors and to the electronic silhouetting. If the mask scanning

head scans a mask color, the associated indicator lamp lights. If the electronic silhouetting is switched on, this lamp also lights.

The pushbuttons arranged in a vertical row are each associated with a lamp and one or more controls, as shown in Table 7.1.

Table 7.1. Relationship between Indicator Lamps, Pushbuttons, and Controls of the Patch Panel

Indicator Lamp	Pushbutton	Control
No. (121 L)	PICTURE (121)	In color computer
No. (122 L)	D ₁ (122)	122 R
No. (123 L)	D ₂ (123)	123 R
No. (124 L)	D ₃ (124)	124 R
No. (125 L)	D ₄ (125)	125 R
No. (126 L)	LOCAL CORR. (local tone and color correction (126) MASK + TEST (127)	LOCAL TONE AND COLOR CORRECTION (35-37) (in color computer)

The middle of the patch panel consists of several rows of contact sockets. They are arranged vertically under the indicator lamps for the switching commands and horizontally alongside the indicator lamps for the picture and exposing functions.

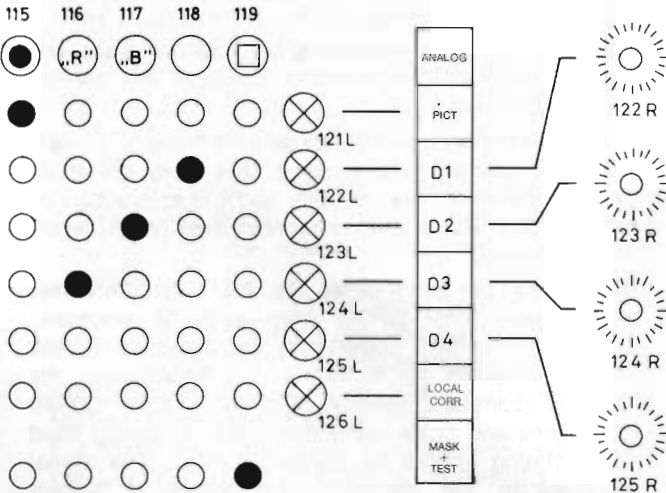


Fig. 7-1 Patch Panel

When the pushbuttons are pressed, the corresponding commands are switched on independently of the programming. The associated exposing signals can now be adjusted without regard to the setting of the mask scanning head. At the same time the associated indicator lamp is lit. In order to allow all commands to

become effective when the picture is exposed, when the machine is started all fixed programming pushbuttons are released. If only a constant density or only the picture without silhouetting is to be exposed, all mask commands on the patch panel must be plugged for this signal.

The MASK + TEST pushbutton (127) is used when the machine is at rest in order to test the indicator lamps and to release the fixed programming pushbuttons in order to check the control color changeover commands. The following is an example of the programming (Figs. 7-1, 7-2 and 7-3):

The control mask (Fig. 7-2) shows the region in which the picture (original) is to be placed filled in black. We now imagine a line running vertically from the "Black" indicator lamp and a line running horizontally from the "Picture" indicator lamp. At the point of intersection of these imaginary lines there is a socket into which a plug is inserted (Fig. 7-1). The switching command "Black" is now connected with the exposing command "Picture". Whenever the mask scanning head scans a black part on the control mask, the "Picture" signal is transmitted to the exposing lamp.

On the control mask there is lettering in the control color "Blue". This control color "Blue" is assigned to the density control D 2. Consequently, we insert a contact plug in the socket at the point of intersection "Blue" - D2. The required density for the lettering to be inserted is readjusted by means of the density control (123 R) for each color separation (Fig. 7-3).

The company emblem is filled in with the control color "Red" on the control mask. This color is assigned to the density control D 3. We therefore insert a contact plug in the socket at the point of intersection "Red" - D 3. The required density for each of the color separations is adjusted with the density control (124 R).

Silhouetting corresponds to "White" on the control mask. This color is assigned to the density control D 1. We therefore insert a contact plug in the socket at the point of intersection "White" - D 1. In all color separations, silhouetting shall correspond to a density D = 0. Consequently, the density D = 0 is set up on the density control (122 R), and maintained in all color separations.

Attention

The density control D1 (122 R) should always be used if possible for silhouetting parts of pictures and lettering. In the case of screening, it is only this control which cancels the effect of the FILM LINEARIZATION 1% control (107 a) and thereby ensures that no screen dots are visible.

The electronic silhouetting is not necessary, and consequently the plug is inserted in a spare socket in the bottom row on the patch panel. This row of sockets is not wired, and is only used for accommodating spare plugs.

The following chapters explain the purposes for which the mask electronics can be used and how it should be operated in the different applications. To avoid complicating the operating instructions, only the exposure of continuous-tone color separations will be described. In most cases it is sufficient to interchange the words "density" and "screen dot size" in order to apply the descriptions to screened color separations.

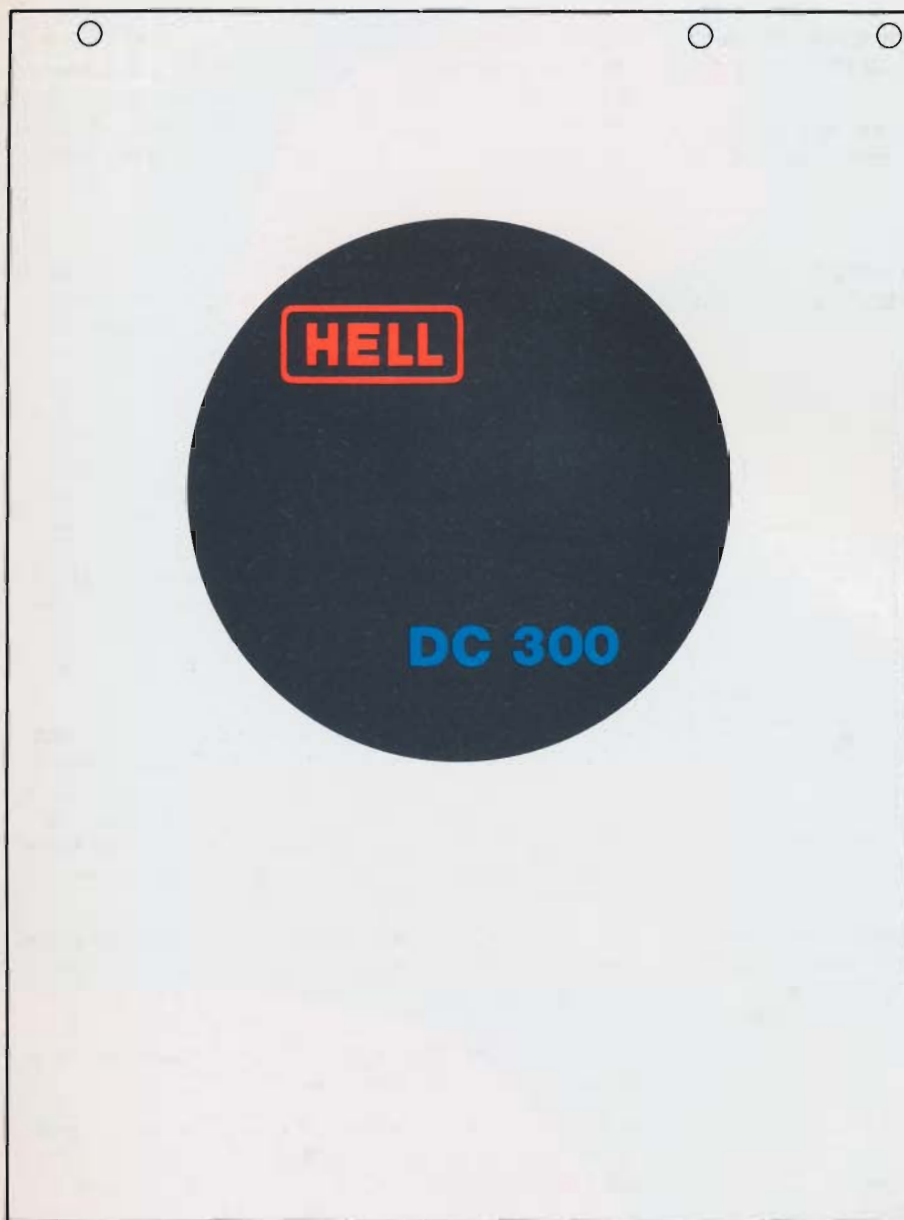


Fig. 7-2 Control Mask

7. 4. Producing a Control Mask

A control mask will give satisfactory switching commands only if the contours on the mask are sharp. Sharp contours are easily obtained on lith film, and it is therefore best to use this for lettering. It is necessary to decide whether it is better to start off from positive or negative lettering. Positive lettering appears black on the control mask, whereas negative lettering appears

white or colored on a black background (Figs. 7-2 and 7-4). In most cases, lettering that has to be inserted is best mounted positive on an "auxiliary mask". This auxiliary mask is then copied on lith film. This copy is then made into the finished control mask. The lettering on it is negative. It has sharp contours which it retains even if it is not to remain white, but is to be underlaid with red or blue.


Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"			Yellow	Magenta	Cyan	Black
x			x		PICTURE	—	—	—	—
	x	x			D ₁	0	0	0	0
					D ₂	1,7	1,5	0	0
					D ₃	1,3	0	1,0	0

Fig. 7-3 Programming



Chromagraph DC 300

Fig. 7-4 Example of a Control Mask (Section)

Original:

X X X

Date:

X X

Drum $\frac{1}{1}$ $\frac{1}{2}$ $\frac{1}{4}$

Percent **500**

Code number from Table
1500 hor **0265** vert

Mask drum
 Picture beginning **031.0**
 Block SD*
 Circumference **1 43,3**
 Silhouetting **500.0**

Scanning Direction \rightarrow **X**
 \leftarrow

Cross-feed **40**

(Silhouetting ON) upper tab
 lower tab (Picture ON)

Scanning drum
 Block SD*
 Circumference **2 25,4**

Cross-feed **4 12,5**

*SD = Scale division

Fig. 7-5 Form for Positioning

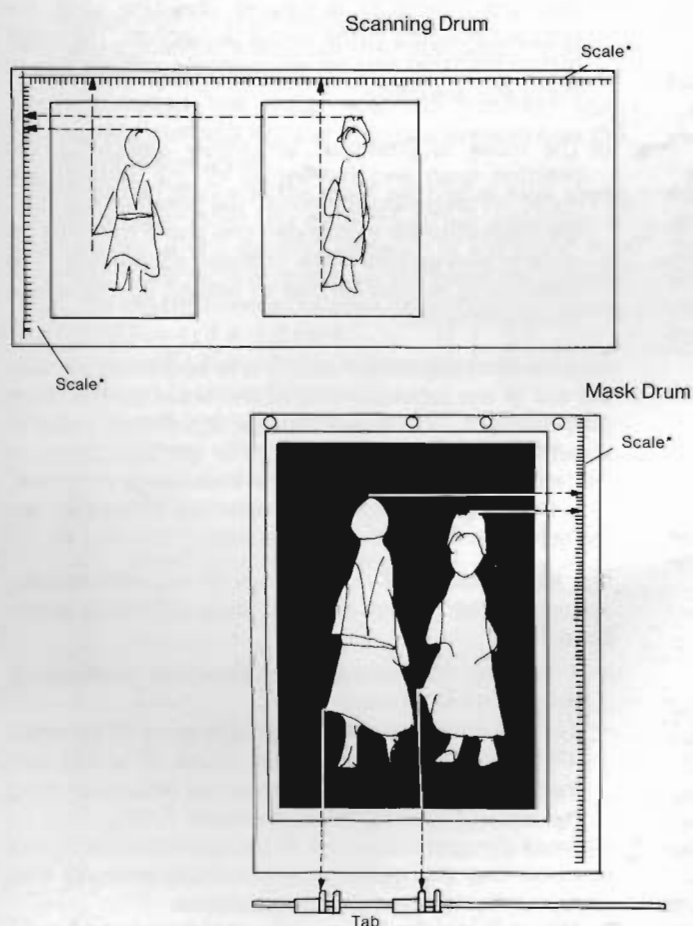


Fig. 7-6 Patterns and Control Mask

When producing a mask, it is usually assumed that each mask color can only give one command. By the use of two tricks it is possible to overcome this limitation to four mask colors.

— We use two or more masks. When working with the first mask using four colors, one of these is used to silhouette the zone in which the colors of the second mask are to switch. One color of the second mask must again silhouette the contours used in the first mask. Thanks to the HELL register-pin system, it is a simple matter to obtain a true-to-register change of the control mask between two exposures.

— The second method is not quite so flexible, but it is sufficient in many cases. It is used in the merging process described in chapter 7.12.

With many control masks it is possible to surround one or more contours with an imaginary rectangle with two sides parallel to the cross-feed direction in such a way that this rectangle contains a complete command area and a part of the adjacent colors. Such a rectangle can always be dealt with by the electronic silhouetting (see chapter 7.8.). In this way, this part of the control mask can be treated differently from the remainder. For example, a picture can be included within the contour in this region, whereas the density $D = 0$ is exposed on the remainder of the film.

In both methods it is necessary to expose each film at least twice.

★ When making multiple exposures on continuous-tone film it must be borne in mind that parts which have already been exposed undergo a slight increase in density of about $D = 0.03$ when re-exposed, even though a density of $D = 0$ has been set up. This has two consequences:

— The number of exposures still to be carried out must be taken into account when setting the film density.

— The complete film must be exposed during every exposure.

★ Covering of the mask, whether with red, blue or black color, by inserting positive or negative contours (e.g. lettering) or by underlaying with colored papers, must be carried out on that side of the base material which faces the colored background paper (quasi-white) during scanning. If this requirement is not met, the following faults may occur:

— Faulty switching due to the formation of shadows on the base paper.

— Unsharp contours due to different focal planes.

★ When a mask is produced, it is necessary to know which process will be used for making the color separations. This decides whether the control mask should be right-reading or wrong-reading by observing the emulsion through the base material.

Example:

Screened positive for offset

This means: wrong-reading mask.

★ The finished control mask should have as few contours as possible vertical to the cross-feed direction, otherwise switching steps several millimetres in length and having the width of an exposed line may occur at these contours: flagstaff effect (this is particularly disturbing). Remedy: Turn the original and the mask.

★ In order to produce control masks with picture subjects, it is first necessary to make a position scan (refer to chapter 7.5.).

Special attention must be paid to the paragraphs marked ★.

7. 5. Positioning the Color Separation relative to the Film

Before deciding on the nature of the positioning to be used, consideration should be given to the following problems.

Problem 1

The positioning must be chosen so as to use the film format advantageously and to avoid losing parts of the color separation because of the format borders.

Problem 2

When producing a mask with silhouetting without picture contours or with lettering, it must be arranged that the desired section of the picture is silhouetted or that the lettering appears in the correct position on the film.

Problem 3

If silhouetting is made according to the picture contours (see chapter 7.10), or when several pictures are to be merged (see chapter 7.12.), it is necessary to make a position scan in the required final scale. There are two possibilities for the positioning:

a) The separations to be mounted are placed anywhere on the film and during the production of the mask they are moved in a parallel direction until the required position in the layout is reached. The mask is then prepared and the adjustments with respect to the optics are made.

b) The mask is produced accurately already in the position scan and the values of the settings are noted. In preparing the mask, the position scan and the mask foils are suspended one above the other on register pins and the mask is drawn accordingly. The positioning is then limited to setting up the values previously noted.

In the case of problems 1 and 2, it is best to adjust with the aid of the tabulator and of the scale on the drum (see chapter 5.14.). In most cases, adjustment errors of about 1/2 mm can be accepted. For the positioning of the lettering and of the silhouette contours of the mask, it is important to know that these are in exactly the same place on the film as on the mask.

The third problem should always be solved in accordance with the method b). This has a number of great advantages:

— It enables the operator to recognize positioning errors at an early stage.

— It allows a production planner to prepare an accurate positioning specification, the values of which can then be set up without much serious reflection using the scales on the DC 300 (see chapter 7.10.).

— Small dimensional errors in the specification do not mean that the montage will not fit, because they repeat themselves in the adjustments.

— The work load on the operator is reduced and he can concentrate more on the color correction.

7. 6. Adapting the Mask Drum Circumference to the Exposing Drum

7.6.1. Basic Considerations

The circumference of the cylinder of the mask scanning drum is somewhat smaller than that of the exposing drum. This is necessary because the mask scanning drum carries a special paper for the "White" command, e.g. Color-aid VRV T 3.

If position scans are used for the production of the control mask, the circumferences of the mask scanning drum and the exposing drum must be exactly equal. For this reason, the control mask must be underlaid so that it and the separation film lie on equal drum circumferences. The mask and the separation film are fixed to the drums with extremely high repeatable accuracy with the aid of the register pins. The mask scanning head and the exposing head are adjusted with respect to one another in such a way that the scanning spot on the mask and the exposing spot on the film are always in the same position relative to the register pins in circumferential direction and cross-feed direction when the drum circumferences are the same.

7.6.2. Calculation of Underlay Thickness for the Mask

In order to determine whether the mask and the separation film lie on the same drum circumferences, and by how much the mask requires underlaying, the following procedure should be adopted:

- On the mask scanning drum, clamp a white mask having a number of black register marks at a distance of three-quarters of the drum circumference from the register pins in cross-feed direction.
- Make a position scan from the mask with the aid of the mask electronics.
- Superimpose the mask and the position scan accurately using a register strip and observe how the register marks agree.

If the register marks on the mask are higher than those on the position scan the mask must be underlaid. If they are below, the existing underlay is too thick. For example, if the register marks on the mask are 0.9 mm high, the total difference between the circumferences is 1.2 mm ($0.9 \times 4/3 = 1.2$ mm).

The thickness of the underlay is calculated as follows:

C = drum circumference

ΔC = part of drum circumference
(here, the circumferential difference,
e.g. 1.2 mm)

r = radius of drum

Δr = part of drum radius
(here, thickness of underlay)

$$C = 2\pi r$$

$$\frac{C}{\Delta C} = \frac{r}{\Delta r}; C = \frac{\Delta C \cdot r}{\Delta r}$$

$$\frac{\Delta C \cdot r}{\Delta r} = 2\pi r; \Delta C = 2\pi \Delta r$$

$$\Delta r = \frac{\Delta C}{2\pi}$$

Example: $\Delta C = 1,2$ mm

$$\Delta r = \frac{1,2}{2\pi} = 0,19 \text{ mm}$$

The mask should therefore be given an additional underlay with material 0.19 mm in thickness. This could be done with a Cronar film (about 0.18 mm) and a sheet of tissue paper (about 0.01 mm).

7. 7. Positioning when Working with the Mask Electronics

When working with the mask electronics, positioning should be carried out as described in chapter 5.14. in most cases. This description is enlarged upon below, and a different procedure is described.

7.7.1. Positioning when Preparing Position Scans

The procedure will be explained on the basis of an example (a combination of two pictures). It has been found best to enter all dimensional data and settings on a form (Fig. 7-5). (The data and values resulting from the example which would be recorded on the form are shown in brackets [].)

Preparations

- Choose size of drum [$1/2$ = medium drum].
- Fix the setting scales on the scanning and mask scanning drums.
- Mount the originals on the scanning drum, square or obliquely according to the layout (Fig. 7-6).
- Determine the scale [500 %].
- From the Table, determine the code number corresponding to the drum and the scale [hor.: 1500; vert.: 0265] and key same in.
- Determine the scanning direction [►].
- On the mask scanning drum determine the distances of the details for the start of the picture in circumferential and cross-feed directions in accordance with the layout (Fig. 7-6).
e.g.: Distance from the perforated film edge 31 mm
Distance from the left-hand film edge 40 mm

Positioning in Circumferential Direction

- Press SCALE/BORDER switch (155) and CL push-button (153) on the electronics cabinet. Afterwards key in 031.0. [031.0]
- Turn the scanning drum so that 3.1 of the scale (209) lies below the mark (211). Lock the drum with the brake.
- Push the optics of the mask scanning head in front of the taped setting scale and read off the scale value using the viewing tube. [Block 1, scale division 43.3]
- Loosen the locking ring on the flange. Bring the detail with which the original picture begins in the circumferential direction under the graticule in the viewing tube of the scanning optics. Retighten the locking ring.
- Bring the scanning optics in front of the setting scale taped in the circumferential direction and read the scale value in the viewing tube. [Block 2, scale division 25.4]

Positioning in Cross-feed Direction

The two upper and the lower right-hand tabs must be at the right-hand end of the tabulator.

- Engage the lower left-hand tab at 40 mm [40].
- Release the mask scanning drum.
- Bring the scanning optics to the detail with which the original picture begins in the cross-feed direction.
- Fasten the starting block and come up to the detail exactly, using the micro-adjustment.

— Turn the scanning drum until the horizontal setting scale is in front of the optics. Read the scale value in the viewing tube. [Block 4, scale division 12.5]
The coordinates for the second picture are also determined, measured and noted on a second form.

7.7.2. Positioning with a Specified Mask Cut-out

If the position of a picture on the film is determined by a specified mask cut-out, it is necessary, for the beginning of the picture in circumferential direction, to determine the position of the mask cut-out. In this, allowance must be made at the same time for a displacement which occurs in the accurate positioning. The value of this does not exceed 0.3 mm. The displacement arises due to the delay time in the enlargement electronics. Its magnitude depends on the nature of the scale change. With electronic reduction, the error is smaller than with the electronic enlargement. Digital operation in the scale 1 : 1 is regarded as an enlargement. The different values of displacement are taken into account by means of two auxiliary marks on the ground-glass in the mask scanning head (Fig. 7-7).

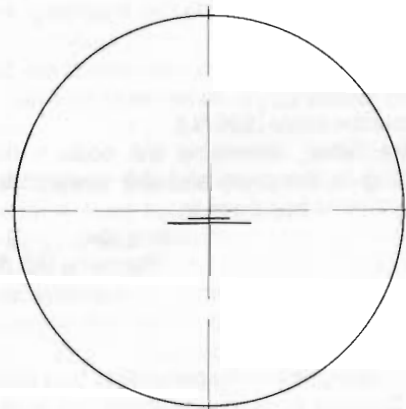


Fig. 7-7 Ground-glass of the Mask Scanning Head with Graticule and Markings for Exact Setting of the Picture Beginning

These auxiliary marks have different sizes. The shorter mark is used in the case of electronic reduction and the larger one for electronic enlargement or in the case of digital 1 : 1 operation.

Note :

Electronic enlargement - larger auxiliary mark
Electronic reduction - smaller auxiliary mark

Positioning in Circumferential Direction

- Bring the large or small auxiliary line on the ground-glass of the mask scanning head to the beginning of the mask cut-out in circumferential direction.
- Lock the mask drum.
- From the scale (209) of the mask drum, read off the value below the mark (211).
- Press SCALE/BORDER switch (155) and CL push-button (153) on the electronics cabinet. Afterwards key in the obtained value.
- Loosen flange.
- Bring the light spot of the scanning optics onto the detail for the beginning of the picture in the circumferential direction.
- Fasten the flange.

Positioning in Cross-feed Direction

- Push all tabs on the tabulator to the right-hand end.
- Bring the graticule on the ground-glass screen of the mask scanning head to the beginning of the mask cut-out in cross-feed direction.
- Fix the mask scanning head with the starting block.
- Press the STOP pushbutton (129).
- Push the upper tab of the tabulator from the right under the silhouetting microswitch on the mask scanning head and back again.
The silhouetting lamp (\square 119) lights.
- Push the lower tab to the left against the actuator of the microswitch for the beginning of the picture. When the silhouetting lamp (119) goes out, engage the tab a further half millimetre to the left.
- Fasten the starting block with the mask scanning head about 2.5 cm further to the left.
- Bring the light spot of the scanning optics onto the detail for the beginning of the picture.
- Fix this position with the starting block.

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
X	X	X	X	X	PICTURE	—	—	—	—

Programming

Note

On all color separations produced with the settings explained above, a horizontal line about 5 mm wide appears at the upper edge of the usable format. The density of this strip will be determined by the density

control last switched through by the control mask. When working without the control mask, the density control (122 R) determines the density exposed in the line since it was programmed at the start of the procedure.

7. 8. Producing a Color Separation with Electronic Silhouetting

This provides a simple method of silhouetting a picture in a rectangular manner and with two edges parallel to the cross-feed direction, or of surrounding it with a tone value of any kind. In addition to data on the beginning of the picture (chapter 7.7.), data on the picture format and the silhouetting density are also necessary.

Example: (see also chapter 7.7.)

Picture beginning → 40 mm

Picture beginning ↓ 31 mm

Picture format: 300 × 400 mm (height × width)

Silhouetting density: D = 0

7.8.1. Setting the Picture Beginning → (See chapter 7.7.1.)

7.8.2. Setting the Picture End →

— Calculate the end point of the picture:

Starting point + width = end point
40 mm + 400 mm = 440 mm

— Set the upper tab on the tabulator rail to 440 mm.


7.8.3. Setting the Picture Beginning ↓ (See chapter 7.7.1.)

7.8.4. Setting the Picture End ↓

— Calculate the end point of the picture:

Starting point + height = end point
31 mm + 300 mm = 331 mm

— After having keyed in the value 031.0 for picture beginning, also key in the value 331.0 for picture end.

Control Commands					Density in Separation Colors				
"Black"	"Red"	"Blue"	"White"			Yellow	Magenta	Cyan	Black
x	x	x	x	x	PICTURE D ₁	— 0	— 0	— 0	— 0

7.8.5. Programming

The density D = 0 is set up with the density control (122 R).

- MEASURE 1 switch (48) in position FILM DENSITY.
- Press D 1 pushbutton (122) and set up the density "0" on the digital meter by means of the control (122 R).

7.8.6. Several Color Separations with the MULTI-COLOR Equipment


Using the MULTI-COLOR equipment it is possible to expose two or four color separations (depending on the size) simultaneously on one film. In this case the mask technique is not required.

— Switch the FORMAT switch (188) to the desired film format (e.g. F4 = 40 × 50 cm film)

— Positioning:

Picture size "vertical" = 21 cm

Picture beginning  Key in 20 mm

Picture end  Key in 230 mm

Picture size "horizontal" = 18 cm

1st line

Picture beginning → lower tab to 10 mm

Picture end → uppertab to 190 mm

2nd line

Picture beginning → lower tab to 210 mm

Picture end → uppertab to 390 mm

When scanning the first line, the horizontal picture size is stored and than recalled when the second line is being scanned. The machine must not be stopped between these two lines since this would erase the storage.

— Move the scanning head to picture beginning.
Secure the starting block.

— Move the scanning head to picture end.

Secure the second starting block (which uncouples the scanning head).

— Set the COLOR SEPARATION 1 switch (49/1) to "Yellow".

— Set the COLOR SEPARATION 2 switch (49/2) to "Cyan".

— Move the scanning head to picture beginning.

— Move the mask head to the starting position.

— Set the tabulator to 51 cm.

— Press the START pushbutton (128).

— When the mask head is located between the two lines, also the scanning head has touched the second starting block and is freely movable.

— Return the scanning head to the starting block.

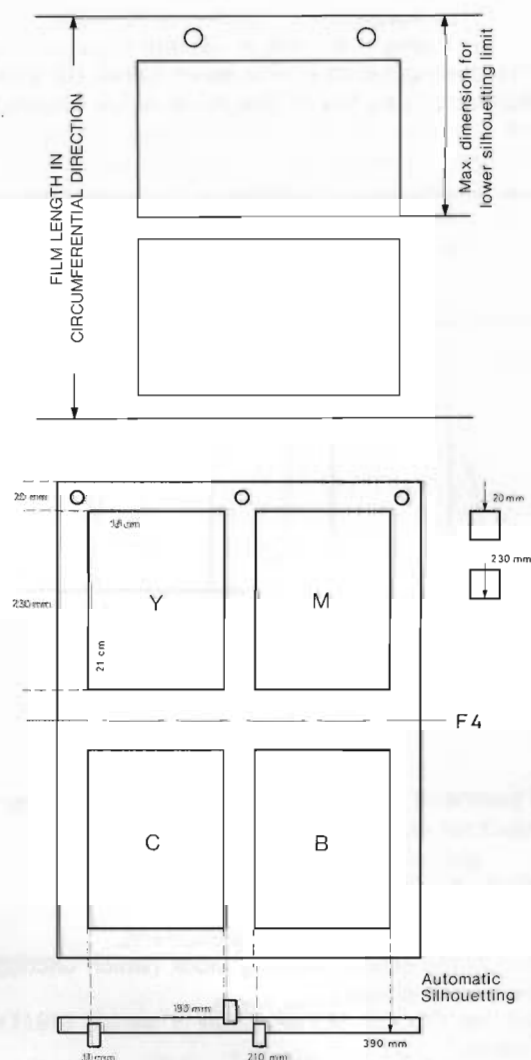
— Set the COLOR SEPARATION 1 switch (49/1) to "Magenta".

— Set the COLOR SEPARATION 2 switch (49/2) to "Black".

— The scanning head starts again.

— The tabulator stops the machine automatically.

FILM FORMAT	FILM LENGTH IN CIRCUMFERENTIAL DIRECTION		LOWER SILHOUETTING LIMIT
	[mm]	[inch.]	
1	180		85
2	300		146
3	400		196
4	500		247
5	431,8	17	211
6	457,2	18	225
7	508,0	20	250



7. 9. Silhouetting with a Geometrical Control Mask and Insertion of Lettering

The control mask enables sections of pictures to be silhouetted and lettering and company names to be inserted in the picture. Fig. 7-2 shows a mask of this kind.

The type of lettering to be inserted is not of importance. The smallest vertical details however must exceed the width of two scanning lines. In the case of 140 L/cm (450 l/in) this equals $2 \times 0.07 \text{ mm} = 0.14 \text{ mm}$ or in the case of 200 L/cm (500 l/in) this equals $2 \times 0.05 \text{ mm} = 0.1 \text{ mm}$.

7.9.1. Producing the Mask

The control mask is drawn or mounted in the well known way on dimensionally stable clear foil. Lettering and company emblems can be placed where desired (see Fig. 7-2). For various reasons it is best to prepare a negative auxiliary mask first, and to copy this onto lith film. In doing this, it must be decided whether the separations are to be exposed right-reading or wrong-reading. Also, the emulsion side of the control mask must lie on the mask drum.


7.9.2. Angular Position of the Original

In many cases the picture is required to be at a certain angle, differing from the normal, to lettering or to the silhouette contour. The original must then be mounted on the scanning drum in the corresponding angular position. If the scale change is the same in both axes as is required in undistorted enlargements, the angular position of the original is independent of the scale. This means that the original must be mounted at the angle at which it is required to appear in the separation.

When dealing with a large original, it is best to place it on a gridded underlay and to engrave at the edges two marks parallel to the grid lines. When the original is mounted on the scanning drum it is now only necessary to fix it so that an imaginary line between the two marks is parallel to the reference line on the drum.

The layout often shows only the outlines of the subjects. In the case of small originals in particular, it is then difficult to determine the correct angular position. In such a case it is recommended that the pictures should be projected with an enlarger into the outline on the layout and the contours of two prominent features drawn in. In this way, the angle can be readily specified in the layout and transferred to the original.

Programming for chapter 7. 9. 4.

Control Commands					Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"		Yellow	Magenta	Cyan	Black
x			x		PICTURE	—	—	—
		x			D ₁	0	0	0
	x				D ₂	1,7	1,5	0
					D ₃	1,3	0	1,0

7.9.3. Positioning the Picture Relative to the Mask Contour

The picture is positioned relative to the mask contour (Fig. 7-2) as described in paragraph 7.7.2.

7.9.4. Programming

In the programming, it must be borne in mind that the lettering is to be colored.

The constant densities in the lettering are set up by means of the density controls (122 R, 123 R, 124 R). For the setting procedure see paragraph 7.8.5.

Note

If the lettering is to appear solid in one of the color separations, this separation can be exposed a second time during screening, the contact screen being omitted in the second exposure. The programming is arranged so that only the lettering is exposed. (The pre-exposure must be switched off.)

7. 10. Silhouetting according to Picture Contours

If it is required to silhouette in accordance with picture contours as in the control mask shown in Fig. 7-8, a position scan of the required picture contents must be prepared. If in addition the color separations are to be changed in scale, the required change must be made when preparing the position scan. After the position scan has been prepared, the position of the original on the scanning drum must not be changed.

(See also chapters 7.4. and 7.5.)

7.10.1. Procedure for Repeatable Adjustment of Scanning Start

The positioning used for producing the position scan must be reproduced precisely when making the color separations. This is not a simple matter concerning the scanning start on the original. Two methods have therefore been developed for this:



Fig. 7-8 Control Mask

a) Engraved Markings

Before the original is mounted on the drum, the starting points for the required picture contents are determined. At the starting points a ruler is first placed parallel to the circumferential direction and then to the cross-feed direction, and markings are engraved on the edges of the original. The original is lined up in accordance with these markings when it is fixed on the scanning drum. These markings also serve as starting points for scanning the original.

(See also paragraph 7.9.2.)

b) Attached Setting Scales

With this method, the original is first fixed to the scanning drum (if necessary, at a specified angle). Scales are then fixed to the drum to the right or left of the original depending on the scanning direction.


The starting points are set with the aid of these scales, as described in paragraphs 5.14.2 and 7.7.1.

7.10.2. Producing the Control Mask

The control mask shown in Fig. 7-8 is prepared with the aid of a position scan which gives the picture contents to the required degree of enlargement. This position scan must be suspended on a register strip with the emulsion side down. A mask foil is placed on this, also fixed by the register strip.

Since the picture content is to be on a background of a constant tone, surrounded by a white framework, the mask is covered with black color so that the picture remains white within the desired contours. The framing must be drawn in and filled with another of the control colors, red in our case.

Programming for paragraph 7. 10. 3.

Control Commands					Density in Separation Colors				
"Black"	"Red"	"Blue"	"White"			Yellow	Magenta	Cyan	Black
x			x		PICTURE	—	—	—	—
	x				D ₁	—	0,5	1,0	0
					D ₂	0	0	0	0

7.10.3. Working with a Correct Position Scan

In the explanation of the "Problem 3" in chapter 7.5., it is recommended that the positioning should be carried out in the position scan as required in the layout.

In this case, the following steps are necessary:

- Set the positions for picture beginning → and ↓ (see chapter 7.7.).
(Note the settings.)
- Expose a film showing the position of the picture.
- Produce the mask (see chapter 7.4.).
(During this time, other operations can be carried out on the machine.)
- Mount the mask underlaid with quasi-white mask paper on the mask drum.
- Mount the scanning drum with the required original.
- Re-set the same position as above.
- Carry out the programming.
- Carry out the remaining settings on the machine.
- Perform the exposing procedure.

7.10.4. Operation with a Control Mask the Contours of which have been Formed by Moving the Position Scan in Parallel Direction

It may occur that the positioning of the color separation on the film is altered after the preparation of the position scan. The position scan can however be used if:

- the position of the original on the scanning drum has not been changed.
- the changed position of the mask is only due to the fact that the position scan has been moved parallel to the cross-feed direction and/or parallel to the circumferential direction (i.e. it has not been turned through an angle).

The adjustment of the picture beginning in the circumferential and cross-feed directions is carried out as described in paragraph 7.7.2. The setting of the starting point for scanning is not changed.

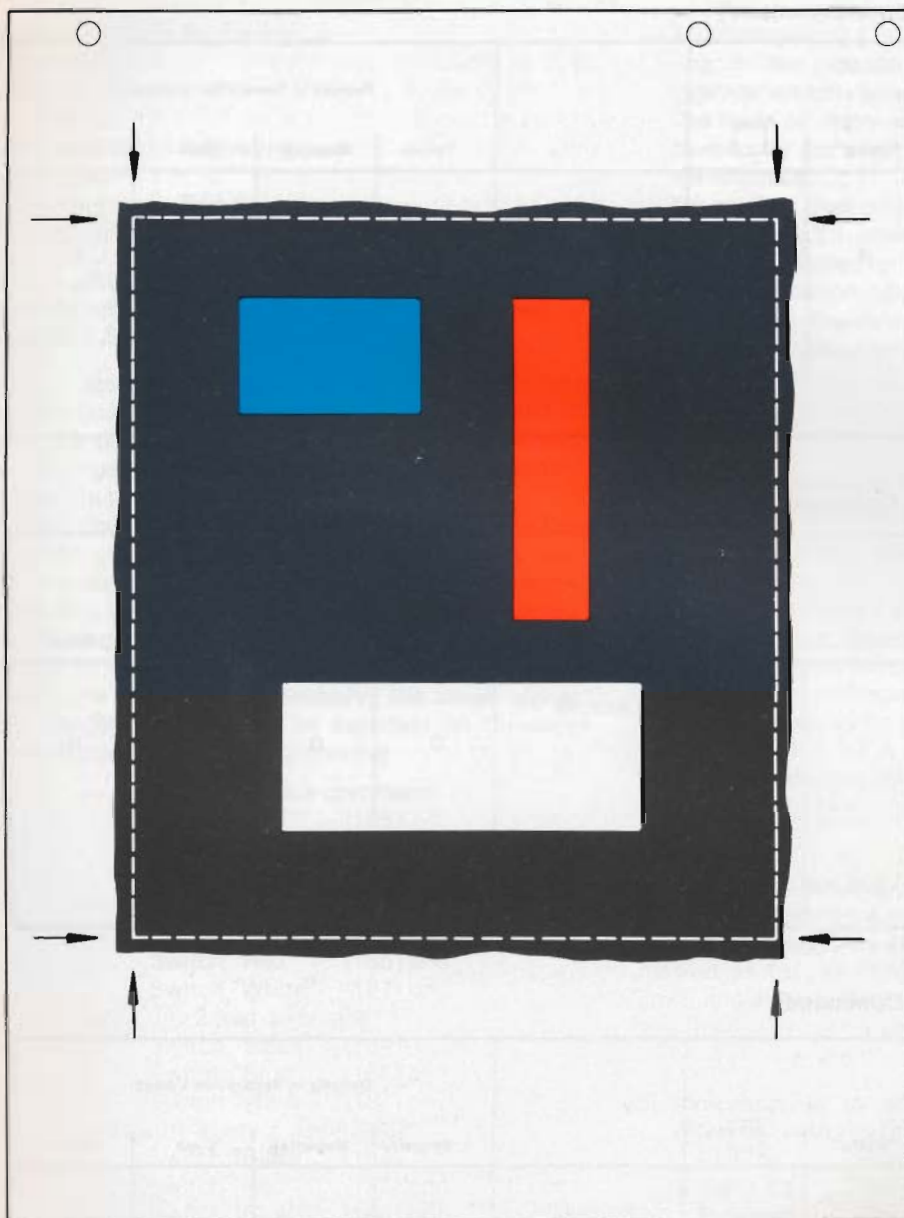


Fig. 7-9 Control Mask

7. 11. Merging Several Subjects on a Background of Constant Density

Three different subjects are to be merged in the three inner rectangles of the control mask (Fig. 7-9). The black area within the dotted lines is to be retained, filled in with a constant tone. The region outside the dotted lines is to be silhouetted electronically.

7.11.1. Sequence of Exposures

The picture beginning and the picture end must be reset in each case for the background and for the individual subjects. In order to ensure that the separations match up correctly with one another it is necessary to expose all the separation colors onto the respective films with the given setting. The unused regions are left uncolored (with density $D = 0$) until their turn comes.

When exposing the density $D = 0$, the exposing lamp cannot be switched off completely, and at those parts of the film onto which a picture has already been exposed there is an increase of density whose magnitude, depending on the type of film, is about $D = 0.03$ for each exposure. This effect can be counteracted by a density reduction in the exposure of the subject in question as described in paragraph

7.14.1.2. If there are three exposures to follow this allowance must be trebled. In addition, in order to be able to make good the allowance, it must be ensured that the picture in question does actually receive three complete exposures with the density $D = 0$. This means that in the case of multiple exposures the same format must be exposed in each operation.

Note

In screening, if pre-exposure is used, this must of course only be switched on for the first operation in the case of multiple exposures.

7.11.2. Exposing a Background of Constant Density

Dimensions: Format 400 × 350 mm (height × width)
 Distance of beginning of density from upper film edge 30 mm
 Distance of beginning of density from left-hand film edge 20 mm

From this results:

Format end ↓ 430 mm

Format end → 370 mm

(For calculation, see paragraphs 7.8.2. and 7.8.4.)

Programming for Background (Black Command)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
x	x	x	x	x	PICTURE	—	—	—	—
					D ₁	0	0	0	0
					D ₂	0,5	0,7	0	0

Programming for Picture 1 (Blue Command)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
x	x	x	x	x	PICTURE	—	—	—	—
					D ₁	0	0	0	0

Programming for Picture 2 (Red Command)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
x	x	x	x	x	PICTURE	—	—	—	—
					D ₁	0	0	0	0

Programming for Picture 3 (White Command)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
x	x	x	x	x	PICTURE	—	—	—	—
					D ₁	0	0	0	0

Setting the Picture Beginning →

see paragraph 7.7.1.

Setting the Picture End →

see paragraph 7.8.2.

Setting the Picture Beginning ↓

see paragraph 7.7.1.

Setting the Picture End ↓

see paragraph 7.8.4.

7.11.3. Programming

The procedure for setting the density is described in paragraph 7.8.5.

7.11.4. Merging of Picture Subjects

The individual picture subjects can now be exposed in turn in the positions determined by the control mask. The settings for the positioning are completely described in paragraph 7.7.2.

The only difference is that the starting stop is not to the left of the picture beginning →. The conditions laid down in paragraph 7.11.1. must be fulfilled. This means that the stop in question must always be located before the beginning of the left-hand silhouetting edge.

In order to avoid white contours when the picture subjects are exposed successively, the mask signal delay (chapter 3.2.8.) must be switched on for each picture, according to the programming.

- Background (black command)
 - Switch "Red" (185),
 - Switch "Blue" (186) and
 - Switch "White" (187) on.
- Picture 1 (blue command)
 - Switch "Black" (184),
 - Switch "Red" (185) and
 - Switch "White" (187) on.
- Picture 2 (red command)
 - Switch "Black" (184),
 - Switch "Blue" (186) and
 - Switch "White" (187) on.
- Picture 3 (white command)
 - Switch "Black" (184),
 - Switch "Red" (185) and
 - Switch "Blue" (186) on.

7. 12. Merging of Several Subjects with Different Scales and Insertion of Lettering

Example Fig. 7-10

On to the (1450 %) sectional enlargement of the first original, which forms the background, four other subjects, enlarged 250 %, are to be merged together with white lettering.

7.12.1. Summary of Procedure

- On the basis of the customer's requirements (layout, Fig. 7-11) a list is prepared giving the coordinates of the picture beginnings on the scanning and exposing drums.
- It is decided which scanning drum is to be used and how the different originals are to be mounted.
- From the data thus established, the operator prepares position scans of subjects 2 to 5. On these, the position of the picture relative to the edges of the film and the scale are in agreement with the montage to be prepared. With skilled arrangement, several objects can be exposed on one film.

- After the position scans have been made, silhouetting of the pictures is carried out and merged together with the lettering into one mask.
- The mask is ready when the silhouetted zones are covered by the control colors required for merging the originals.
- The mask is then mounted on the scanner which has been in use for other operations in the meantime. The settings used for the position scans are re-set.
- The combination can then be completed in accordance with the data taken from the layout in the production planning.

7.12.2. Preparations for Merging Subjects which can be Performed by a Production Planner

7.12.2.1. Mounting the Originals on the Scanning Drum

Everyone who mounts originals on the scanning drum should know that the success of the color separations depends largely on the care with which this is done.

In our case it is particularly important that the originals should be attached as close as possible to the start line, in order that the required angling can be checked. When a vacuum drum is being used, this is self evident, because the start line is also a suction channel.

a) Marking the Emulsion Side of Transparencies

In order to help the operator to recognize the correct scanning direction, each transparency should be marked as follows: place it with the emulsion side down and make a mark in the upper right-hand corner, e.g. the number of the original.

b) Indication as to whether the Original is to be Mounted with the Emulsion Side Up or Down

Picture 1	Emulsion side down
Picture 2	Emulsion side down
Picture 3	Emulsion side up
Picture 4	Emulsion side up
Picture 5	Emulsion side down

c) Positioning the Original at an Angle to the Start Line

(see paragraph 7.9.2.)

(Set the original to the required angle on a light table and engrave markings on the edges parallel to the start line.)

The layout often shows only the contours of the subjects (Fig. 7-11). The correct angling is very difficult to determine, particularly in the case of small originals. It is therefore recommended to project the subjects into the countour on the layout with an enlarger, and to draw in two important contours. The angling can be determined from these in the layout and transferred to the original.

Picture 1 (Picture 1 and picture 5 are sectional enlargements of the same original. Since the angles are different, the original must first be mounted at the angle for picture 5, which is the more important.)

Picture 2	Turn counterclockwise by 38°
Picture 3	Turn counterclockwise by 13°
Picture 4	Turn counterclockwise by 5°
Picture 5	Do not turn.

d) Marking the Scanning Starting Point on the Original
(see paragraph 7.10.1.)

Small enlargements: engraved markings at the edge
Large enlargements exactly positioned: fine-division scales attached next to the transparency

- Picture 1 Engraved markings (no high degree of exactness is required for the background)
Picture 2 Engraved markings
Picture 3 Engraved markings
Picture 4 Engraved markings
Picture 5 Engraved markings and attached scales
(If the production planner considers the markings to be insufficiently accurate, he must provide a short description of the beginning, in order that the attached scales can be suitably adjusted.)

e) Drum on which the Original is to be Mounted

- Picture 1 Small drum (mount after picture 5 has been exposed)
Picture 2 Medium drum
Picture 3 Medium drum
Picture 4 Medium drum
Picture 5 Medium drum (use another drum in order that the transparency can be attached in the angling for picture 1)

7.12.2.2. Preparing Position Scans

(The dimensions given are always with respect to the upper and the left-hand edges of the film.)
The production planner must know the printing process for which the composite color separations are to be

used. The mask is then positioned for right-reading or wrong-reading scanning with the register holes in the correct position. This must naturally also be taken into account in the positioning on the position scan.

Example:

Screened positive for offset:
wrong-reading mask

a) Utilization of Film

First film pictures 2 + 4
Second film pictures 3 + 5

No position scan is necessary or possible for picture 1, because the original cannot yet be changed over.
Those pictures having the same control colors on the mask should always be exposed together on one film. This has the advantage that the silhouetting data to be used later in the final film can be used and tested for the position films.

b) Method of Operation

Direct screening

c) Data regarding Scale and Picture Beginning

These data should be noted in a standardized manner on forms (see completed form for picture 2).

— Picture 2 (medium drum)

Scale: 0750/0525 (250%)

Picture beginning (end) on the **exposing side**:

Cross-feed direction (→) 78.5 / 164 mm

Circumferential direction (↓) 44.0 / 95 mm

Short description of subject: fish at top

Scanning direction: →

Picture beginning on the **scanning side**:

(See engraved markings)

Optimal separation: Cyan

Original: Emperor Fish - Picture 2-	Date :
--	--------

Drum

1/1	1/2	1/4
-----	----------------	-----

Percent

250

Code number from Table

0750	0525
hor	vert

Scanning Direction

→	X	←
---	---	---

Mask drum

Picture beginning	044,0
Block	SD*

Circumference

Picture beginning	
Block	SD*

Silhouetting

095,0

Scanning drum

Block	SD*
-------	-----

Circumference

Block	SD*
-------	-----

Cross-feed

Block	SD*
-------	-----

Cross-feed diagram:

		78,5	164	
--	--	------	-----	--

 (Silhouetting ON) upper tab

lower tab (Picture ON)

* SD = Scale division

Form for Positioning

Fig. 7-10 Four-color Print of Pet Fish →

HELL



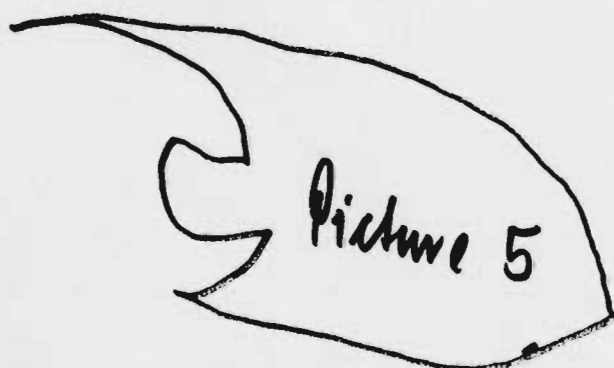
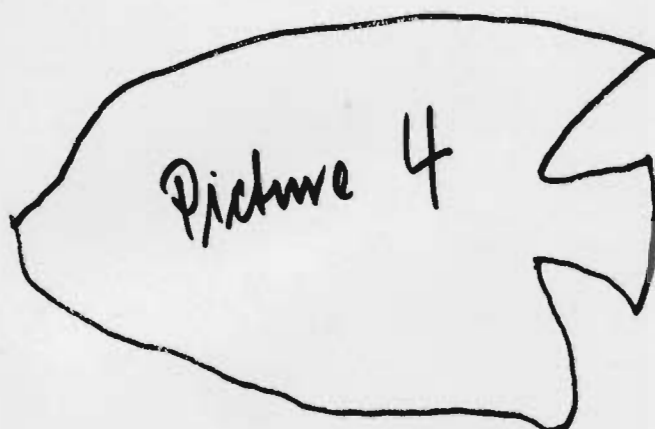
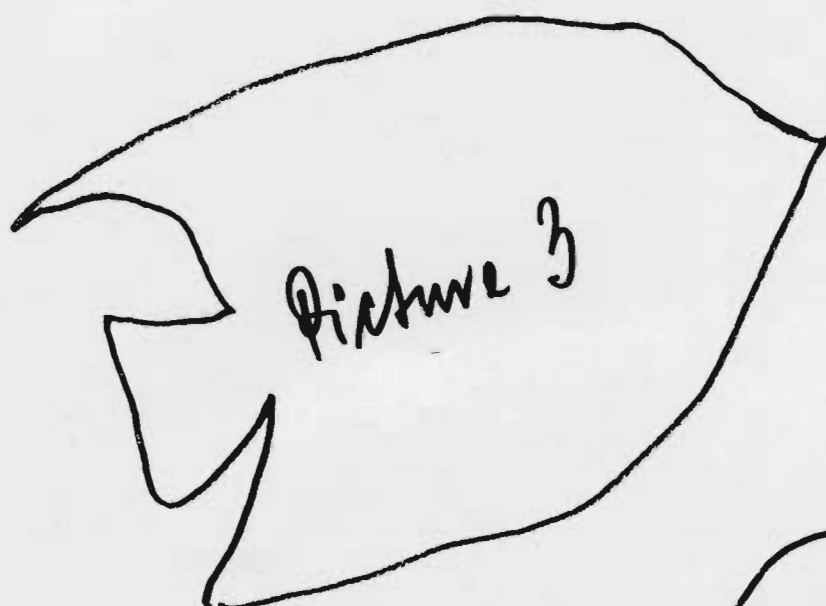
Chromagraph DC 300

Hell Verein / www.hell-kiel.de

HELL



Picture 1



Chromagraph DC 300

Fig. 7-11 Layout of Pet Fish

- **Picture 4** (medium drum)
Scale: 0750 / 0525 (250 %)
Picture beginning (end) on the **exposing side**:
Cross-feed direction (→) 32.5 / 135 mm
Circumferential direction (↓) 173.5 / 239 mm
Short description: fish in middle, to the right
Scanning direction: →
Picture beginning on the **scanning side**:
(See engraved markings)
Optimal separation: Cyan
- **Picture 3** (medium drum)
Scale: 0750 / 0525 (250 %)
Picture beginning (end) on the **exposing side**:
Cross-feed direction (→) 110.5 / 226 mm
Circumferential direction (↓) 112.5 / 193 mm
Short description: fish in the middle, left
Scanning direction: →
Picture beginning on the **scanning side**:
(See engraved markings)
Optimal separation: Cyan
- **Picture 5** (medium drum)
Scale: 0750 / 0525 (250 %)
Picture beginning (end) on the **exposing side**:
Cross-feed direction (→) 126.5 / 215 mm
Circumferential direction (↓) 224 / 278 mm
Short description: fish, below
Scanning direction: ←
Picture beginning on the **scanning side**:
(See engraved markings)
After the adjustments, the exact scale values should be entered in this list or on a form.
Optimal separation: Cyan

7.12.2.3. Producing a Control Mask

(See also chapter 7.4. and Appendix B)

The control mask:

- Film format 300 × 400 mm
- Contour silhouetting and lettering must be wrong-reading when the mask is mounted.
- The mask must be mounted on the drum with the emulsion side down.
(Refer to paragraph 7.12.2.2.)
- The control mask is made as a contact copy from an auxiliary mask.

The auxiliary mask:

- Prepare a wrong-reading enlarged position scan from

each of the picture subjects 2 to 5, with two subjects on one film if possible. See Fig. 7-12.

- The mask foil is mounted together with a position scan on register pins. Then the picture subject is covered with black color.
- Mount the lettering and the company emblem, printed in positive form on the film, wrong-reading on the mask foil (auxiliary mask) in the positions specified by the layout (Fig. 7-13).
- Hang the completed auxiliary mask together with a lith film (paint to emulsion) on the register pins and make a contact print of the auxiliary mask.
- The contact print acts as the control mask after it has been filled in on the painted side with the control colors red and blue:

Picture 1 (background)	black
Picture 2 (emperor fish)	red
Picture 3 (halfmoon emperor fish)	blue
Picture 4 (sea bride)	red
Picture 5 (moon fish)	blue
Company emblem and lettering	white

Fig. 7-14 shows the completed control mask.

7.12.2.4. Hints on Performing the Settings for the Merging Procedure

Before the control mask is mounted on the mask drum, the operator must make certain whether screened or continuous-tone separations are required. Since the continuous-tone film is thicker than the screen film, it may be necessary to change the circumference of the mask drum to that of the exposing drum (see paragraph 7.6.2.).

Rule

Screen: underlay quasi-white paper with screen film.

Continuous-tone: underlay quasi-white paper with continuous-tone film.

In the case of multiple exposures on continuous-tone film, it must be borne in mind that parts that have already been exposed experience a slight increase in density (about $D = 0.03$), even when the density has been set to $D = 0$. This has two consequences:

- The number of subsequent exposures must be taken into account in the picture setting.
- During each exposure, the complete film must be exposed.
(See also paragraph 7.11.1)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
		X			PICTURE	—	—	—	—
X	X		X	X	D ₁	0	0	0	0

a) Picture 5

(After the exposure of the film change picture 5 to the angling for picture 1 and use the small drum.)

- Programming
- Number of exposures to come (important with continuous-tone separations)
- Details of scale, scanning drum and picture beginning, see paragraph 7.12.2.2. c)

b) Picture 3

- Programming, see a), Picture 5.
- Number of exposures to come (important with continuous-tone separations)
- Details of scale, scanning drum and picture beginning, see paragraph 7.12.2.2. c)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
X	X	X	X	X	PICTURE D ₁	— 0	— 0	— 0	— 0

c) Picture 2

- Programming
- Number of exposures to come (important with continuous-tone separations)
- Details of scale, scanning drum and picture beginning, see paragraph 7.12.2.2. c)

d) Picture 4

- Programming, see c), Picture 2.
- Number of exposures to come (important with continuous-tone separations)
- Details of scale, scanning drum and picture beginning, see paragraph 7.12.2.2. c)

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
X	X	X	X	X	PICTURE D ₁	— 0	— 0	— 0	— 0

e) Picture 1

- Programming
- Number of exposures to come: none
- Details of scale, scanning drum and picture beginning
- Scale: 4368 / 0184 (1450 %, small drum)

Picture beginning (end) on the **exposing side**:

Cross-feed direction (→) 20 / 236 mm

Circumferential direction (↓) 20 / 325 mm

Final format 216 × 306 mm

Short description of subject: Water, upper center

Scanning direction: →

Picture beginning on the **scanning side**:

(See engraved markings)

7. 13. Producing a Film by Multiple Exposure

7.13.1. Example of Application

Pressing the MULT. pushbutton (156) enables the Chromagraph DC 300 to expose scanned lines several times below each other on the separation film, so that a column of similar pictures is obtained. By repeating the process at another part of the film, a complete tableau of similar separations can be produced. Arrangements of this kind can be useful in the production of labels.

7.13.2. Operational Procedure

In operation with the MULT. pushbutton (156) not pressed, the scanning and storage process will be initiated when the picture ↓ begins. At a certain distance from this, the output and the exposing process begins automatically. This automatic process is interrupted when the MULT. pushbutton (156) is operated. The output of the stored scanning data then begins whenever the control mask evaluates the PICTURE command. This means that the control mask and the associated electronics determine where and how often pictures are exposed one below the other.

Attention

In order to ensure that the desired picture information is correctly exposed in the first of the multiple exposures, the picture beginning instant (see paragraph 7.7.2.) must precede the first evaluated picture command by a time corresponding to about 1 mm.

In order that the electronics can run back to the starting point between two output processes, the separation line between two pictures must be at least 0.1 mm wide. Since the beginning and end of picture exposure are determined entirely by the contours of the control mask, special care must be taken to ensure that these are applied straight and parallel to the cross-feed and circumferential directions. It cannot therefore be expected that the pictures on a separation film will match one below the other. However the associated pictures on the different color separation films do match each other.

Advantage can be taken of distortions introduced by the control mask to produce effects which would be very difficult to achieve by conventional means.

In the case of electronic reduction, in the region of the separation film which is covered by the original when

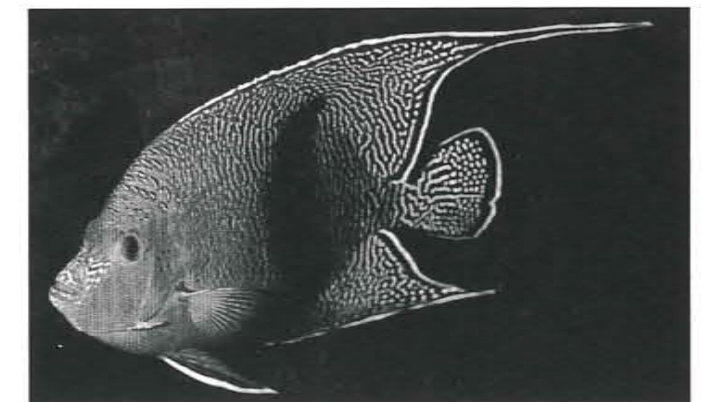
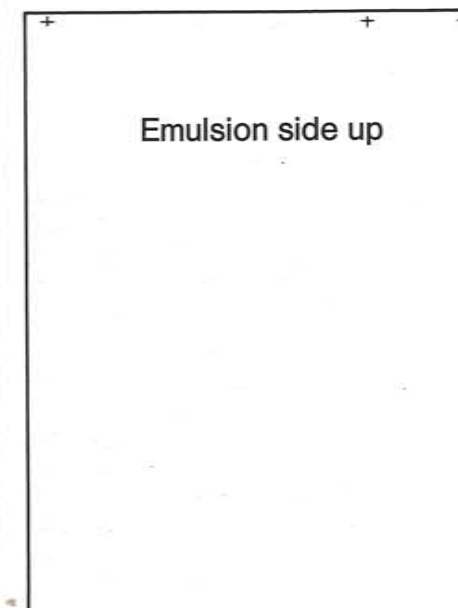
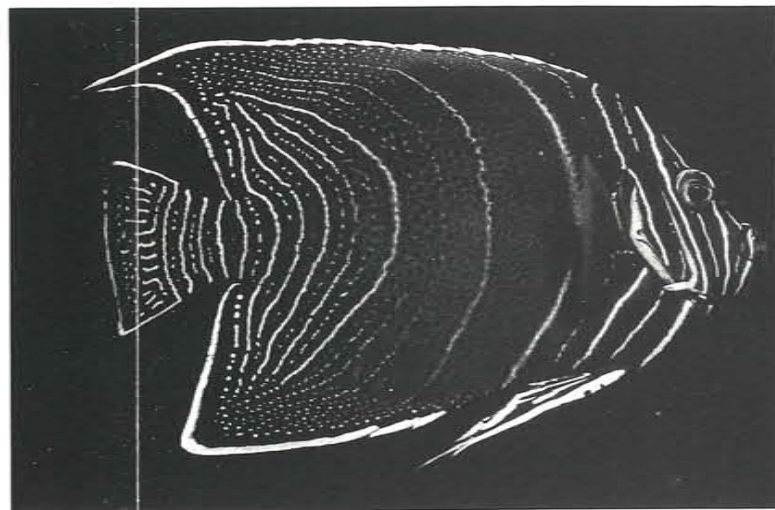
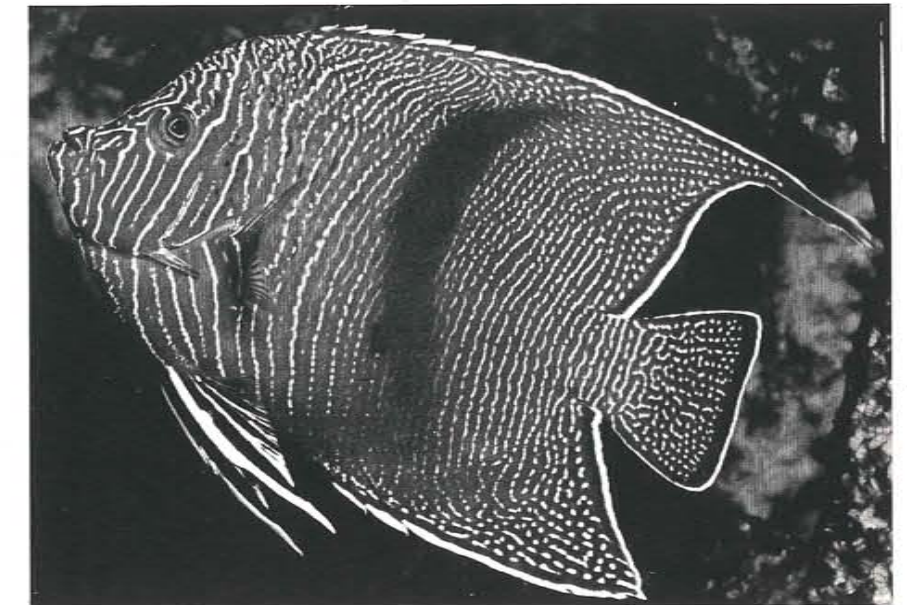
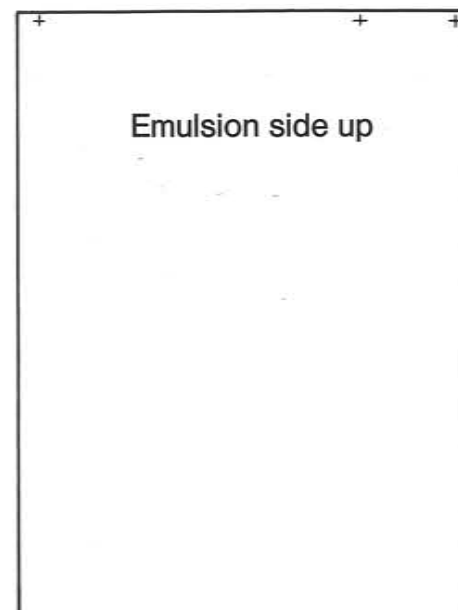
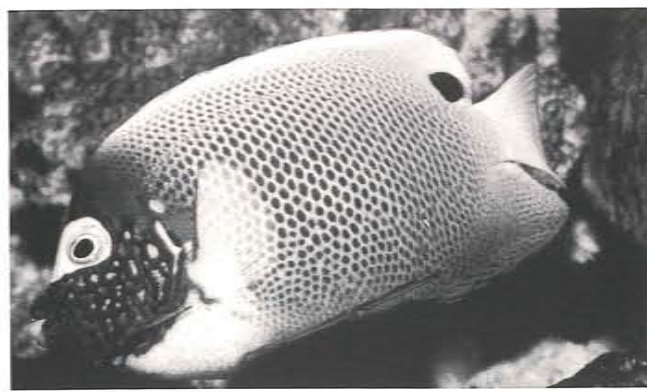
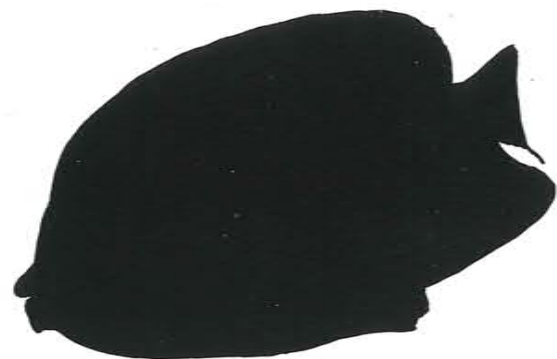


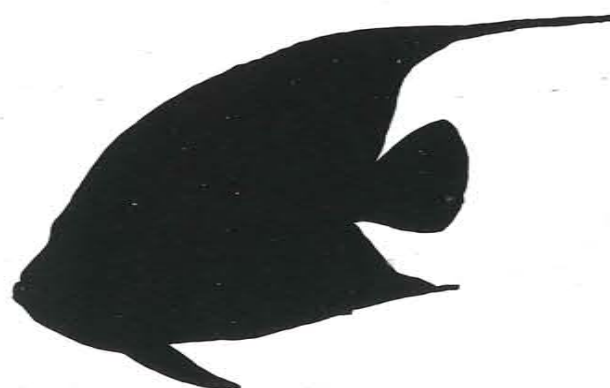
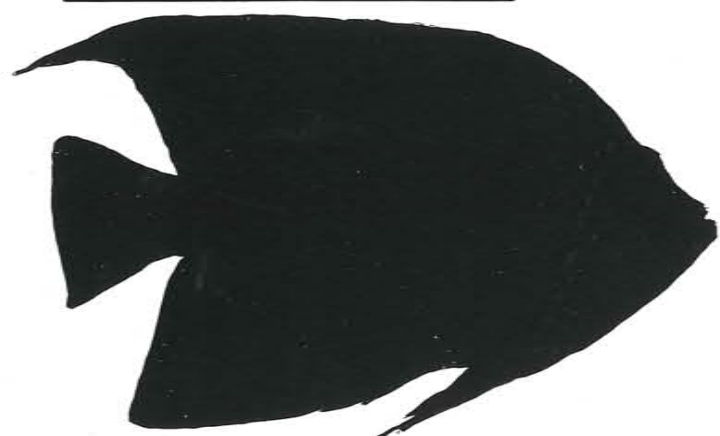
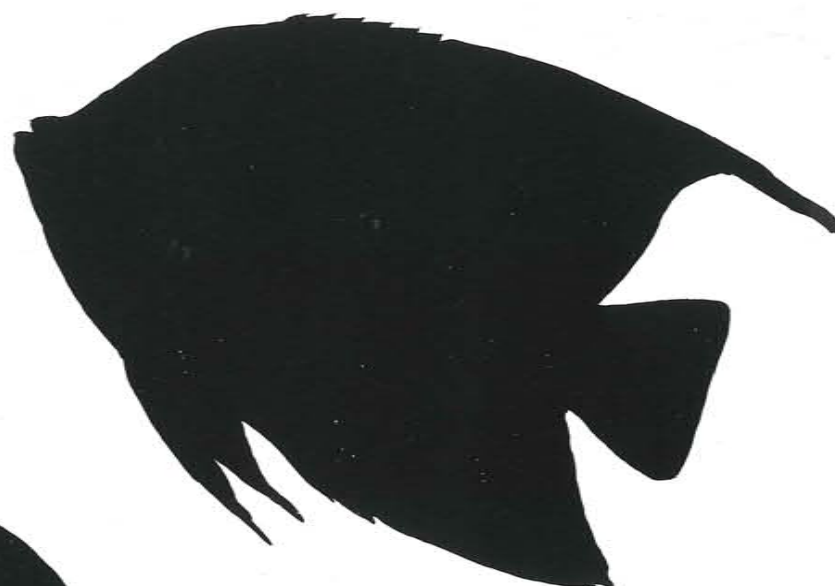
Fig. 7-12 Position Scans of Pet Fish
Pictures 2 and 4
(Cut-out)

Position Scans of Pet Fish
Pictures 3 and 5
(Cut-out)

HELL



Dimensionally stable transparent foil.
Drawing and montage of lettering on the top.
Lettering wrong-reading.
Fish filled-in with black.



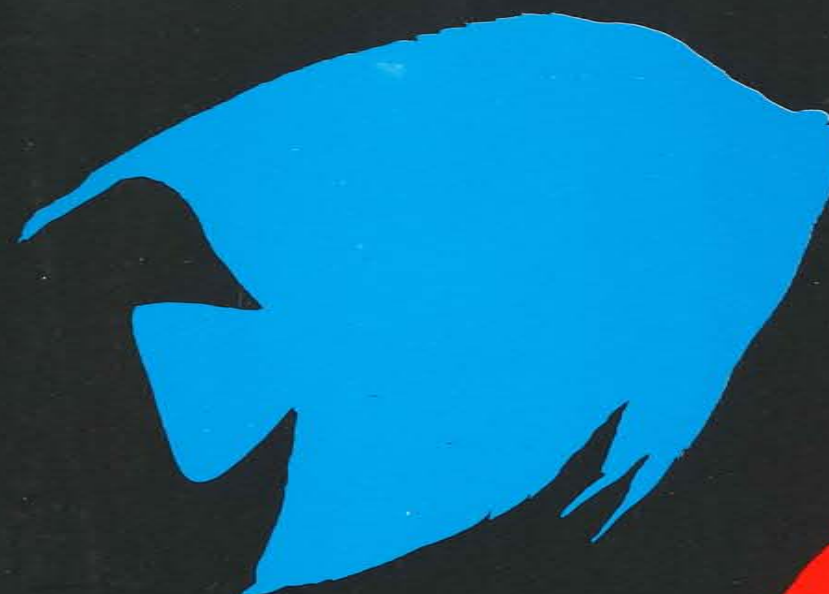
Chromagrap DC 300

Fig. 7-13 Auxiliary Mask (Cut-out)

HELL



Emulsion Side.
Control colors applied to emulsion side.



Chromagrap DC 300

Fig. 7-14 Control Mask (Cut-out)

this is placed on the film (upper edge at picture beginning ↓), a lateral displacement of the picture data, amounting to the width of a line, can occur. In special individual cases, this may be visible in the separation.

7.13.3. Special Details in Connection with Mask Production

It was stated in paragraph 7.13.2. that each new control mask PICTURE command initiated a new output process. If there is a fault, due for instance to smudgy work, in the PICTURE color zone, the PICTURE command will be switched off for a short time. When this command is restored, a new output process begins in the middle of the picture. Slight mask errors whose size is of the same order of magnitude as that of an exposed dot, and which is scarcely visible in other operations with the control mask, can suddenly be clearly seen.

These difficulties can be avoided if the following points are borne in mind:

- The black color should be assigned to the PICTURE command, because black can be reproduced cleanly by the photographic process. Faults can be made good with photographic varnish.

- The separating lines between pictures should be applied in red (not in white, because faults in black are generally white).

- During programming all color commands apart from red are switched to PICTURE. The required density is assigned to red.

7.13.4. Appearance of a Control Mask for Multiple Exposure

A picture is to be exposed in place of the black zones. The number of pictures per film is variable within wide limits (see paragraph 7.13.2.).

7.13.5. Setting the Picture Beginning and End in the Cross-feed Direction (→)

(Picture beginning → see paragraph 7.7.2.)

The second picture tab on the tabulator rail is used in order to set the second column of pictures. (Further picture tabs can be supplied, if required.)

Before exposing the second column, the scanning head must be returned to the starting point. For this purpose, the coupling between the cross-feed spindle and the scanning head (see paragraph 2.1.2.) must be switched off. Use is made of the switch opposite the switch in the scanning head, for setting the beginning of

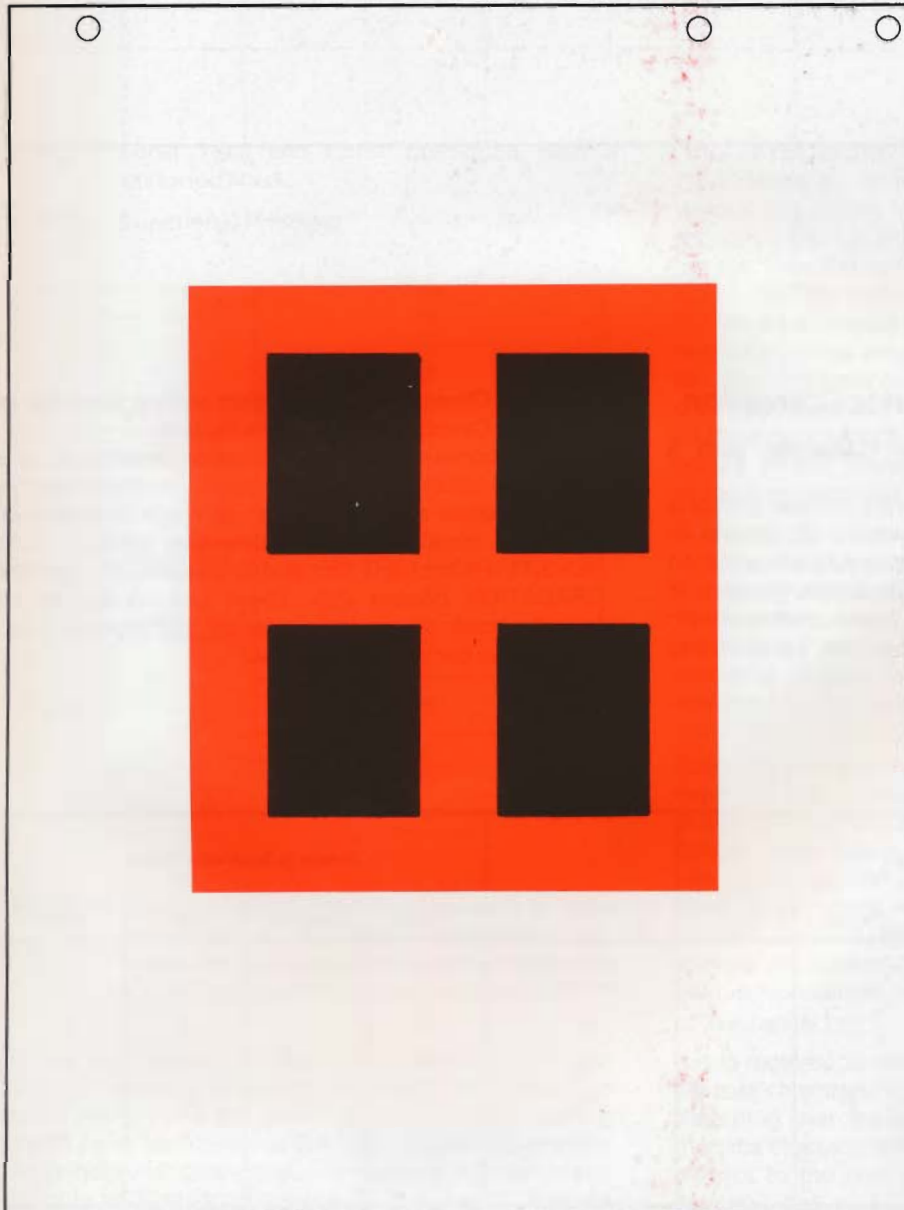



Fig. 7-15
Control Mask
for Multiple Exposure

scanning. The switch serves for setting the end of scanning. If one adjusts the end stop in such a way that the switch is released immediately after the picture scanning, the scanning cross-feed is switched off and the lamp in pushbutton (139) is extinguished. The scanning head can now be pushed to the start of scanning again. If the mask scanning head moves over the next picture tab, the scanning cross-feed starts again.

Note

Pushbutton  (139)

(see paragraph 3.2.8.) cannot be employed in this case since the scanning cross-feed is only switched off as

long as the pushbutton is pressed. No true-to-register repetition of the start is then possible.


7.13.6. Setting the Picture Beginning and End in Circumferential Direction (↓)

Picture beginning ↓ see paragraph 7.7.2.

Picture end ↓ see paragraph 7.8.4.

Setting is relatively simple, since bordering of the picture is undertaken by the control mask. The value for picture end to be keyed in, must be selected so that the silhouetting process is switched on below the last picture in the column.

7.13.7. Programming for Multiple Exposure

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"			Yellow	Magenta	Cyan	Black
X		X	X		PICTURE	—	—	—	—
	X				D ₁	0	0	0	0

7. 14. Local Tone and Color Correction


7.14.1. Local Tone and Color Correction with a Normal Control Mask

To be able to influence certain sharply-defined portions of the color separation independent of others in gradation and density, these zones must be marked on the control mask by one of the four command colors. If this color command is evaluated by the mask electronics, special electronic assemblies can be switched into the signal path.

7.14.1.1. Changing the Highlights and/or Shadows in Certain Portions of the Picture

In certain zones of the color separation determined by a command color in the control mask, improvements in the tone values and drawing can be made by means of the local tone and color correction controls FILM DENSITY-HIGHLIGHT (36) and SHADOW (37), and the GRADATION control (35). These can be applied to reproductions of furniture, leather goods, and furs. Flesh tones can also be improved.

Programming using all commands

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"			Yellow	Magenta	Cyan	Black
X					PICTURE	—	—	—	—
				X	D ₁	0	0	0	0
		X			D ₂	1	0,5	0	—
			X		D ₃	0	0	0	1,7
	X				TK	—	—	—	—

7.14.1.2. Addition or Subtraction of a Constant Density

- Removal of colored reflections from neutral areas.
Examples:
Reflections in bright-colored kitchen furniture.
Reflections of the colored underlay in steel and silver ware.
- Pronounced under-color removal without affecting the adjacent zones.
Example: black fur coat.
- Programming with electronic silhouetting (normal programming only takes place for yellow, magenta, cyan, and black)

Two plugs are inserted in the column for the "red" command. Addition or subtraction results from the PICTURE and D 1 commands in the red zone being switched through at the same time.

Attention

When two plugs are inserted for one command, no exact mathematical addition or subtraction will take place. This means: if a density of $D = 0.5$ is set with the density control and the second plug inserted, the picture content will not exactly be altered by a density of 0.5. Thus, the final density can only be set when both plugs are inserted or the two corresponding pushbuttons (in this case, PICTURE (121) and D 1 (122) are pressed for permanent programming.

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<input type="checkbox"/>		Yellow	Magenta	Cyan	Black
X	X X	X	X		PICTURE	—	—	—	—
				X	D ₁	Deduct density 0.5			—
					D ₂	0	0	0	0

7.14.2. Local Tone and Color Correction with a Distorted Mask

7.14.2.1. Functional Principle

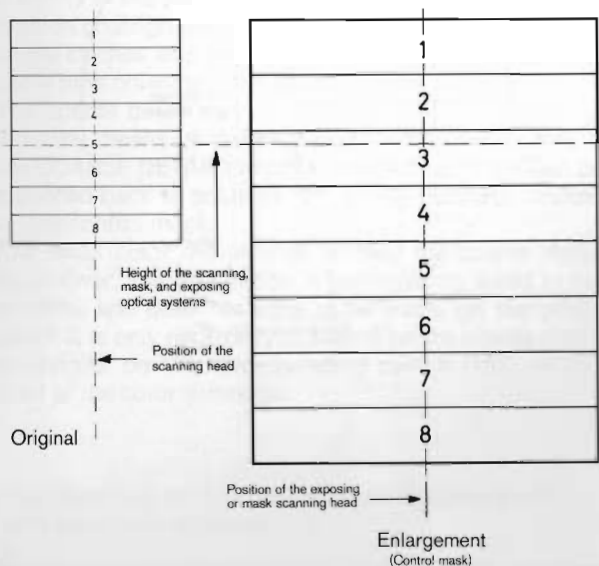


Fig. 7-16 Representation of the Displacement in Time and Space of the Picture Information between the Scanning and Exposing Sides with 2 × Enlargement Using the Large Drum

To set the line beginning in circumferential direction turn the scanning and exposing drums with respect to each other so that the scanning and exposing starting points cover each other. It has already been explained in the principle of scale change (chapter 4.3.) that this is the only point where a certain scanning point is at the same time an exposing point.

(This is not exactly the same as stated in paragraph 7.7.2. However, with respect to the following observations this difference does not need to be taken into account.) During enlargement, the scanning clock is quicker than the exposing clock. This is illustrated in Fig. 7-16. The dotted, horizontal line in the middle of the diagram represents the height of the scanning and exposing optical systems. Whereas on the original side the scanning head has reached number 5 with its higher clock, the number 3 has only been read out of the store on the exposing side. Therefore, a displacement in time occurs in the circumferential direction between the associated points on the scanning and exposing side.

Scale change in cross-feed direction results from the fact that the scanning cross-feed operates more slowly (for enlargement) or more quickly (for reduction) than the exposing cross-feed. The ratio of the speeds is proportional to the scale change. For this reason, scanning always takes place in the line correctly assigned to the exposing side (see the dotted, vertical line in Fig. 7-16).

Scanning of the control mask is rigidly connected to the exposing side by means of the exposing drum and mask scanning head cross-feed. In the applications of the control mask discussed until now, the control mask was always applied in the required final size (position scan). This means that only the picture information delayed in time behind the scale electronics (i.e. towards the scanning side) can be affected. (This signal path is represented as a normal assignment at the end of the manual.)

If it is required to influence the signal before it reaches the mask electronics, as is necessary for example when switching over the coarse detail (paragraph 7.14.2.2.), then the displacement of the scanning information with respect to the control mask signal in circumferential direction has to be removed. This is achieved when scanning an original on the large scanning drum by

setting the height of the control mask, regardless of the scale change, to the height of the original. Since the cross-feed timing is correctly assigned, the final size width will be maintained. A distorted control mask is formed by extending or compressing the picture height.

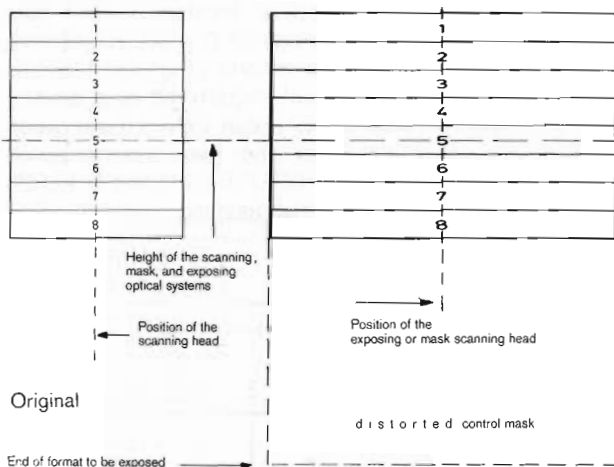
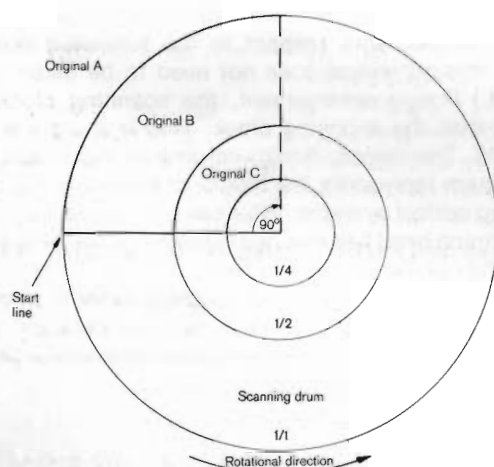


Fig. 7-17 Representation of the Relationship between the Scanning and Mask Side with a Distorted Mask with 2x Enlargement Using the Large Scanning Drum



2x enlargement with the large scanning drum is represented in Fig. 7-17. If the medium or small scanning drum is to be used, the ratios in Fig. 7-17 can no longer be applied. Instead, use the angle in Fig. 7-18.

If you stand at the front left-hand side of the Chromagraph DC 300, axially observe the drum, and treat the supports as transparent, the scanning drum with original and the mask drum with control mask can be seen as they are represented in Fig. 7-18.

— Large scanning drum: Let us start with the case familiar to us from Fig. 7-17. Original A spans the drum by 90°. After enlargement by the factor 2, the separation will span the drum by 180°. From the length representation it is known that the distorted mask must have the same length as the original in circumferential direction. After turning the drums by 90°, the original and control mask have been scanned from beginning to end. The height of the mask has therefore been compressed by the factor $180:90 = 2$.

Electronic scale change Mel is calculated from the formula given in chapter 4.4. to:

$$\text{Mel} = \text{MTab} \cdot 1/1 = 200\% \cdot 1/1 = 200\%.$$

(Enlargement by the factor 2.)

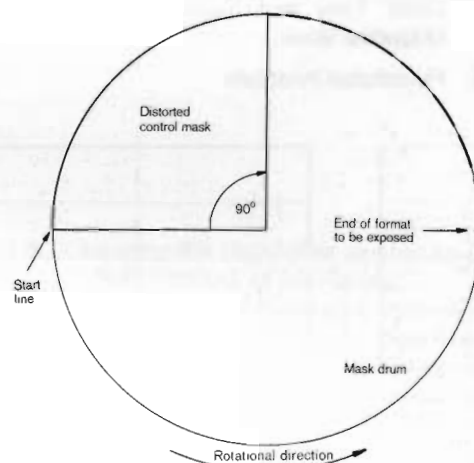


Fig. 7-18 Representation of the Relationship between Scanning and Mask Side with a Distorted Mask, 2x Enlargement Using the Large Scanning Drum, 4x Enlargement Using the Medium Scanning Drum, and 8x Enlargement Using the Small Scanning Drum

— Medium scanning drum: Original B spans the medium scanning drum by 90°, and has only half the length of original A. To enlarge the original to the final size as shown in Fig. 7-18, a scale change of $\text{MTab} = 400\%$ must be performed. This results in an electronic enlargement of $\text{Mel} = \text{MTab} \cdot 1/2 = 400\% \cdot 1/2 = 200\%$. (Enlargement by the factor 2.)

If the drums are turned by 90°, the original and control mask will also be completely scanned by the scanning point. Since the format to be exposed covers 180° of the drum, the mask will also be distorted in this case by the factor of $180:90 = 2$.

— Small scanning drum: Here also the original covers 90° of the scanning drum. Because of its shorter length, for a scale change to 180° of the exposing drum, it has to be enlarged by $\text{MTab} = 800\%$. This results in an electronic enlargement of $\text{Mel} = \text{MTab} \cdot 1/4 = 800\% \cdot 1/4 = 200\%$. (Enlargement by the factor 2.)

If the drums are turned by 90°, the original and control mask will also be completely scanned by the scanning point. Since the format to be exposed covers 180° of the drum, the mask will also be distorted in this case by the factor of $180:90 = 2$.

Conclusion:

The example shown before applies generally: the factor of the mask distortion is the same as the factor of electronic scale change. The limits are shown in Fig. 7-19 and amount to 1/3 (factor 3) for reduction and 4 for enlargement.

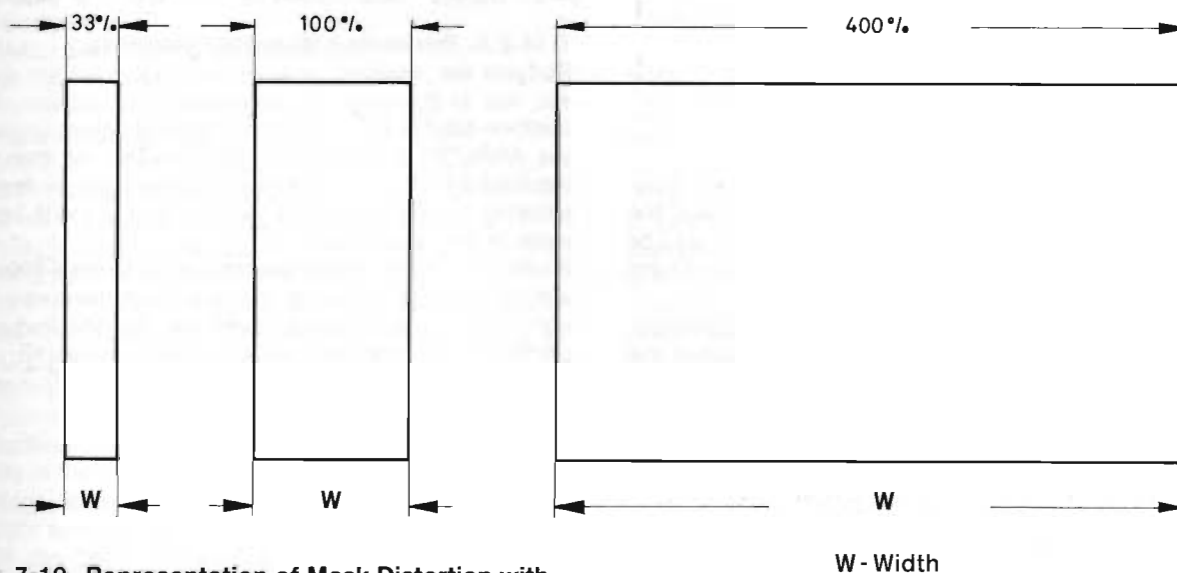


Fig. 7-19 Representation of Mask Distortion with Extreme Scale Change M_{el}

7.14.2.2. Switching-over of the Coarse Detail

The most important application of the distorted mask is the possibility of weakening the coarse detail in certain portions of the picture. This is especially applicable in fashion photographs. Here, good sharpness is required in the clothes and hair of the photo model and at the same time drawing in the face and other flesh parts.

The coarse detail can be switched over in a ratio of 3.5:1 by means of the electronics. This means that if the COARSE DETAIL control is in position "7", it can be switched back to position "2", to the portions marked on the control mask.

The mask color red or blue is used for coarse detail switchover. The connection is permanently wired in the machine and does not have to be made on the patch panel. It is only necessary to switch on the coarse detail switchover on the corresponding switch (183) on the front of the color computer.

7.14.2.3. Application of Other Local Tone and Color Correction Procedures

In addition to the coarse detail switchover, the previously mentioned local tone and color correction procedures can also be made. So that the distorted control mask is correctly controlled, the signal path in the scanner must be altered by pressing the M pushbutton (95) — refer to the pull-out diagram at the end of the manual.

The mask electronics are now switched with the MOS switch and inverter board before the scale electronics so that the assignment of commands for the distorted mask are correct.



Attention

It may be difficult to perform a local tone and color correction with halftone separations when the M pushbutton (95) is pressed. A special circuit causing the dots in the catchlights to be lost does not function here.

Programming for coarse detail switchover (red) with electronic silhouetting

Control Commands						Density in Separation Colors			
"Black"	"Red"	"Blue"	"White"	<div><input type="checkbox"/></div>		Yellow	Magenta	Cyan	Black
X		X	X		PICTURE	—	—	—	—
				X	D ₁	0	0	0	0

7.14.2.4. Notes

- Electronic gray scale: Pressing the pushbutton  (93) makes switching over ineffective by means of the M pushbutton (95), so that the gray scale appears on the film in the usual manner.
- Electronic silhouetting (with the M pushbutton (95) pressed, cross-feed direction ): Since the exposing and mask cross-feeds are rigidly coupled, setting is made in the usual way.
Circumferential direction (\downarrow): Setting is no longer made to final size, but to the distorted mask or original.
- Insertion of lettering:
Pushbutton M (95) pressed: Since the mask electronics are switched before the scale electronics, the scale of the lettering in the control mask will also be altered. This must also be applied in a distorted form on to the control mask.
Pushbutton M (95) not pressed (normal assignment): The lettering can be applied in final size and in the

final position. This means that a distorted and undistorted control mask can be merged together. However, difficulties may arise in that the lettering and the zone for the coarse detail switchover cover each other, due to different scales. This can be remedied by moving the lettering.

7.14.2.5. Producing a Distorted Control Mask

Perform the required position settings (chapter 7.7.) and key in the scale on the electronics cabinet. The position scan is now exposed in analog operation, with the ANALOG pushbutton (120) pressed, so that the required distortion is obtained on the separation film. If lettering is now to be inserted, the film is made into a mask in the usual way.

If only one coarse detail switchover is to take place it will be enough to paint the separation film on the emulsion side (upper side) on to the required portions. It can then be used as a control mask.





8. Summary of Operation

8. 1. Summary of Operation for Producing Screened Color Separations


Condition:

- Exposing head for screened color separations inserted.
- DAY pushbutton (228) depressed.
- Pre-exposure set.
- Film linearization for screening performed.

Pre-operational set-up:

- Calculate the reproduction scale.
- Select and insert the scanning drum.
- Select the number of lines.
- Press pushbutton  (223) or  (222).
- Press the POS pushbutton (91).
- Set the ORIGINAL POS / NEG switch (42) to POS 3.
- Set the TYPE OF GRADATION switch (43) to SCREEN.
- Mount the original on the scanning drum.
- Position the picture relative to the film and set electronic silhouetting.
- Key in the code numbers.
- Hinge down the mirror on the mask scanning head (light spot visible).
- On the patch panel, insert the plug into socket "Black"-PICTURE.
- On the patch panel, insert the plug into socket  - D1.
- Press density pushbutton D 1 (122).
- Set "0" with density control (122 R).
- Set the unsharp-masking filter wheel to magenta symbol.
- Set the scanning apertures as per Tables 5.2. to 5.4.
- Set DETAIL CONTRAST as per Table 5.5.
- Set color correction as per Table 5.6.
- Set the controls PICTURE ADJUSTMENT — HIGH-LIGHT — Y, M, C (62) to "100" (one turn of 360° from the left-hand stop to the right).
- Set controls NEUTRAL TONES — UNDER-COLOR REMOVAL — ADDITION OF COLOR to "0".
- Set CATCHLIGHTS switch (85) to OFF.
- Press the  pushbutton (100).
- Press the SCANNING LIGHT SOURCE ON pushbutton (101).
- Press the PICTURE pushbutton (121).
- Perform the basic calibration (white alignment: For this purpose, set the scanning head to clear glass and the mask scanning head to quasi white).
- Set the film densities.

Operation:





- Perform the picture calibration.
- Check the color correction; correct, if required.
- If required, set under-color removal, addition of color, highlight drop-out, density limiters.
- Check that all vacuum channels are free from adhesive tape.
- Load the cassette with lith film and contact screen.
- Switch on the vacuum for the exposing drum.
- Insert the cassette and mount the film.
- Move the scanning head and the mask scanning head to the start blocks and couple.
- Press the START pushbutton (128).
- After the exposure of the color separation, press pushbutton  (93) until approx. 1.5 cm are exposed.
- Press the STOP pushbutton (129).
- Remove the film.
- Process the film.

8. 2. Summary of Operation for Producing Continuous-tone Color Separations


Condition:

- Exposing head for continuous-tone separations inserted.
- DAY pushbutton (228) depressed.
- Film linearization for continuous-tone operation performed.

Pre-operational set-up:

- Calculate the reproduction scale.
- Select and insert the scanning drum.
- Select the number of lines.
- Press pushbutton  (223) or  (222).
- Press the POS (91) or NEG (92) pushbutton.
- Set the ORIGINAL POS / NEG switch (42) to POS 3.
- Set the TYPE OF GRADATION switch (43) to GRAVURE or OFFSET / LETTERPRESS.
- Mount the original on the scanning drum.
- Position the picture relative to the film and set electronic silhouetting.
- Key in the code numbers.
- Hinge down the mirror of the mask scanning head (light spot visible).
- On the patch panel, insert the plug into socket "Black"-PICTURE.
- On the patch panel, insert the plug into socket  - D1.
- Press density pushbutton D 1 (122).
- Set "0" with density control (122 R).
- Set the unsharp-masking filter wheel to magenta symbol.
- Set the scanning aperture as per Tables 5.2. to 5.4.
- Set DETAIL CONTRAST as per Table 5.5.
- Set color correction as per Table 5.6.
- Set the controls PICTURE ADJUSTMENT — HIGH-LIGHT — Y, M, C (62) to "100" (one turn of 360° from the left-hand stop to the right).
- Set controls NEUTRAL TONES — UNDER-COLOR REMOVAL — ADDITION OF COLOR to "0".
- Set CATCHLIGHTS switch (85) to OFF.
- Press the  pushbutton (100).
- Press the SCANNING LIGHT SOURCE ON pushbutton (101).
- Press the PICTURE pushbutton (121).
- Perform the basic calibration (white alignment: For this purpose, set the scanning head to clear glass and the mask scanning head to quasi white).
- Set the film densities.

Operation:

- Perform the picture calibration.
- Check the color correction; correct, if required.
- If required, set under-color removal, addition of color, highlight drop-out, density limiters.
- Hang a sample film of the film size to be used over the register pins of the exposing drum and tape the remaining vacuum channels (the middle vertical channel must remain free).
- Load the cassette with film.
- Switch on the vacuum for the exposing drum.
- Insert the cassette and mount the film.
- Move the scanning head and the mask scanning head to the start blocks and couple.
- Press the START pushbutton (128).
- After the exposure of the color separation, press the  pushbutton (93) until approx. 1.5 cm are exposed.
- Press the STOP pushbutton (129).
- Remove the film.
- Process the film.

9. Technical Data, Accessories and Documentation

9. 1. Technical Data

Chromagraph	DC 300																
Reproduction Scale:	Adjustable from 20 % to 1685 %																
Color Computer:	4-channel design with operational amplifiers in integrated circuit technique with extended selective color correction																
Scanning Drums:	3 scanning drums for the following maximum original sizes:																
Large	40 × 50 cm (16" × 20")																
Medium	25 × 40 cm (10" × 16")																
Small	13 × 13 cm (5" × 5")																
Originals:	Reflection copies or transparencies, positives or negatives																
Mask Drum:	For scanning a control mask: maximum size: 40 × 50 cm (16" × 20")																
Output Pitches:	140 lines / cm (350 lines / inch) 200 lines / cm (500 lines / inch) 300 lines / cm (750 lines / inch) 400 lines / cm (1000 lines / inch)																
Exposing Drum:	For the following standard film sizes: 16" × 20" 40 × 50 cm 14" × 18" 30 × 40 cm 14" × 17" 24 × 30 cm 12" × 18" 18 × 24 cm 12" × 17" 10" × 12"																
Color Separations:	Continuous-tone or screened, right-reading or wrong-reading																
Film Material:	Commercial continuous-tone and lith films																
Register System:	HELL 4-pin register system																
Time Required:	<table><tr><td>140 l / cm (350 l / in.)</td><td>200 l / cm (500 l / in.)</td><td>300 l / cm (750 l / in.)</td><td>400 l / cm (1000 l / in.)</td></tr><tr><td>7 sec.</td><td>10 sec.</td><td>15 sec.</td><td>20 sec.</td></tr><tr><td>18 sec.</td><td>25 sec.</td><td>38 sec.</td><td>50 sec.</td></tr><tr><td>150 sec.</td><td>210 sec.</td><td>315 sec.</td><td>420 sec.</td></tr></table>	140 l / cm (350 l / in.)	200 l / cm (500 l / in.)	300 l / cm (750 l / in.)	400 l / cm (1000 l / in.)	7 sec.	10 sec.	15 sec.	20 sec.	18 sec.	25 sec.	38 sec.	50 sec.	150 sec.	210 sec.	315 sec.	420 sec.
140 l / cm (350 l / in.)	200 l / cm (500 l / in.)	300 l / cm (750 l / in.)	400 l / cm (1000 l / in.)														
7 sec.	10 sec.	15 sec.	20 sec.														
18 sec.	25 sec.	38 sec.	50 sec.														
150 sec.	210 sec.	315 sec.	420 sec.														
Dimensions:																	
Scanner:	Width 3230 mm Depth 800 mm Height 1220 mm																
Electronics Cabinet:	Width 780 mm Depth 700 mm Height 1660 mm																
Weights:																	
Scanner:	990 kg																
Electronics Cabinet:	225 kg																
Power Supply:	Three-phase																
Line Voltage:	220 / 380 V (other voltages on special order)																
Line Frequency:	50 or 60 Hz (as ordered)																
Permissible Line Voltage Fluctuation:	± 10 %																
Power Consumption:	2 kVA without electronic screening equipment 3.5 kVA with electronic screening equipment plus 3.2 kVA for vacuum pumps																

9. 2. Accessories

Machine cover	Order No. 0360066
Container for transparency attachment	0360171
Container for lamp	0360090
Container for optical system	
(only optical systems of series no. 232 XVIII)	0359823
Stand for exposing head	0360007
Stand for drums	0359912
1 Register punch	0853593
4 Register-pin plates	0316962
Flexible millimeter tape	0359815
Flexible inch tape	0359734
10 Setting scales	0359718
20 Setting scales	0359971
50 Masks	0359963
50 Masks	0359882
12 Sheets of Color-aid paper, 457 × 610, VRVT 3	0129771
1 Jar of PELIKAN Plaka, vermilion, 60 cm ³	0129186
1 Tube of PELIKAN Tempera, cobalt blue no. 7, 25 cm ³	0129194
1 Anti-static cloth, 225 × 310	0057606
Oil gun (polypropylene), 5 ml	0347221
1 Bottle of Anti-Newton oil, 100 cm ³	0129100
Lamp for transparency viewing	0360198
1 Optical viewing system, complete	0360104
HELL documentation	
1 Cleaning tool kit for optical system	0359920
1 Tool kit, complete	0360015
1 Tube of grease no. 231 (HELL)	
1 Bottle of Shell Tellus oil no. 117	0360155
1 Bottle of Shell Torna 72 transmission lubricant	0360074
2 Angular hooks	0359726
3 Filters	0317179
6 Valve-protecting caps DI 12 PE-soft, GPN 250/12	0128635
2 Hose clips 12 wide, no. 2 1/2, IDEAL	0347841
1 Safety goggles	0291951
1 Double safety plug socket, surface	0130451
3 Fuse links 3 AG, 1 A, slow-blowing, 313.001, 6.3 × 32	0138509
2 Fuse links 3 AG, 0.5 A, slow-blowing, 313.500, 6.3 × 32	0138479
1 Fuse link 3 AG, 0.2 A, slow-blowing, 313.200, 6.3 × 32	0240834
4 Fuse links 3 AG UL, 1 A, quick-acting, 312.001, 6.3 × 32	0138282
1 Fuse link 3 AB UL, 6 A, medium, 314.006, 6.3 × 32	0138428
3 Fuse links 3 AB UL, 10 A, medium, 314.010, 6.3 × 32	0240699
1 Fuse link 3 AG, 3 A, slow-blowing, 313.003, 6.3 × 32	0138541
2 Fuse links 3 AB, 4 A, medium, 314.004, 6.3 × 32	0138398
1 "G" fuse link, 0.032 A, medium, 19201, 5 × 20	0137812

9. 3. Documentation

9.3.1. HELL Documentation 3012.12.99800.4

CHROMAGRAPH DC 300 B MULTI-COLOR, Operating Manual	3012-B3e-7704
CHROMAGRAPH DC 300, CN 320, Table of Reproduction Scales	3012-M1d/e-7602
CHROMAGRAPH DC 300, Theory	3001-S1e-7404
CHROMAGRAPH DC 300, Reproduction Patterns	3012-R1e-7704

10. Measuring Sheets M 1 to M 6

Examples of how to read the measuring values on the digital meter (47)

M 1 White Values Scanning Head

M 2 White Values Mask Head

M 3 Film Density Values – Screening

M 4 Film Density Values – Continuous-tone

M 5 Current Values

M 6 Light Values

WHITE VALUES

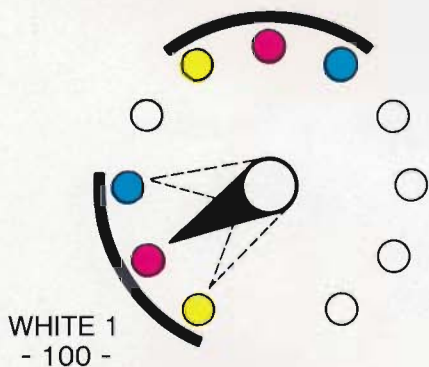
1. Basic Calibration: Scanning Head

Condition :

Scanning head on clear glass

Setting :

Press pushbutton WHITE ADJUSTMENT-
WITH COLOR SHIFT COMPENSATION
(round white pushbutton).



MEASURE 1 (48)

Checking the automatics :

Switch MEASURE 1 (48) in sector : WHITE 1
on color dot "Yellow" or "Magenta" or "Cyan".

DISPLAY

60.0

M 1

WHITE VALUES

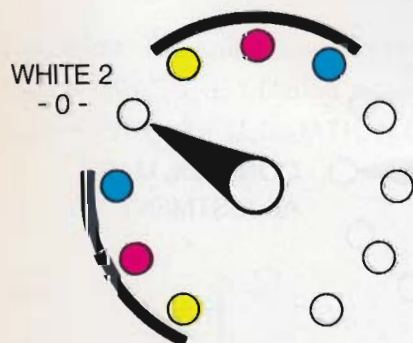
1. Basic Calibration: Scanning Head

Condition :

Scanning head on clear glass

Setting :

Press pushbutton WHITE ADJUSTMENT-
WITH COLOR SHIFT COMPENSATION
(round white pushbutton).



MEASURE 1 (48)

Checking the automatics :

Switch MEASURE 1 (48) in position
WHITE 2.

DISPLAY



WHITE VALUES

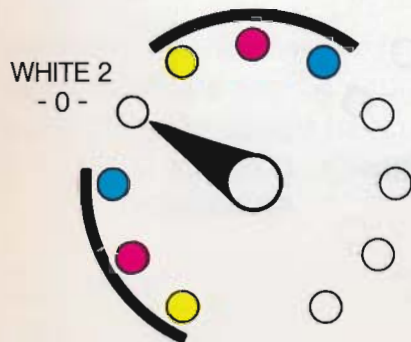
1. Basic Calibration: Scanning Head

Condition :

Scanning head on clear glass

Setting :

Press pushbutton WHITE ADJUSTMENT-
WITH COLOR SHIFT COMPENSATION
(round white pushbutton).



MEASURE 1 (48)

Checking the automatics :

Switch MEASURE 1 (48) in position
WHITE 2.

DISPLAY



WHITE VALUES

2. Basic Calibration: Mask Head

Condition :

Mask scanning head on quasi white with clear glass.

Setting :

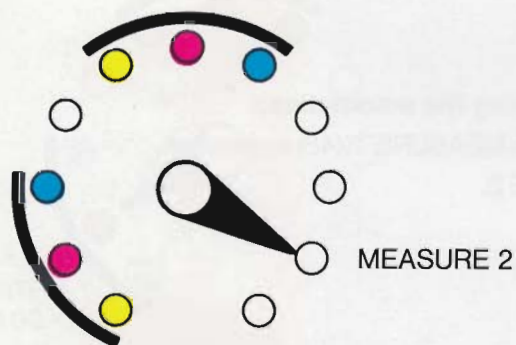
Press pushbutton "White Alignment Mask" (94).

Checking the automatics :

Switch MEASURE 1 (48) in position : MEASURE 2

Switch MEASURE 2 (90) in position : CONTROL MASK ADJUSTMENT

Press pushbutton "Red" (108) or "Blue" (109).



MEASURE 1 (48)

MEASURE 2 (90)



DISPLAY

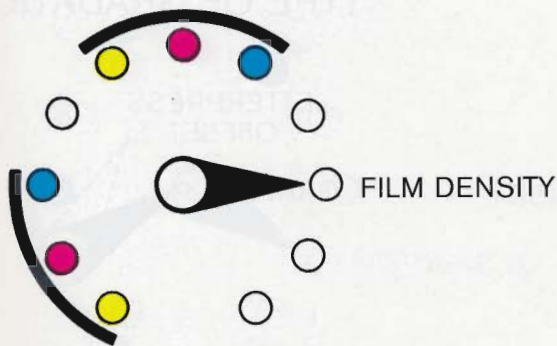


FILM DENSITY – SCREENING

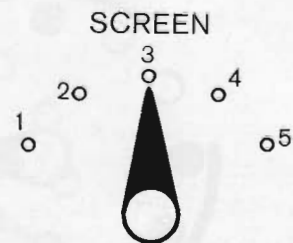
READING $\hat{=}$ 83%



Picture Calibration for Screening



TYPE OF GRADATION (43)



MEASURE 1 (48)

Condition: Scanning head on required picture area
Switch MEASURE 1 (48) in position: FILM DENSITY
Switch TYPE OF GRADATION (43) in position: SCREEN

FILM DENSITY
COLOR SEPARATION



HIGHLIGHT



SHADOW

LOCAL TONE AND
COLOR CORRECTION



GRADATION
FILM DENSITY

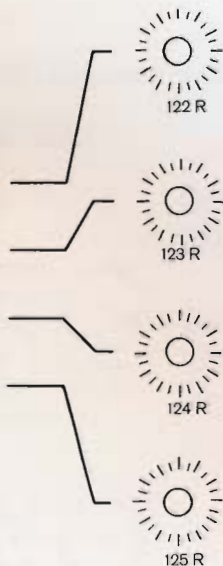


HIGHLIGHT



SHADOW

ANALOG
120
PICTURE
121
D 1
122
D 2
123
D 3
124
D 4
125
LOCAL CORR.
126
MASK + TEST
127



Setting with:

control (FILM DENSITY) COLOR SEPARATION

control HIGHLIGHT (64)

control SHADOW (65)

or control (LOCAL TONE AND COLOR CORRECTION)

control GRADATION (35)

control HIGHLIGHT (36)

control SHADOW (37)

or
density control (122 R to 125 R)

Press pushbuttons D1 to D4 (122 to 124).

M 3

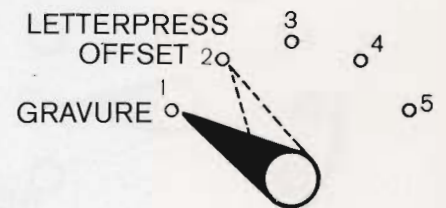
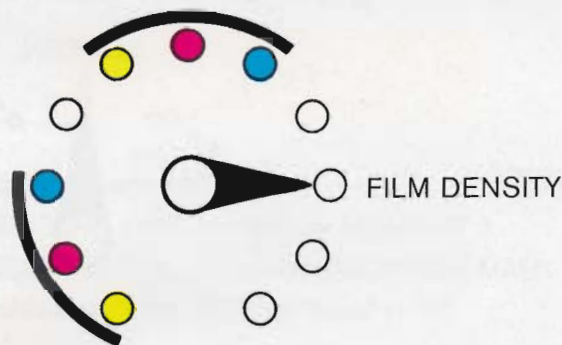
FILM DENSITY – CONT.-TONE

READING $\triangleq D = 1.50$



Picture Calibration for Continuous-tone

TYPE OF GRADATION (43)



MEASURE 1 (48)

Condition: Scanning head on required picture area

Switch MEASURE 1 (48) in position: FILM DENSITY

Switch TYPE OF GRADATION (43) in position: GRAVURE

or { LETTERPRESS
OFFSET

FILM DENSITY
COLOR SEPARATION



HIGHLIGHT



SHADOW

LOCAL TONE AND
COLOR CORRECTION



GRADATION



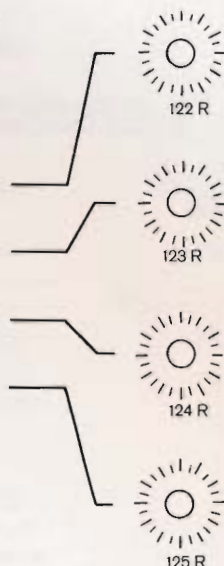
FILM DENSITY

HIGHLIGHT



SHADOW

ANALOG
120
PICTURE
121
D 1
122
D 2
123
D 3
124
D 4
125
LOCAL CORR.
126
MASK + TEST
127



Setting with:

control (FILM DENSITY) COLOR SEPARATION

control HIGHLIGHT (64)

control SHADOW (65)

or control LOCAL TONE AND COLOR CORRECTION

control GRADATION (35)

control HIGHLIGHT (36)

control SHADOW (37)

or

density control (122 R to 125 R)

Press pushbuttons D1 to D4 (122 to 124).

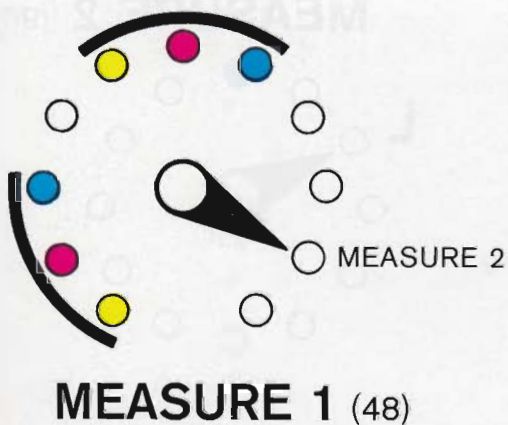
M 4

CURRENT VALUES

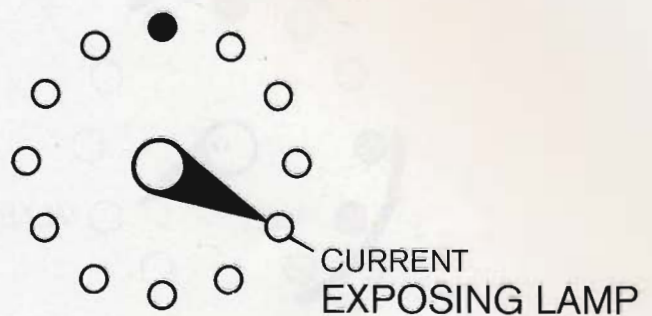
READING $\hat{=}$ 28 mA



Film Linearization

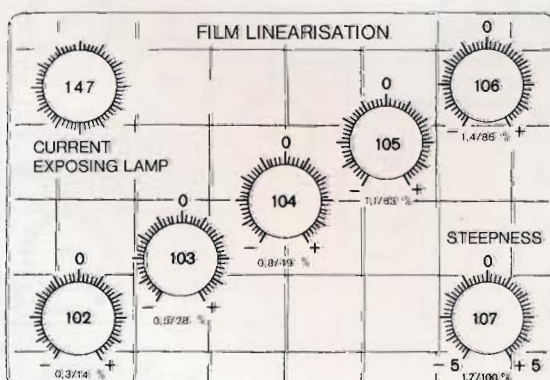


MEASURE 2 (90)



Condition: Switch MEASURE 1 (48) in position: MEASURE 2
Switch MEASURE 2 (90) in position: CURRENT EXPOSING LAMP

Setting : with control CURRENT EXPOSING LAMP (147)



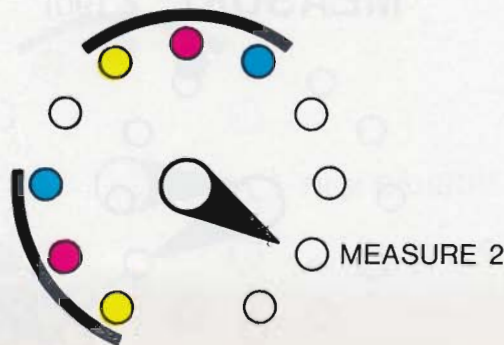
M 5

LIGHT VALUES

READING $\hat{=}$ 37.5 mA

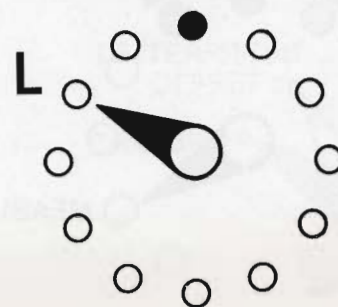


Film Linearization



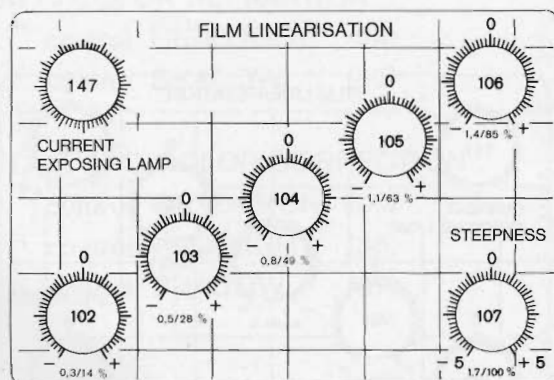
MEASURE 1 (48)

MEASURE 2 (90)



Condition : Switch MEASURE 1 (48) in position : MEASURE 2
Switch MEASURE 2 (90) in position : L (LIGHT VALUE)

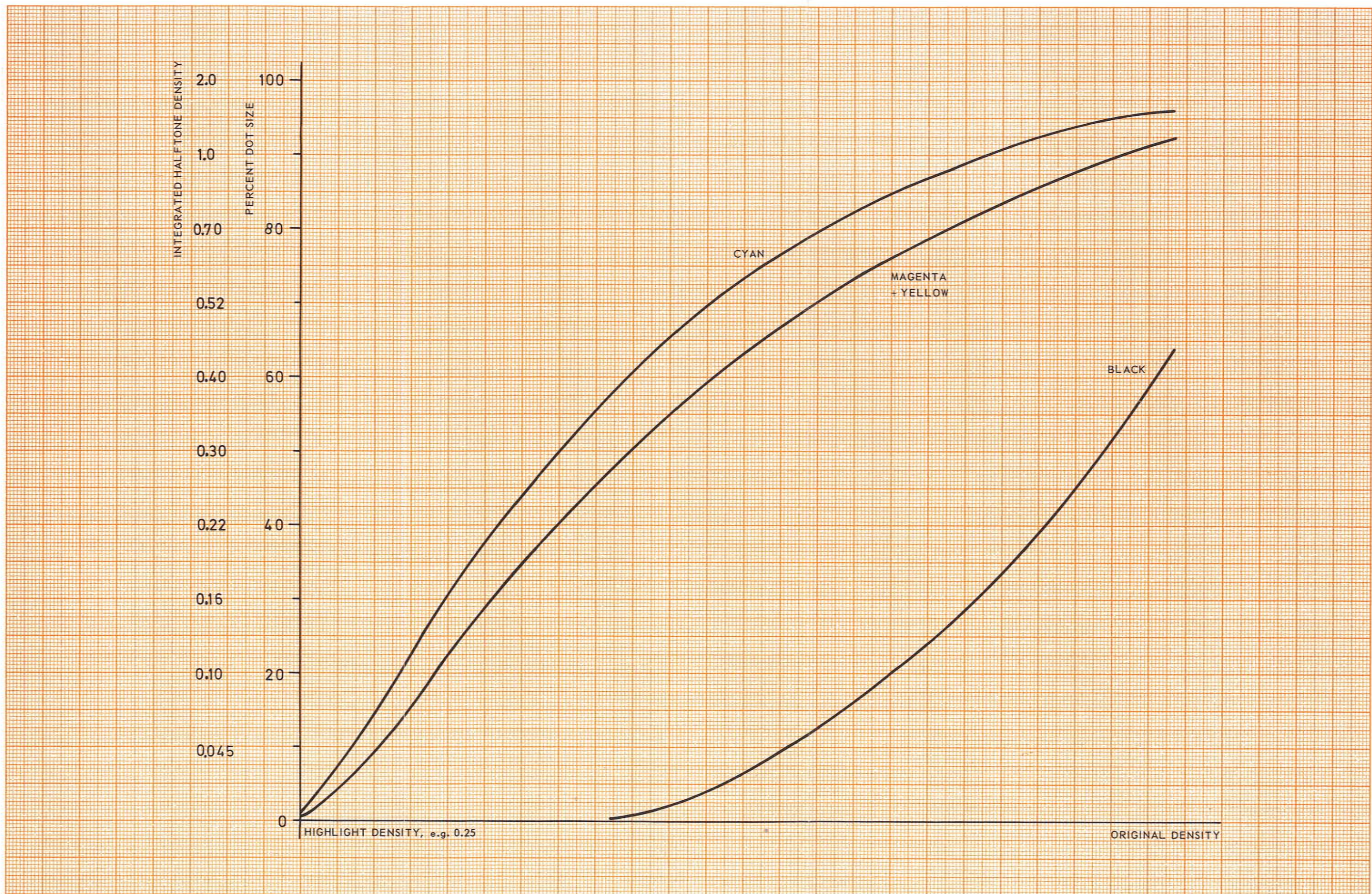
Setting with controls : FILM LINEARIZATION (102 to 107a)



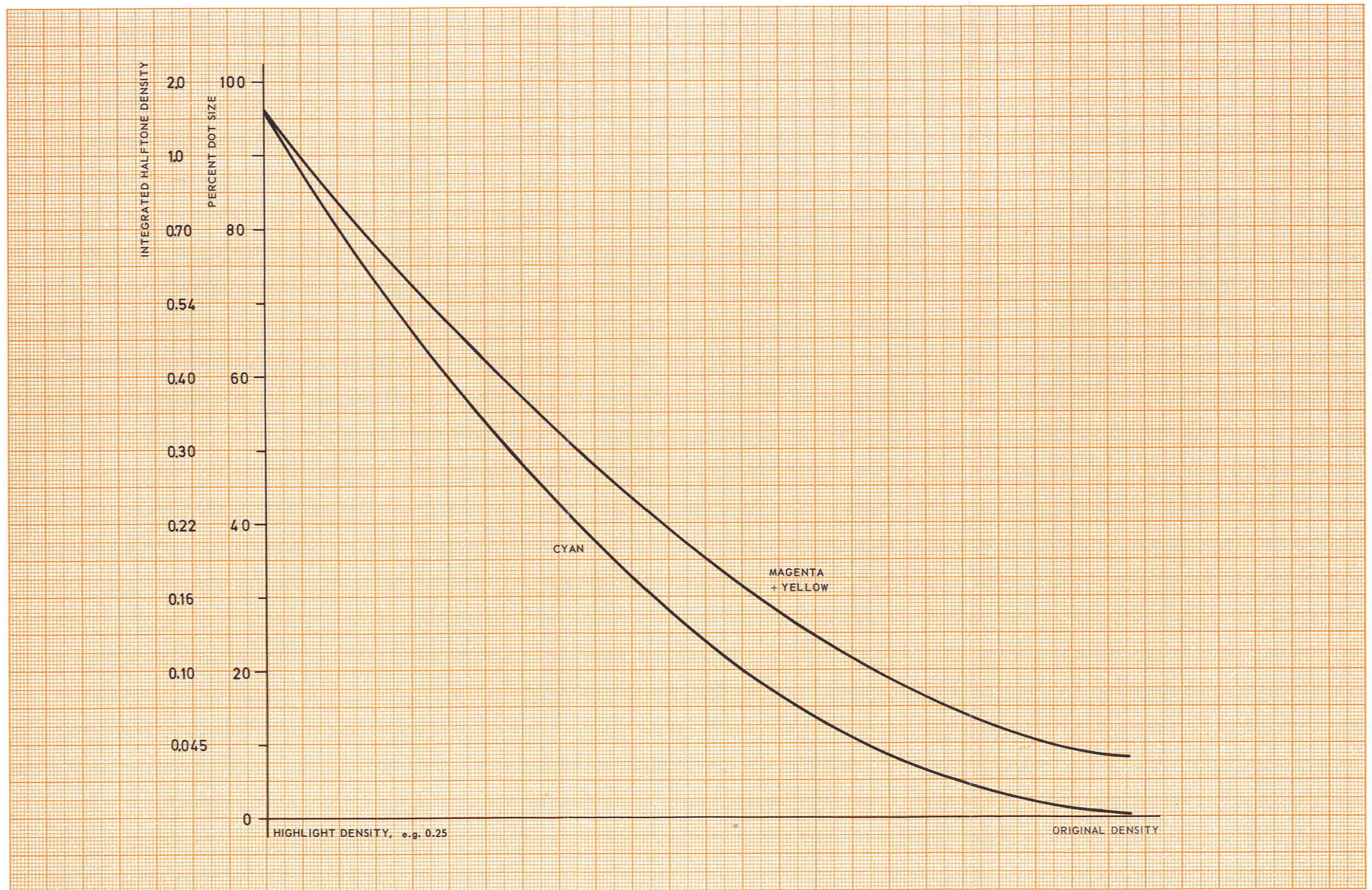
M 6

11. Curves K 1 to K 6

- K 1 Halftone Positives**
- K 2 Halftone Negatives**
- K 3 Positives for Offset and Letterpress**
- K 4 Negatives for Offset and Letterpress**
- K 5 Positives for Gravure**
- K 6 Negatives for Gravure**

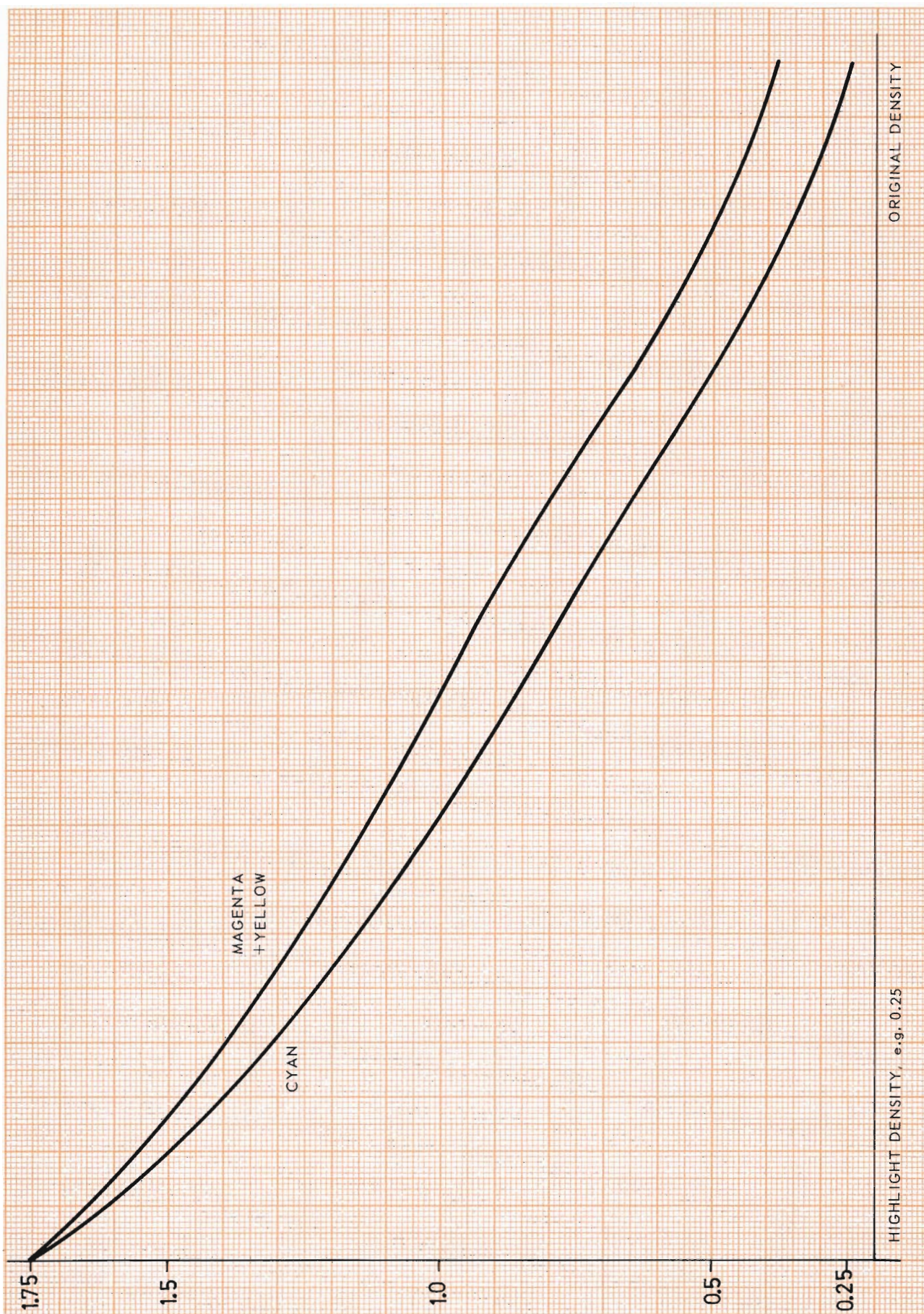


Halftone Positives



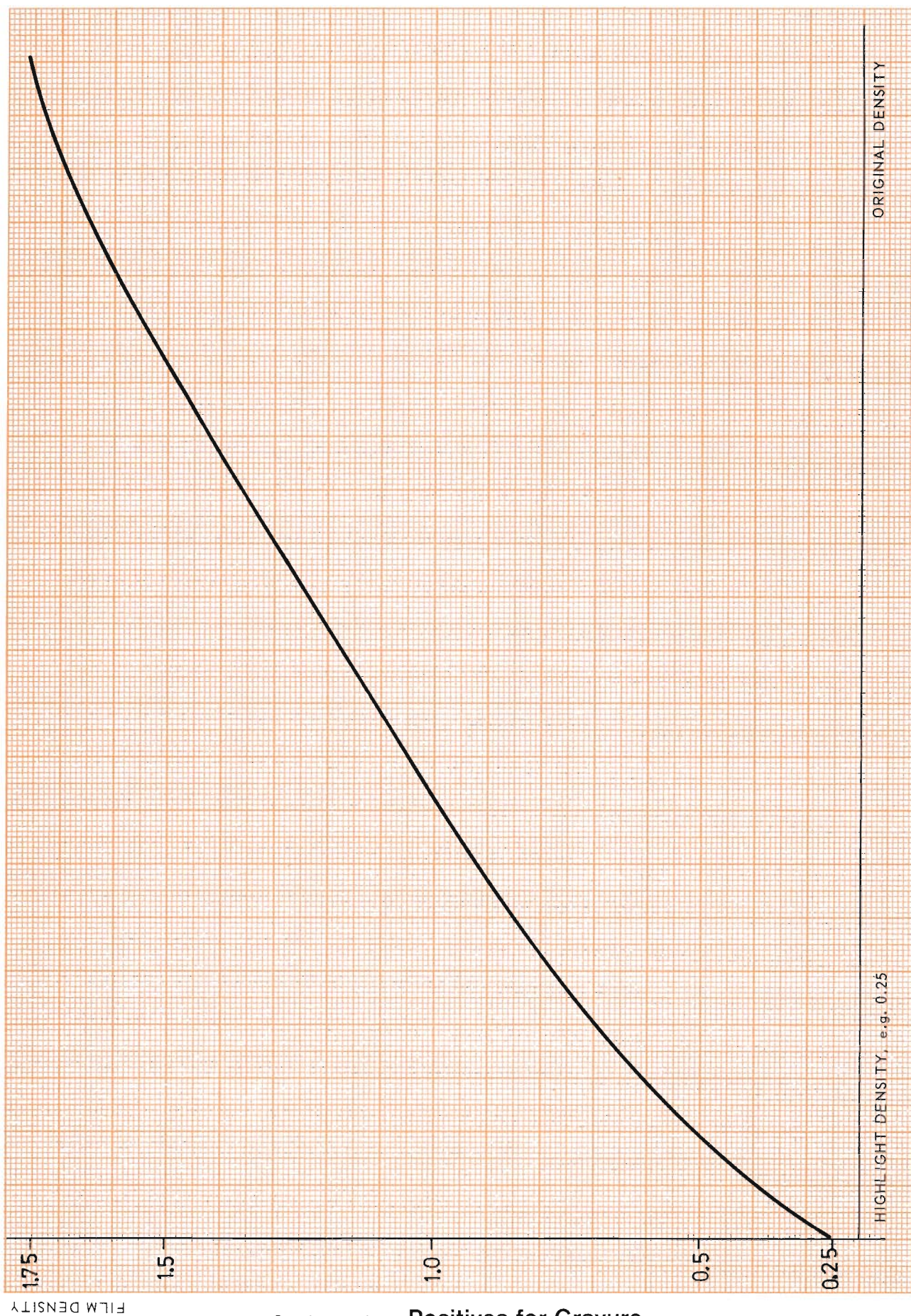


Continuous-tone **Positives for Offset and Letterpress**
 Original Density Range: 2.0 and more



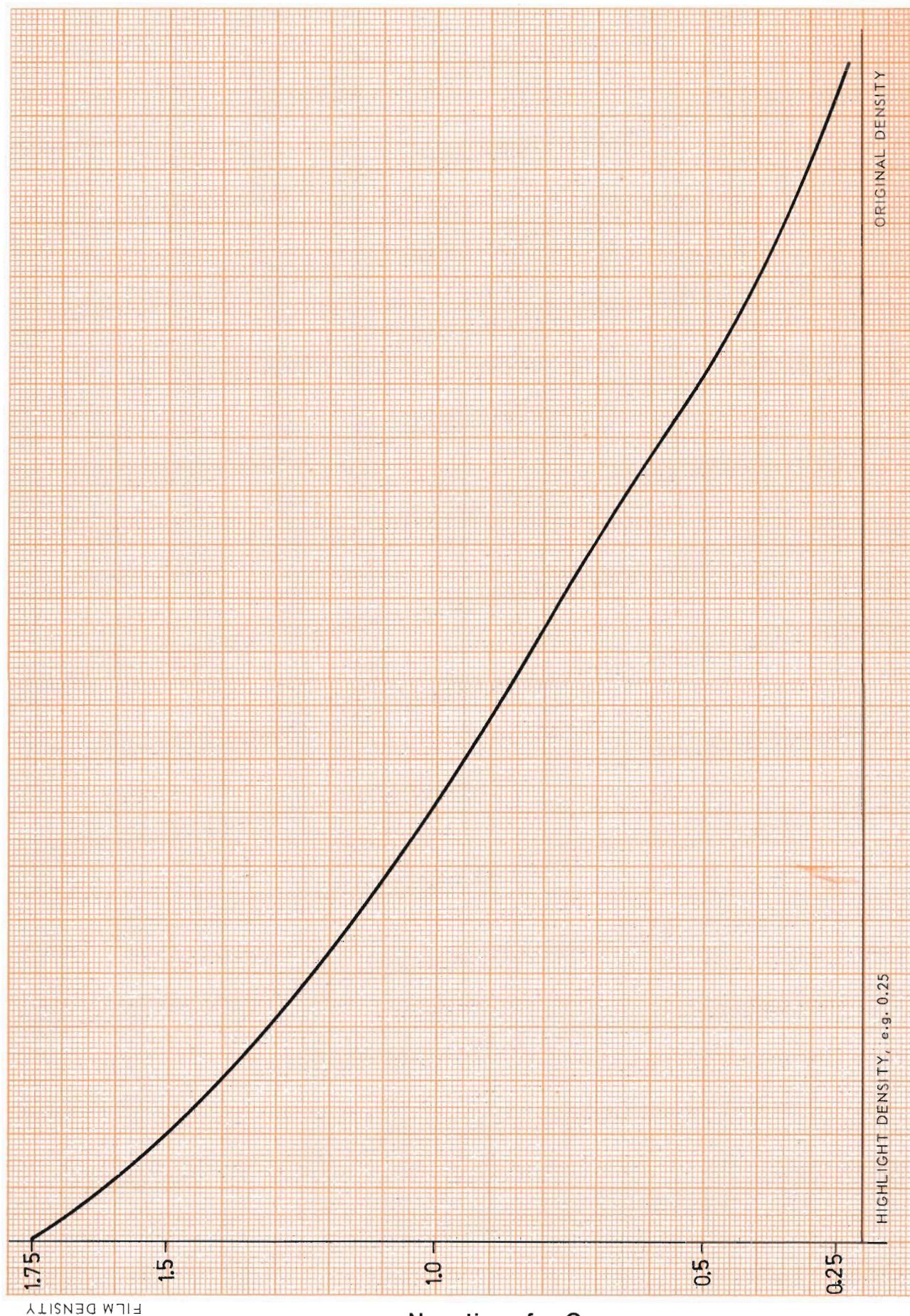
Continuous-tone **Negatives for Offset and Letterpress**
 Original Density Range: **2.0** and more

K 4



Continuous-tone **Positives for Gravure**
Original Density Range: **2.0** and more

K 5



Continuous-tone **Negatives for Gravure**

Original Density Range: **2.0** and more

K 6

12. Operator Maintenance

The maintenance work should only be performed by specially trained operating personnel.

12.1. Localizing Troubles

The purpose of the following instructions is to enable the operator to roughly determine the source of troubles so that the service engineer can be informed before his arrival by telephone.

When streaks or similar faults appear on the separation, the cause of which is not obvious, their location must be determined (mechanical, optical or electronic section). For this purpose, a test strip must be exposed with the test-exposure system. If the trouble re-appears, it is caused by the mechanical section provided the test-exposure system functions properly. However, if the trouble does not re-appear, the following exposure should be made using the inverter stage:

- Hinge down the mirror so that no signal can be transmitted by the scanning head.
- Turn control FILM DENSITY — HIGHLIGHT (64) to the left-hand limit and controls UNDER-COLOR REMOVAL (70), ADDITION OF COLOR (75) as well as DETAIL CONTRAST — INTENSITY (44) to the left-hand limit.
- With control FILM DENSITY — SHADOW (65), set the film density in which the trouble can most easily be recognized. Expose a film.

If the trouble re-appears, it may be located in the inverter stage, the output stage (including the film-linearization system) or in the DC voltage supply.

To localize trouble in the signal path, first check the input signal at the color computer. Perform the basic calibration for the scanning head and observe the meter. If the reading varies approx. 0.3 (see measuring sheet M 1), the trouble may be located in the multiplier unit, in the picture lamp, its regulation or its voltage supply. Especially if the fluctuation is the same for all channels, the main source of trouble is in the voltage supply.

If the fault has disappeared on the test strip and no signal fluctuations have been observed on the meter, the fault could be in the under-color removal circuitry or in the unsharp-masking system. Therefore, repeat the test exposure using only the inverter stage. For this purpose, again hinge down the mirror, turn control FILM DENSITY — HIGHLIGHT (64) to the left-hand limit and turn up the UNDER-COLOR REMOVAL controls (70) as well as the DETAIL CONTRAST — INTENSITY control (44).

If streaks appear on screened separations, try to localize the trouble with continuous-tone operation, as described above.

12.2. Changing the Picture Lamp for Transparency Scanning

In case of the first DC 300 units of the 3012 type the picture lamp is accommodated in the so-called lamp insert in the lamp housing. Recently constructed 3012 units do no longer need a lamp housing since the picture lamp is fitted on the so-called lamp holder which is mounted on the transparency illumination arm

a) Lamp insert in lamp housing (Fig. 12-1)

Removal:

- Release the SCANNING LIGHT SOURCE ON push-button (101).
- Open the flap of the lamp compartment.
- Unscrew the knurled-head screw (Fig. 12-1/1) which retains the plate on the holder.
- Lift plate and halogen lamp from the holder.
- Loosen the screws (Fig. 12-1/2) on the clamps of the lamp socket and withdraw the lamp.

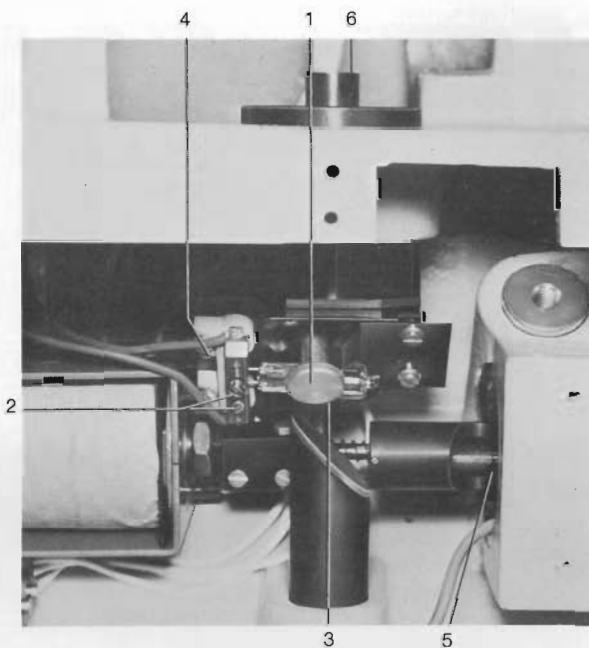


Fig. 12-1 Lamp Insert in Lamp Housing

Fitting:

Important: Do not touch the bulb of the new halogen lamp with your fingers. Handle the new lamp only with the protective covering pulled over.

- Fix the new halogen lamp on the plate. The bulb must flush with the aperture of the guiding plate. The longitudinal axis of the coil and the deflection mirror holder (Fig. 12-1/3) must flush.
- Slightly tighten the clamping screws (Fig. 12-1/2).
- Fix the plate with the knurled-head screw (Fig. 12-1/1) on the holder in the position determined by the cylindrical pin (Fig. 12-1/4).
- Press the + "transparency scanning" pushbutton (100) and the SCANNING LIGHT SOURCE ON push-button (101). The lamp coil is projected via the optical system of the transparency illumination arm on its diaphragm (Fig. 12-1/5) and must completely illuminate the aperture. Otherwise adjust as follows:
 - In vertical direction, by turning the adjusting axle (Fig. 12-1/6),
 - in horizontal direction, by turning the plate around the cylindrical pin (Fig. 12-1/4), after loosening the knurled-head screw (Fig. 12-1/1).

b) Lamp holder on transparency illumination arm holder (Fig. 12-2)

- Release the SCANNING LIGHT SOURCE ON pushbutton (101).
- Open the flap of the lamp compartment.
- Unscrew the knurled-head screw (Fig. 12-2/1) which retains the plate on the angle of the holder.
- Lift the plate with the halogen lamp from the angle.
- Loosen the screws (Fig. 12-2/2) on the clamps of the lamp socket and withdraw the lamp.

Important: Do not touch the bulb of the new halogen lamp with your fingers. Handle the new lamp only with the protective cover pulled over.

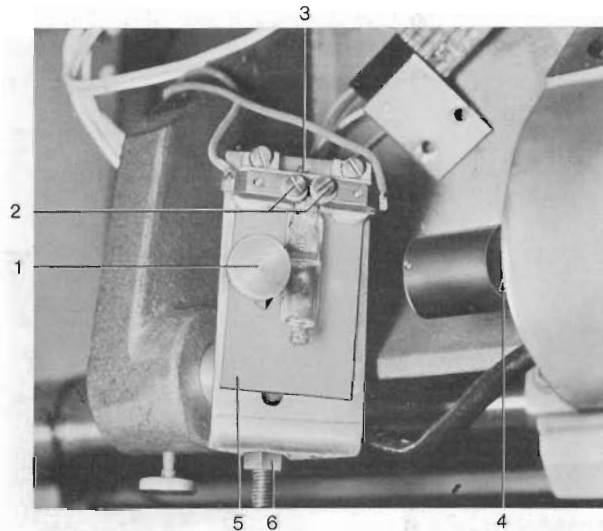



Fig. 12-2 Lamp Holder on Transparency Illumination Arm Holder

- Fix the new lamp on the plate. Slightly tighten the clamping screws (Fig. 12-2/2).
- Fix the plate with the knurled-head screw (Fig. 12-2/1) on the holder in the position determined by the cylindrical pin (Fig. 12-2/3).
- Press the  "transparency scanning" pushbutton (100) and the SCANNING LIGHT SOURCE ON pushbutton (101). The lamp coil is projected via the optical system of the transparency illumination arm on its diaphragm and must completely illuminate the aperture (Fig. 12-2/4). Otherwise adjust as follows:
In vertical direction, by turning the plate around the cylindrical pin (Fig. 12-2/3), after loosening the knurled-head screw (Fig. 12-2/1),
in horizontal direction by shifting the angle (Fig. 12-2/5) with the nut (Fig. 12-2/6) on the bar.

12.3. Changing the Picture Lamp for Reflection-copy Scanning (Figs. 12-3 + 4)

The picture lamp is located in the scanning head and accessible through the round upper clearance.

- Release the SCANNING LIGHT SOURCE ON pushbutton (101).
- Turn the upper cover (Fig. 12-3/3) aside so that the clearance is exposed. Unscrew the sheet cover on the right-hand side of the scanning head (seen from behind).

- Turn out the three knurled-head screws (Fig. 12-3/2) which hold the support (Fig. 12-3/1) for the halogen lamp and withdraw the support from the lamp bulb.
- Loosen the clamping screws (Fig. 12-4/1) of the lamp socket which are accessible through the lateral recess.
- Lift the defect lamp with a laterally inserted screw driver from the socket and withdraw it from the lens holder (Fig. 12-4/2).

Important: Do not touch the bulb of the new halogen lamp with your fingers. Handle the new lamp only with the protective cover pulled over.

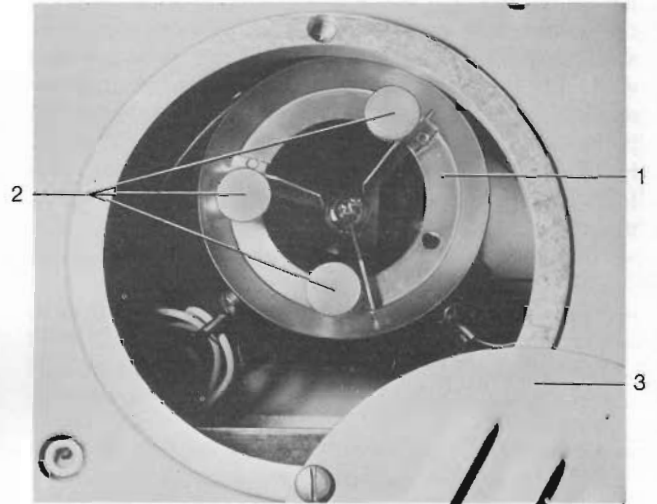


Fig. 12-3 Changing the Picture Lamp for Reflection-copy Scanning

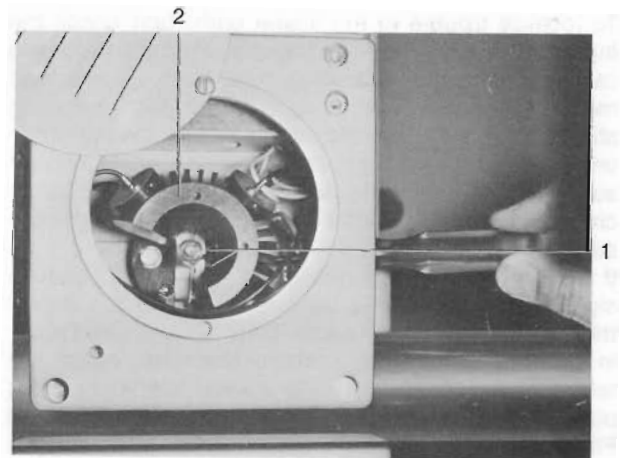



Fig. 12-4 Changing the Picture Lamp for Reflection-copy Scanning

- Insert the new lamp below the clamps into the socket.
- Pull the support (Fig. 12-3/1) over the bulb of the new lamp and fasten in with the knurled-head screws (Fig. 12-3/2).
- By means of an appropriate screw driver or something similar, carefully press the lamp as far as possible into the socket.
- Slightly tighten the clamping screws (Fig. 12-4/1).
- Replace the covers.
- Press the  "reflection-copy scanning" pushbutton (99) and the SCANNING LIGHT SOURCE ON pushbutton (101). Check whether the capacitors of all light conductors are uniformly lighting.

12.4. Changing the Picture Lamp in the Mask Scanning Head

It is recommended to remove and mount the picture lamp from the rear side of the unit.

Removal:

- Release the ON pushbutton (101).
- Loosen the slot bolts of the conductor clamps on the right- and left-hand sides of the mask scanning head and withdraw the terminals.
- Loosen the knurled-head screw on the right-hand side of the mask scanning head, shift the lamp holder to the right front and remove it upwards (Fig. 12-5).

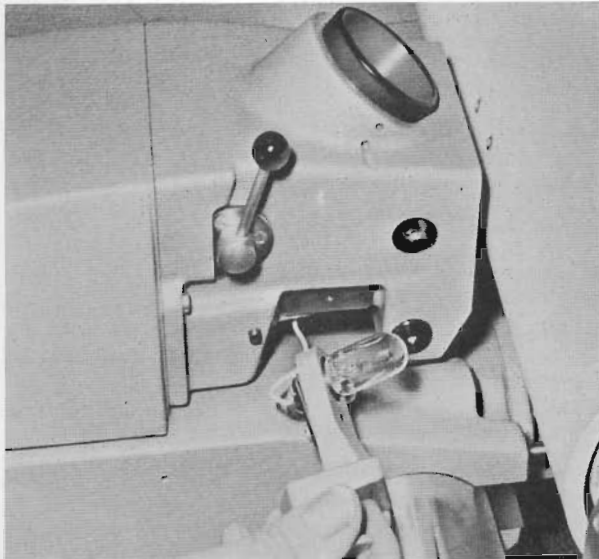


Fig. 12-5 Changing the Picture Lamp in the Mask Scanning Head

- Loosen the forked clamp and withdraw it from the lamp socket.
- Withdraw the picture lamp.

Fitting:

Important: Do not touch the bulb of the new lamp with your fingers.

- Insert the lamp so that the nose of the lamp plate fits into the recess of the lamp socket.
- Fit the clamp and slightly tighten the fastening screw. Make sure that the clamp does not rest on the lamp socket. Align both thighs of the clamp symmetrically to the lamp socket (Fig. 12-6).
- Draw out one wire end in longitudinal direction of the holding and push the lamp holder through with the wire end in front below the mask scanning head.
- Place the lamp holder on the set pins and tighten the knurled-head screw.
- Clamp the conductors.

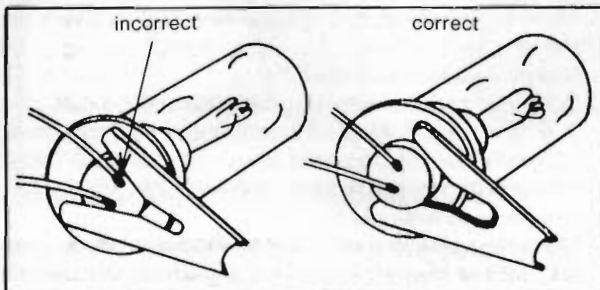


Fig. 12-6 Fastening the Picture Lamp

12.5. Changing the Transparency Illumination Lamp and the Starter in the Power Supply

The lamp requires replacement when it has bright burnt spots which cause browning of the Astralon cover.

- Move the scanning head to the left-hand stop.
- Remove the scanning drum.
- Remove the Astralon cover. Turn the lamp and remove from the holder.
- Insert the new lamp into the holder and turn it so that the lettering on the lamp is below in direction of the reflector.
- Check lighting of the lamp before replacing the Astralon cover.

The starter for the transparency illumination lamp is located in the power supply for the picture lamp. After turning the starter counterclockwise, it can be removed from its socket.

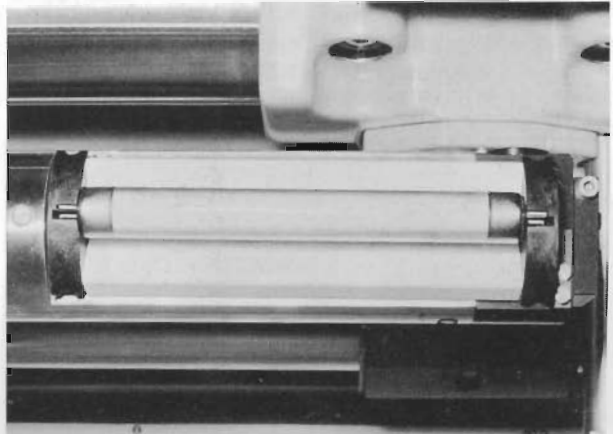


Fig. 12-7 Changing the Transparency Illumination Lamp

12.6. Changing the Exposing Lamp

- Switch off the machine with the main switch (219).
- Open the cover at the rear of the exposing compartment.
- Loosen the fixing screw (knurled screw) of the exposing lamp holder on the side of the lower part of the exposing head.
- Withdraw the cylindrical exposing lamp holder downwards.
- On the exposing lamp holder, loosen the adjusting screws for lamp adjustment.
- Remove the exposing lamp.

Fitting:

- Insert the exposing lamp into the holder. Proper fitting of the lamp is ensured by a nose at the base. Avoid fingerprints. Clean the glass bulb of the lamp with clean cotton wool, spirit, and distilled water, if required. With the two setscrews, visually adjust the exposing lamp centrally to the cylindrical lamp holder.
- Insert the lamp holder into the lower part of the exposing head, turning the exposing lamp holder so that the two centering screws point backwards and can be adjusted without loosening the holder (seen from the rear of the machine).
- Slightly tighten the fixing screw.

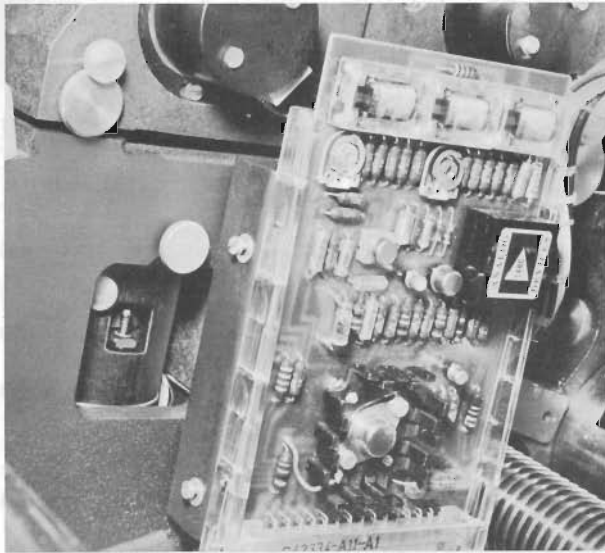


Fig. 12-8 Lower Part of Exposing Head with Exposing Lamp Holder

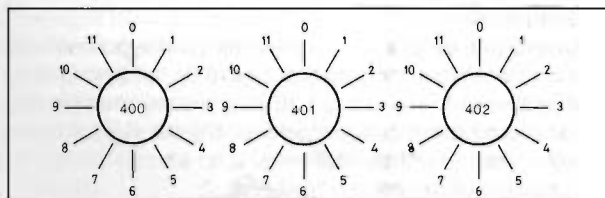


Fig 12-9 Exposing Lamp Holder with Centering Screws

- Again switch on the machine. The exposing lamp will light.
- Again loosen the fixing screw and shift the exposing lamp holder downwards or upwards so that the smallest light spot can be seen through the magnifier at the exposing head.
- Tighten the fixing screw on the side of the lower part of the exposing head.
- Align the exposing lamp with the two centering screws of the lamp holder so that the exposing aperture is centered on the illuminated area.

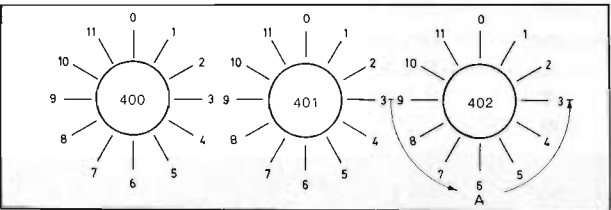
12.7. Focusing the Exposing Optics

12.7.1. Operating Elements in the Exposing Compartment



12.7.2. Exposing Head for Continuous-tone Separations

- Open the cover of the exposing compartment.
- Set the iris diaphragm to "1" and close the cover of the exposing compartment.
- Insert the film.
- Move the mask scanning head to the right-hand stop.



- Note the initial position of the knurled knob (402), make a test exposure within a range of three graduations each, i.e. turning the knurled knob counter-clockwise and clockwise; e.g. with initial position 6, the test exposure is made from graduations 9 to 3.
- Set the knurled knob to graduation 9 (three graduations next to the initial position).
- Move the scanning light spot of the mask scanning head to the left-hand film beginning (1.5 cm).
- Move the start block to the mask scanning head and lock.
- Press density pushbutton D 1 (122) and set the film density control D 1 (122 R) as per Table 12.1.

Table 12.1. Film Density Values for Focusing the Exposing Head for Continuous-tone Separations

Type of Color Separations to be Produced	Film Density
Mainly separation negatives	D = 1.4
Mainly separation positives	D = 0.6
Approx. same number of separation positives and negatives	D = 1.0

- Start the machine; quickly press and release push-button D = 0 (137) several times. Single lines will be exposed (approx. 10 mm).
- Stop the machine.
- Move the start block to the mask scanning head. The beginning of the next test exposure is thus determined.
- Move the mask scanning head to the right-hand stop.
- Set the knurled knob (402) to graduation 8.
- Move the mask scanning head to the start block (to the left).
- Make a new test exposure.
- Similarly perform focusing tests using graduations 7, 6, 5, 4, and 3. After each test, move the start block to the mask scanning head in order to mark the initial position for the next test.
- Process and evaluate the film.
- Move the mask scanning head to the right-hand stop and set the knurled knob to the graduation at which optimum sharpness has been achieved.
- Re-set the iris diaphragm to initial value.

12.7.3. Exposing Head for Screened Color Separations

For focusing the exposing head for screened color separations, an unexposed continuous-tone film is mounted on the drum. Pressing the microswitch located at the front of the exposing head, the shutter opens and the exposing spot becomes visible on the film. It is now possible to assess the sharpness with a magnifier and to carry out any correction, if necessary.

A close examination of the sharpness is only feasible when a picture has been exposed. The picture area to be judged is then exposed on a film with several positions of the knurled knob (402).

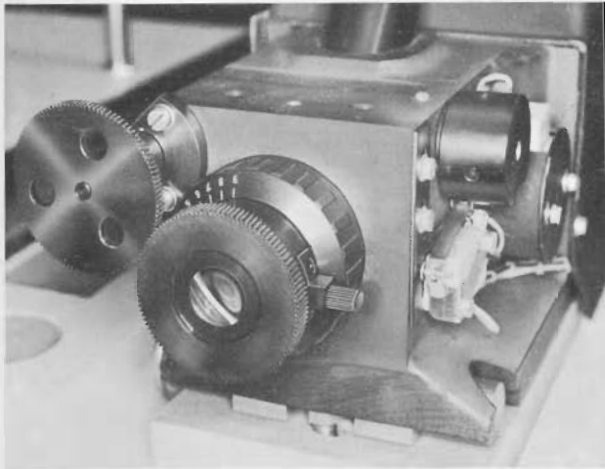


Fig. 12-10 Exposing Lens

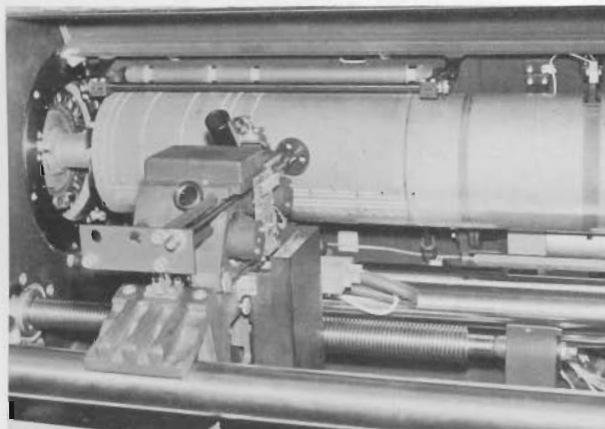


Fig. 12-11 Exposing Compartment

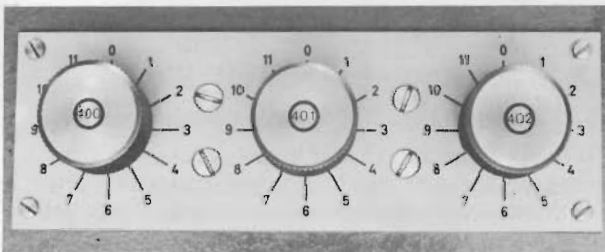


Fig. 12-12 Adjusting Knobs on the Cover of the Exposing Compartment - Iris Diaphragm, Focusing, Line Thickness

12.8. Adjusting the Line Thickness (Line Structure)

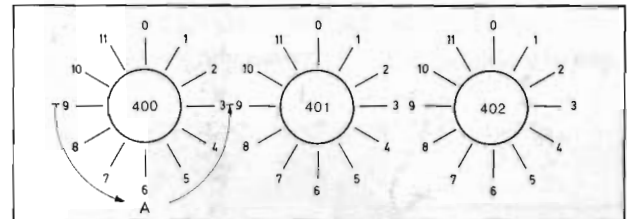
12.8.1. Line Thickness for 140 Lines/cm (350 Lines/inch)

This adjustment is only performed for the exposing head for continuous-tone separations, using knurled knob (400) for 140 lines/cm (350 lines/inch).

Condition:

The exposing optics should have been focused as described in chapter 12.7.

- Remove the black cover on the upper part of the exposing head.
- Loosen the locking screw.
- Insert the film.
- Press the 140 Lines/cm (350 lines/inch) push-button (151) on the electronics cabinet.
- Note the initial position of the knurled knob (400).
- From this initial position, make a test exposure within a range of three graduations each, i.e. turning the knurled knob counterclockwise and clockwise; e.g. with initial position 6, the test exposure is made from graduation 9 to 3.



- Set the knurled knob to graduation 9 (three graduations next to the initial position).
- Move the scanning light spot of the mask scanning head to the left-hand film beginning (1.5 cm).
- Move the start block to the mask scanning head and lock.
- Start the machine; press the gray scale pushbutton (93) and expose 10 mm of film.
- Stop the machine.
- Move the start block to the mask scanning head. The beginning of the next test exposure is thus determined.
- Move the mask scanning head to the right-hand stop.
- Set the knurled knob (400) to graduation 8.
- Move the mask scanning head to the start block (to the left).
- Perform the second test exposure similar to the first exposure.
- In the same manner, perform line structure tests using graduations 7, 6, 5, 4, and 3. After each test, move the start block to the mask scanning head in order to mark the initial position for the next test.
- Process and evaluate the film.

Attention

The quality of the line structure is judged with the densities which are mostly used in operation (see Table 12-2).

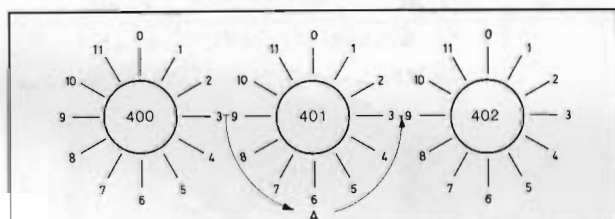
- Move the mask scanning head to the right-hand stop and set the graduation with which the best line structure was achieved.

Table 12.2. Film Density Values for Adjusting the Line Thickness

Type of Color Separations to be Produced	Film Density
Mainly separation negatives	D = 1.4
Mainly separation positives	D = 0.6
Approx. same number of separation positives and negatives	D = 1.0

12.8.2. Line Thickness for 200 Lines/cm (500 Lines/inch)

Setting of the line thickness for 200 lines/cm (500 lines/inch) is made the same as for 140 lines/cm (350 lines/inch), using the middle knurled knob (401). If a change in density occurs when the number of lines is switched over, the service technician can align the density on the exposing amplifier output board. The height of the aperture is permanently fixed.



12.9. Setting the Density Values for Test Exposure

(Using the Exposing Head for Continuous-tone Separations)

By pressing the test-exposure pushbutton (97 or 98) of the control section, densities $D = 0.3$ and $D = 1.7$ are exposed. If these densities are not obtained, the aperture height must be aligned. This alignment does not affect the normal operation of the machine.

- Insert the film.
- Move the scanning light spot of the mask scanning head to film beginning.
- Move the start block to the mask scanning head and lock.
- Start the machine.
- Press pushbutton ● (97) and expose approx. 10 mm of the film.
- Press pushbutton ○ (98) and expose approx. 10 mm of the film.
- Process the film and measure the densities.
- In case of deviations, remove the cover of the exposing head in the exposing compartment.
- If the densities are too large (e.g. 0.5 and 2.0), turn the setcrew into the exposing head (clockwise). The aperture will become smaller and the exposed density lower.
- Replace the cover.
- Insert the film.
- Repeat the test until the required densities are obtained.

- If the densities are too low (e.g. 0.2 and 1.6), turn the setcrew out of the exposing head (counter-clockwise). The aperture will become larger and the exposed density higher.

12.10. Changing the Test-exposure Lamp in the Exposing Head

This lamp is located at the rear of the exposing head, on the left-hand side (seen from the rear). It need rarely be changed, as it is only operated for a short time and at undervoltage.

However, it should be changed if:

- the lamp is burnt out,
- the glass bulb is darkened or
- the lamp burns irregularly.
- Switch off the machine.
- Open the cover of the exposing compartment.
- Remove the cover of the exposing head.
- Withdraw the lamp together with the metal plate into which it is soldered. Insert the new lamp with metal plate. (Clean the contact surface of the metal plate with polishing emery, if required.)
- When inserting the lamp, make sure that the flat part of the metal plate points backwards.
- The lamp and the plate form one adjusted unit and should only be replaced as such.
- Replace the exposing head cover.
- Close the cover of the exposing compartment.
- Switch on the machine.



Fig. 12-13 Changing the Test-exposure Lamp

12.11. Changing the Multipliers

12.11.1. Changing a Multiplier in the Scanning Head

12.11.1.1. Changing a Multiplier

- Loosen and withdraw the multiplier unit.
- Remove and mark the multiplier cap with gray filter.
- Withdraw the metal cylinder.
- Remove the multiplier and insert the new multiplier. Avoid fingerprints on the multiplier surface. Use the cleaning tool kit for optical systems, if required.
- Mount the metal cylinder and the cap.
- Insert and screw on the multiplier unit.

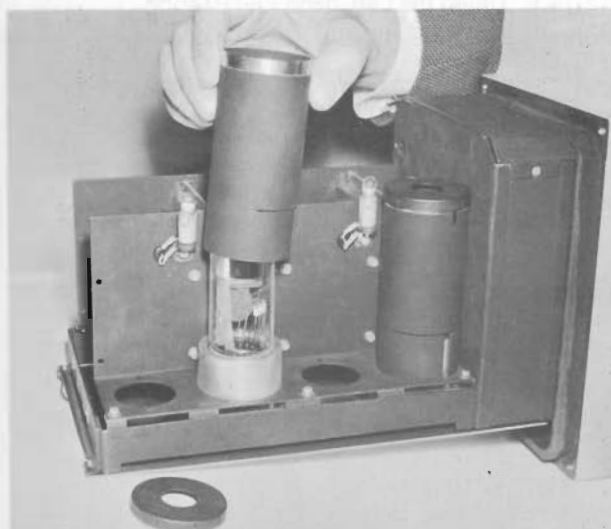


Fig. 12-14 Removing the Cylinder




Fig. 12-15 Changing a Multiplier

12.11.2. Changing a Multiplier in the Mask Scanning Head

- The multiplier change is performed as described in paragraph 12.11.1.
- Carry out the white alignment after the multiplier change.

12.11.3. Changing a Multiplier in the Exposing Head (Exposing Lamp Regulation)

- Open the cover of the exposing compartment.
- Remove the exposing head.
- Remove the multiplier cap and the metal cylinder.
- Change the multiplier.
- Replace the metal cylinder and turn so that it engages.

- Replace the cap and turn so that it engages.
- Mount and lock the exposing head.
- To set the corresponding value for the exposing head (for continuous-tone or screened color separations) by means of the regulation, proceed as follows:
- Set the MEASURE 1 switch (48) to MEASURE 2.
- Set the MEASURE 2 switch (90) to PICTURE LAMP REGULATION.
- Press pushbutton  (96) and, with control (147) on the attachment to the mask scanning head, set the value taken from No. 4 or No. 5.

12.12. Changing a Pushbutton Lamp

If a pushbutton lamp fails, remove the pushbutton cap and test whether the lamp lights by pressing it into its socket. If it still does not light, pull out the lamp with a lamp extractor.

Attention

Do not touch any contact in the lamp base with a metal tool when the machine is on.

12.13. Changing the Pre-exposure Lamp of the Exposing Head for Screened Color Separations

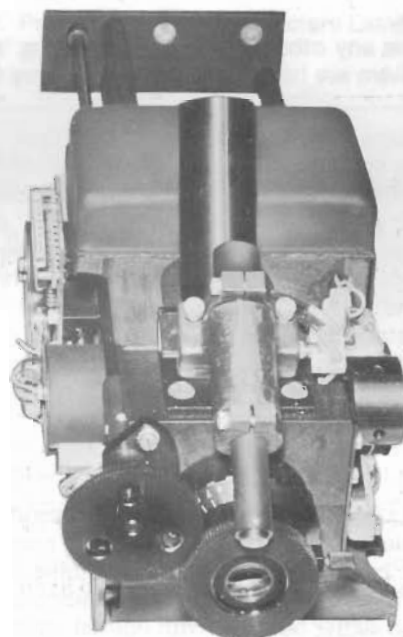


Fig. 12-16 Exposing Head for Screened Separations with Pre-exposure Unit

- Remove the exposing head.
- Loosen the locking screw with an Allen-type wrench (2.5 mm).
- Withdraw the cylindrical lamp holder with lamp backwards.
- Screw out the lamp and replace by a new lamp.
- Insert the lamp holder as far as the stop and retighten the Allen screw.

12.14. Cleaning and Lubrication

The machine is largely maintenance-free.

12.14.1. Cleaning the Objective and Condenser Lenses

Special attention should be paid to the following parts: Scanning lenses, exposing lens, transparency lens in the attachment to the transparency illumination arm, condensers for reflection-copy illumination in the scanning head and mask scanning head, lens of the viewing window. Loose dust can be blown off with a rubber syringe; for adhering dust use a hair brush. Smears are removed by breathing on the lenses and gently polishing the surfaces with the special lens-cleaning cloth (nap cloth) provided in the cleaning tool kit. To preserve it, the downy side of this cloth should not be handled. — Lens-cleaning fluids or special powders are obtainable from various companies. A mixture of spirit and water (mixing proportion 1 : 1) is also very suitable.

The nap cloths must be washed from time to time and dried without damaging the downy sides.

12.14.2. Cleaning the Scanning Drum and Mask Drum

The plexiglass drums can easily be scratched. For this reason, only recently washed and soft cleaning cloths should be used. Chamois leather must be absolutely soft. Remove foreign particles from the drums by wiping. To remove smears and old anti-Newton layers, use a cloth moistened with "Hascherix 212". Exclusively apply this agent supplied. Hascherix acts as an anti-static cleaning agent.

Attention

Do not use any other cleaning agents (e.g. spirit) as many of them are harmful to or even destroy the drum material.

Clean drums electrostatically attract dust particles which may affect the scanning quality. To remove dust, use a commercial anti-static cloth, proceeding as follows:

Place the scanning drum on a completely clean support so that it cannot be damaged or fall down. Then ball a cloth to the same diameter as the drum, wrap the ball in the anti-static cloth and push it slowly through the drum tube, always in one direction, until the drum is free from dust or the residue can be blown off.

Try to remove any scratches from the surface or inside of the drum by persistently polishing with the polishing cloth and plexiglass polish contained in the tool bag.

12.14.3. Lubricating the Bearing of the Scanning Drum

Apply a thin layer of Vaseline or a similar non-corrosive grease to both bearings of the scanning drum, i.e. mounting cone in the left-hand end bearing and driving cone in the center bearing. With normal operation, this lubrication should be carried out every week.

12.14.4. Cleaning and Lubricating the Guide Tubes and Spindles

The guide tubes should be kept free from dust by wiping them well with a cloth at short intervals. Then apply a thin uniform layer of non-corrosive grease to the tubes.

To clean the spindle, cover the inside of the exposing compartment with paper, wrap the exposing head in a clean cloth (observe the spindle), and free the thread of the spindle from dust and old grease by brushing with a suitable brush and benzine. If necessary, use a piece of string or wood to clean the spindle thread. Subsequently, with a small cloth or brush, apply a thin uniform layer of Molykote paste to the thread of the rotating spindle.

12.14.5. Oiling the Left-hand End Bearing

The left-hand end bearing is factory-oiled with Tellus 117 oil from Shell AG. The oil has a viscosity of 10 cSt = 1.837 E°. This oil must also be used for subsequent oiling. The bearing requires oiling every 200 operating hours approximately. Turn out the red oiling screw (see arrow) and apply 2 to 3 drops of oil to the bearing. Replace the oiling screw.

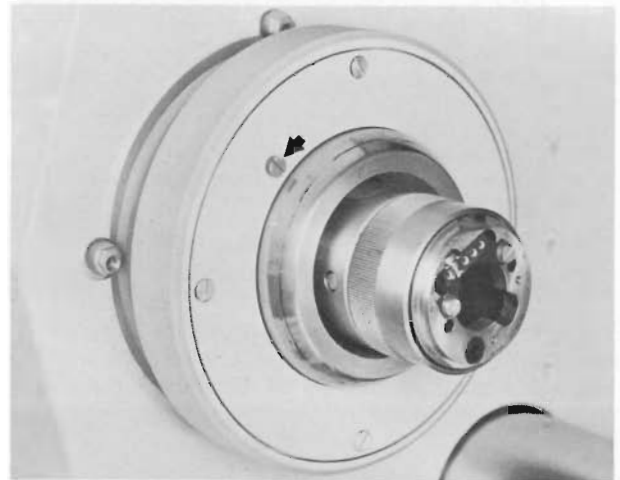


Fig. 12-17 Oiling the Bearing

12.14.6. Cleaning the Suction Holes of the Exposing Drum

If no film is mounted on the exposing drum when the vacuum pump is running, a considerable amount of air will be sucked through the suction holes, causing them to be eventually blocked by dust. To ensure secure mounting of the films on the drum, it will be necessary to clean the suction holes from time to time with a fine wire.

It will be necessary to perform this operation when the vacuum meter (131) indicates an increased basic vacuum when no film is mounted on the drum.

12.14.7. Cleaning and Changing the Air Filter in the Electronics Cabinet

The filter should be cleaned every two weeks and replaced every six months. It must be cleaned or replaced immediately when the warning buzzer indicates by a continuous tone that the cooling air is not sufficient.

a) Cleaning:

- Press the NIGHT pushbutton (229).
- Open the front door of the electronics cabinet.
- Clean the filter from outside through the perforated sheet with a vacuum cleaner.
- Close the door of the electronics cabinet.
- Press the DAY pushbutton (228). When the ventilator motor has run up to full speed, the warning buzzer must be switched off automatically. If this is not the case, the filter must be changed.

b) Changing:

- Press the NIGHT pushbutton (229).
- Open the front door of the electronics cabinet.
- Unlock the perforated sheet and remove it with the filter.
- Replace the filter and mount the perforated sheet together with the new filter on the cabinet frame.
- Close the door of the electronics cabinet.
- Press the DAY pushbutton (228). When the ventilator motor has run up to full speed, the warning buzzer must be switched off automatically.

12.15. List of Fuses

Attention

We emphasize that blown fuses which blow again immediately after being exchanged, indicate deficiencies which can be repaired only by the Service personnel. (The same applies to automatic cut-outs.)

12.15.1. Power Supply Insert (Figs. 12-18 and 12-19)

— Q-contactor

protects the drive motor for the production of the vacuum

— J-contactor

protects the drum motor

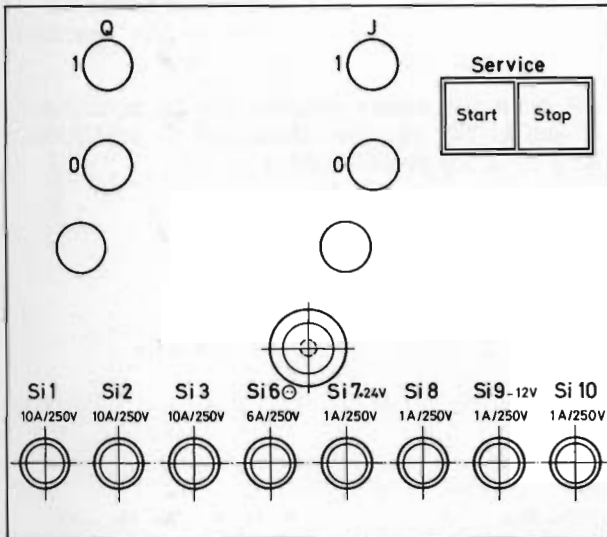


Fig. 12-18 Power Supply Insert

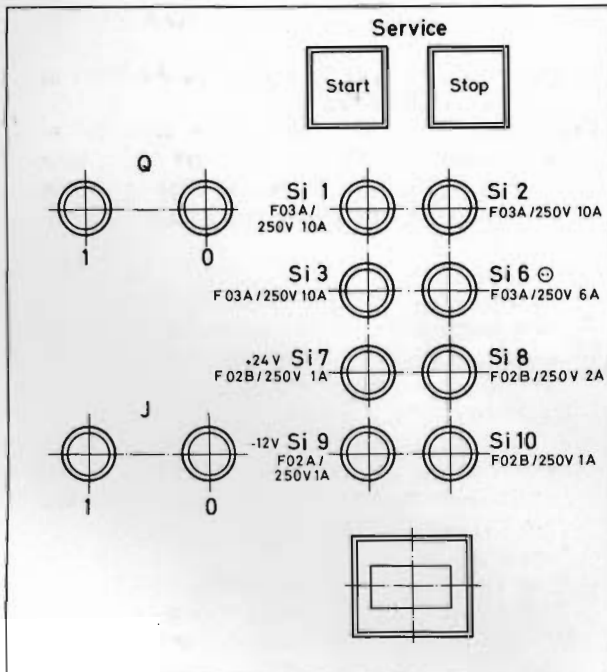


Fig. 12-19 Power Supply Insert

- Si 1 (10 A/250 V)
- Si 2 (10 A/250 V) : A.C. supply for power supply
- Si 3 (10 A/250 V) : unit of picture lamp
- Si 6 (6 A/250 V) : Terminal block
- Si 7 (1 A/250 V) : + 24 V for DAY and NIGHT operation
when failing : - no drum drive
- no supply of the power supply unit of the picture lamp
- lamp failure on the operating panel (DAY, NIGHT, etc.)
- Si 8 (2 A/250 V) : Power supply step motor - scanning cross-feed
- Si 9 (1 A/250 V) : Supply ± 15 V and + 5 V also during NIGHT operation. Specially for high-voltage generation in the multiplier inserts.
- Si 10 (1 A/250 V) : Power supply step motor - exposing cross-feed

12.15.2. Power Supply Unit for Picture Lamp (Fig. 12-20)

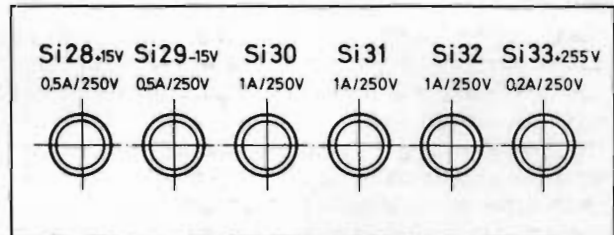
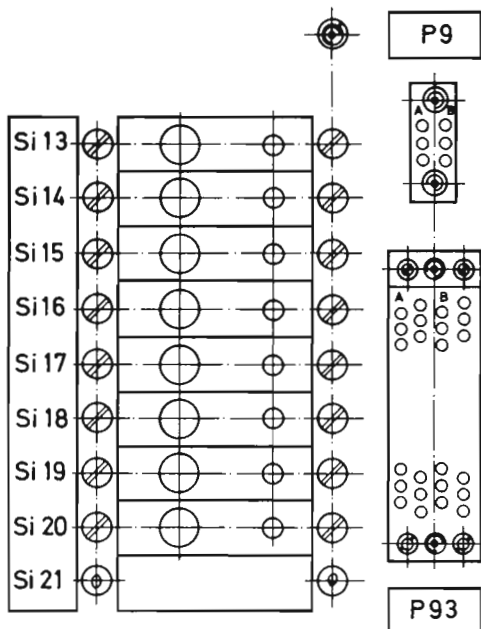


Fig. 12-20 Power Supply Unit for Picture Lamp

- Si 28 (0.5 A/250 V) : Power supply for capacitor + 15 V (SS-C 16)
supplies : Control section, color computer, scanning head, mask scanning head, frequency generation, and register start
- Si 29 (0.5 A/250 V) : Power supply for capacitor - 15 V (SS-C 06)
supplies - 15 V for: see Si 28
- Si 30 (1 A/250 V) : Pump motor for scanning vacuum
- Si 31 (0.5 A/250 V) : Power supply for halogen lamps reflection-copy and transparency scanning
- Si 32 (0.5 A/250 V) : Power supply for the lamp in the mask scanning head
- Si 33 (0.2 A/250 V) : Power supply (250 V D.C.) of the exposing lamp

12.15.3. UL Power Supply Unit (Electronics Cabinet)
(Fig. 12-21)



- Si 20 : Protects all automatic cut-outs except Si 19
- Si 13 : Supply of power supply board C/ -6V in the scale computer
- Si 14 : Supply of power supply board A/ + 15V in the scale computer
- Si 15 : Supply for E_{REF} / scale computer - quantizer
- Si 16 : Supply of power supply board C/ + 12V in the scale computer
- Si 17 : Supply of power supply board A/ -15V in the scale computer
- Si 18 : Supply of the relays on the operating panel of the scale computer and/or screening computer. Control of the change between continuous-tone operation and laser screening.
- Si 19 : Ventilating fan motor in the electronics cabinet

All electronic supply voltages can be controlled by means of the switches MEASURE 1, MEASURE 2, MEASURE 5, and MEASURE 6.

Fig. 12-21 Power Supply Unit

APPENDIX A

OPERATING MANUAL

CONTENTS

1. Hewlett-Packard Oscilloscope Model 120 B	1
2. Macbeth Quantalog Densitometer Model TD-102	7
3. Continuous-tone and Lith Films	8

Hewlett-Packard Oscilloscope Model 120B

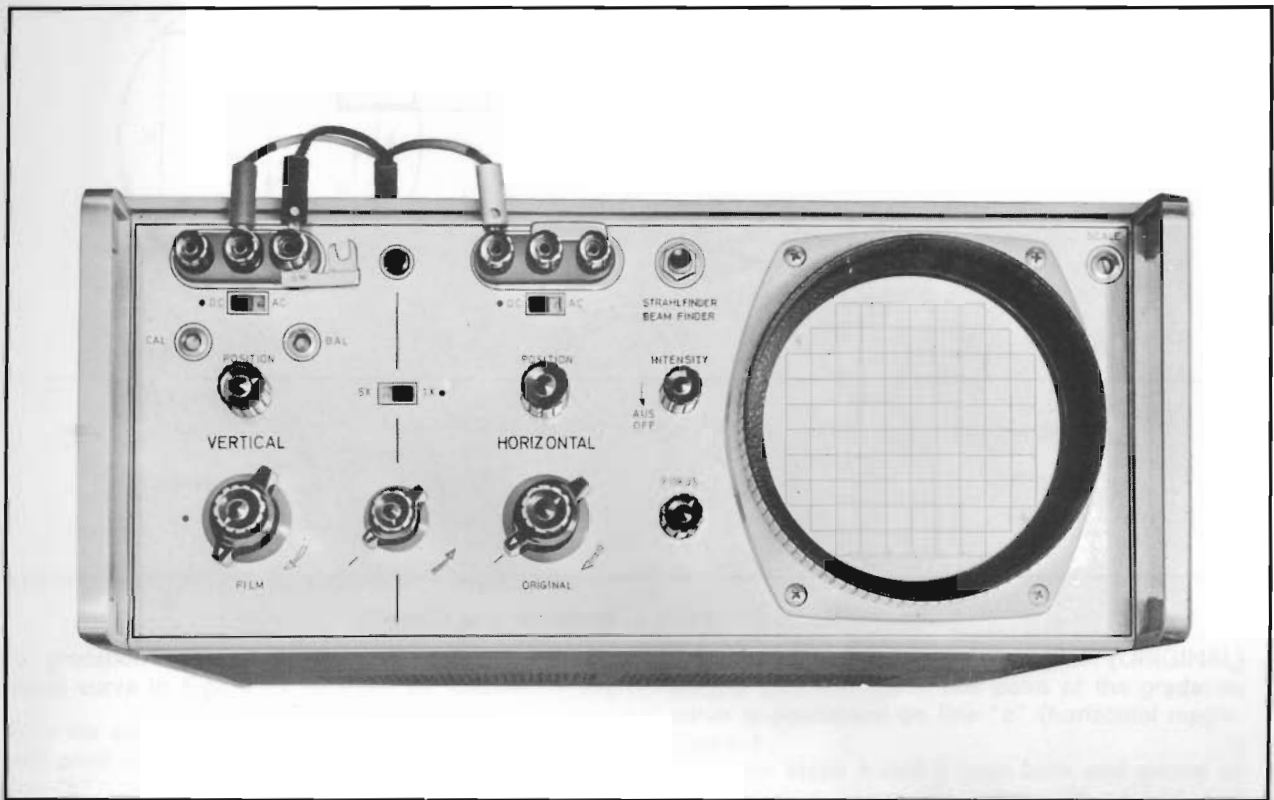


Fig. 1 Oscilloscope, Operator Control Panel

1. Connections and Basic Adjustments

1. Insert the gray Souriau plug and the black three-prong plug of the oscilloscope into the sockets provided on the underside (left-hand side) of the color computer.
2. Insert the flat power plug into the socket under the bottom (center) of the oscilloscope.
3. Connect three cables to the terminal strips of the oscilloscope. From left to right: blue, black, yellow. The bridge of the left-hand terminal strip should be open, that of the right-hand terminal strip closed. (See Figure 2.)
4. The two small DC-AC switches below the terminal strips should always be in "●DC" position (Figure 3).
5. Do not change the CAL., BAL., and SCALE screw-driver adjustments.
6. The 5X-1X SWEEP MAGNIFIER switch should always be in "1X●" position (Figure 3).
7. (See Figure 3.) The vertex of the small triangle on each of the three black switches (VERTICAL SENSITIVITY, TRIGGER SOURCE, HORIZONTAL DISPLAY) located under the red controls (VERTICAL VERNIER, TRIGGER LEVEL, HORIZONTAL VERNIER) should always point to the relevant mark.

In the direction of the arrow, turn the middle red control (TRIGGER LEVEL) to the left-hand limit (a click can be heard).

The other two red controls (VERTICAL VERNIER, HORIZONTAL VERNIER) are used for calibration of crt display.

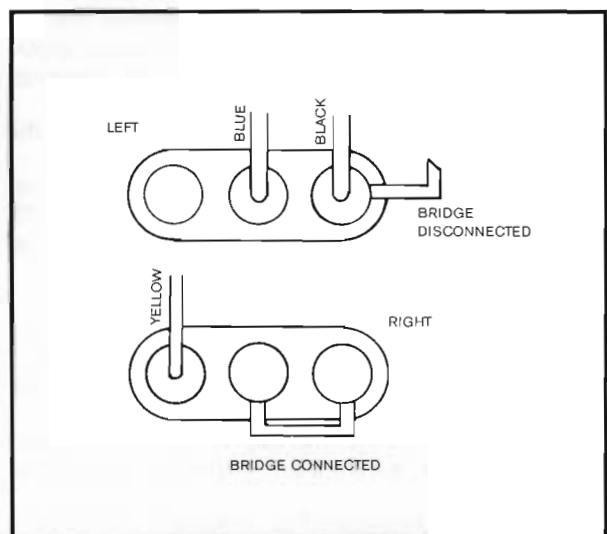


Fig. 2 Connections

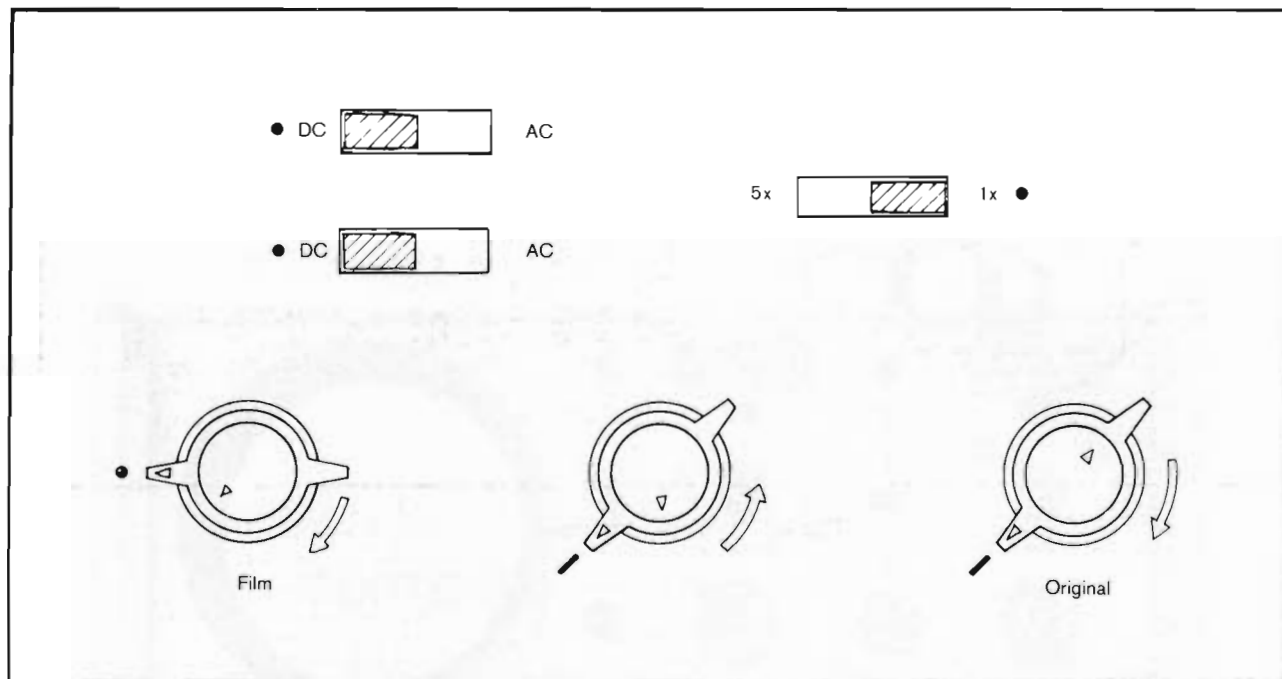
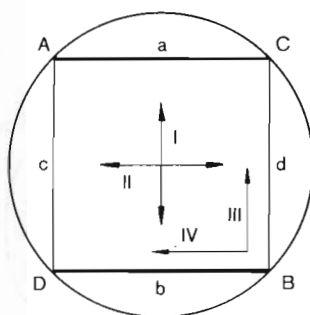


Fig. 3 Basic Positions of Switches and Controls

2. Operating Procedure

1. Apply power to the oscilloscope with the (INTENSITY &) POWER control; the red indicator lamp will light. Turn the control clockwise. Allow approximately one minute warm-up.
 2. Set the GRADATION controls on the scanner.
 3. Press the NEG. or POS. button as well as the "500" button.
 4. Adjust the scanner according to the end points of a gray scale. Using the end points for WHITE and BLACK adjustments simplifies the settings for crt display.
 5. In the circumferential direction, cover the scanning drum apart from the gray scale steps used with a black mask when producing separation negatives. Do not cover the scanning drum for separation positives.
 6. Set the required film density as per E-D diagram.
 7. Start the scanner without engaging the cross-feed.
 8. Turn the red HORIZONTAL VERNIER (ORIGINAL) and VERTICAL VERNIER (FILM) controls to the left-hand limit.
 9. While depressing the BEAM FINDER pushbutton, center the crt trace on the crt face with the vertical POSITION and horizontal POSITION controls.
 10. Release the BEAM FINDER pushbutton.
 11. Adjust the FOCUS control for a well-defined trace.
 12. Set a medium intensity with the INTENSITY control.
- Excessive intensity may cause burning of the crt phosphor.
13. (See Figure 4. Also refer to "How to Display a Gradation Curve".) Set the end points of the gradation curve to "A" and "B" for a negative curve or to "C" and "D" for a positive curve. Set the vertical deflection so that the end points of the gradation curve are positioned on lines "a" and "b". Set the horizontal deflection so that the end points of the gradation curve are positioned on lines "c" and "d". These settings are performed with the red VERTICAL VERNIER (FILM) and HORIZONTAL VERNIER (ORIGINAL) controls with the aid of the relevant POSITION control.
- Note:** After use, remove power from the oscilloscope.



- I. Shift by turning the vertical POSITION control.
- II. Shift by turning the horizontal POSITION control.
- III. Magnification by turning the red VERTICAL VERNIER (FILM) control clockwise.
- IV. Magnification by turning the red HORIZONTAL VERNIER (ORIGINAL) control clockwise.

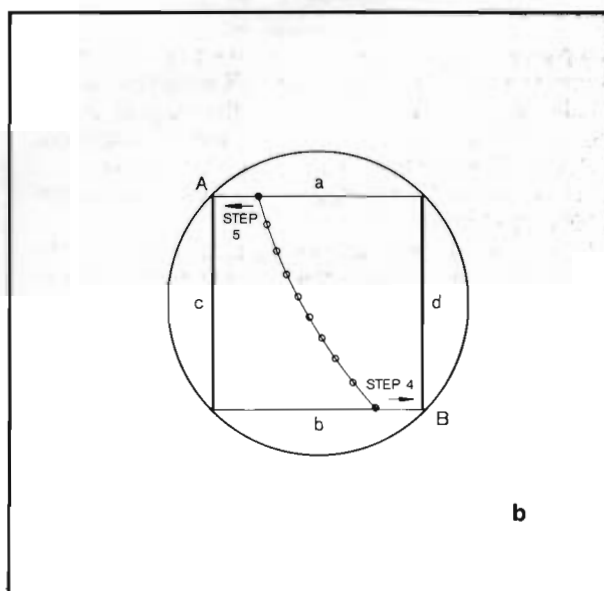
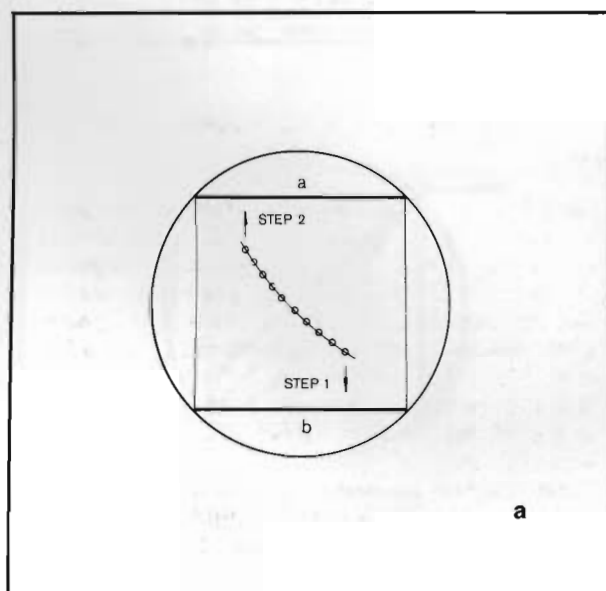
Fig. 4 Control Functions

3. How to display a Gradation Curve

If the gradation curve displayed is too small (upper left-hand curve in Figure 5), proceed as follows:

1. Turn the vertical POSITION control until the lower end point of the gradation curve is positioned on line "b".
2. Turn the red VERTICAL VERNIER (FILM) control until the upper end point of the gradation curve is positioned on line "a" (vertical magnification).
3. Alternate steps 1 and 2 until both end points of the gradation curve are positioned on lines "a" and "b".
4. Turn the horizontal POSITION control until the lower end point of the gradation curve is positioned on line "d".
5. Turn the red HORIZONTAL VERNIER (ORIGINAL) control until the upper end point of the gradation curve is positioned on line "c" (horizontal magnification).
6. Alternate steps 4 and 5 until both end points of the gradation curve are positioned on "A" and "B" (negative gradation).

Note: The highlight point of a positive gradation curve should be positioned on "D", the shadow point on "C".



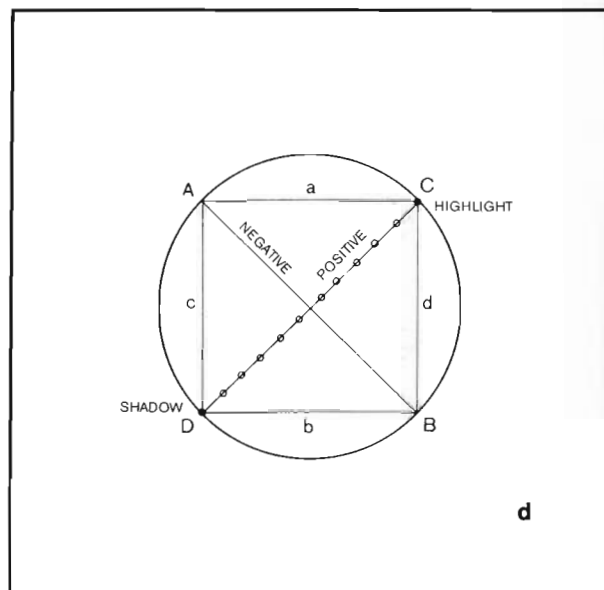
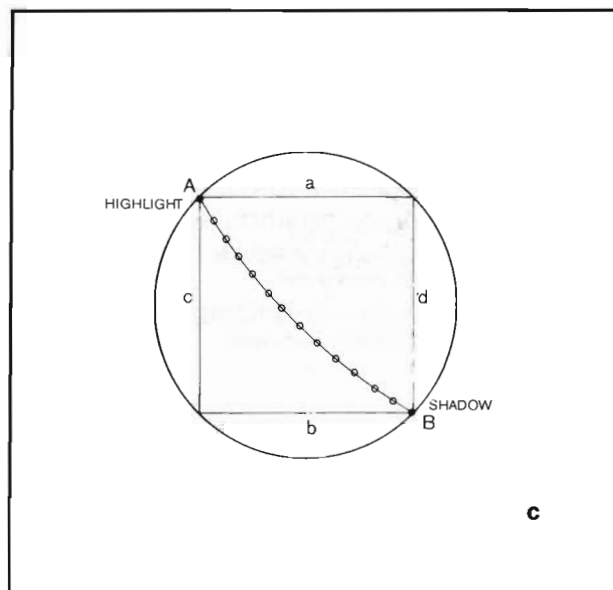


Fig. 5 c/d Displaying a Gradation Curve

4. CRT Displays

The following gradation curve changes can be displayed.

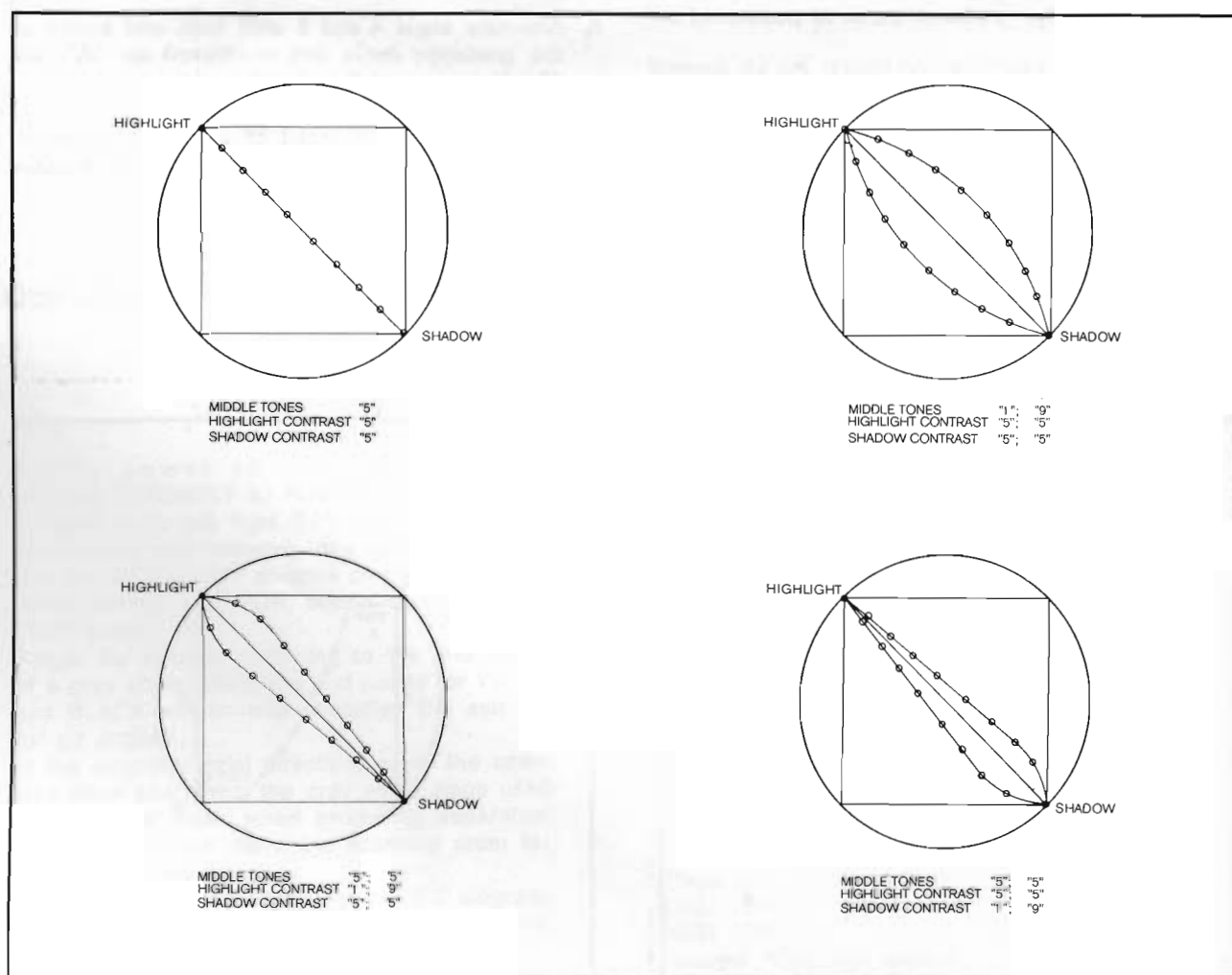


Fig. 6 Effect of Different GRADATION Control Settings

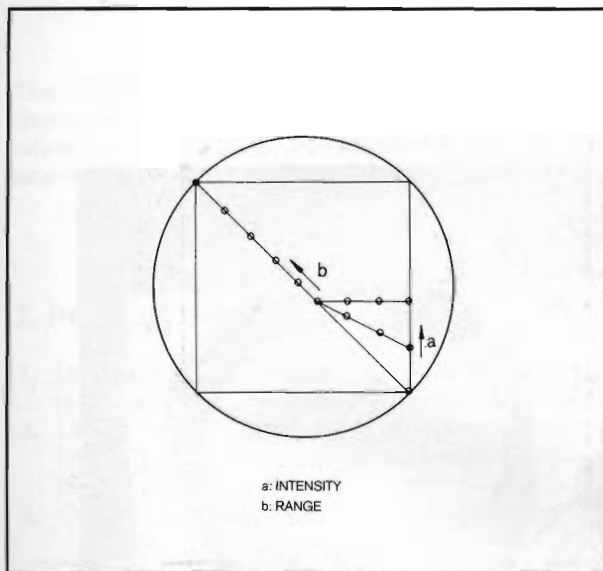


Fig. 7 Under-color Removal

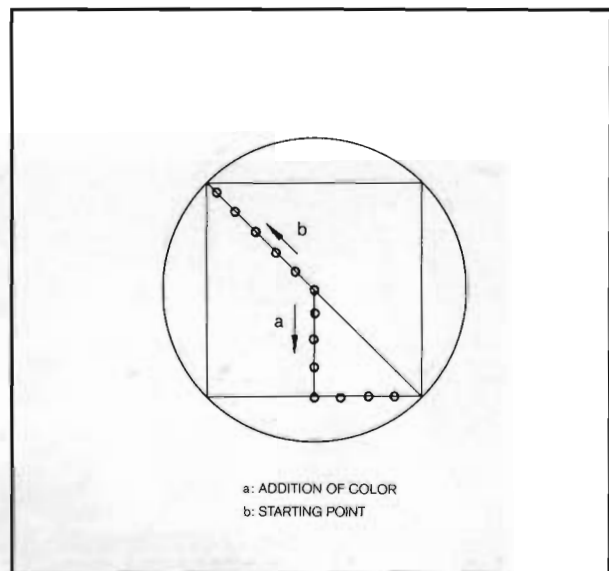


Fig. 8 Addition of Color

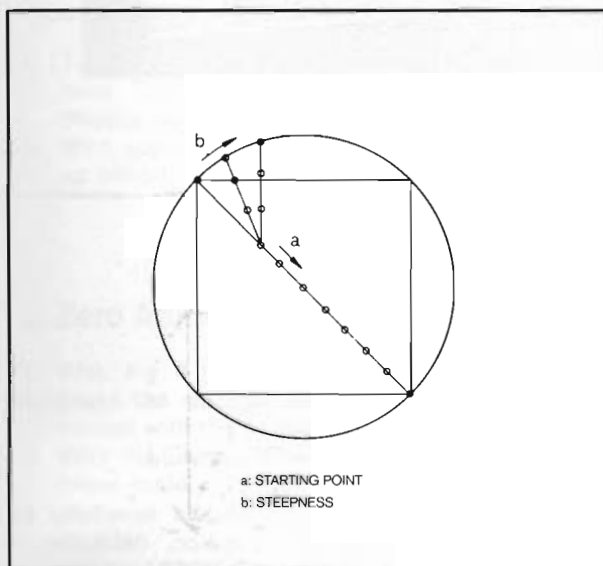


Fig. 9 Highlight Drop-out

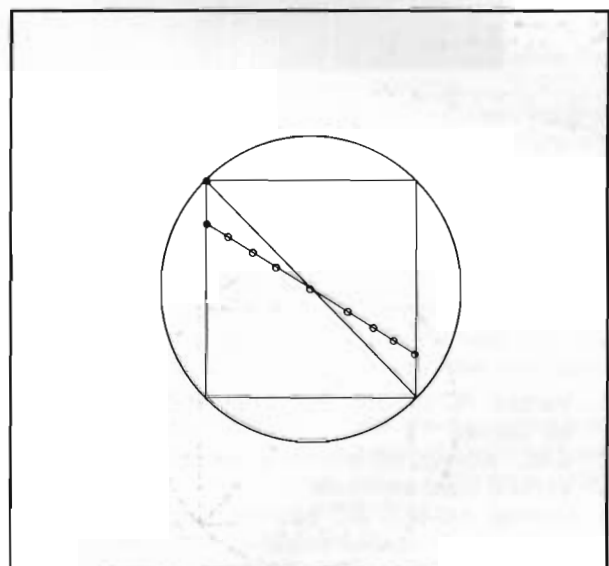


Fig. 10 Film Density

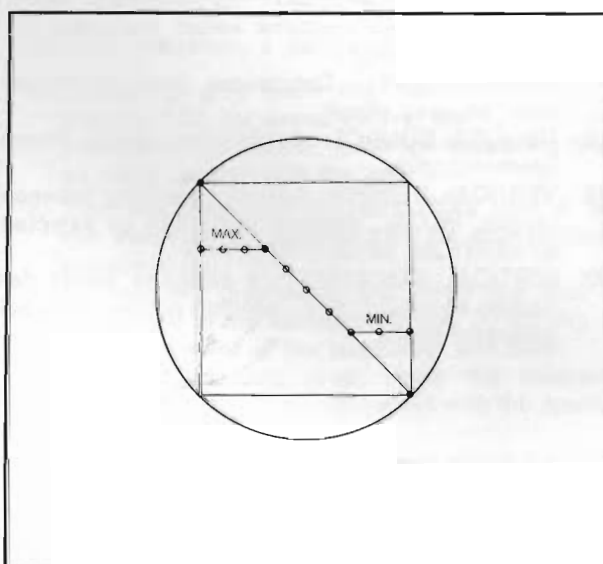


Fig. 11 Maximum and Minimum Limitation

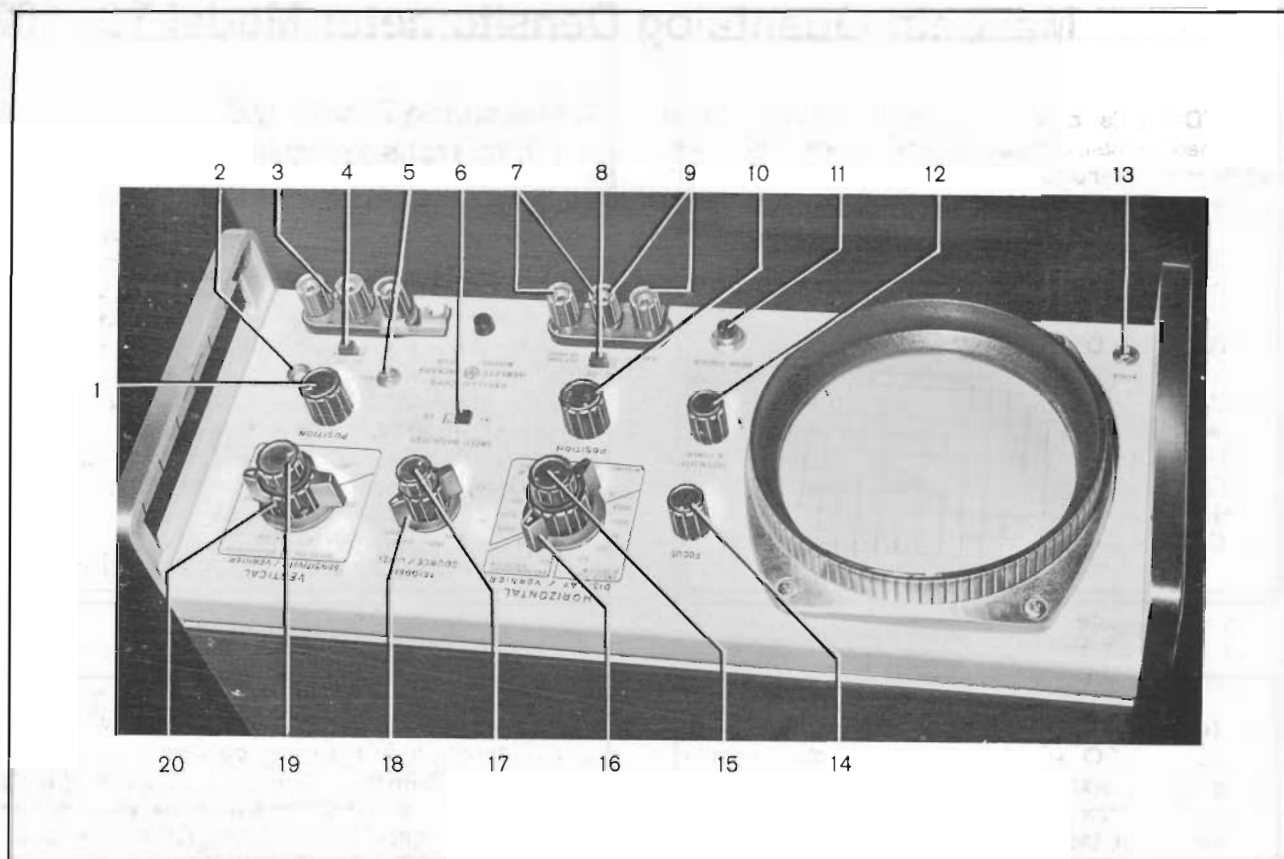


Fig. 12 Maintenance Adjustments on Control Panel

1. Vertical POSITION: Controls vertical position of crt display.
2. CAL.: Adjusts calibration of vertical input.
3. Vertical input terminals.
4. Vertical AC-DC: AC position input capacitively coupled into vertical amplifier. DC position input directly coupled into vertical amplifier.
5. BAL.: Adjusts for no vertical shift with rotation of VERTICAL VERNIER.
6. SWEEP MAGNIFIER: In X 1 position sweep time selected by HORIZONTAL DISPLAY. In X 5 position sweep speed is 5 times faster.
7. EXT. SYNC. OR HORIZ.: External synchronization or horizontal input.
8. Horizontal AC-DC: AC position input capacitively coupled into horizontal amplifier. DC position input directly coupled into horizontal amplifier.
9. Z AXIS: Input for crt intensity modulation signal.
10. Horizontal POSITION: Controls horizontal position of crt display.
11. BEAM FINDER: Returns beam to crt face regardless of horizontal and vertical POSITION settings.
12. INTENSITY & POWER: Applies AC line power and controls crt intensity.
13. SCALE: Aligns trace with graticule.
14. FOCUS: Controls crt focus.
15. HORIZONTAL VERNIER: Adjusts sensitivity between ranges; in CAL. position, deflection as indicated by selected VOLTS/CM position of HORIZONTAL DISPLAY.
16. HORIZONTAL DISPLAY: 15 positions select sweep speed, 3 positions select horizontal deflection sensitivity.
17. TRIGGER LEVEL: Determines level of trigger point on sync signal.
18. TRIGGER SOURCE: 4 positions select sweep synchronization.
19. VERTICAL VERNIER: Adjusts sensitivity between ranges; in CAL. position, deflection as selected by VERTICAL SENSITIVITY.
20. VERTICAL SENSITIVITY: 4 positions select deflection sensitivity. CAL. position displays internal calibrator signal.

Macbeth Quantalog Densitometer Model TD-102

The TD-102 is a photo-electric densitometer. It is designed to measure positive and negative black-and-white transparencies as well as positive color transparencies.

1. Installation

1. Unpack the densitometer, remove the packing material, and carefully clean the instrument.
2. Use a lint-free, soft cloth to remove dust and fingerprints from the glass surfaces; breathe on them if necessary.
3. Connect the instrument to the power source.

CAUTION

The densitometer should be operated from regulated 220 VAC, 50 Hz; i.e. an AC voltage stabilizer is required. Power consumption approximately 60 watts.

4. To apply power to the instrument, turn the left-hand ZERO ADJUST control clockwise until a clicking noise is heard and the lamp lights.
5. Wait approximately 15 minutes. After this warm-up period, the densitometer is ready for operation.

2. Zero Adjustment

1. With the left-hand lever of the measuring arm, lower the measuring probe to bring it in direct contact with the aperture disc.
2. With the ZERO ADJUST control, set zero on the meter scale.

3. Black Calibration

For this calibration, a calibrated gray scale is used.

1. Locate the gray scale step marked "calibration" (density 2.68, for example) over the aperture and, with the left-hand lever, lower the measuring probe to make contact with the gray scale.
2. Turn the right-hand CALIBRATION control until the meter reads density 2.68 (in this particular example).
3. Remove the gray scale and insert the filter incorporated in the measuring probe by moving the right-hand lever of the measuring arm back.
4. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc.
Note the meter reading in a place where it is clearly visible. This value is the calibration value for the shadow point.
5. Move the right-hand lever forwards.

Now the entire calibrated gray scale can be measured; tolerance 0.02.

4. Measuring Black- and White Transparencies

1. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc. Check for accurate zero adjustment. Re-adjust with the ZERO ADJUST control if necessary.
2. Move the right-hand lever back. Check that the meter reads the value noted in the preceding paragraph, "Black Calibration", step 4. Re-adjust with the CALIBRATION control if necessary.
3. Move the right-hand lever forwards.
4. Insert the transparency, read the densities, and mark the lightest and the darkest spot.

5. Measuring Color Transparencies

Before taking density readings, all four filter positions of the filter selector knob should be calibrated. Proceed as follows:

1. Turn the filter selector knob until the white filter trim control is in the down position.
2. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc. The meter should read zero. Otherwise, adjust with the ZERO ADJUST control.
3. Calibrate black with the right-hand lever back. With the right-hand CALIBRATION control, set the noted calibration value.
4. Move the right-hand lever forwards.
5. Turn the filter selector knob to the next filter position so that, for example, the red filter trim control is in the down position.
6. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc. The meter should read zero. Otherwise, adjust with the red filter trim control.
7. Perform steps 5 and 6 for green and blue as well.

Now the color transparency can be measured.

6. Changing the Aperture Disc

A. Changing the Aperture Disc

1. Remove the glass stage disc.
2. From the rear, press out the aperture disc using a rounded object.
3. Press in the new aperture disc from the front. Replace the glass stage disc.

B. Changing the Lamp

1. Remove power.
2. Place the instrument on one side.
3. Loosen the front fixing screw of the bottom plate and remove the latter by sliding it back.
4. Remove the black lamp lead from the terminal strip, loosen the retaining screws of the lamp, and withdraw the lamp from its bracket.
5. Insert the new lamp, fix it, and connect the lead.
6. Restore the densitometer to operative condition.
7. Perform zero adjustment and black calibration.

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The TD-102 is a photo-electric densitometer. It is designed to measure positive and negative black-and-white transparencies as well as positive color transparencies.

1. Installation

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3. Connect the instrument to the power source.

CAUTION

The densitometer should be operated from regulated 220 VAC, 50 Hz; i.e. an AC voltage stabilizer is required. Power consumption approximately 60 watts.

4. To apply power to the instrument, turn the left-hand ZERO ADJUST control clockwise until a clicking noise is heard and the lamp lights.
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3. Remove the gray scale and insert the filter incorporated in the measuring probe by moving the right-hand lever of the measuring arm back.
4. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc.
Note the meter reading in a place where it is clearly visible. This value is the calibration value for the shadow point.
5. Move the right-hand lever forwards.

Now the entire calibrated gray scale can be measured; tolerance 0.02.

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1. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc. Check for accurate zero adjustment. Re-adjust with the ZERO ADJUST control if necessary.
2. Move the right-hand lever back. Check that the meter reads the value noted in the preceding paragraph, "Black Calibration", step 4. Re-adjust with the CALIBRATION control if necessary.
3. Move the right-hand lever forwards.
4. Insert the transparency, read the densities, and mark the lightest and the darkest spot.

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3. Calibrate black with the right-hand lever back. With the right-hand CALIBRATION control, set the noted calibration value.
4. Move the right-hand lever forwards.
5. Turn the filter selector knob to the next filter position so that, for example, the red filter trim control is in the down position.
6. With the left-hand lever, lower the measuring probe to bring it in direct contact with the aperture disc. The meter should read zero. Otherwise, adjust with the red filter trim control.
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Now the color transparency can be measured.

6. Changing the Aperture Disc

A. Changing the Aperture Disc

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1. Remove power.
2. Place the instrument on one side.
3. Loosen the front fixing screw of the bottom plate and remove the latter by sliding it back.
4. Remove the black lamp lead from the terminal strip, loosen the retaining screws of the lamp, and withdraw the lamp from its bracket.
5. Insert the new lamp, fix it, and connect the lead.
6. Restore the densitometer to operative condition.
7. Perform zero adjustment and black calibration.

Continuous-tone and Lith Films

1. Introduction

The following information comprises only the most important data and explanations on film processing. For further details, refer to the literature published by the film manufacturers.

The films used are suitable for the Chromagraph DC 300 with regard to size, speed, and gradation; they are offered by different manufacturers.

In general, the continuous-tone films exposed in the Chromagraph DC 300 are only processed in tank processors or roller-type processors, the lith films in trays or tank processors, or — under certain conditions — in roller-type processors.

2. Continuous-tone Films

2. 1. Materials

	Film	Developer
Du Pont	CCS 7 CSF 1	CFLD
Agfa Gevaert	S 23 p	G 5 c oder G 7 c
Kodak	Ortho Scanner Film	Ortho Scanner Film Developer

Temperature of the developer: $20 \pm 0.2^\circ \text{C}$

Development time: 5 to 7 min.

The nitrogen burst should be set for an interval of approx. 10 sec. and a duration of 1 to 2 sec., with a pressure of 0.8 to 1 atmos.

The stop and fixing baths are uncritical and should be used according to the manufacturer's instructions.

The replenisher depends upon the developer used.

2.2 Processing

A. Notes on Tank Processors

The temperature of the developer and the development time should be such that a gamma (γ) value of 1.4 to 1.6 is obtained; the following empirical values serve as a guide:

B. Notes on Roller-type Processors

For example, Pakarol processor G 24—1

G 24—1.5

The temperature of the developer shall be 27° to 28°C , the transport speed of the film $14''$ to $16''/\text{min.}$ (30 to 45 cm/min.). The resulting values will be the same as mentioned under "A".

To check the processing consistency, it is recommended to use a control strip from the corresponding film manufacturer.

3. Lith Films

3. 1. Materials

A. Films

Regarding their suitability for the Chromagraph, the films can be classified as follows:

Du Pont: CRS-4 (Cronar Raster Scanfilm)

Kodak: 2592 MP

B. Contact Screens

For direct screening in the scanner specially manufactured gray contact screens are used. They are available from HELL. The special characteristics of the contact screens are:

- They are precisely cut to fit the individual Chromagraph models.
- Angling:
 - 96° preferably for yellow separations (film has one notch);
 - 81° preferably for magenta separations (film has two notches);
 - 51° preferably for cyan separations (film has three notches);
 - 111° preferably for black separations (film has four notches).
- Special holes in a reinforced strip at the longitudinal edge of the screen.
- Reduced density range.

The manufacturer, the number of lines per cm and per inch, the manufacturing number, and the angling are indicated at the lower right-hand edge of each contact screen. If the notches are in the upper right-hand

corner, the screen emulsion faces the operator. Contact screens should be handled with maximum care. Contact screens must be handled and stored according to the manufacturer's instructions.

C. Developers

See Table "Processing of Lith Films".

3. 2. Processing (General)

3.2.1. Tank Processing

Tank processing allows a good standardization of the development process. This can be achieved only in conjunction with our tank processors. For details, refer to separate operating instructions.

A. Developer Bath

1. General

The developer should be very carefully prepared in the lith tank, according to the manufacturer's instructions. The tank and nitrogen distributor as well as the nitrogen and replenisher supply pipes must be thoroughly cleaned beforehand.

The temperature of the water to be added should be between 68° F (20° C) and 77° F (25° C). The lith developer must by no means be contaminated with continuous-tone developer. Even a few drops of continuous-tone developer destroy the lith effect.

2. Developer Quantity and Temperature

The tank capacity is approx. 40 l.

Required temperature of the developer: 24 ± 0.2° C

3. Developer Preparation in the Lith Tank

G 8c:	Part A	2x5l
	Water (80.6 to 86° F/ 27 to 30° C)	approx. 25l
	Part B	2x1l
G 9c:	Part A	5l
	Water (80.6 to 86° F/ 27 to 30° C)	approx. 25l
	Part B	5l

In both cases fill the tank with water (80.6 to 86° F / 27 to 30° C) to the filling level and mix. Add 1 l of restrainer if necessary.

4. Agitation of the Developer

Agitation of the developer is performed by nitrogen bursts from a built-in gas distributor. Duration of the burst is 1 sec., the interval between two bursts 2 to 5sec. The nitrogen agitation should be switched on before development starts.

5. Development Time, Activity of the Developer

Development time: 2½ to 6 min., depending upon the film; with restrainer 4 to 6 min. The time depends upon the dot quality obtained and the halftone gradation.

Processing of Lith Films

Film Type	KODAK 2592 MP	DU PONT CRS-4
Darkroom Lighting	Dark red	Red
Iris Diaphragm "1" 20 mA max.		
Tank Development Developer G8c 24° C Developer G9c 24° C		51/2 min.
Development in Roller-type Processor LOG-E-FLO LD-18 LD-24	1'50"	3'30"

Complete activity of the fresh developing solution will not be obtained before six hours. Exposed films of the film type to be used later should be previously developed; normally four 14" x 17" sheets are sufficient.

B. Loading the Lith Tank

1. Mounting the Films on Frames

Two films can be mounted on each steel frame. The frames must have been carefully cleaned before drying. The film emulsion should face outwards. To facilitate mounting, the film-mounting device can be used. Care should be taken that the films are tightly mounted as loose or buckled films disturb the nitrogen agitation, which causes cloud formation.

2. Inserting the Frame into the Lith Tank

The frame with the mounted films should be rapidly and evenly inserted into the lith tank. Make sure that the lower guide pins of the steel frame engage on both sides with the plastic guide strip of the tank. Only then should the frame be smoothly inserted immediately after one nitrogen burst. To remove any air bubbles adhering to the film, jerk the frame several times up and down during the first 5 sec. Start the clock immediately after immersing the films into the developing solution.

C. Processing the Films

1. General

Development is effected within a certain time. The result of the development cannot be assessed during development. The tolerance is only ± 5 sec. unless restrainer be added to the developing solution (± 10 sec. with restrainer). The first seconds of development, particularly uniform wetting of the films, are decisive for the result.

Fixing, washing, and drying are performed in the usual

manner. To shorten fixing and washing, compressed-air burst is recommended. For dot improvement, films can be cleared in Farmer's Reducer or similar solutions commonly used in reproduction techniques.

2. Replenishing the Developer

The chemical activity of the developer changes constantly. It depends upon the number of films developed, oxydation from the air, etc. To regenerate the developer, replenishers are used: G 8c R or G 9c R, depending upon the type of developer. By no means should restrainer be added to the replenisher. The replenisher rate must be determined by experience.

Developer activity and condition can be controlled with pre-exposed Gevalith control strips. The development time required for the control strips is approx. $2\frac{1}{4}$ to $2\frac{1}{2}$ min. The development must be performed with maximum care. The control strips should always have the same position in the tank (in the middle if possible). For this purpose, a window for the control strip should be cut into Astralon film and the control strip attached by neutrally reacting, water-resistant adhesive tape.

3. Controlling the Developer

Film processor, developing solution, and film material form an integrated whole which cannot be extended at will. At present, it is not advisable to develop other film types in the lith tank as well. This may rapidly upset the chemistry of lith development.

When the fresh developer has aged six hours and films have been previously developed, a master strip is processed which serves as a standard for the activity of the developer and dot quality. If the activity strongly increases (decreases) in the course of time, the replenisher rate is too high (low).

It is recommended to enter the control results on a diagram so that the tendency of the developer can be readily read off. (See diagram "Developer Control".)

Extreme individual results must not be used, if possible. The result should be taken into account only when the same result is obtained with a second or third control strip. If the control strip indicates too high an activity, exposed film material can be developed to reduce the activity of the developer. In this case, replenishment must be dispensed with. Another test with the control strip provides information on whether or not the measurement has been successful.

Note that the addition of replenisher becomes effective only after a certain time. For this reason, large amounts of replenisher must not be added at short intervals. Seen as a whole, the chemistry may be interfered with in a reasonable manner and at long term.

The durability of lith developers in the tank is only a few weeks. The tank capacity is therefore limited to 40 l.

4. Checking the Development Process

Uniformity of development in the tank processor.
Production of test films.

A gray scale is exposed over the full film size. For this purpose, five or six steps are sufficient which should, however, be at least 5 cm wide so that the uniformity of the developing solution can be assessed. The dot size should be increased from about 20 to 90%. Particular care should be taken that the contact between contact screen and film be perfect and dust avoided. To prevent additional exposures by electrostatic discharges, the relative humidity of the air in the working rooms should be sufficient, i.e. 40 to 60%.

D. Film Evaluation, Assessment of Faults

When viewed on a light table, the screened films should be absolutely smooth, i.e. without cloud formation. Minor irregularities in tonal ranges above 90% do not affect the printing quality. If clouds appear on one of the test films in lower tonal ranges, it should first be checked whether the stains are due to:

- bad contact between lith film and contact screen;
- a defective contact screen (creases);
- wrong exposure or unsuitable darkroom light.

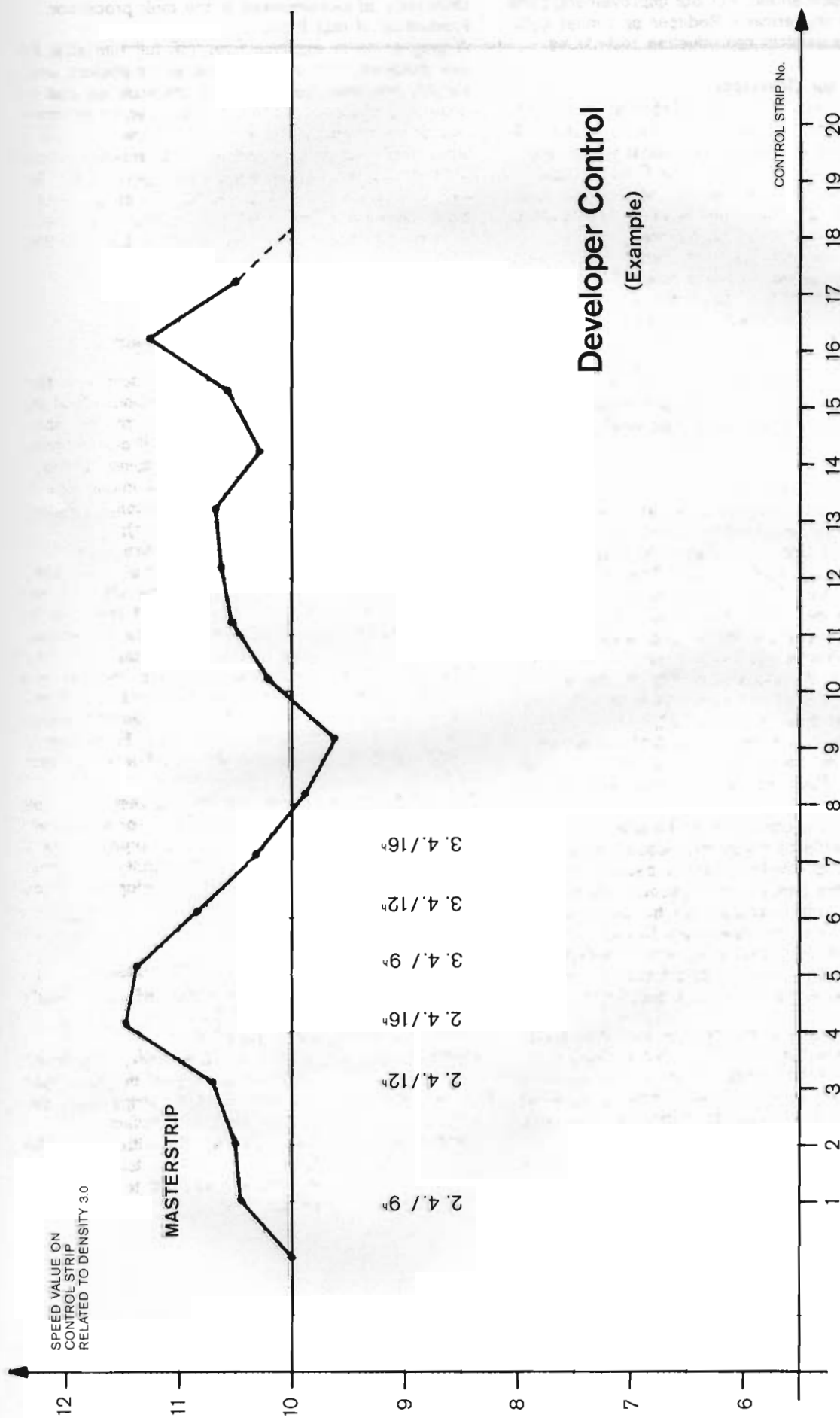
If the fault is not caused by one of the above items, the nitrogen burst setting should be checked and changed if necessary. In both parts of the tank the nitrogen bubbles must uniformly rise to the surface. Otherwise, outlets are clogged and should be carefully cleared, or the gas outlet pipes are not in a horizontal position so that they must be adjusted with the setcrews provided. If necessary, burst pressure and interval should again be changed. Foam can be counteracted by adding KODAK Anti-Foam (one drop to 10 l).

The difference in dot size on the two test films must not exceed $\pm 5\%$. In case of cloud formation with development times of 2 to 3 min., improvement is possible by adding the prescribed quantity of restrainer. This more or less doubles the development times.

3. 2. 2. Processing in Roller-type Processor

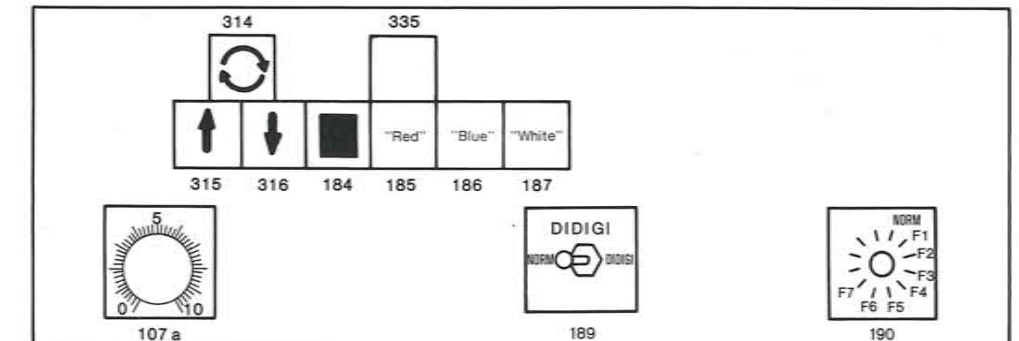
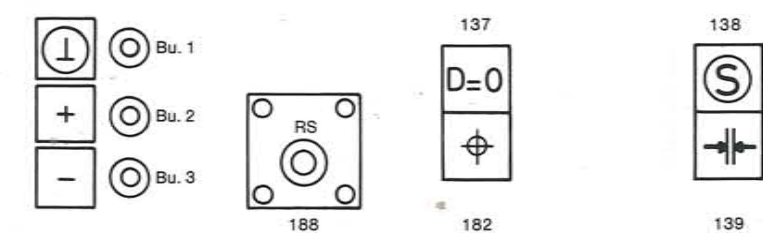
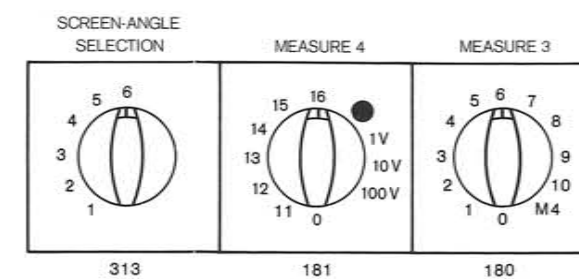
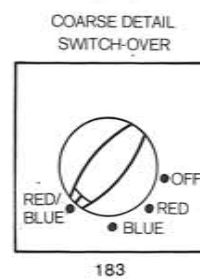
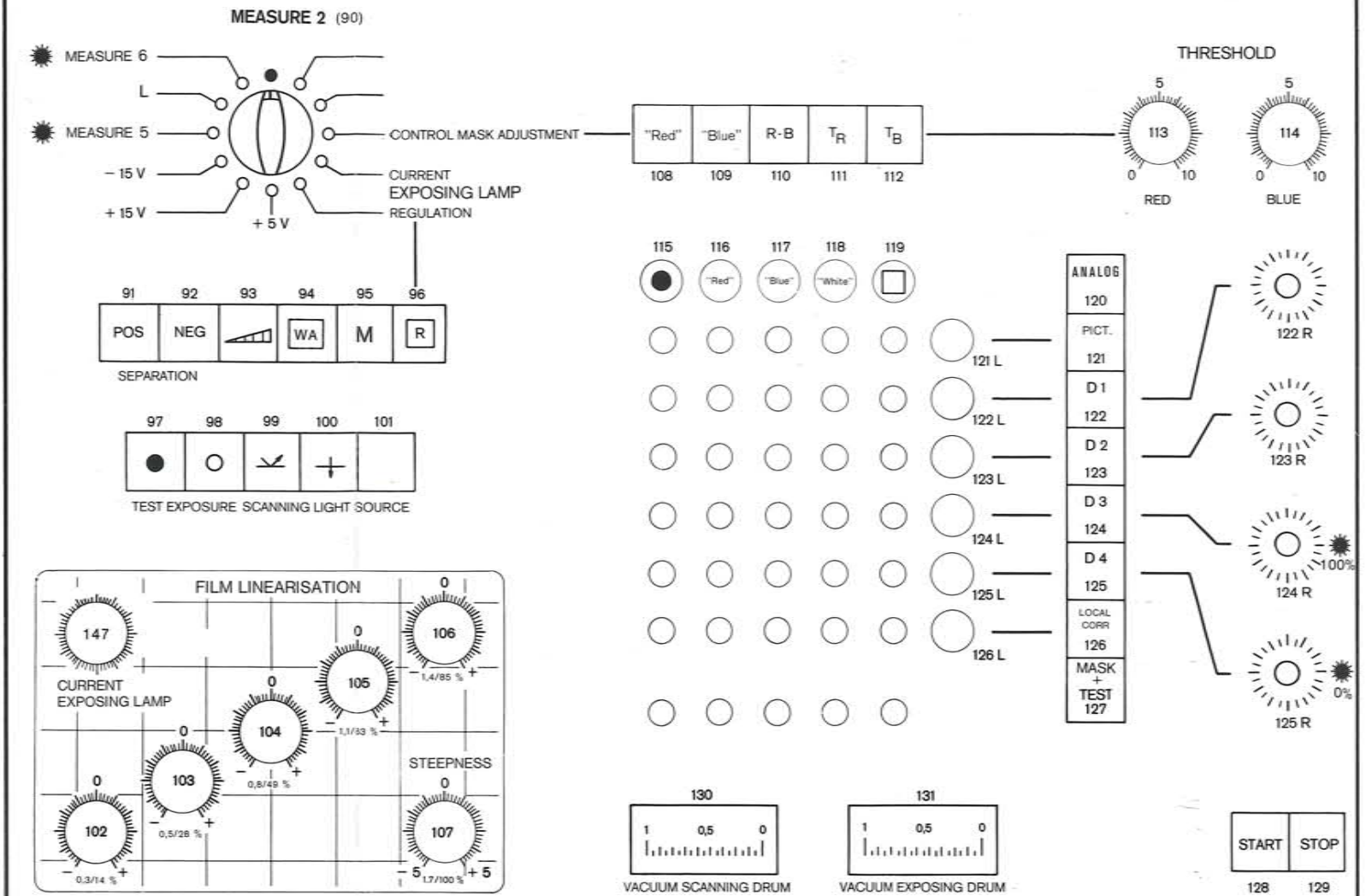
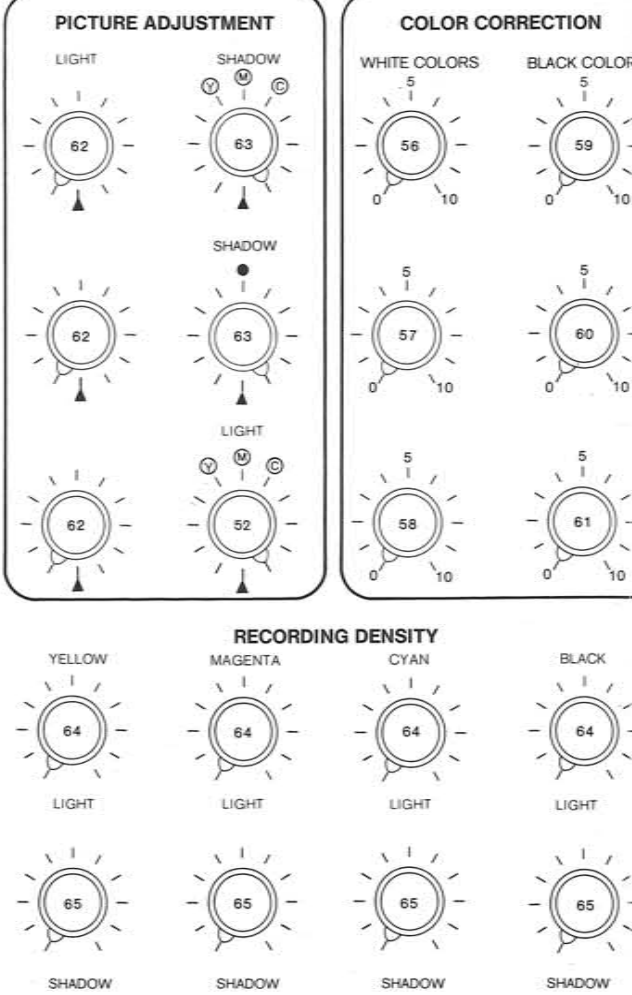
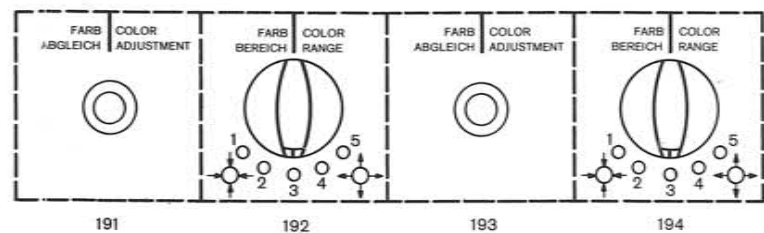
(See also Table "Processing of Lith Films")

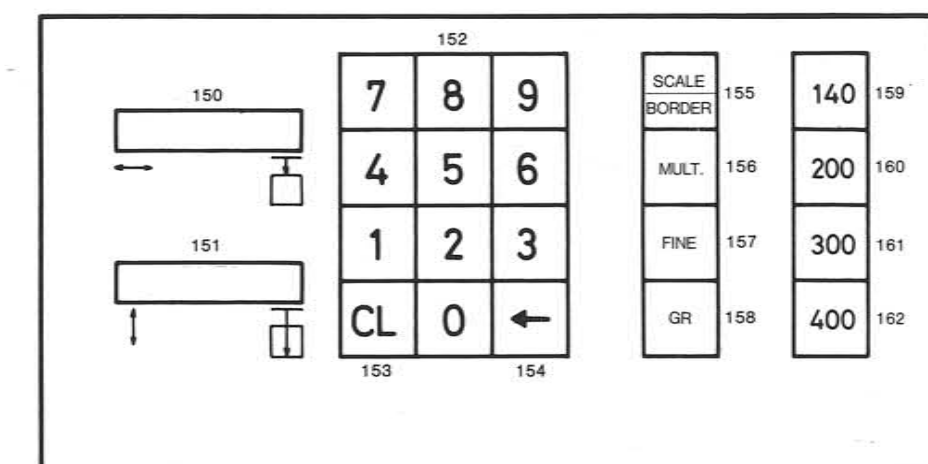
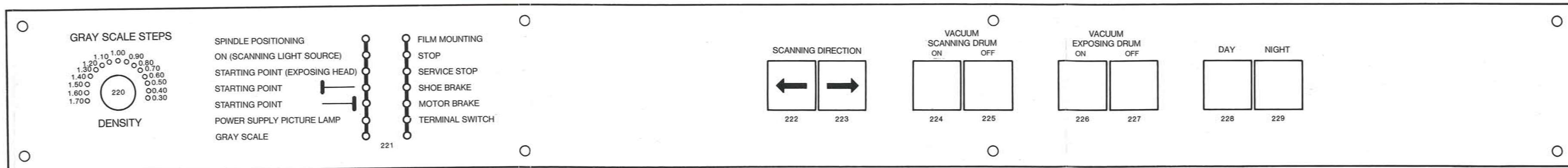
Developer:	G 8c or G 9c
Temperature:	80° F (26.6° C)
Transport speed:	24 to 30 inches/min., depending upon the activity of the developer
Developer control:	Gevalith control strips (as described by the manufacturer)
Compatibility:	The compatibility with other film types discussed for tank processing equally applies to roller-type processors.



APPENDIX B

DIAGRAMS

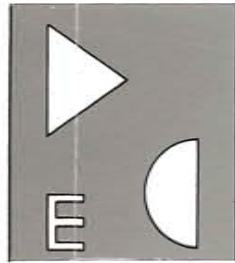




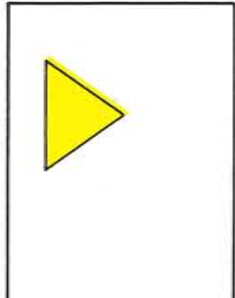
CHROMAGRAPH DC 300
Scanning Unit and Electronics Cabinet

Control Mask Produced by Copying

Layout

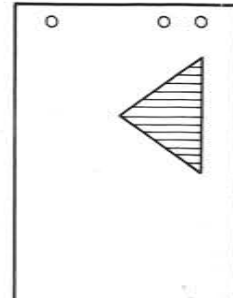


Original 1

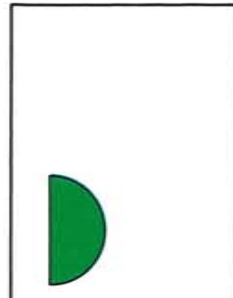


Scanning Direction

Position Scan 1

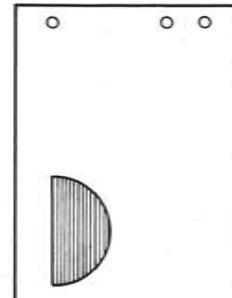


Original 2

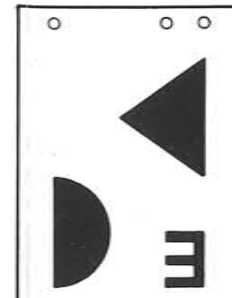


Scanning Direction

Position Scan 2



Auxiliary Mask



drawn
Lettering Mounted
wrong-reading

Control Mask



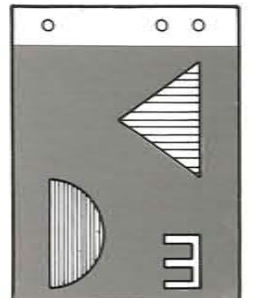
Contact Copy
of the Auxiliary Mask
Colored

Control Mask



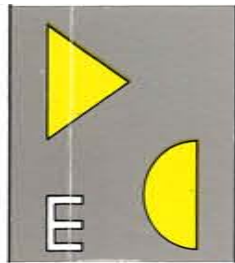
Turned over
Emulsion and Color
down

Color Separation (4 x)



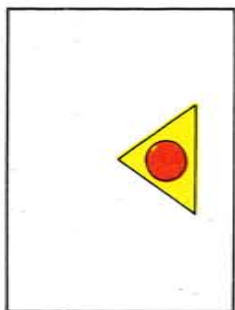
A Constant Density
is Exposed as
Background

Reproduction



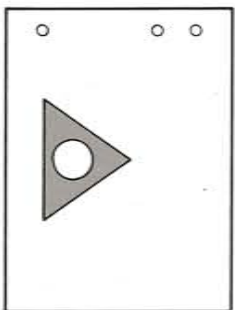
Control Mask directly Painted

Original

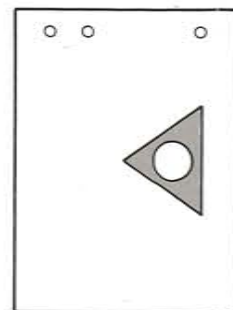


Scanning Direction

Position Scan

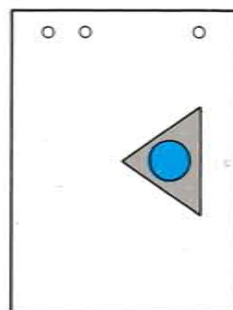


Position Scan



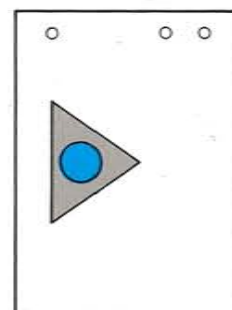
Turned over

Control Mask



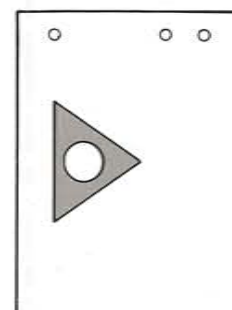
Colored

Control Mask



Turned over

Color Separation



Reproduction

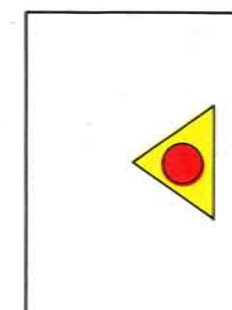


Table 5.2. Scanning Apertures Large Scanning Drum

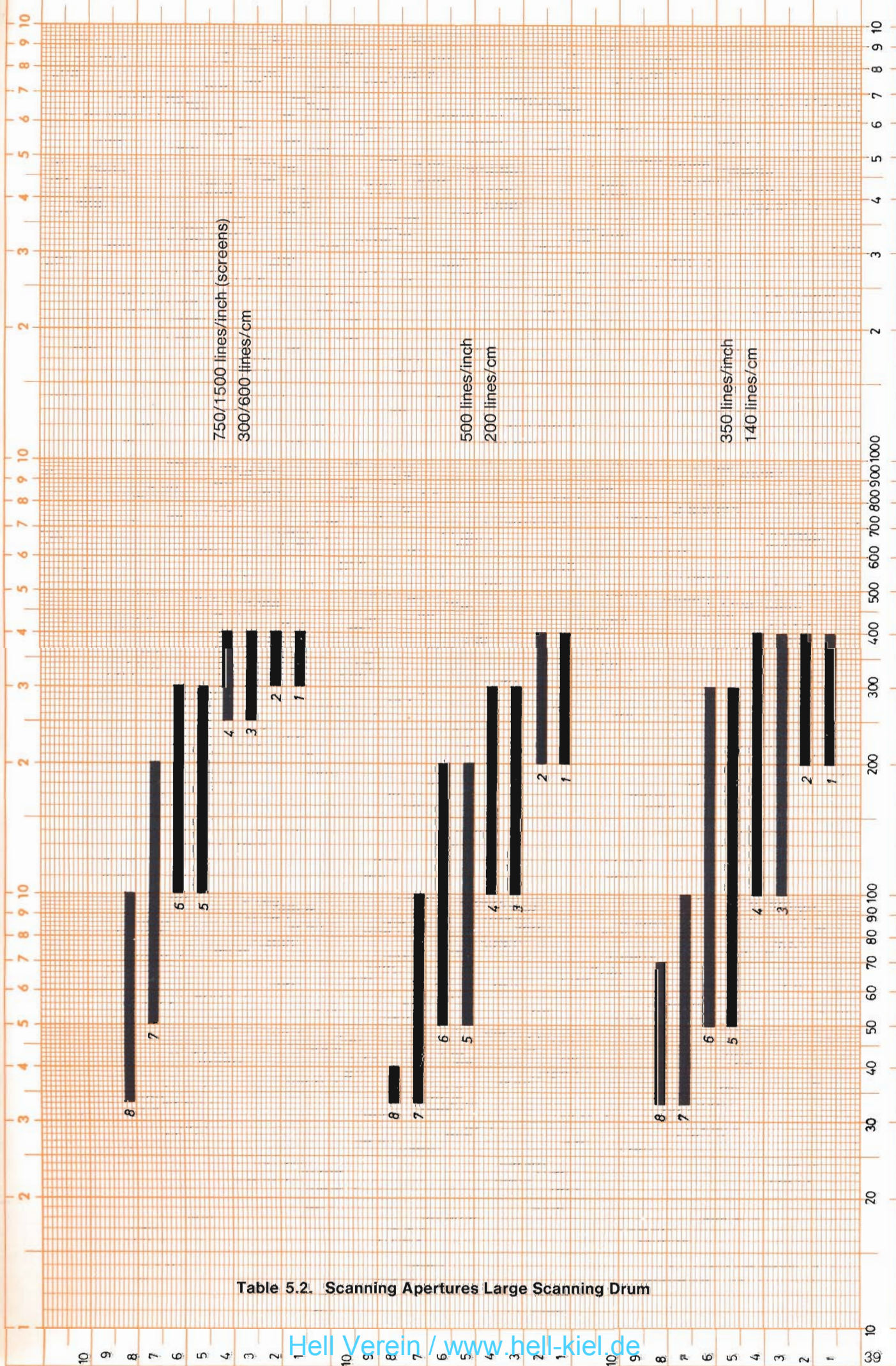


Table 5.3. Scanning Apertures Medium Scanning Drum

750/1500 lines/inch (screens)
300/600 lines/cm

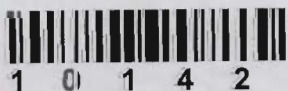
500 lines/inch
200 lines/cm

350 lines/inch
140 lines/cm

Table 5.4. Scanning Apertures Small Scanning Drum



HELL-Sammlung



1 01 1 4 2

Hell Verein / www.hell-kiel.de