BARCO
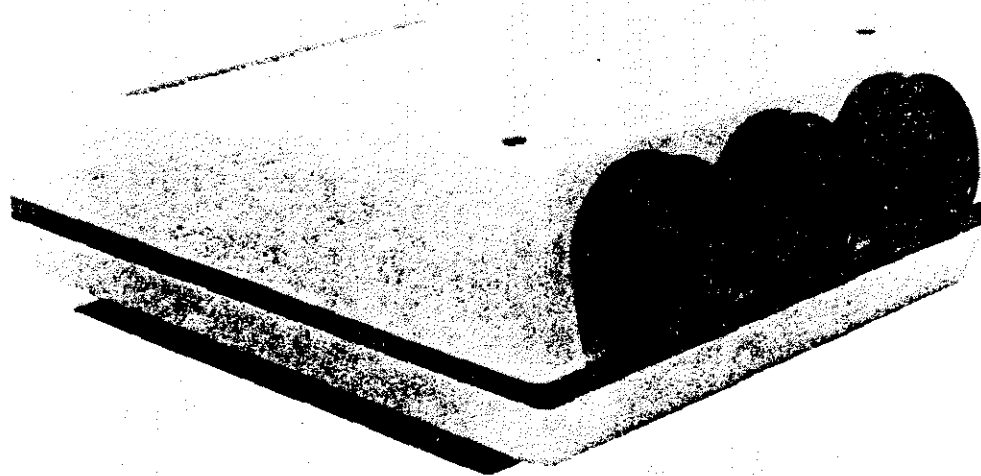
BARCO DATA

90 00050

The BARCO projector is designed for composite video in all existing broadcast standards, RGB(S) analogue signals and RGB-HVS-TTL signals as well as many non-standard frequencies. It will display the signals in colour from all standard video tape recorders and video disk outputs in both North American and European standards. However, it is primaly designed for data display, both alphanumeric and graphics. As such it must operate at many non-standard line rates and frame rates.

CONTENTS

INTRODUCTION

I. OPERATION AND SERVICE CONTROLS

FRONT : optical focussing of projection lens (independent center and edge focus adjustment)

REAR EXTERNAL : - Power ON/OFF switch

- On control box, plugged in on the projector or via remote cable (connector, D-type 15 pins)

> Brightness control
> Contrast control
> Tint control
> Colour saturation control
> Decoder selection P S N4 / P S N3
> Sync selection Slow/Fast
> Input mode selection Video/RGsB/RGBS/RGB TTL
> Two line/frame frequency selection Fstd/Fadj
> Frequency adjustment : Line & Frame in Fadj mode

- AC power input

INTERNAL (top cover opened) :

- electrical focussing Red, Blue and Green

- on Sync + Vert. deflection board

> Adjustment of : Horizontal Hold I
>
> Vertical Hold I
>
> Hold I : - 50 Hz
> - 60 Hz + adj. 50/60 Hz detector
>
> Horizontal Phase
>
> Vertical Blanking (650 ─→ 1600 us)
>
> 50/60 Hz detector

> Picture geometry : Vertical linearity and amplitude
>
> Vertical amplitude 60 Hz
>
> Vertical shift for Red, Green and Blue
>
> Horizontal amplitude I and II
>
> Horizontal trapezium
>
> Horizontal bow
>
> Horizontal Pin Cushion Correction

- on N/S + Hor. Shift board

        Picture adjustments : Horizontal shift for Red, Green and Blue

                              N/S amplitude for Red, Green and Blue

                              Vertical Bow for Red, Green and Blue

                              Trap-distorsion for Red, Green and Blue

                              Picture width for Red, Green and Blue

- on RGB-TTL board

        Adjustment of : - Blue in Green

                    - Hor. sync delay

                    - High/low intensity

        Switches :   - Input TTL signals from neg. to pos. logic

                    ($\overline{\text{Blue}}$, $\overline{\text{Green}}$, $\overline{\text{Red}}$, $\overline{\text{Hor. sync}}$, $\overline{\text{Vert. sync}}$, $\overline{\text{Composite sync}}$)

                    - High/low intensity inversion

                    - Hor. sync delay ON/OFF

                    - Blue in Green   ON/OFF

- on RGB analog board

        Adjustment of : - Level Blue in Green

        Switches :   - Blue in Green OFF

                    - Sync input 1V or 4V (for separate sync input signal)

                    - 75 Ohm termination ON/OFF for Red, Green, Blue and separate sync signal

II. VIDEO CIRCUITS

INPUT : 2 BNC connectors (looped through)

       75 Ohm termination switch

       1 Vpp ± 6 dB

III. RGB(S) ANALOG CIRCUIT

Input selector : switch RGB analog/RGB-TTL ⟶ RGsB : for sync on Green

                                                  or

                                         ⟶ RGB+S : for separate sync

INPUT : 4 BNC connectors :

        Red 0,7 Vpp $\pm$ 3 dB

        Green 0,7 Vpp $\pm$ 3 dB

            1 Vpp $\pm$ 3 dB if sync on green

        Blue 0,7 Vpp $\pm$ 3 dB

        Sync (separate) 4 Vpp neg. $\pm$ 3 dB or 1 Vpp (switchable)

        (All inputs are 75 Ohm terminated by means of a switch on the RGB analog board).

IV. RGB-HVS-TTL CIRCUIT

Input selector : switch RGB analog/RGB-TTL ⟶ RGB-TTL

Input : - D-type 9 pin connector

      - standard TTL levels for Red, Green, Blue, Comp. sync or Hor. & Vert. sync or Hor. & Vert. Blanking, High-Low info

      - all inputs TTL switchable from pos. to neg. logic

      (switches on RGB-TTL board)

V. DEFLECTION CIRCUITS

VERTICAL DEFLECTION

    Frequency range : from 50 Hz to 110 Hz

    Retrace time   : 650 us

HORIZONTAL DEFLECTION

    Frequency range : Fstd : line 15625 Hz - Frame 50 Hz
                         line 15750 Hz - Frame 60 Hz

                  Fadj : line 15625 Hz upto 32 kHz - Frame 50 Hz upto
                                                      110 Hz

    Retrace time : < 7 us

Note : scanning rates can be adjusted on 2 different values (I and II) for video or RGB inputs. (Max. 10 different values when using the source selector RCVDS 2).

VI. HIGH VOLTAGE

Stabilised EHT : 34.7 KV

VII. POWER REQUIREMENTS

- 220V AC + 10 % - 15 % can be internally switched for 110V AC + 10 % - 15 %
- frequency independence between 40 - 100 Hz
- rated consumption : 350 W

VIII. DISPLAY

Projection tubes : - 5" high resolution rectangular projection tubes
- liquid cooled system
- colours : Red, Green and Blue

Lenses : high resolution F 1.0 lenses, with independent center and edge focus adjustment.

Picture format : 3 x 4 ratio.

Picture dimensions (standard version) : min 1 m x 0.75 m
max 2.6 m x 1.95 m

Throw distance : 1.6 x picture width (see table)

Max light output : 440 lumens (measured on 20 % peak white)

Screen application : flat, parabolic or cylindrical screen

Geometric distorsion : + 1 % in circle equal to picture height
+ 1.5 % outside

Convergence : calibration using 9 independent zones

IX. MECHANICAL CHARACTERISTICS

Dimensions : 830 mm (L) x 565 mm (W) x 235 mm (H)
Weight : 37 kg

X. MOUNTING

Table mounting and ceiling mounting; front projection and rear projection possibility in both mounting positions.

Adaptation ceiling ◄─► table : incorporated switch

Adaptation front ◄─► rear : incorporated switch

XI. VIDEO COLOUR STANDARDS

PAL - SECAM - NTSC 4.43 - NTSC 3.58 :

- automatic selection between PAL - SECAM and NTSC
- switchable between PAL/SECAM/NTSC 4.43 and PAL/SECAM/NTSC 3.58 by external switch on the *CONTROL SWITCH BOX.*

XII. SAFETY

The unit meets all relevant international standards.

X-radiation : DHHS

Safety : IEC 65

Interference suppression : FCC

XIII. ENVIRONMENT

Max. operating range

Temperature : 0° to 40° C
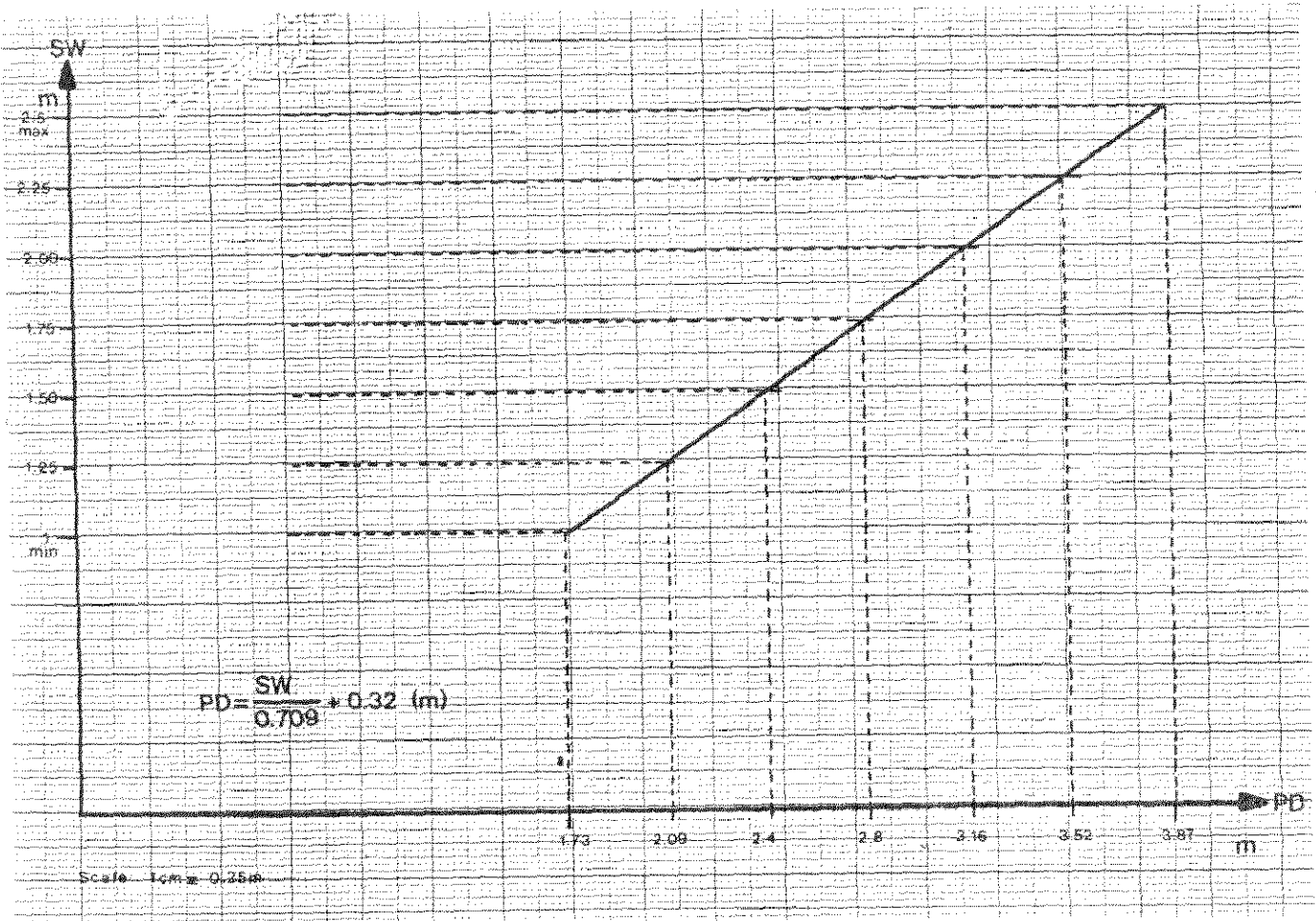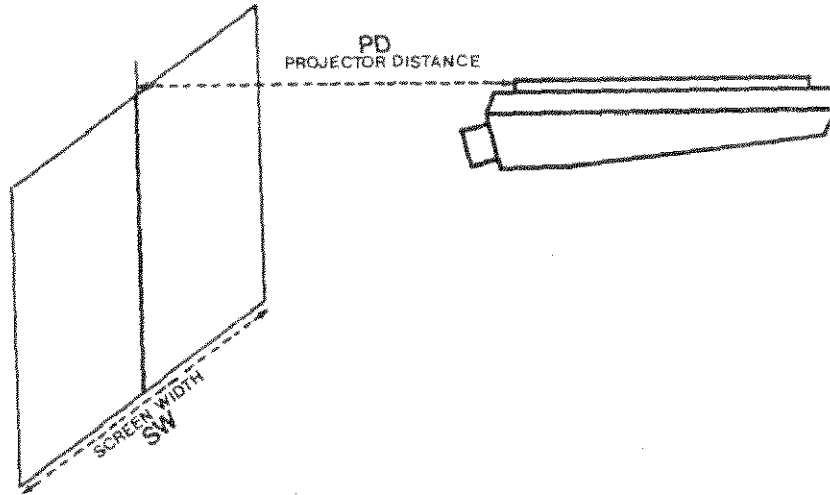
Humidity   : 0 - 90 % non condensing

Altitude   : 0 - 3,000 m (0 - 10,000 ft)

Storage

Temperature : - 30° to 65° C

The following graphic indicates the projector distance (screen-top U bracket) in function of the wanted screen width for all projector applications (ceiling or desk).
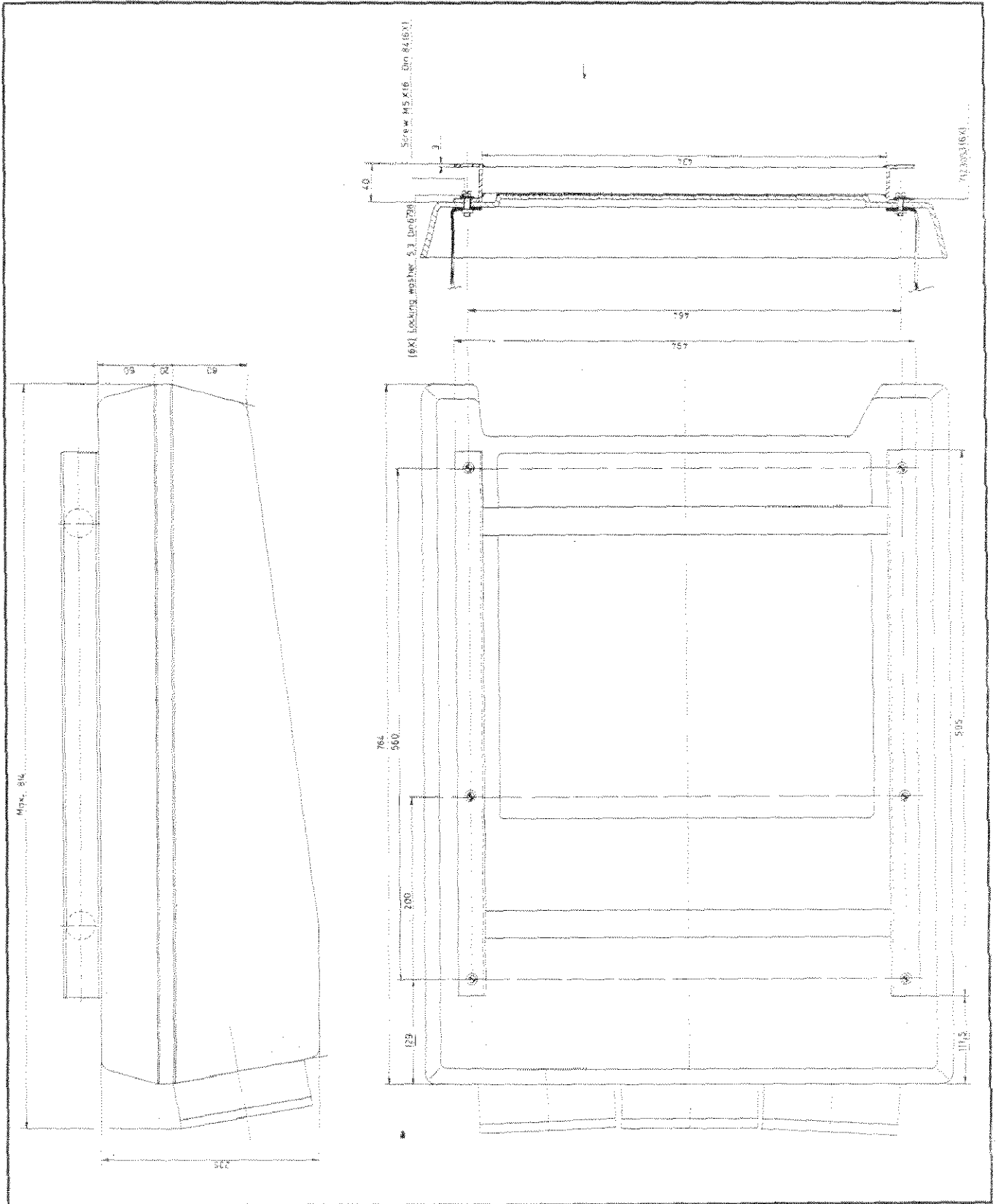

$$PD = \frac{SW}{0.709} + 0.32 \ (m)$$

Scale 1cm = 0.25m

WARNING

- In order to avoid any convergence faults, be sure first that the projector is always installed level (therefore use a water-level) and secondly that the projector axis is perpendicular on the screen surface (see fig.).
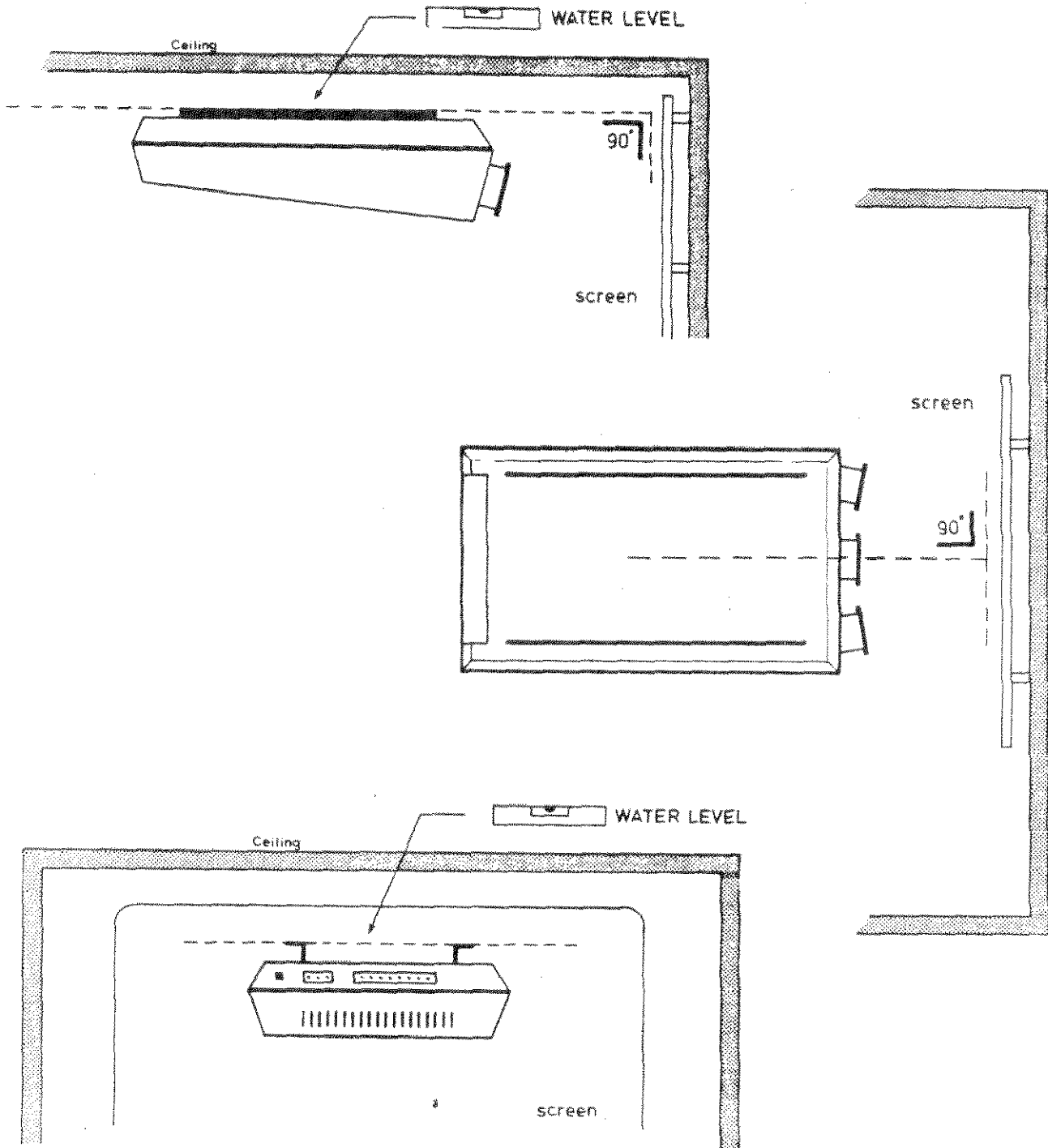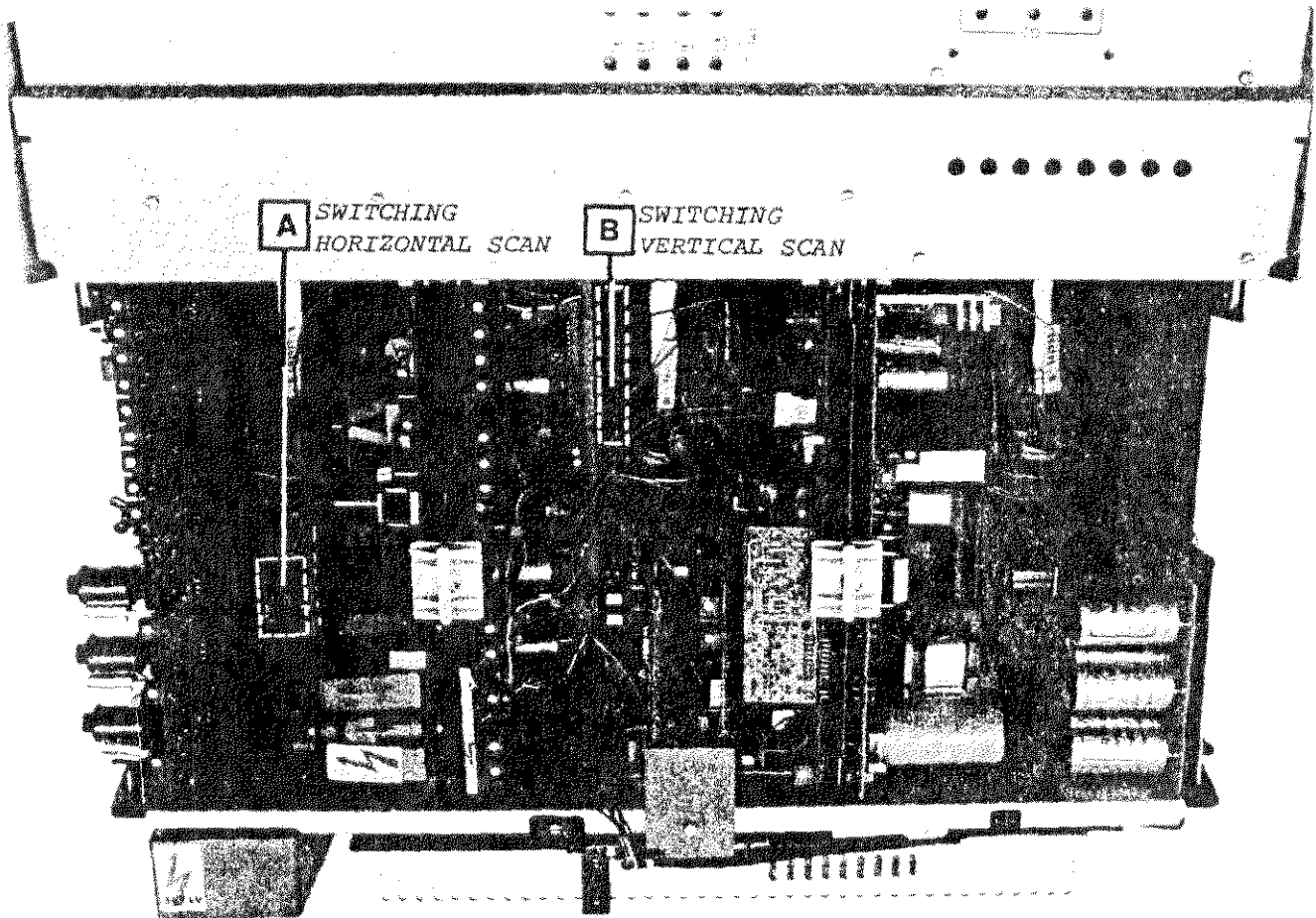
The BARCODATA has reversal capability for ceiling, floor and rear-screen applications. Therefore, two switches are provided on the motherboard of the projector.

IMPORTANT : Scan reversion has to be done always with the projector switched off.

Positions of the switches :

Switch	Ceiling Front	Ceiling Rear	Floor Front	Floor Rear
A				
B				

⬤ pressed

▮ not pressed

Note : Switching over from floor to ceiling or reversed requires a complete readjustment of picture geometry and convergence (see "Service adjustment and alignments of the BARCODATA").

Unlock the top cover by turning both fixation screws anti-clockwise a quarter of a turn.
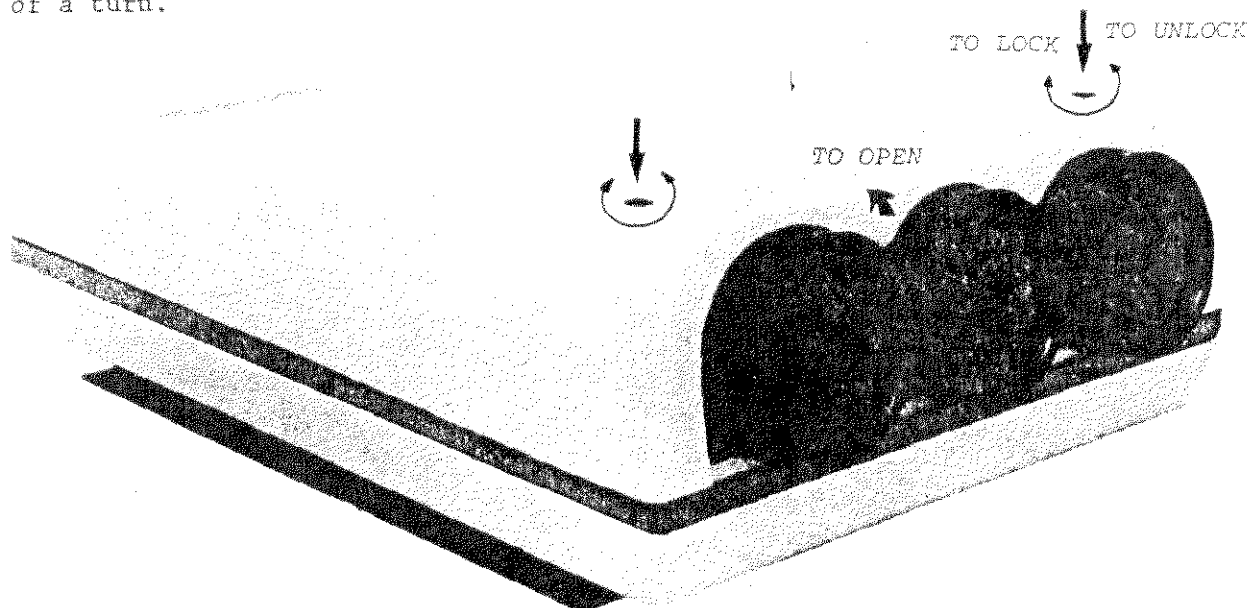
Open the top cover by lifting it up. An incorporated support keeps the top cover opened.
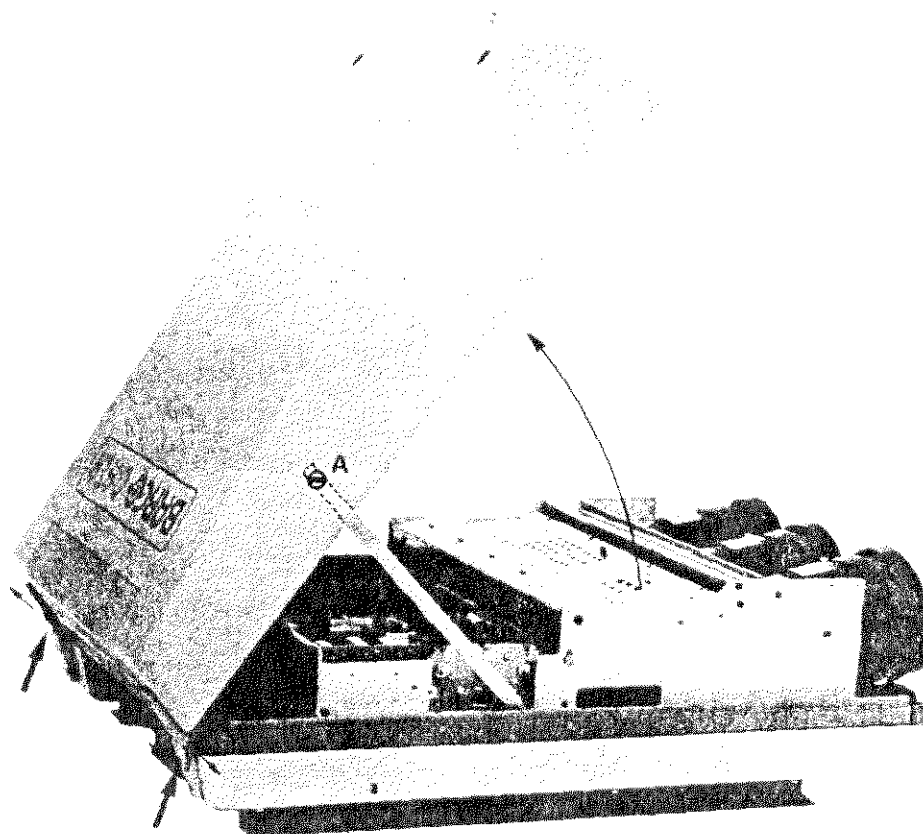
Note : The top cover can be removed when removing screw A and the two hinge-joints of the hinges.
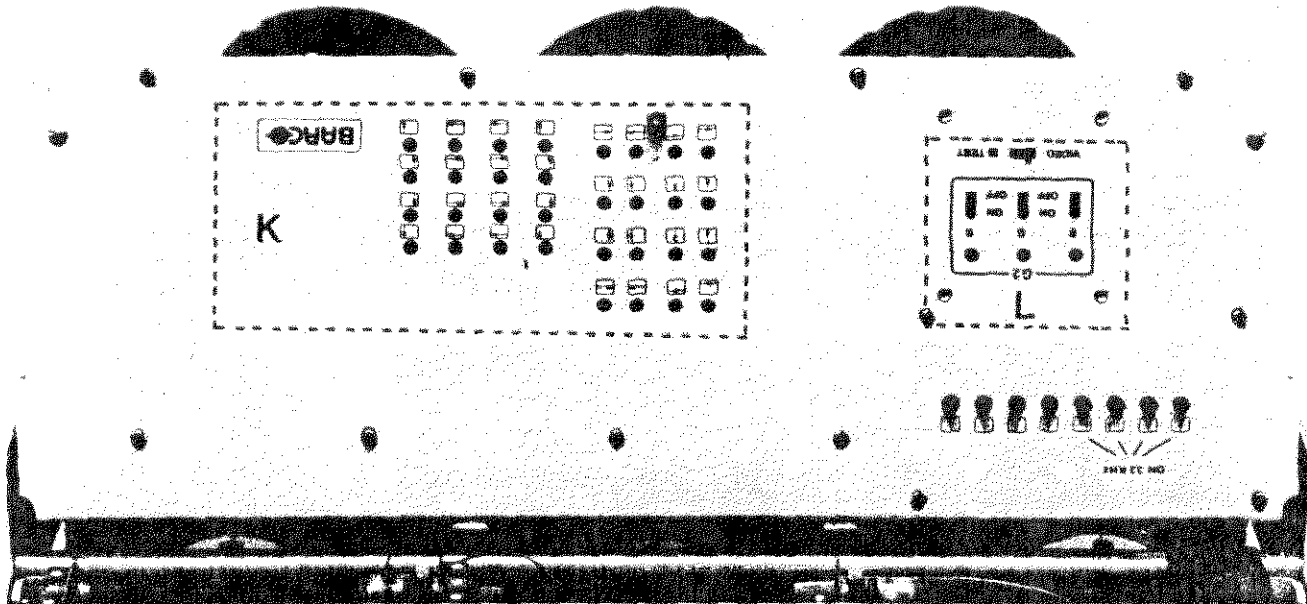
(A)	RGB TTL INPUT	76 11155	(G)	FOCUS CONTROL + CONTROL LAMPS	76 1198
(B)	RGB ANALOG INPUT	76 11145	(H)	POWER INPUT	76 11802
(C)	VIDEO INPUT + CONVERGENCE GENERATOR	76 12135	(I)	P.S N3 N4 DECODER + RGB OUTPUT	76 11605
(D)	SWITCH MODE POWER SUPPLY	76 1175	(J)	NORTH-SOUTH CORRECTION	76 1254
(E)	SYNC + VERT. DEFLECTION	76 1271	(K)	CONVERGENCE	76 1282
(F)	HOR. DEFLECTION + EHT	76 1262	(L)	G2-CONTROL	76 11995

Gede borst
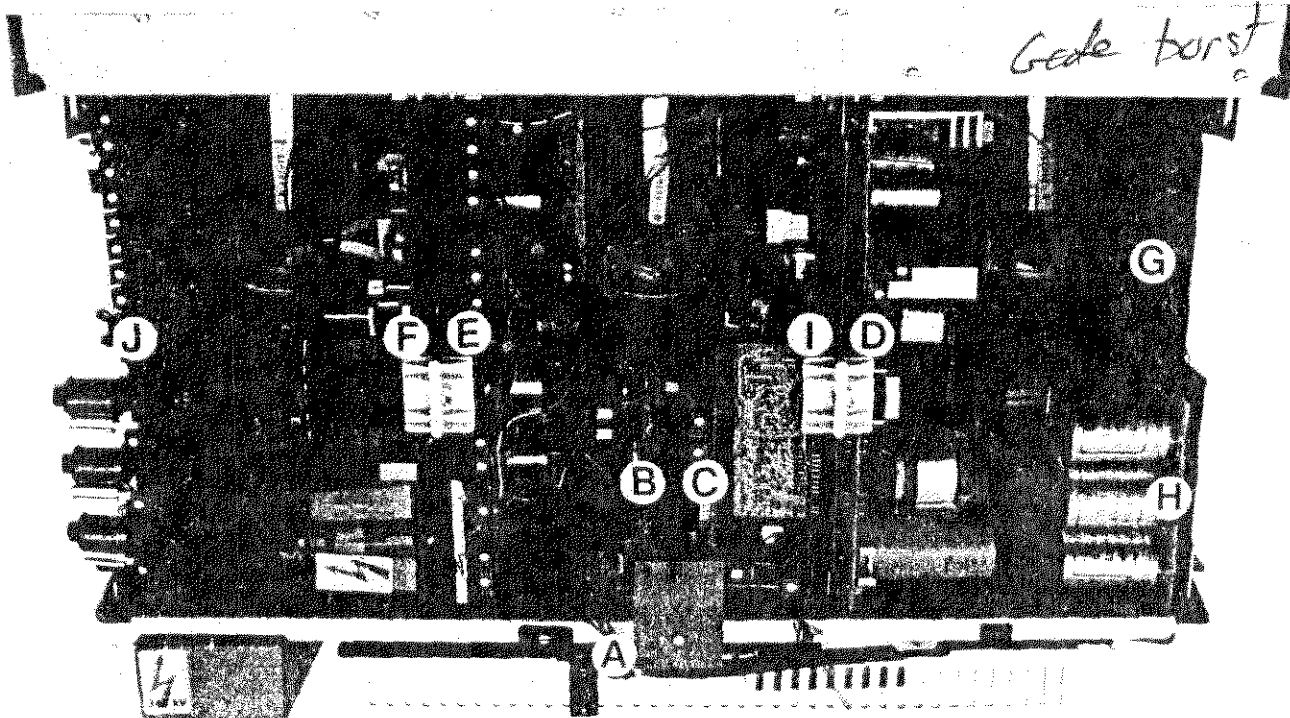
Adaptation of the projector for 110V AC or 220V AC operation.

Procedure : 1. Switch OFF the projector.

2. Remove the top cover to access the POWER INPUT BOARD.

3. Pull the MAINS INPUT selector from its connector and re-insert it into the connector according to the inscription on the board.

Fig. 1 : 220V AC operation

Fig. 2 : 110V AC operation
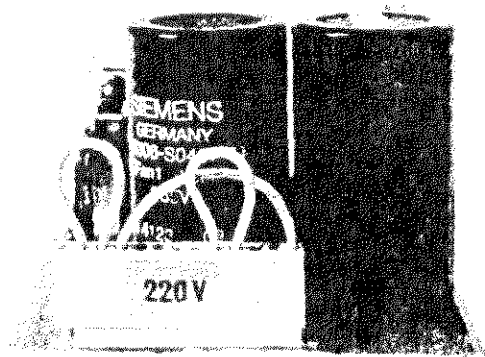
Fig. 1   220V AC
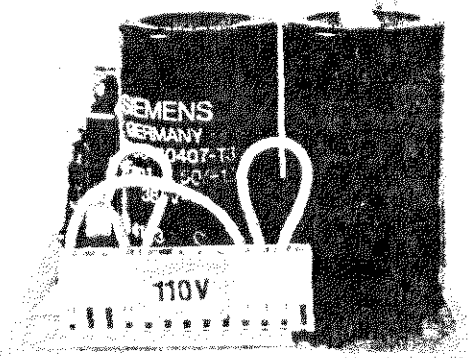
Fig. 2   110V AC
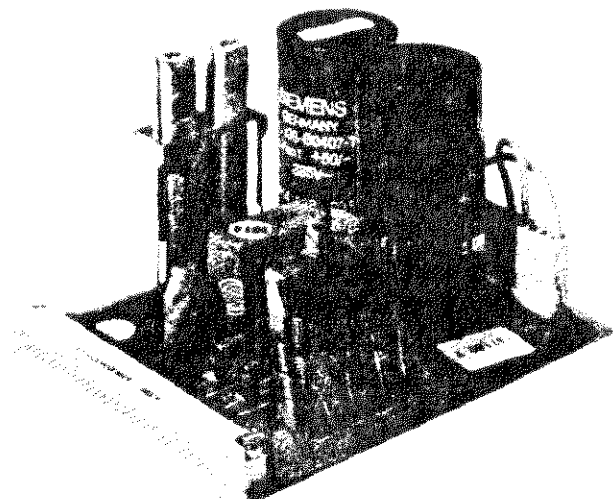
Fuses :	CAUTION
	For continued protection against fire hazard
	- replace with the same type of fuse
	- refer replacement to qualified service personnel

				Barco ord. n°
F1 F2	(2x)	4A/250V slow		31 41041

A. *POWER*

220V AC   POWER
           INPUT

*PUSHBUTTON ON/OFF
(with built-in
control lamp)*
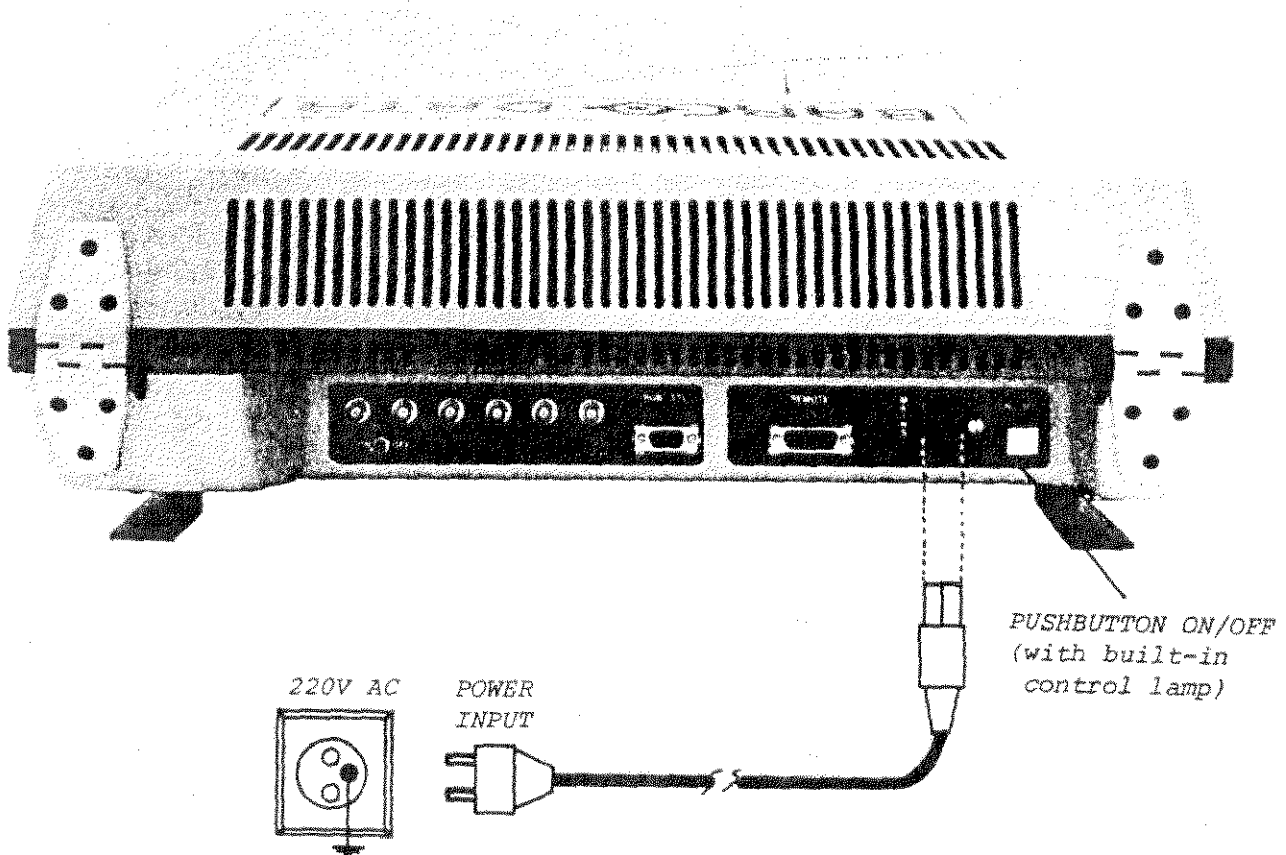
With the projector switched OFF, attach the line cord to the projector and a 220V AC power source.

NOTE : For nominal 110V AC operation, see "INPUT POWER BOARD" for internal plug change procedure.

SWITCHING ON/OFF : The projector is switched ON and OFF using the power switch ___ ON ___ OFF. The built-in control lamp indicates the operation mode.

B. *CONTROLS*

Plug the *CONTROL/SWITCH BOX 79 15516* into the 15 pin connector on the projector or use the remote cable for the *CONTROL/SWITCH BOX* connection.

CONTROL/SWITCH BOX plugged in on the projector.

Fastening screw
for control/switch unit
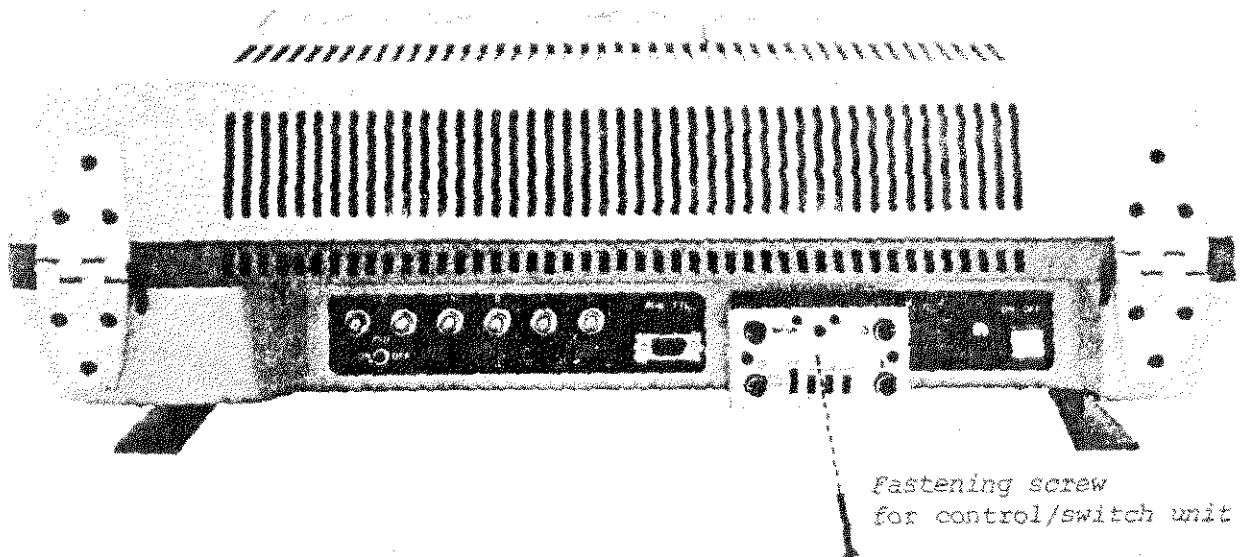
CONTROL/SWITCH BOX connected with projector using remote cable.
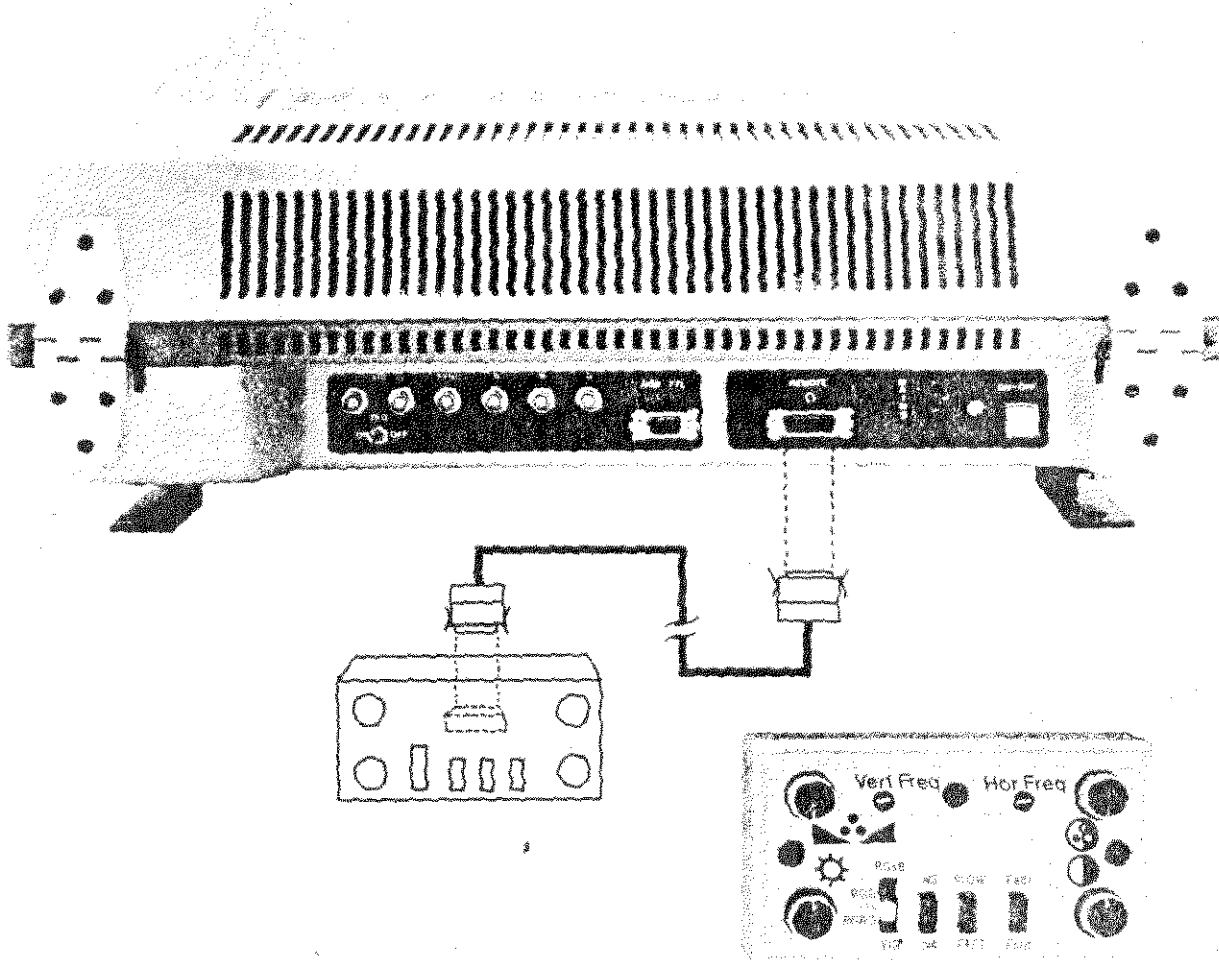
C. *SIGNAL PROCESSING*

  1. Input signal : *VIDEO COMPOSITE*

VIDEO COMPOSITE
IN/OUTPUT (BNC)
IN LOOP-THROUGH

LINE FREQ. ADJ.
FRAME FREQ. ADJ.

POSITION OF THE SWITCHES

- FREQUENCY SELECTION
     F_{std} - F_{adj} (see explanation)

- SYNCHRONISATION SELECTION
     Slow - Fast (see explanation)

- DECODER SYSTEM SELECTION
     N3 - N4 (see explanation)

- SIGNAL INPUT SELECTION
     Video

- 75 OHM TERMINATION SWITCH
     On - Off (see explanation)
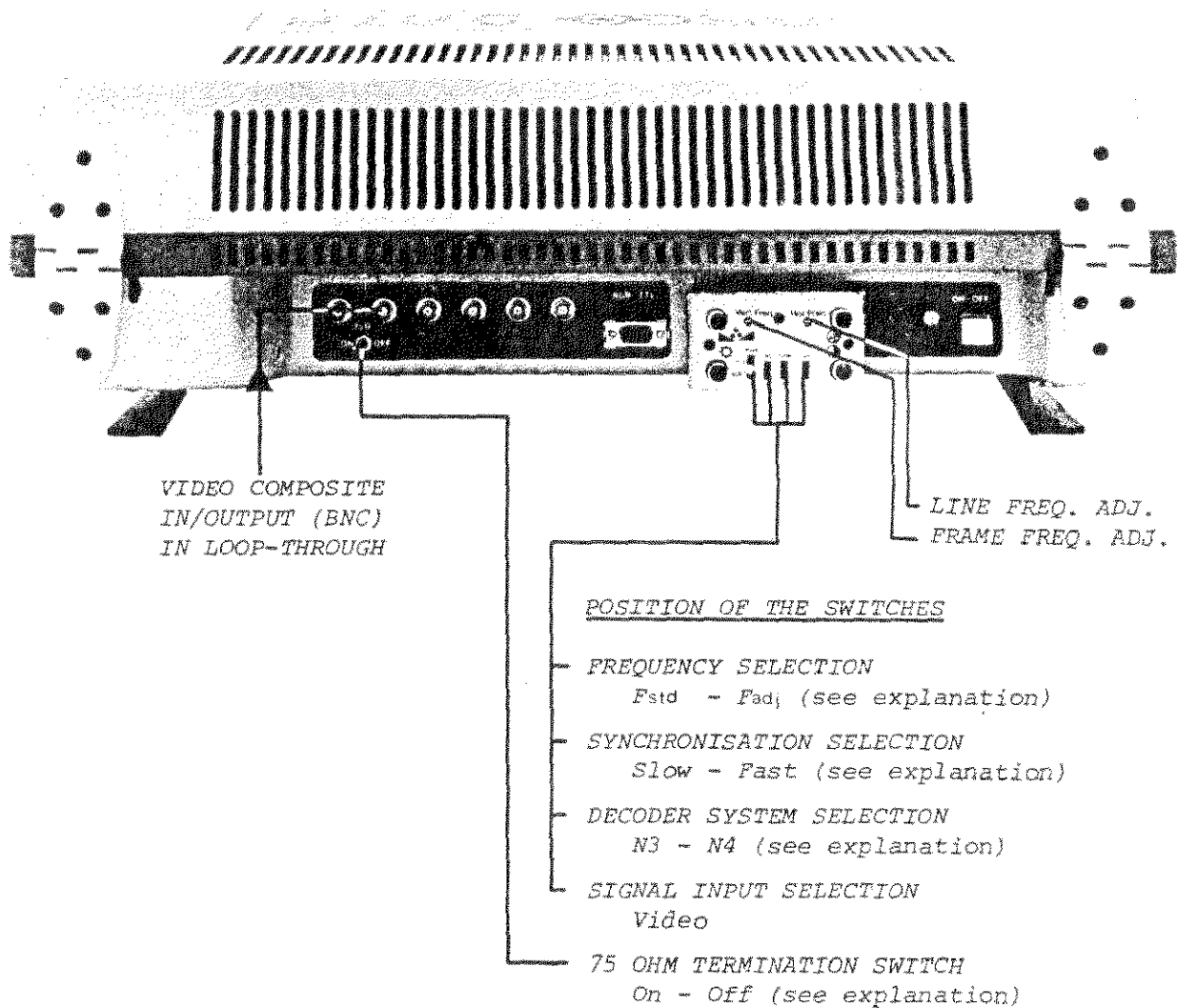
Video composite signal :

   Attach a composite video source using a coaxial cable with a BNC connec-
   tor.

Frequency range selector :

   Position Fstd : Frequency Range 1 : Line   / Frame frequency

                                       15625 Hz   50 Hz
                                       15750 Hz   60 Hz

                                       (presetable on the Sync + Vert. Defl.
                                       board)

   Position Fadj : Frequency Range 2 : Line frequency : 15625 Hz upto 32 kHz
                                       Frame   "   : ·50 Hz upto 110 Hz

                                       (continuously adjustable with the two
                                        freq. controls on the Control/Switch
                                        Box)

75 Ohm termination switch :

Terminate the projector input using the 75 Ohm/Hi-Z switch between the
input loop-through connectors, if the unit is the only one on the video
cable or the last unit in a string. To terminate put the switch in the
75 Ohm position.

Decoder selection :

N4 : PAL, SECAM or NTSC 4.43 is automatically selected.

(NTSC 4.43 : for playback of an NTSC recorded video tape with a
video tape recorder/player specially designed for
use with the NTSC 4.43 system).

N3 : PAL, SECAM or NTSC 3.58 is automatically selected.

(NTSC 3.58 : for playback of an NTSC 3.58 video signal from e.g. an
external TV receiver/decoder, video tape recorder 3.58,
etc).

Synchronisation selection :

SLOW : playback decoded OFF AIR signals.

FAST : playback VIDEO signals from e.g. video recorders.

Schematic diagram input
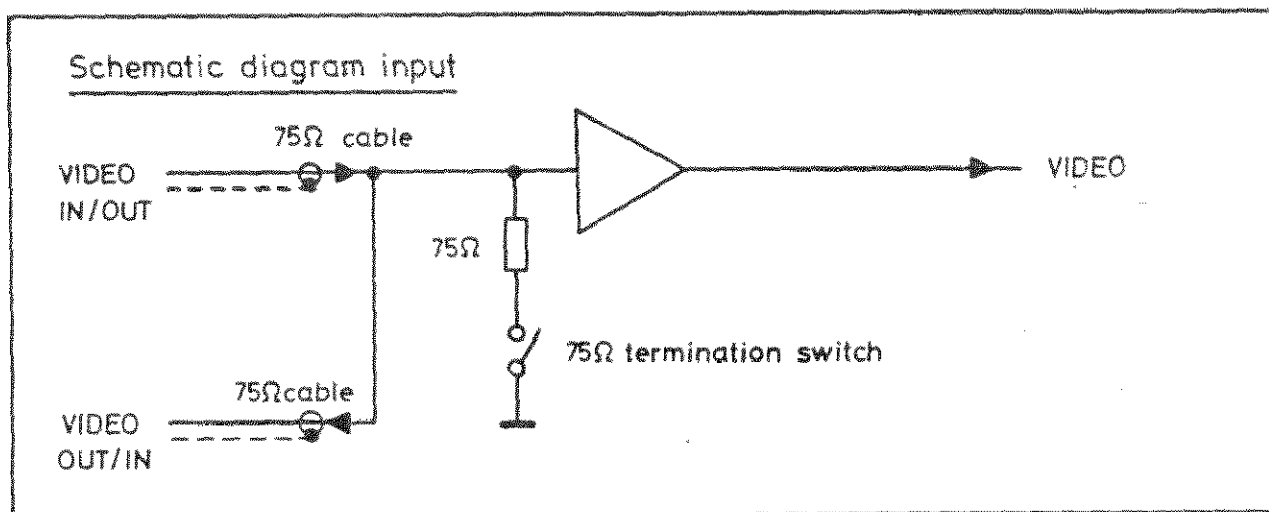
2. *Input signal : RGB Analog or RGB TTL*

Allows a character generator, micro computer, video camera or a special
adapter for videotext/teletext having digital (RGB TTL) or analog (RGB
Analog) RGB outputs.

SEPARATE   BLUE   RED   GREEN
SYNC (BNC)   (BNC)   (BNC) (BNC)

LINE FREQ. ADJ.
FRAME FREQ. ADJ.

POSITION OF THE SWITCHES

FREQUENCY SELECTION
    Fstd - Fadj (see explanation)

SYNCHRONISATION SELECTION
    Slow

DECODER SYSTEM SELECTION
    No function

SIGNAL INPUT SELECTION
    RGsB - RGBS (see explanation)
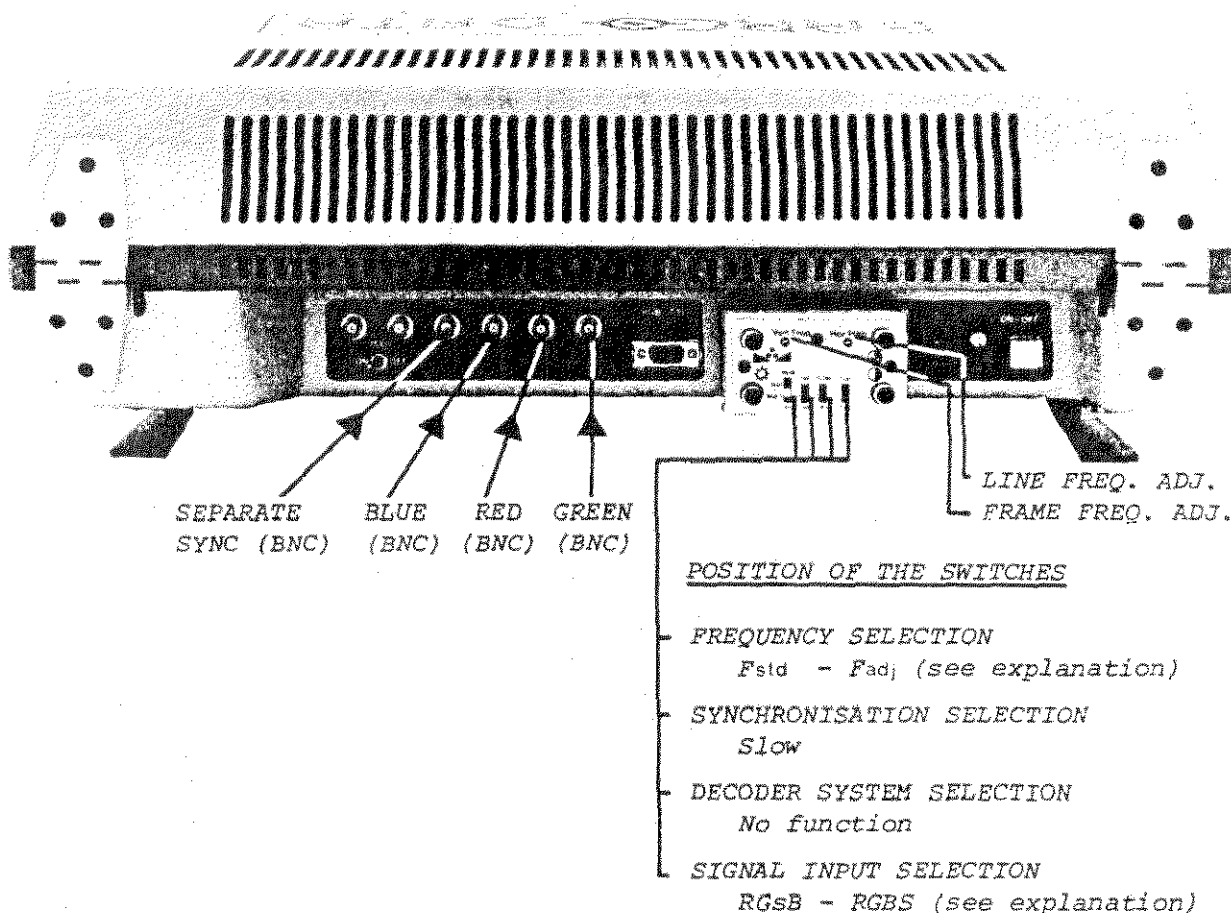
RGsB or RGB+S input signals :

Selection : RGsB : RGB input signals with sync on Green.

            RGB+S : RGB input signals with separate sync signal.

Attach the RGsB or RGB+S source signals using coaxial cables with
a BNC connector.

Frequency range selector :

Position Fstd : Frequency Range 1 : Line   / Frame frequency

                                               15625 Hz   50 Hz
                                               15750 Hz   60 Hz

                                             (presetable on the Sync + Vert. Defl. board)

Position Fadj : Frequency Range 2 : Line frequency : 15625 Hz upto 32 kHz
                                             Frame   "   :   50 Hz upto 110 Hz

                                             (continuously adjustable with the two freq. controls on the Control/Switch Box)

On the RGB Analog board the following switches are provided for :
(attainable when the top cover is opened)

75 OHM TERMINATION SWITCHES FOR
OFF   ON

RED

GREEN

BLUE

SYNC

BLUE IN GREEN
ON   OFF

SYNC LEVEL ADAPTATION
4V   1V

BLUE IN GREEN ADJUSTMENT
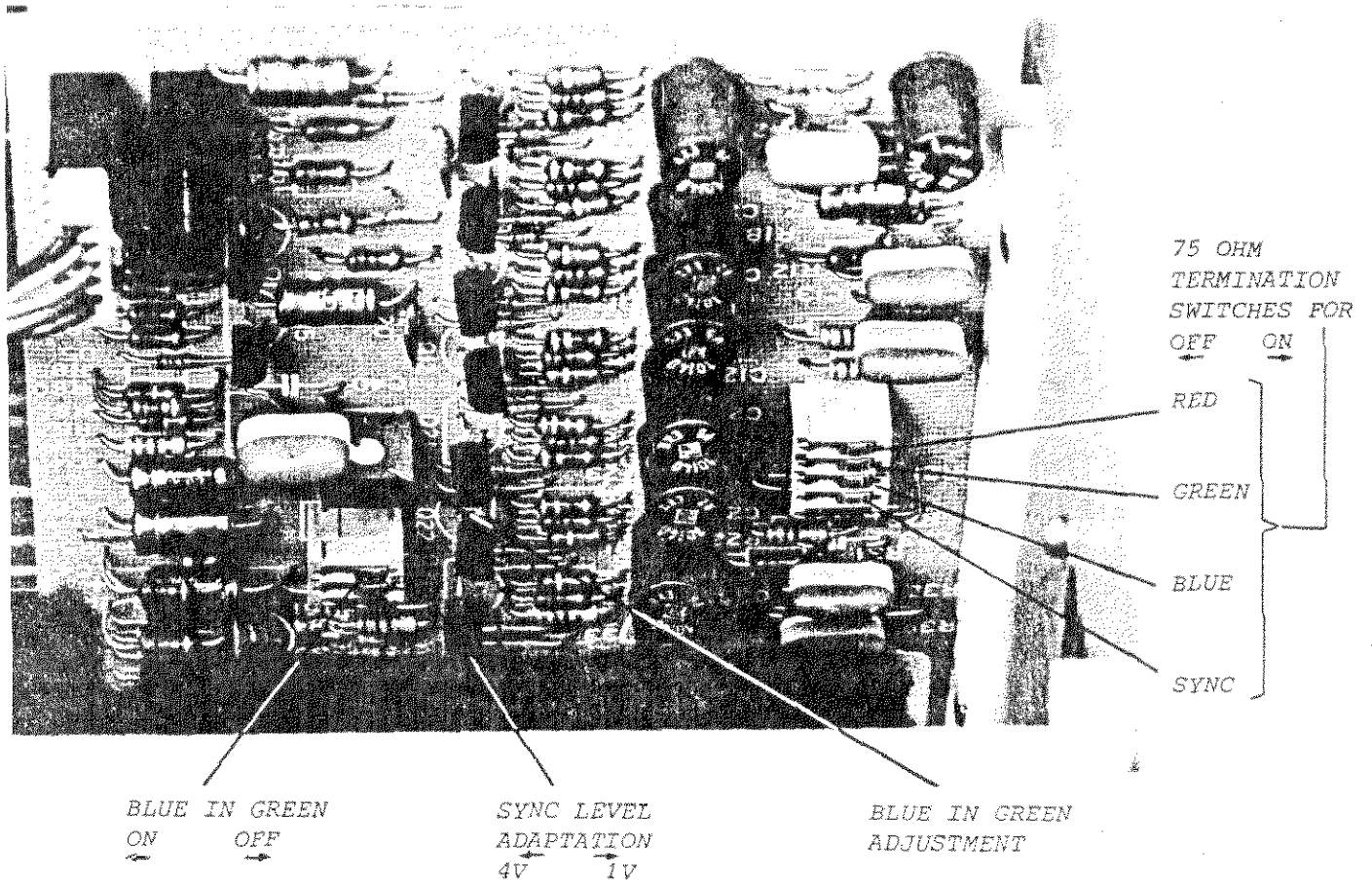
75 Ohm termination switches :

The R, G, B and sync inputs of the projector must be 75 Ohm terminated using the 75 Ohm/Hi-Z switches (ON position).
In case of a loop-through connection, using T-BNC connectors on the respective inputs, the termination switch 75 Ohm/Hi-Z must be put in the 75 Ohm position *if the set is the LAST unit in the string.*

The separate sync input accepts normally a sync level of 4 Vpp (switch
in the 4V position).
If the sync signal is about 1 Vpp, the input is adapted for that level
putting the switch in the 1V position.

Blue in Green switch :

Display of characters in uniform Blue is in most cases very difficult
to read.
In order to improve the character visability on the screen, put the
switch "Blue in Green" in the ON position. The blue colour will be
changed in cyanic, giving a better character visability (proportion
Blue in Green is adjustable).

Schematic diagram inputs   RGB Analog

R   75Ωcable   R
                        75Ω

G   75Ωcable   G
                        75Ω

B   75Ωcable   B
                        75Ω
                                    Adj. blue in green

Sync   75Ωcable   sync (S)
seperate
                        75Ω   Sync level
                              ON 1V   R84   adaptation
                              OFF 4V

LINE FREQ. ADJ.
FRAME FREQ. ADJ.

Input D-connector

1 Red
2 Green
3 Blue
4 ⊥
5 ⊥
6 Sync composite
7 High-Low
8 H-sync
9 V-sync

POSITION OF THE SWITCHES

FREQUENCY SELECTION
Fstd — Fadj (see explanation)

SYNCHRONISATION SELECTION
Slow

DECODER SYSTEM SELECTION
No function

SIGNAL INPUT SELECTION
RGB-TTL

Frequency range selector :

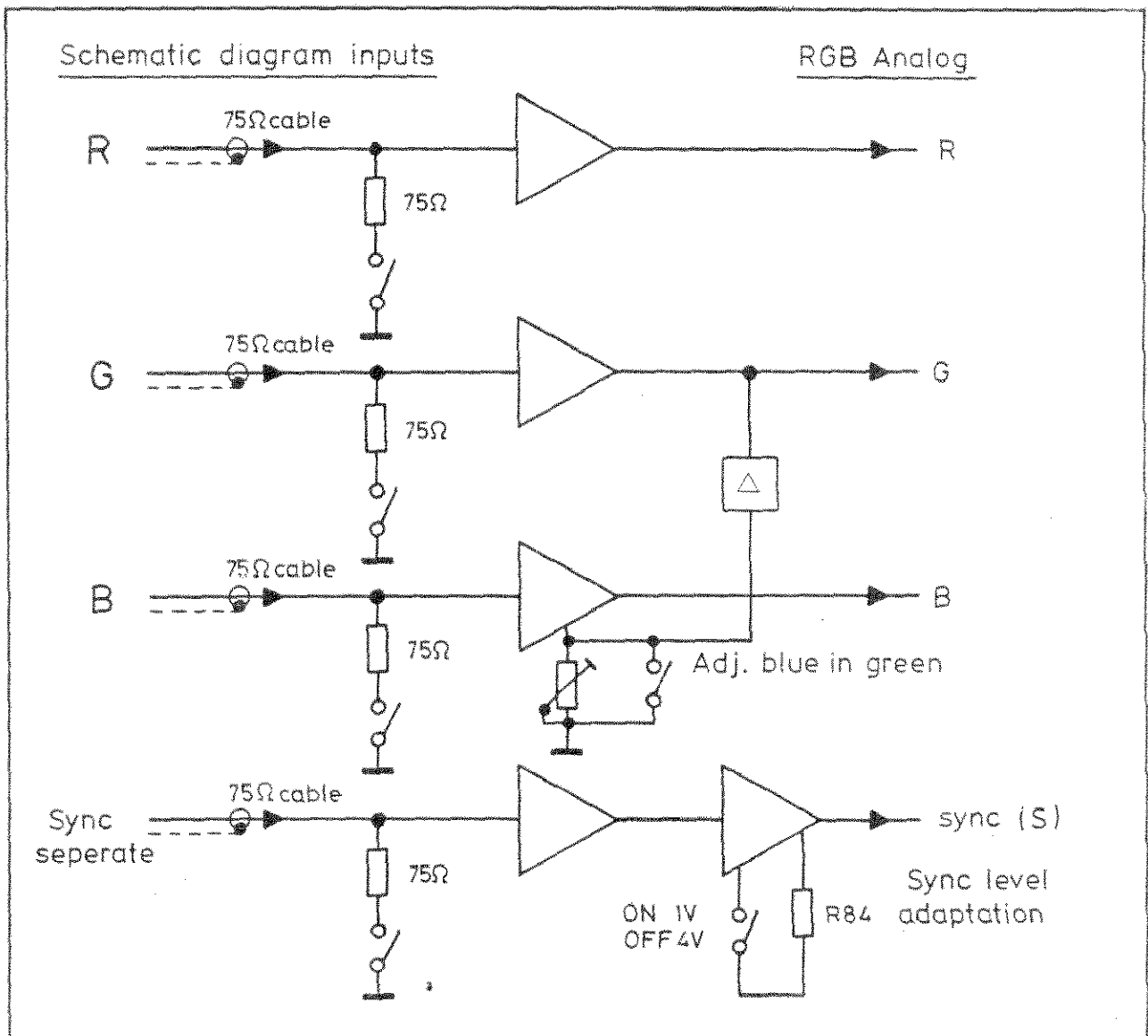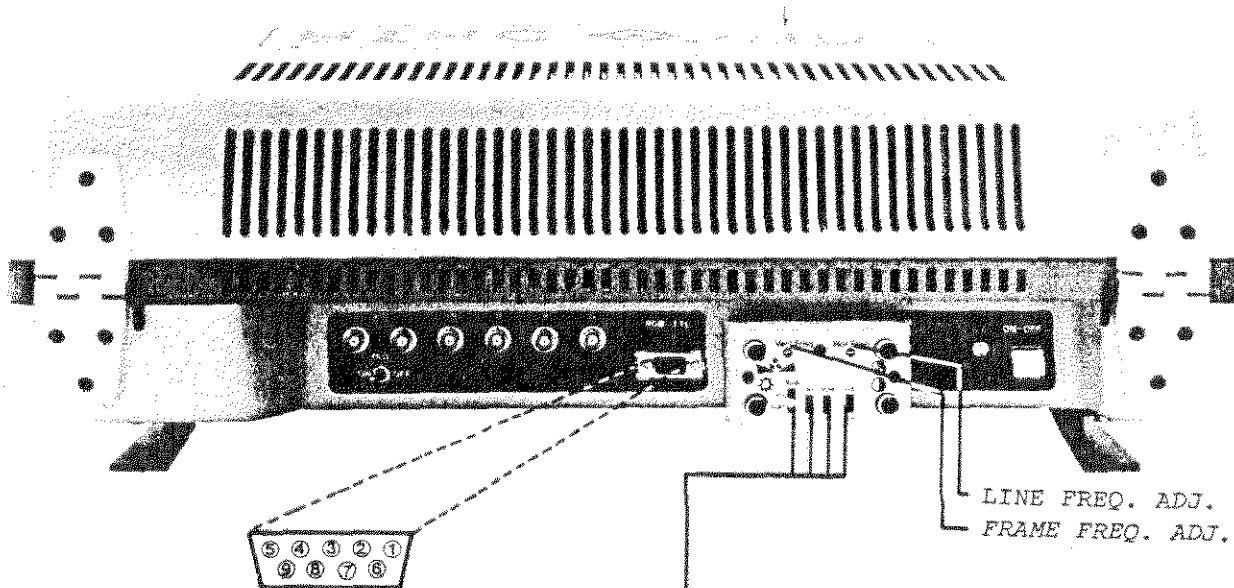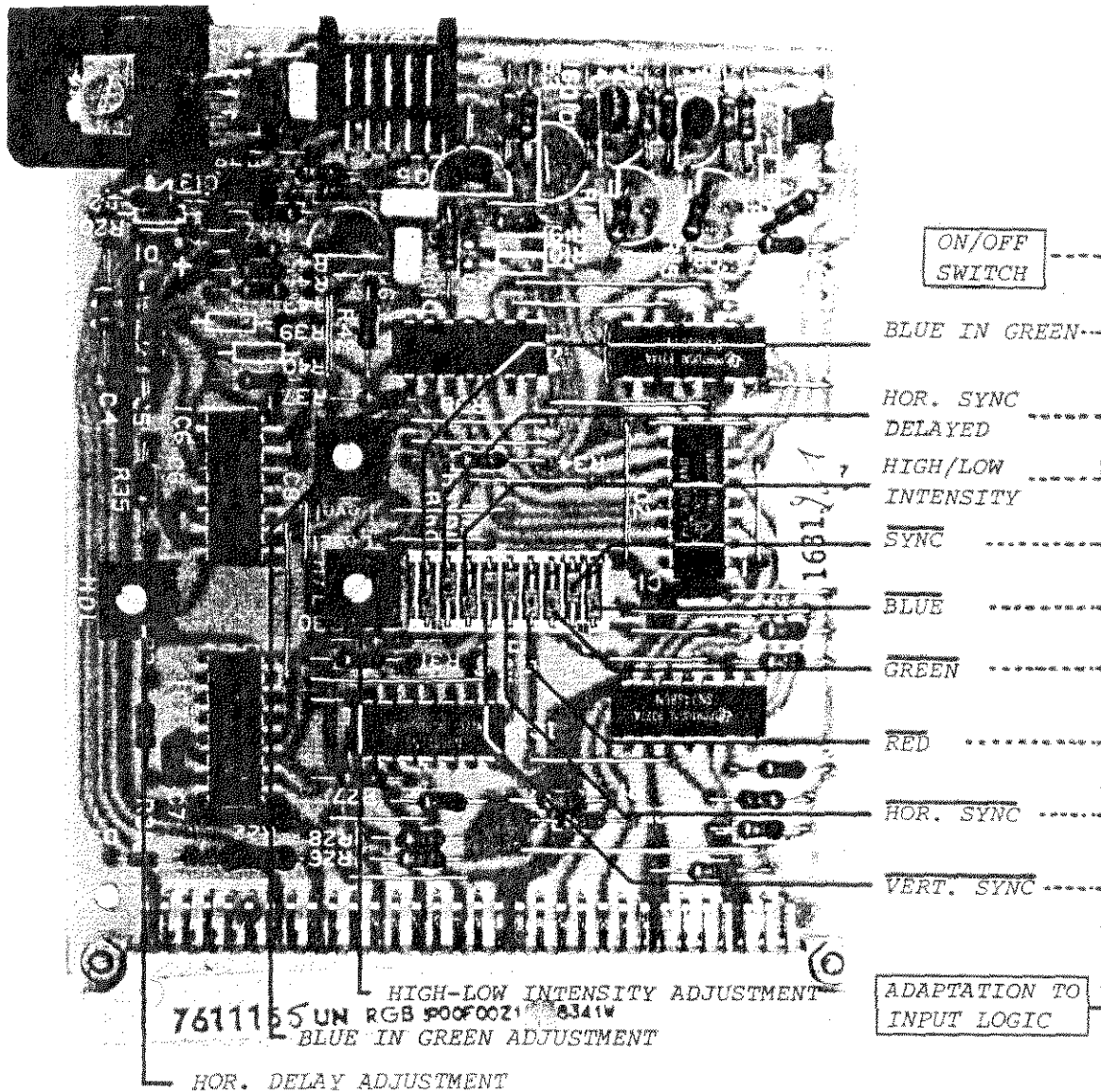Position Fstd : Frequency Range 1 : Line   /   Frame frequency

Line	Frame
15625 Hz	50 Hz
15750 Hz	60 Hz

(presetable on the Sync + Vert. Defl. board)

Position Fadj : Frequency Range 2 : Line frequency : 15625 Hz upto 32 kHz
Frame   "   :   50 Hz upto 110 Hz

(continuously adjustable with the two freq. controls on the Control/Switch Box)

On the RGB TTL board the following switches are provided for :
(attainable when the top cover is opened)

ON/OFF SWITCH

BLUE IN GREEN

HOR. SYNC DELAYED

HIGH/LOW INTENSITY

SYNC

BLUE

GREEN

RED

HOR. SYNC

VERT. SYNC

ADAPTATION TO INPUT LOGIC

HIGH-LOW INTENSITY ADJUSTMENT

BLUE IN GREEN ADJUSTMENT

HOR. DELAY ADJUSTMENT

Explanation of the input possibilities :

1. TTL input signals : Red   (pin 1)
                       Green (pin 2)
                       Blue   (pin 3)
                       Composite sync (pin 6)

   Switches 1 to 4   : allows an adaptation of the E-OR input with
                       regard to the computer logic (pos. or neg.).

2. TTL input signals : Red   (pin 1)
                       Green (pin 2)
                       Blue   (pin 3)
                       Separate sync : Vert. sync (pin 9)
                                       Hor. sync (pin 8)

   Switches 1-3-4   : allows an adaptation of the E-OR input for the
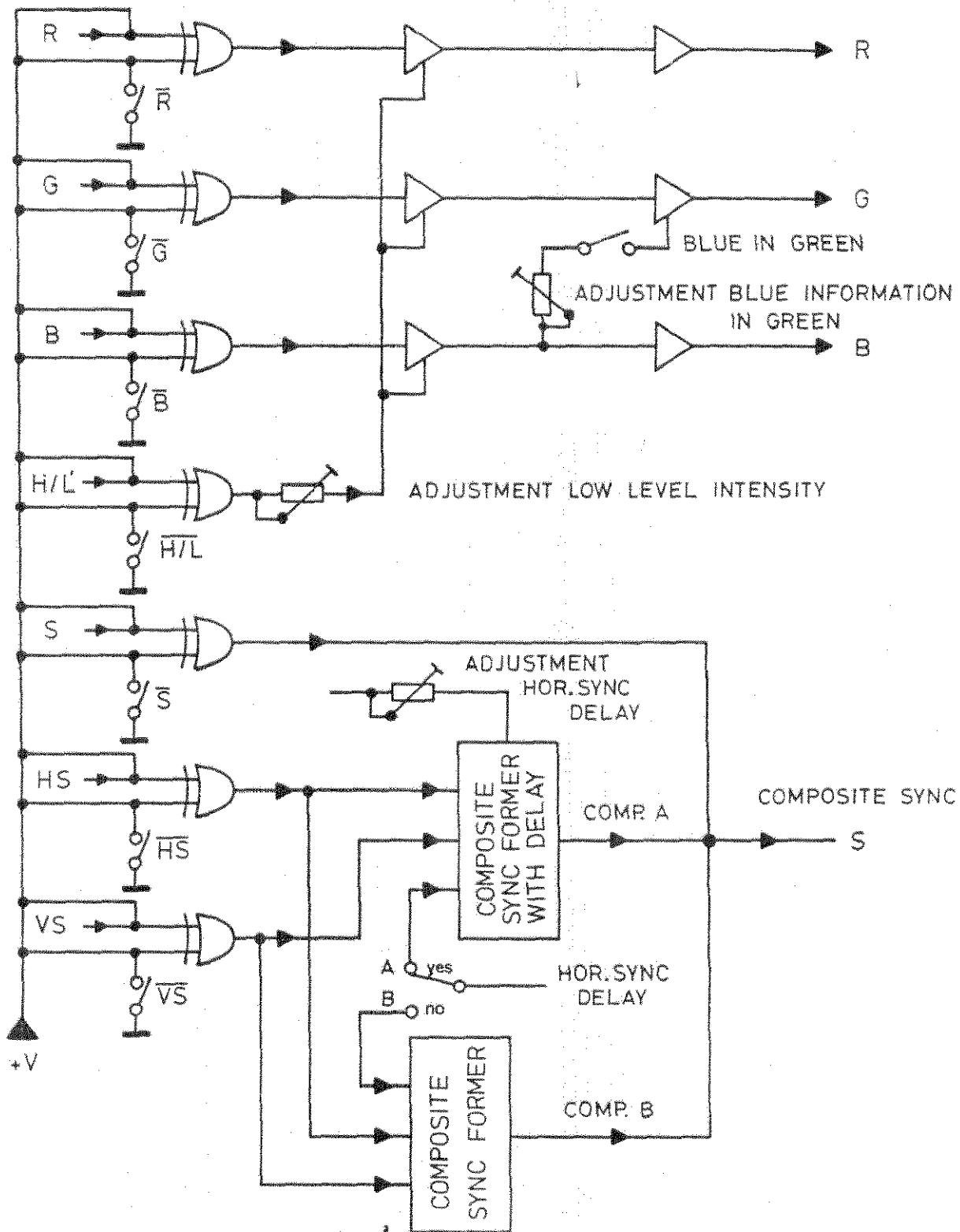   colour signals with regard to the computer logic
                       (pos. or neg.).

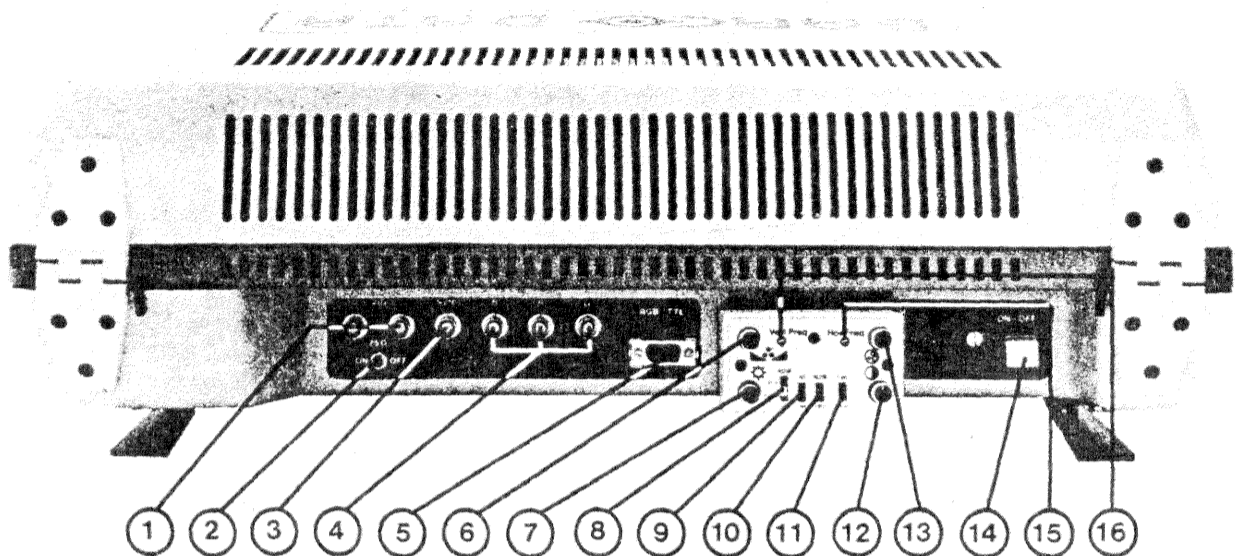|	
Switch 2	: allows an adaptation of the E-OR input for the composite sync signal with regard to the computer logic (pos. or neg.).
Switch 5-6	: allows an adaptation of the E-OR input for the separate sync signals with regard to the computer logic (pos. or neg.).
Switch 8	: Hor. sync delay YES or NOT. In case of a not usual hor. & vert. sync signal, this switch has to be put in the OFF position. As reference the hor. & vert. input signal, a logic circuit on the board will deliver hor. & vert. sync pulses for correct synchronisation. The position of the hor. sync pulse is adjustable with the potentiometer "Hor. delay time".
Switch 9	: Blue in Green : YES or NOT (same function as on the RGB Analog board).
Switch 7	: allows an adaptation of the E-OR input for the H/L info with regard to the computer logic. High/Low intensity info : Computer signal, applied to the High/Low intensity input, commands the BARCO projector to display the respective characters in a higher intensity (H/L intensity level is adjustable with the potentiometer "H/L intensity adj.").

Note : E-OR indicates exclusive-or gate circuitry.

R

G

BLUE IN GREEN

ADJUSTMENT BLUE INFORMATION
IN GREEN

B

ADJUSTMENT LOW LEVEL INTENSITY

R

G

B

H/L'

S

HS

VS

+V

R̄

Ḡ

B̄

H̄/L̄

S̄

H̄S̄

V̄S̄

ADJUSTMENT
HOR. SYNC
DELAY

COMPOSITE
SYNC FORMER
WITH DELAY

COMP. A

COMPOSITE SYNC

S

A yes
B no

HOR. SYNC
DELAY

COMPOSITE SYNC FORMER

COMP. B

1. SWITCHING ON-OFF THE PROJECTOR

Press the power switch ⑭ to bring the projector into operation. The built-in pilot lamp will light.
To switch OFF, press the power switch again.

2. SELECT THE DESIRED PROGRAM AS FOLLOW :

VIDEO (VID) : For a program source connected to the VID input ①.

- Switch ⑧ in the VID position.

- Switch ② in the ON position (75 Ohm terminated) in a non-loop-through connection.

- Switch ⑨ and ⑩ :

a) Automatic colour system selection ⑨

N4 : PAL-SECAM or NTSC 4.43 is automatically selected

(NTSC 4.43 : for playback of an NTSC-recorded video tape with a video tape recorder /player specially designed for use with the NTSC 4.43 system).

N3 : PAL-SECAM or NTSC 3.58 is automatically selected

(NTSC 3.58 : for playback of an NTSC 3.58 video signal from an external TV receiver/decoder, video tape recorder 3.58, etc.).

b) Synchronisation speed selection ⑩
- playback OFF AIR signals : select SLOW position.
- playback VIDEO signals from e.g. video recorder : select FAST position.

RGsB
RGB+S   : For a program source connected to the RGB Analog input ④.

- Switch ⑧ in the RGsB position for RGB signals with sync on green.
- Switch ⑧ in the RGB+S position for RGB signals with separate sync (separate sync input ③).
- Switch ⑩ in the SLOW position.

RGB TTL   : For a program source connected to the RGB TTL input ⑤.

- Switch ⑧ in the RGB TTL position.
- Switch ⑩ in the SLOW position.

3. *TURN ON THE CONNECTED EQUIPMENT*

The picture will be projected on the screen.

4. *ADJUST THE PICTURE TO YOUR PREFERENCE*

Important : playback RGB signals : picture is controlled only by the Brightness and Contrast control.

BRIGHTNESS ⑦ and CONTRAST ⑫ controls :

Correct brightness and contrast settings are important for good colour reproduction.

Brightness ⑦ : adjust brightness control so that the darkest parts of the picture appear as black.

Contrast ⑫ : adjust contrast from the lowest setting to the desired level according to your preference and room lighting conditions.

(Note : don't overdrive into "smearing").

COLOUR CONTROL ⑬

Adjust the colour intensity of the picture. Clockwise rotation makes the picture vivid; counter-clockwise rotation makes it pale.

TINT CONTROL (HUE) ⑥

This control is effective only when playing an NTSC-recorded tape using the NTSC 4.43 system or playback NTSC 3.58 video signals.
Clockwise rotation makes the skin tones greenish; counter-clockwise rotation makes them purplish. Adjust the tint to give the most natural skin tones.

5. *ADAPTATION OF THE BARCODATA TO THE LINE AND FRAME FREQUENCY OF TWO INPUT*
   SOURCES : SWITCH (11)
                 ADJ. CONTROLS (15) *AND* (16)

Frequency ranges :

        RANGE 1

Standard line : 15625 Hz or 15750 Hz 64 us 63.4 us - Standard frame : 50 Hz or 60 Hz	Switch Fstd/Fadj in the Fstd position

Presetable on the SYNC + VERT. DEFL. of the BARCODATA

        RANGE 2

Non-standard line : 15625 kHz to 32 kHz 64 us to 31.2 us - *Adjustable with control* (15) Non-standard frame : 50 Hz to 110 Hz	Switch Fstd/Fadj in the Fadj position

    Adjustable with control (16)

Continuously adjustable on the Control/Switch Box :

        Adj. control (15) : Hor. frequency
        Adj. control (16) : Vert. frequency

The Switch Fstd/Fadj (11) : allows switching between two different scanning
frequencies, one corresponding to line and frame frequencies in RANGE 1 and
the other corresponding to line and frame frequencies in RANGE 2.

Adjustment procedure for line and frame frequency in range 2 :

a) Hor. freq. adjustment

   - short-circuit capacitor C8 on the SYNC + VERT. DEFL. BOARD.
   - adjust HOR. FREQ. control (15) for min. horizontal tearing of the
     picture.
   - remove the short-circuit.

b) Vert. freq. adjustment

   - short-circuit capacitor C15 on the SYNC + VERT. DEFL. BOARD.
   - adjust VERT. FREQ. control (16) for min. vertical rolling of the
     picture.
   - remove the short-circuit.

After the projector is correctly installed and all electrical connections are made, proceed to the electrical adjustments.

IMPORTANT : Picture geometry and convergence adjustments have to be adjusted at standard line and frame frequency. Switch Fstd/Fadj on the CONTROL/SWITCH box always in the Fstd position.

Preparation :

1. *Open the top cover of the projector (see "Top cover removal").*

2. *Put the VIDEO/TEST switch in the TEST position (Internally generated grid test pattern).*

VIDEO   TEST
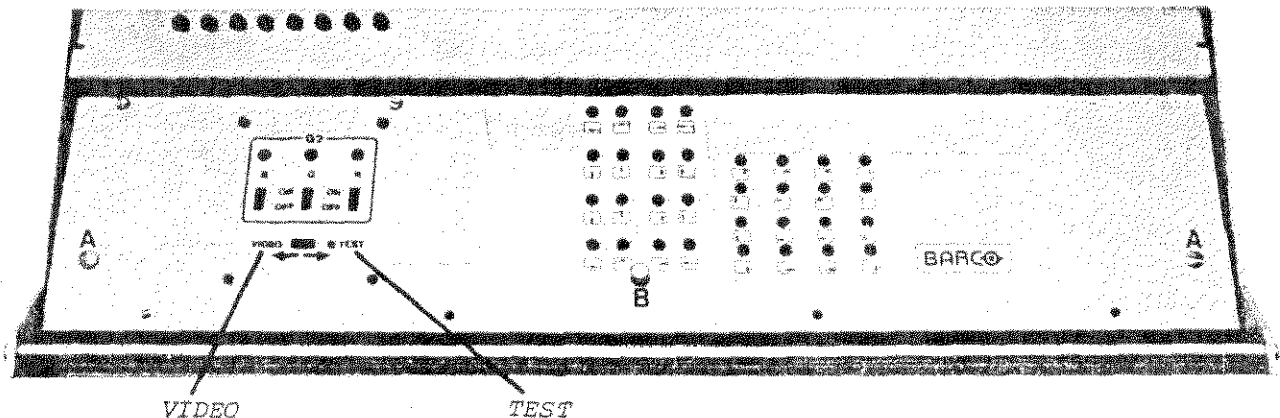
Display video or RGB   Display internally
Signals applied on   Generated grid test
the respective inputs   pattern

3. *Connect the projector to the power line using the corresponding power cord.*

   Attention : Before switching ON the projector, always check if the factory set power voltage of the projector corresponds to the power voltage in the room.

A. PICTURE CENTERING

   Preparation

   Disconnect the convergence board from the motherboard by pulling out the convergence connector.

   Proceed as follow (see the above picture) :

   - *unlock the convergence board by turning both fixation screws A anti-clockwise a quarter of a turn.*

   - *lift up the convergence board using grasp B.*

   - *between the Red and Green picture tube, on the motherboard (frame), the convergence connector is plugged in (follow the convergence cord to locate the right connector).*

   - *pull out the convergence connector and proceed to the following adjustments.*

   Switch on the projector by pressing the pushbutton ON/OFF.
   The built-in control lamp will light up.

1. ON CRT SCREEN

Positioning of the picture display in the center of the CRT screen for
each tube :

- place brightness and contrast at a low level, using the brightness
  and contrast controls.

- while looking into the respective lenses, adjust the potentiometers :

  HOR. SHIFT (located on the "N/S + Hor. shift board") and VERT. SHIFT
  (located on the "Sync + Vert. defl. board") corresponding with each
 picture tube for the center position of the displayed picture with
  regard to the screen surface.
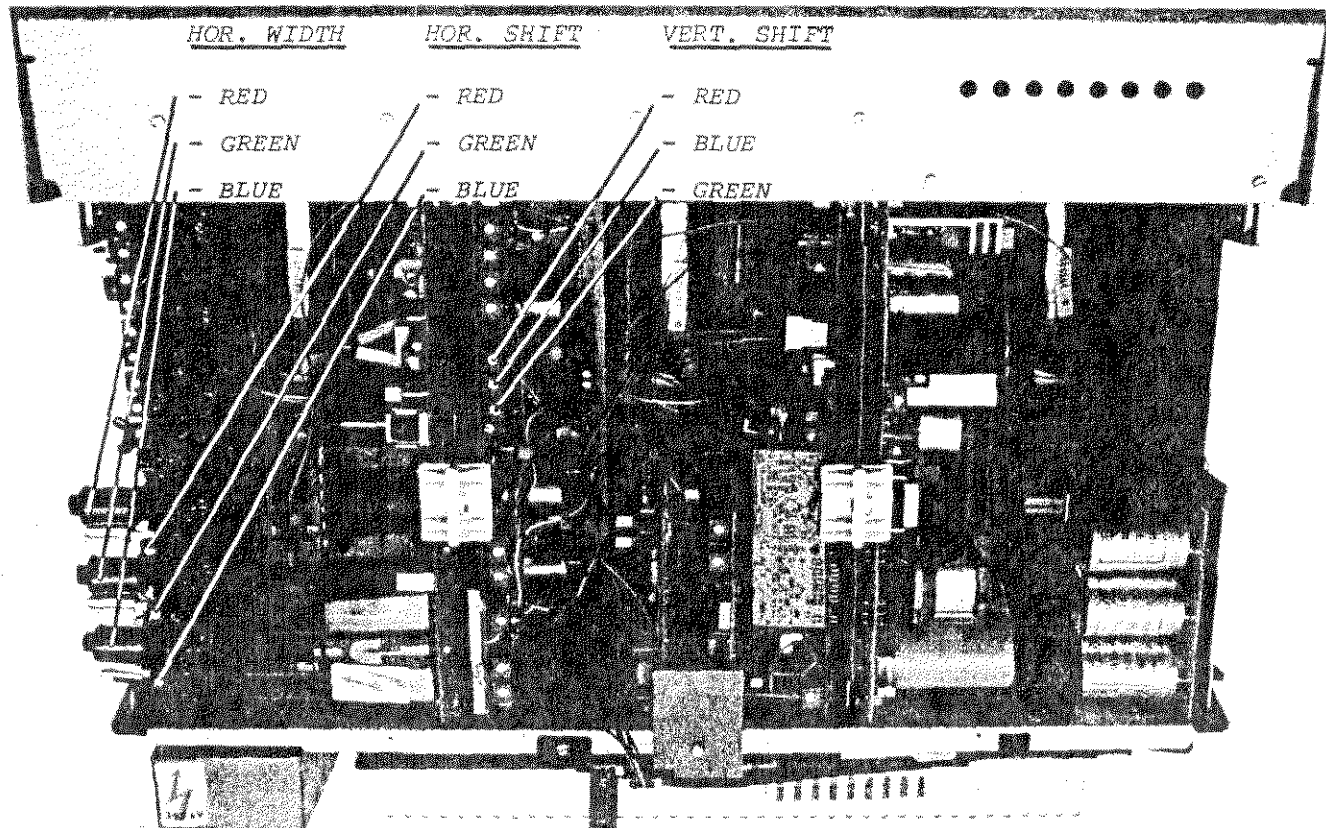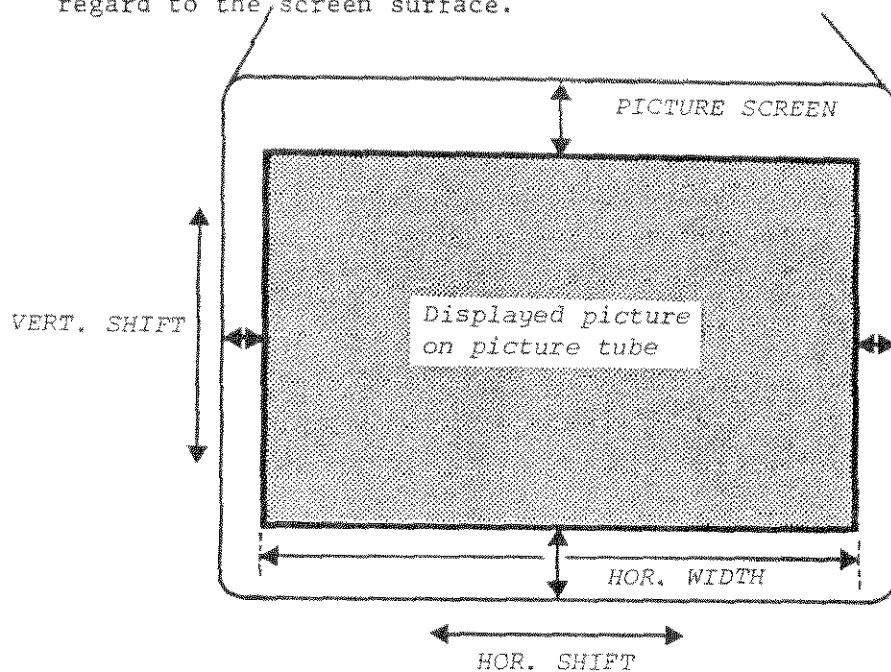
2. ON PROJECTION SCREEN

- Adjust brightness and contrast control for picture display on the screen.
- Proceed to the following adjustments :

    Important : In order to accomplish the following adjustments, first proceed
    to a quick picture sharpness adjustment (see procedure pages
    33/34).

    a) Horizontal center lines of the Red and Blue picture do not coincide
    with these of the Green picture.
    This error has to be eliminated by readjusting the VERT. SHIFT poten-
    tiometer for Red and Blue until coincidence is obtained.

HOR. LINES IN PICTURE CENTER
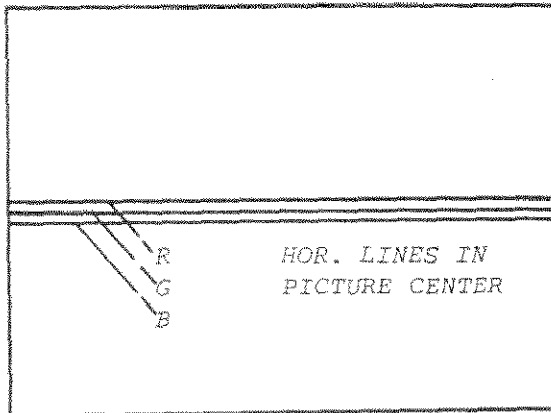
ATTENTION : Referring to the Green
picture

If the Green picture is projected
too low or too high on the screen
surface, first adjust the VERT.
shift of Green for correct position
of the Green picture on the screen.

Then proceed to the above-mentioned
adjustment (2 a)).

VERT. SHIFT

- RED
- BLUE
- GREEN
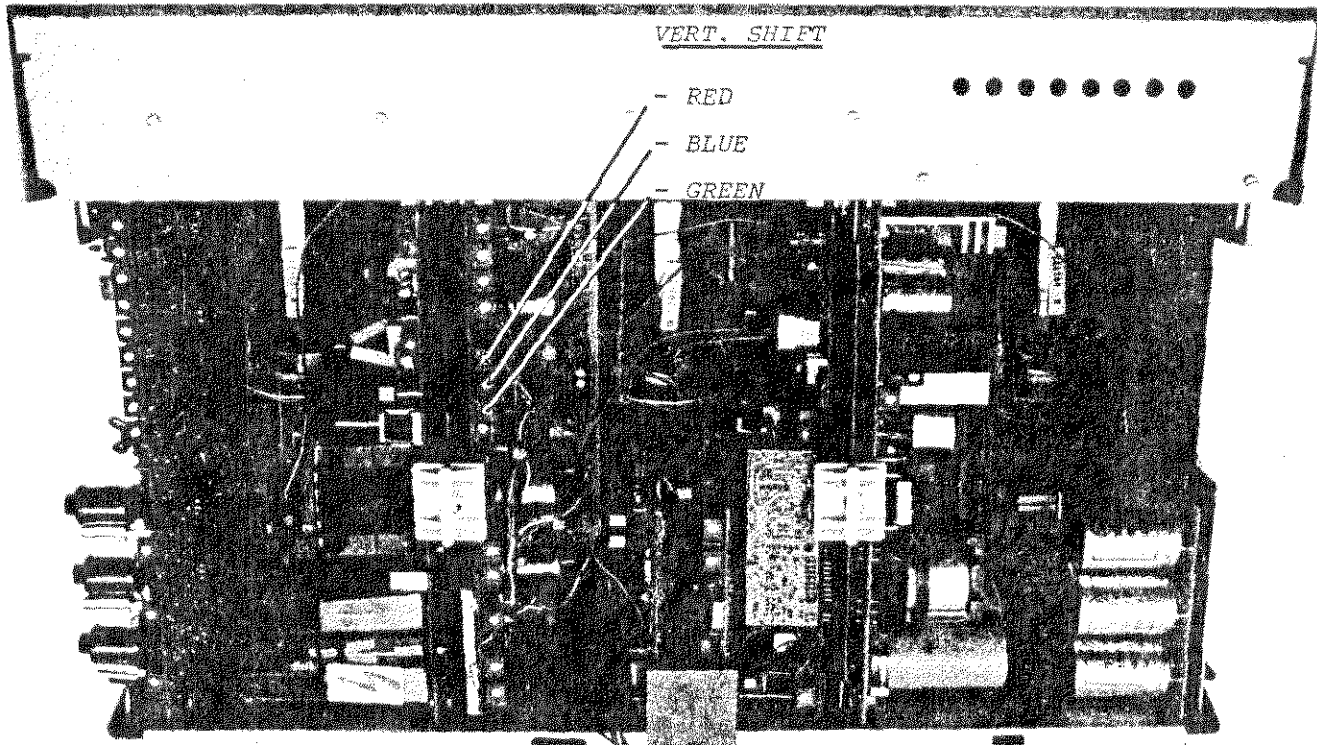
    b) Vertical center line of the Red and Blue picture doesn't coincide with
    this of the Green picture.
    This error has to be eliminated by readjusting the projection angle
    of the Red and Blue picture tube.

UNIT "LENS-PICTURE TUBE" MOVEMENT

PROJECTOR

PROJECTION SCREEN

VERT. LINE
GREEN
BLUE
RED
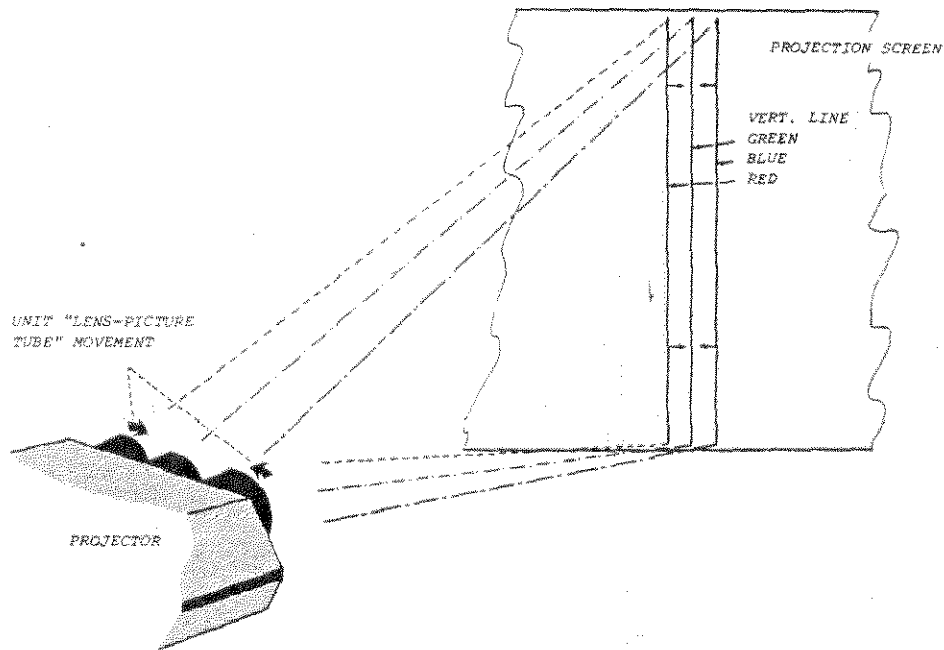
Proceed as follow :

- loosen the four screws (A) fastening the cooling house of the red and blue picture tube.

- now you can move the two outside "lens-picture tube unit" slightly in a horizontal plane.

- proceed to this correction until the vertical center line of the red and blue displayed picture coincides with this of the green.

Bottom view

Top view
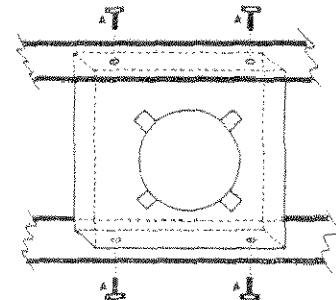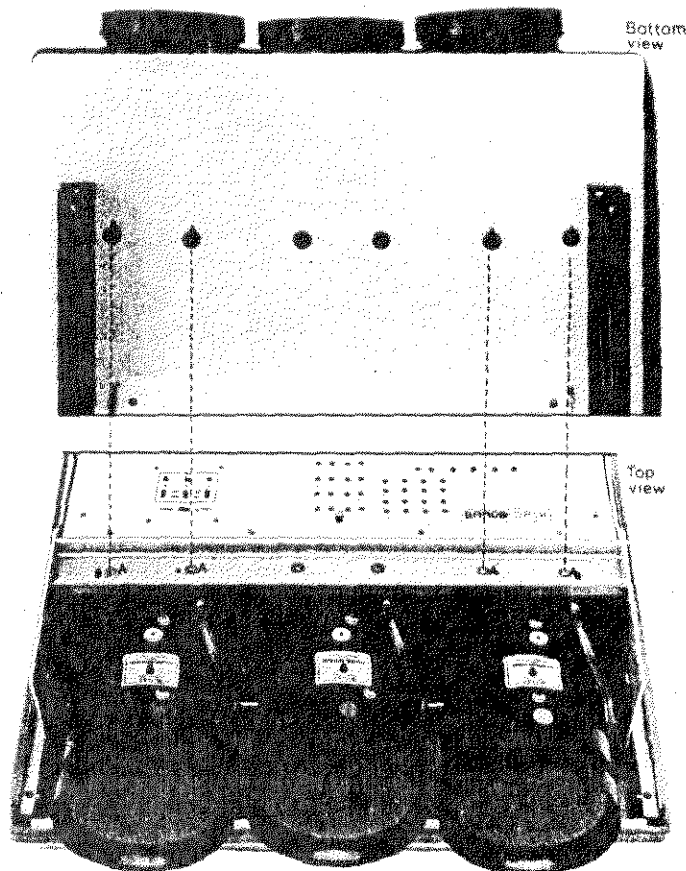
- Secure the right projection angle of the Red and Blue "picture tube / lens" by fastening the corresponding screws A.

a) *Common adjustments*

These adjustments have to be done only on one colour picture, e.g. green picture, because the other colour pictures are automatically corrected in the same way.
(switch OFF the Blue and Red picture, putting the respective G-2 switch in the OFF position).

1. *VERTICAL LINEARITY and AMPLITUDE :*

Adjust vert. linearity control for vertical equal size of crosshatch squares on the projected screen.
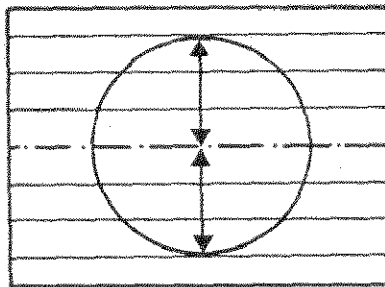
Adjust vertical amplitude control for correct ratio width-height 4 by 3.

$$\frac{W}{H} = \frac{4}{3}$$
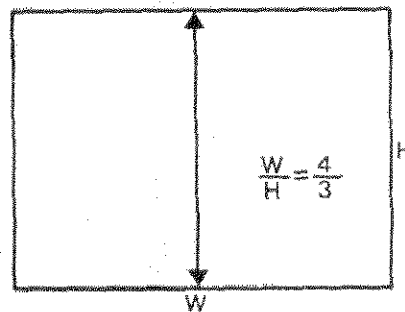
VERTICAL LINEARITY   VERTICAL AMPLITUDE
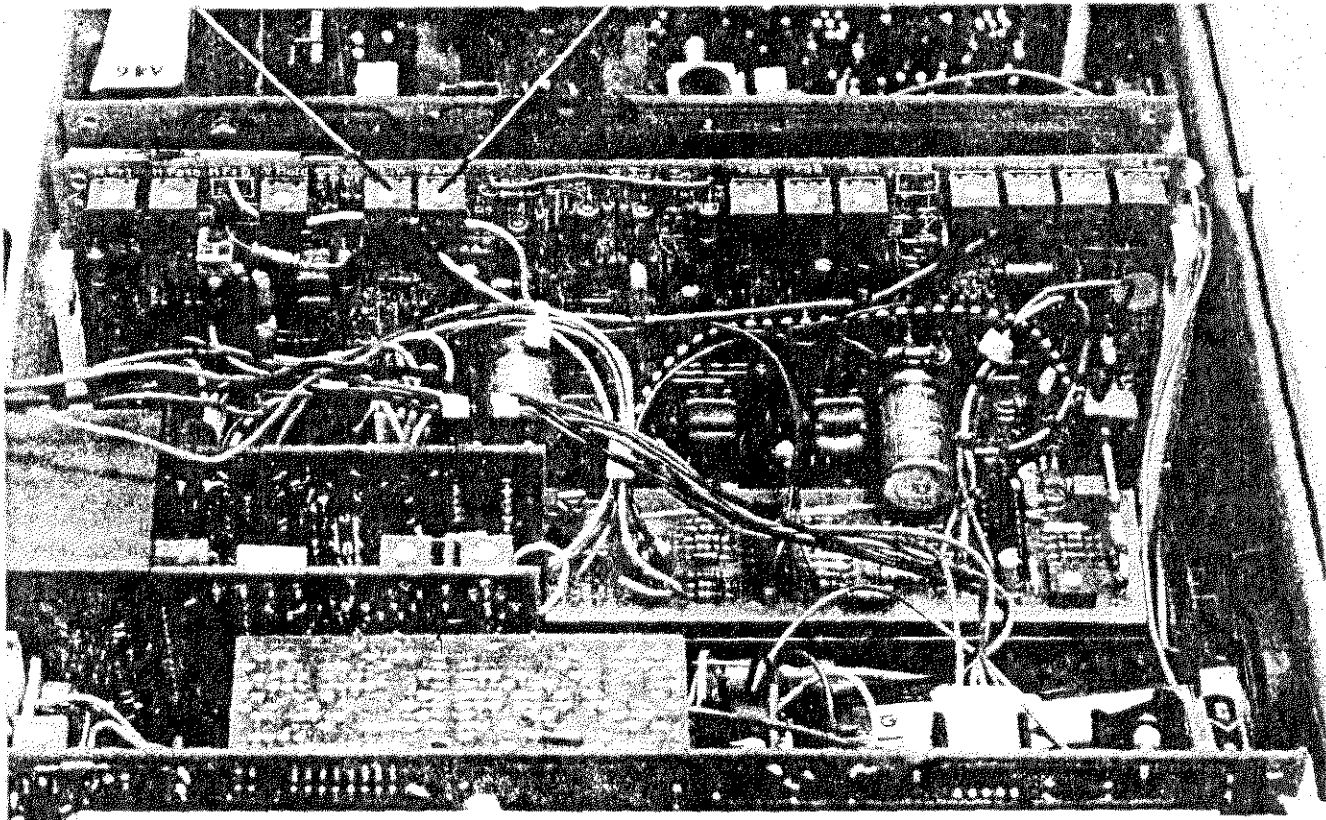
2. HORIZONTAL LINEARITY and AMPLITUDE

IMPORTANT : Before proceding to the following adjustments, first
adjust "Horizontal picture width" (see page 31).

Adjust hor. linearity control
for horizontal equal size of
the crosshatch squares on the
projection screen.
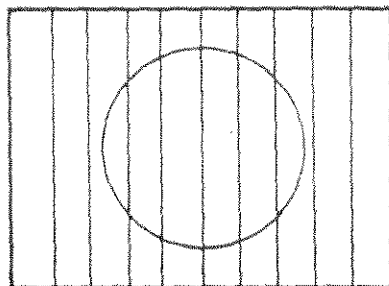
Adjust hor. amplitude I control
for correct ratio width-height
4 by 3.

HOR. LINEARITY
L1

$$\frac{W}{H} = \frac{4}{3}$$

HOR. AMPLITUDE

HORIZONTAL AMPLITUDE II   HORIZONTAL AMPL. I
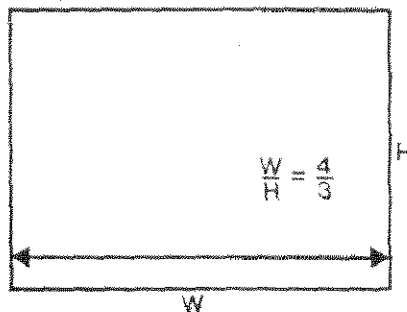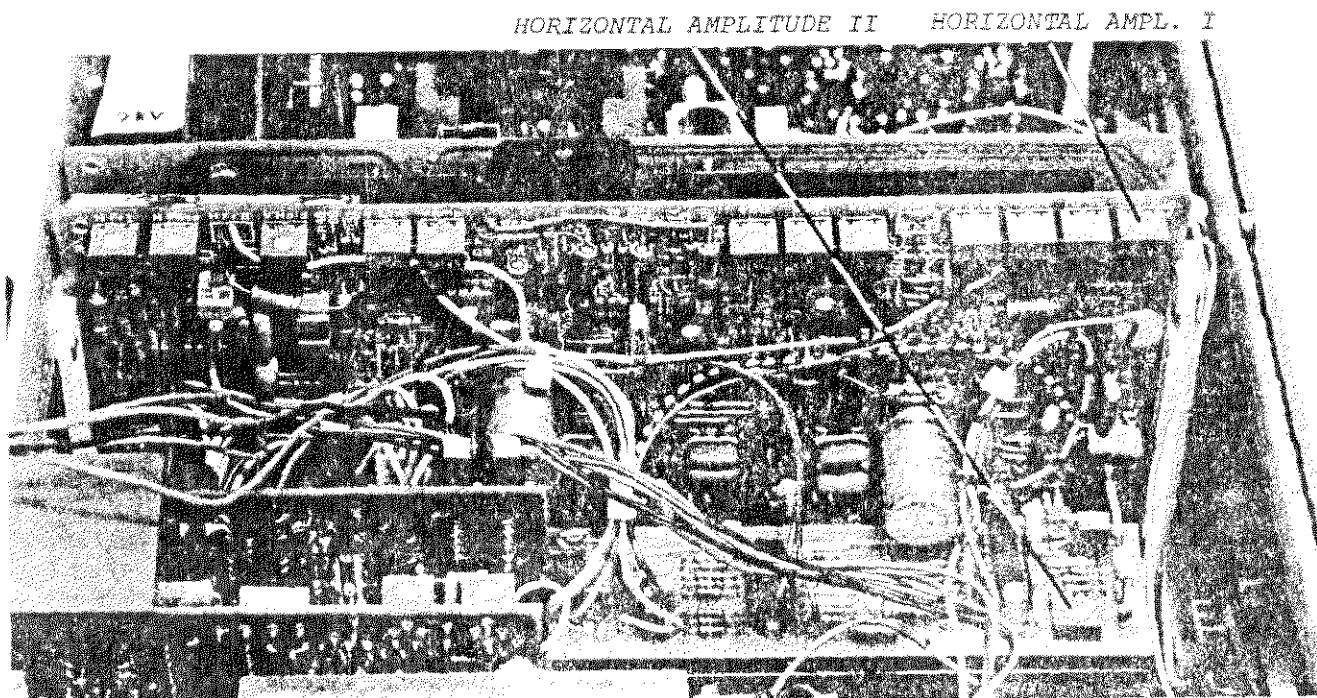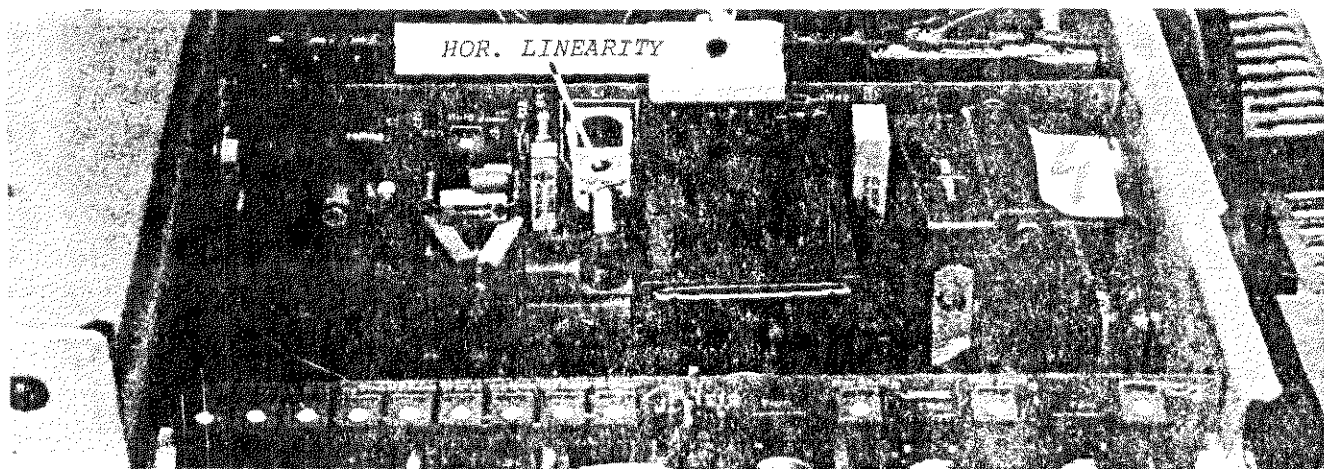
Remark : Adjustment of HOR. AMPL. II (on SYNC + VERT DEFL. BOARD) :
correction of the Hor. amplitude in the FII operation mode
(to be adjusted on the highest line frequency)
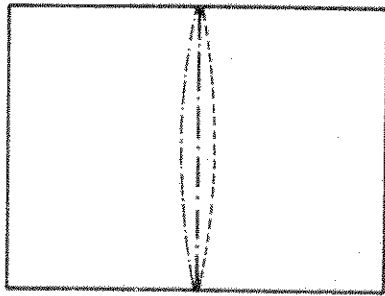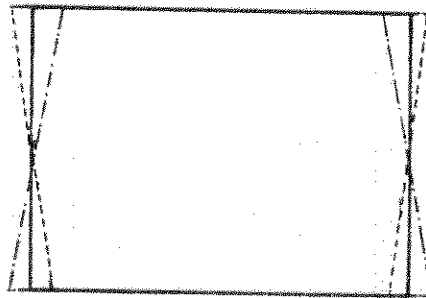
HOR. BOW   TRAPEZOIDAL DISTORSION   PIN CUSHION CORRECTION

TRAP. DIST.   BOW   PCC
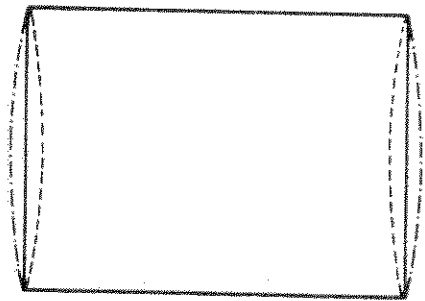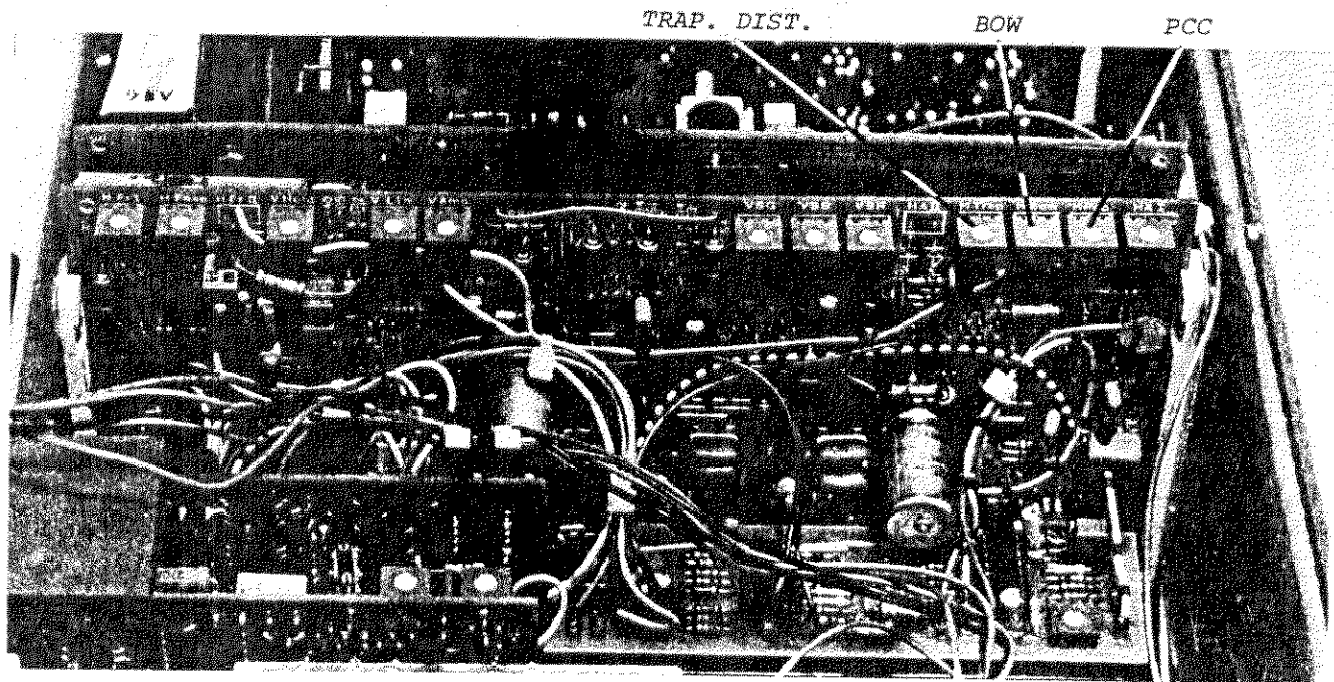
b) *Adjustment for each colour picture*

The following picture geometry adjustments have to be done separately for each tube.

Important : For the two following adjustments, do not forget to disconnect the convergence board from the motherboard by pulling out the respective connector (see : picture centering).
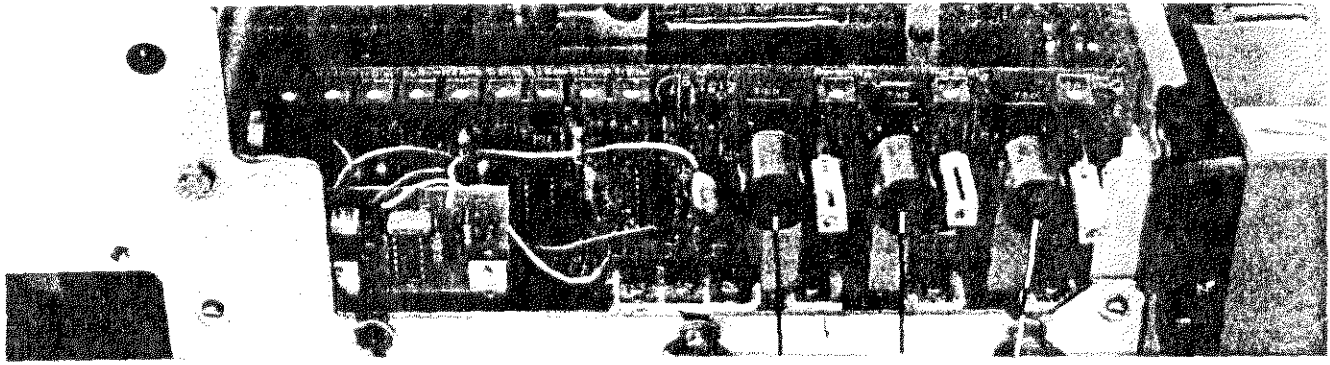
1. *HORIZONTAL PICTURE WIDTH*

Adjust the coils T100 for Red, T90 for Green and/or T80 for Blue in order to obtain the same picture width for each projected picture. *TAKE CARE THAT ALWAYS ONE OF THE CORES OF THE THREE COILS IS FULLY TURNED IN.*

Practical experience : Core of the coil for Red fully turned in. Adjust the two other coils for same picture width as for Red.
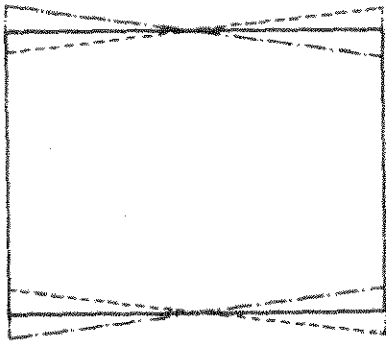

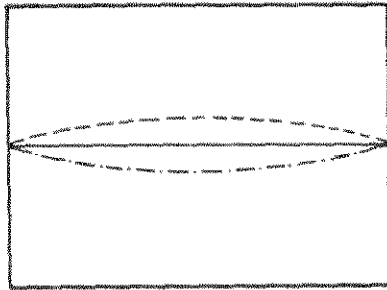R G B
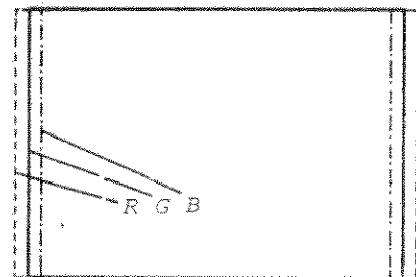
PICTURE WIDTH

RED   GREEN   BLUE

HOR. WIDTH

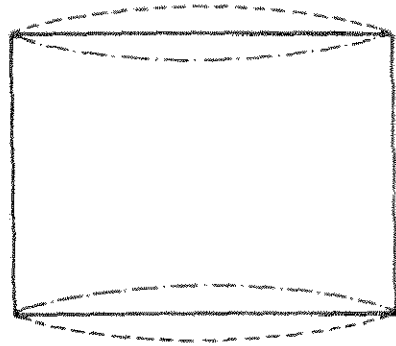2. Vert. corrections : TRAP. DISTORSION - BOW - NORTH/SOUTH AMPLITUDE

TRAPEZOIDAL DISTORSION   BOW   NORTH/SOUTH AMPLITUDE
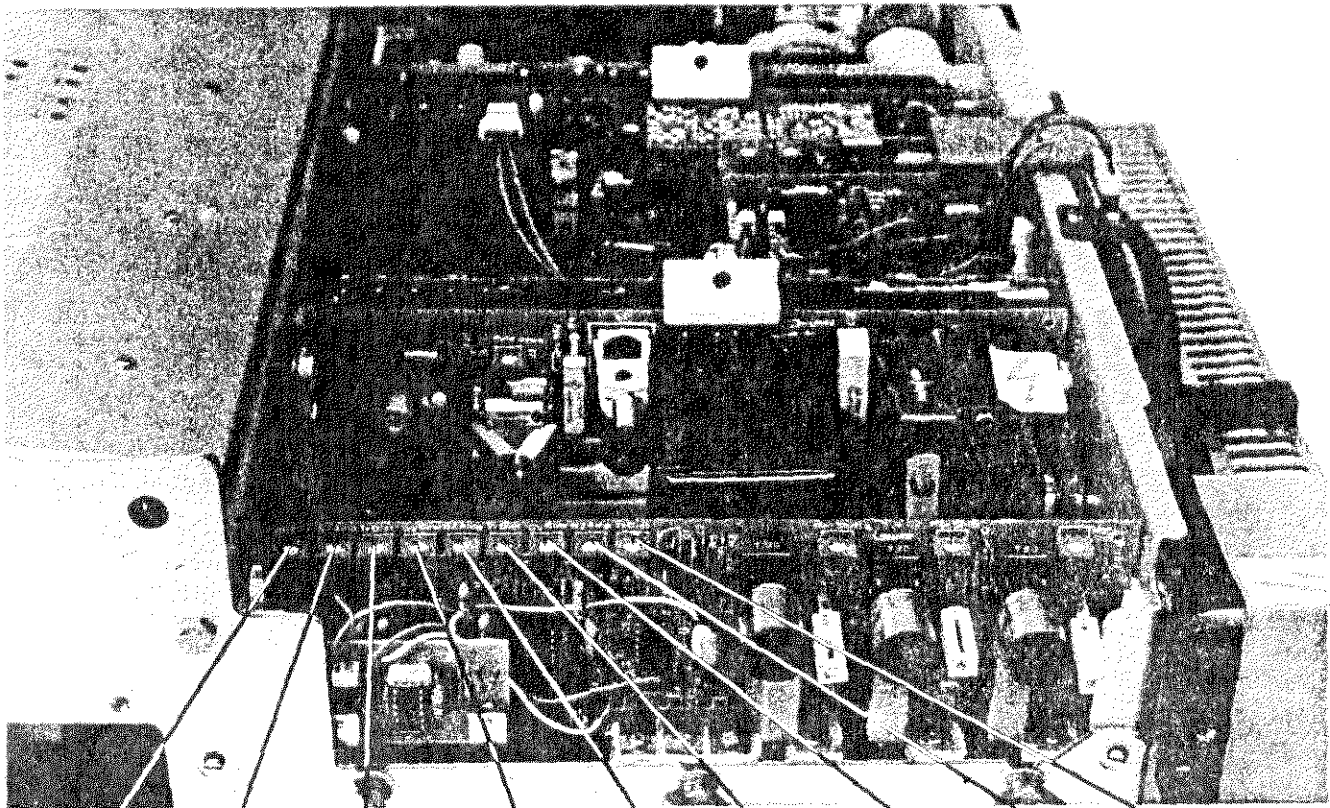

BOW   N/S   TRAP.   BOW   N/S   TRAP.   BOW   N/S   TRAP.
              DIST.   DIST.   DIST.
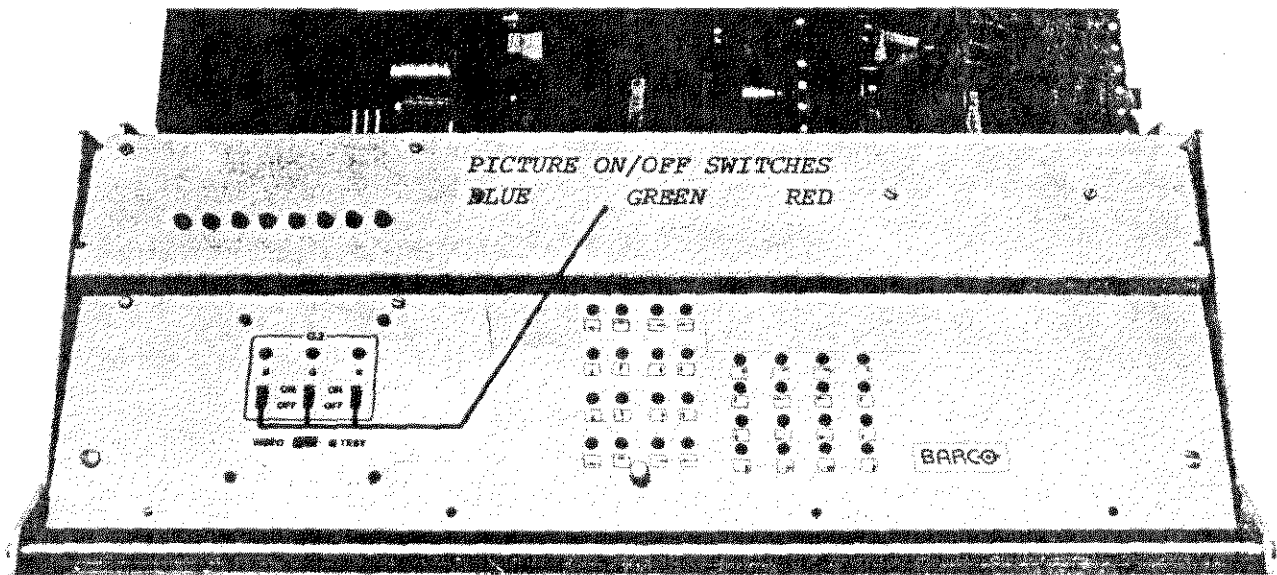
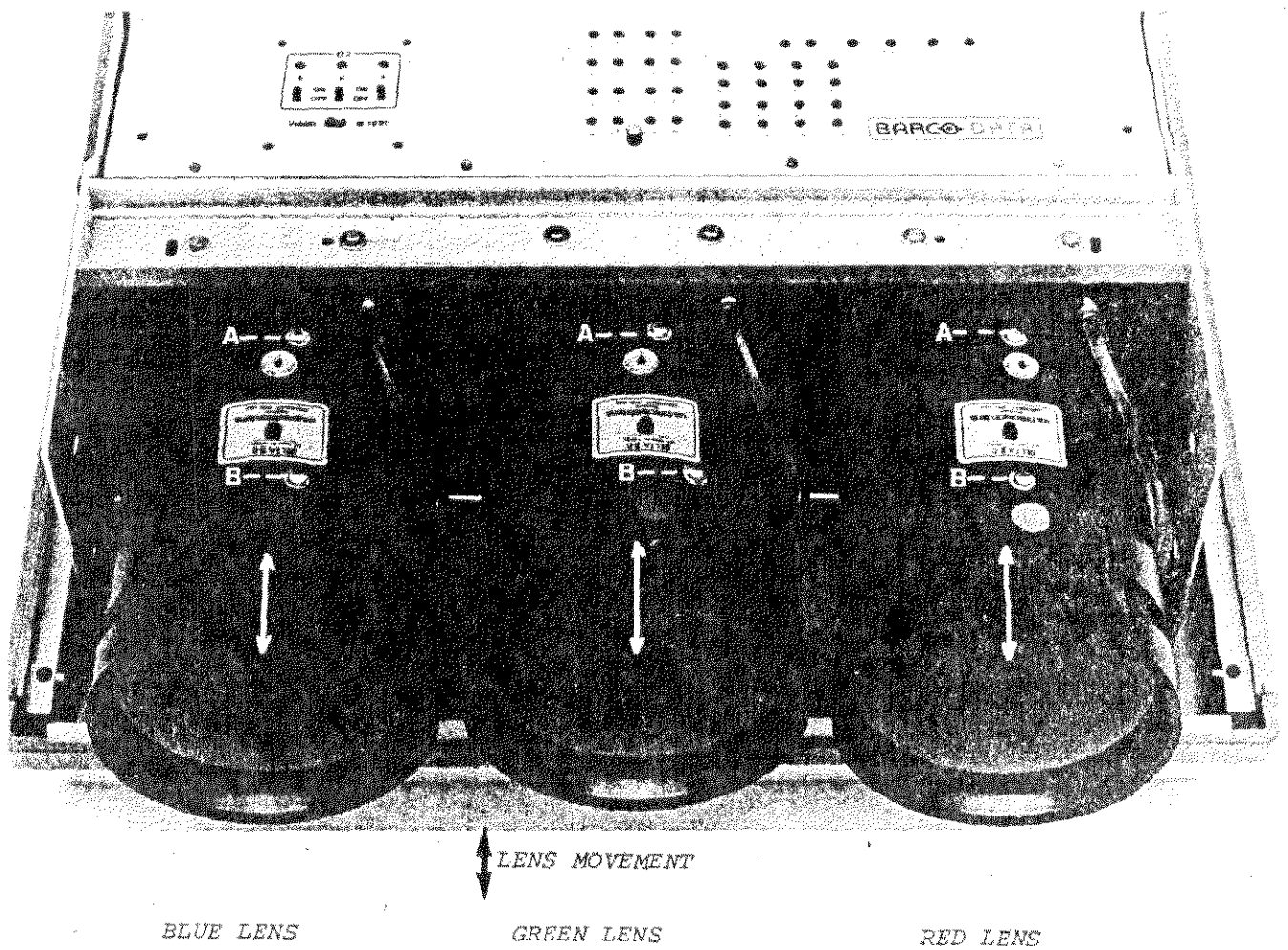BLUE PICTURE   RED PICTURE   GREEN PICTURE

C. PICTURE SHARPNESS ADJUSTMENT

The following adjustments have to be done separately for each colour.
Each colour picture can be switched OFF by means of the respective G2-switch.

1. Lens focus adjustment

LENS MOVEMENT

BLUE LENS   GREEN LENS   RED LENS

a) *Mechanical focussing in the MIDDLE of the screen*

- loosen screw A on each lens unit (be sure that screw B is fastened).

- adjust the lens of Green, Red and Blue separately for the sharpest picture on the screen.

- secure the exact position of each lens by tightening lens screw A.

b) *Mechanical focussing in the CORNERS of the screen*

- loosen screw B on each lens unit (be sure that screw A is fastened).

- adjust the lens of Green, Red and Blue separately for the sharpest picture on the screen.

- secure the exact position of each lens by tightening lens screw B.

2. *Electrical focussing*

Important : Electrical focus adjustment has to be done with a reduced contrast and brightness level (e.g. contrast and brightness controls in their medium position).

THIS ADJUSTMENT CONTROL IS FACTORY SET AND NEEDS NO READJUSTMENT.

RED   GREEN   BLUE

ELECTRICAL FOCUSSING
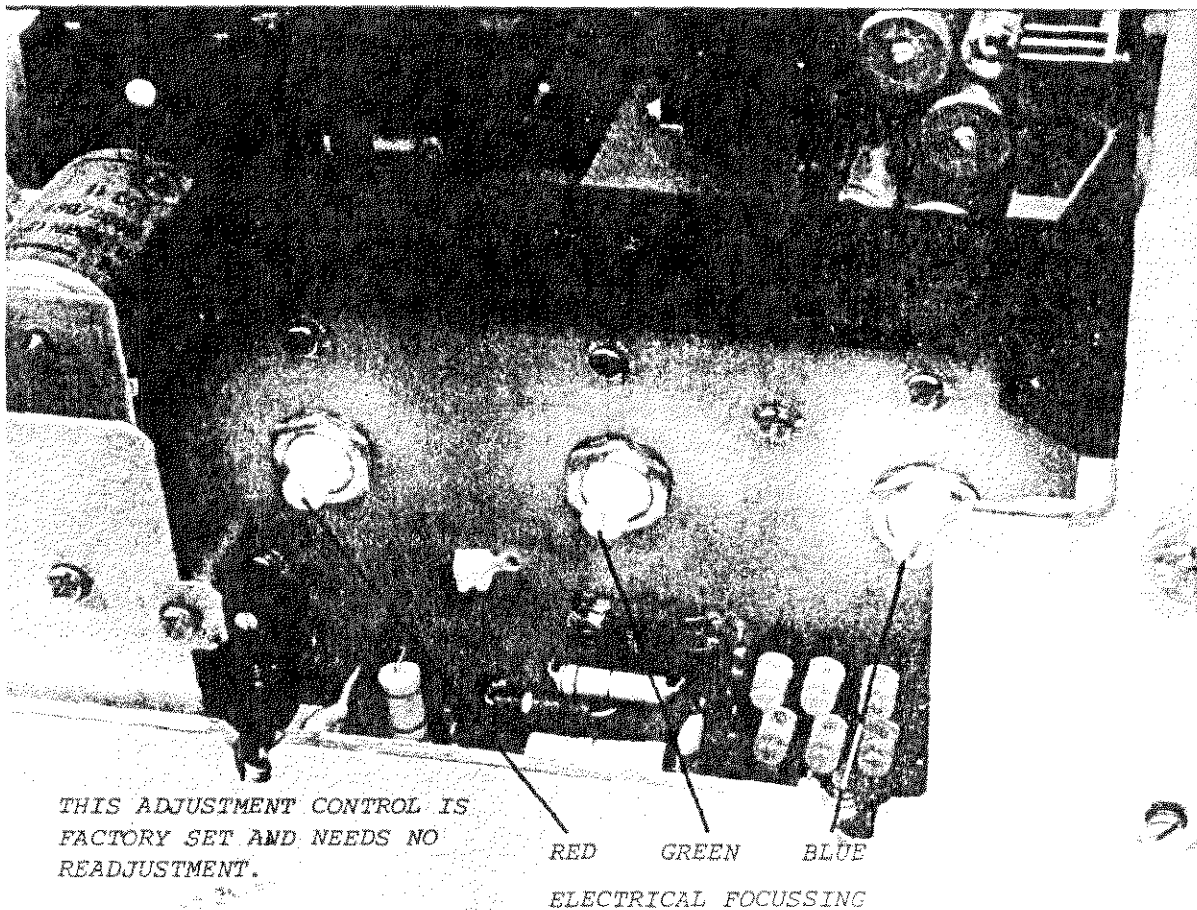
Adjust the focus potentiometer for RED, GREEN and BLUE for sharpest picture on the screen.

NOTE : To be sure that maximum picture sharpness is obtained, look on the screen if scanning lines structure is sharp in the respective area.

B(D2h)

D. CONVERGENCE ADJUSTMENT

Before starting the convergence adjustments, let the projector warm up for
at least 15 minutes.

Attention ! - If you did follow the "service adjustments and alignments" from
the beginning, do not forget now to plug in the convergence
connector onto the frame.
- Convergence adjustments have to be done on standard frequency
(switch Fstd/Fadj in the Fstd position).

I. Static convergence (center screen)

convergence module
not connected

convergence module
connected
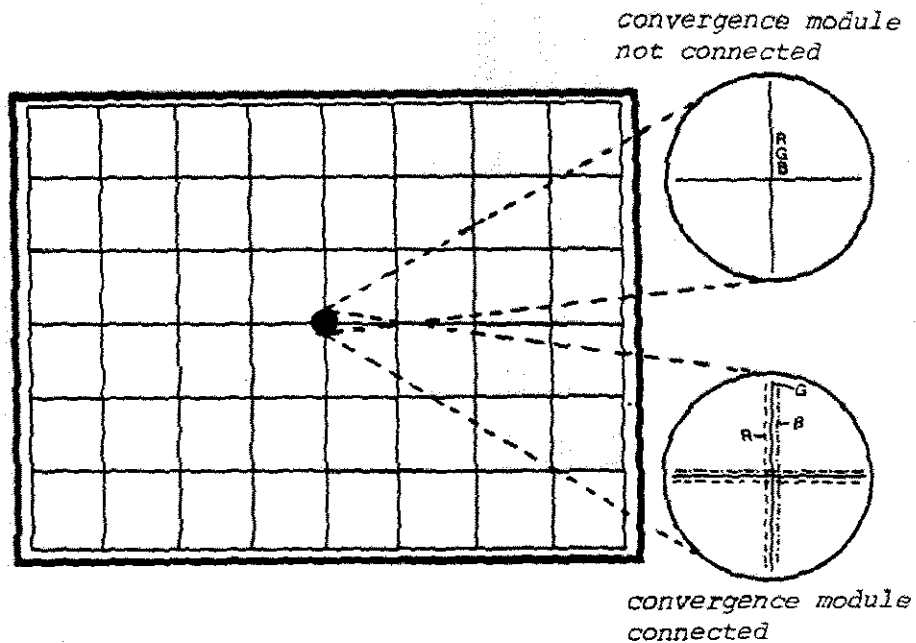
After re-connection of the convergence module to the frame, eventual mis-
convergence in the center of the cross-hatch picture can be re-adjusted
by means of the vert. & hor. shift controls.

Important : Converge blue and red on green in the center of the picture
without touching the shift controls for green.

HOR. SHIFT   VERT. SHIFT

- RED   - RED
- GREEN   - BLUE
- BLUE   - GREEN

B(D2b)
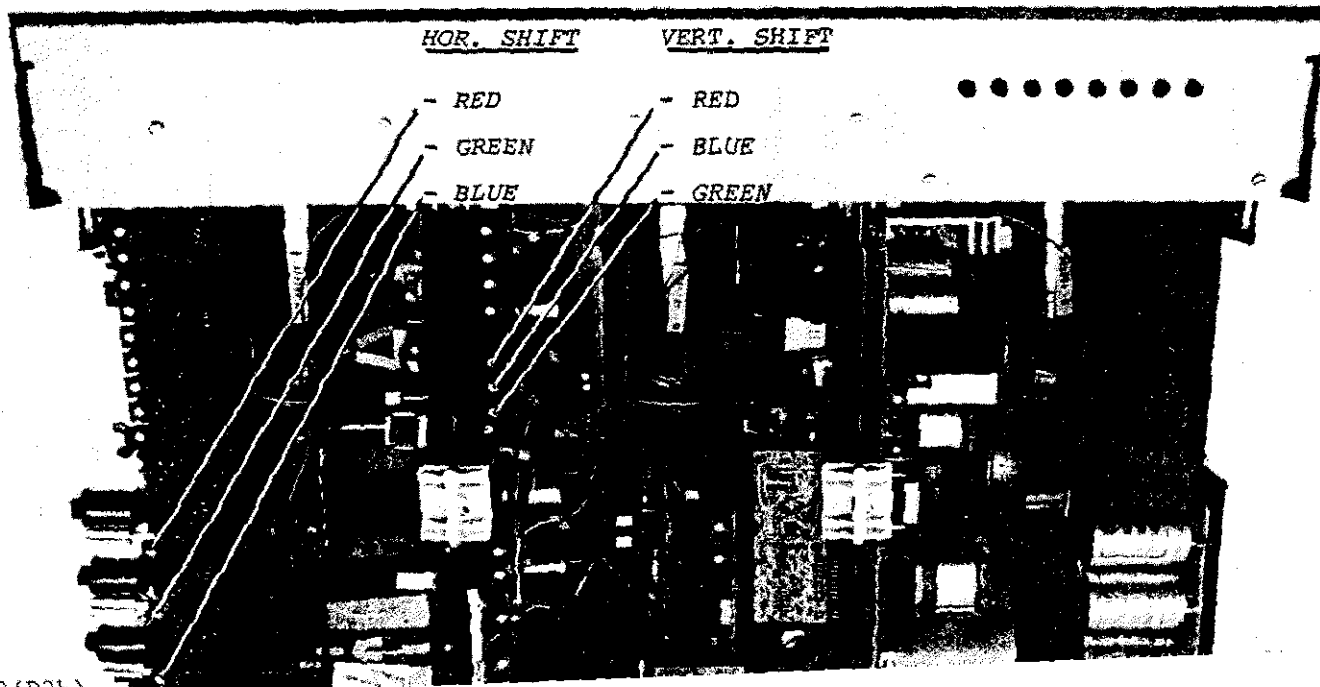
II. Dynamic convergence

The convergence control uses the split screen principle; by dividing the screen picture into 9 picture zones of equal size, each colour can be perfectly adjusted in each zone without adversily affecting convergence in any of the other zones.

Proceed as follow :

1. *Vertical and horizontal convergence of the red and green picture.*

   - switch OFF the Blue picture (corresponding G2-switch in the OFF position).

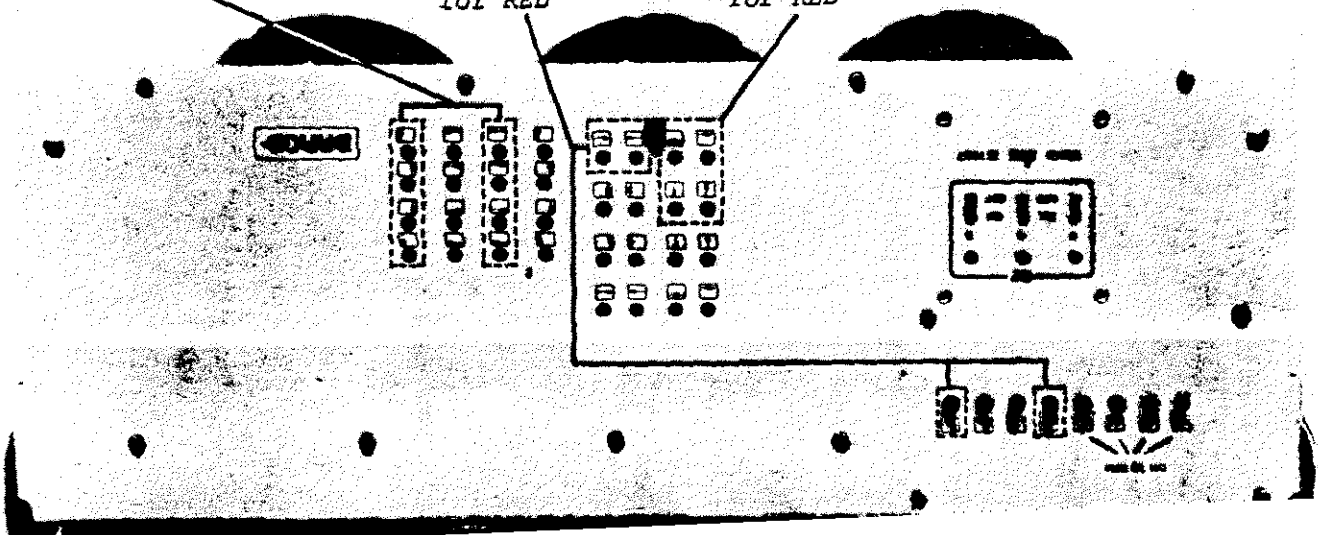   - converge the Red picture on the Green picture in the following order :
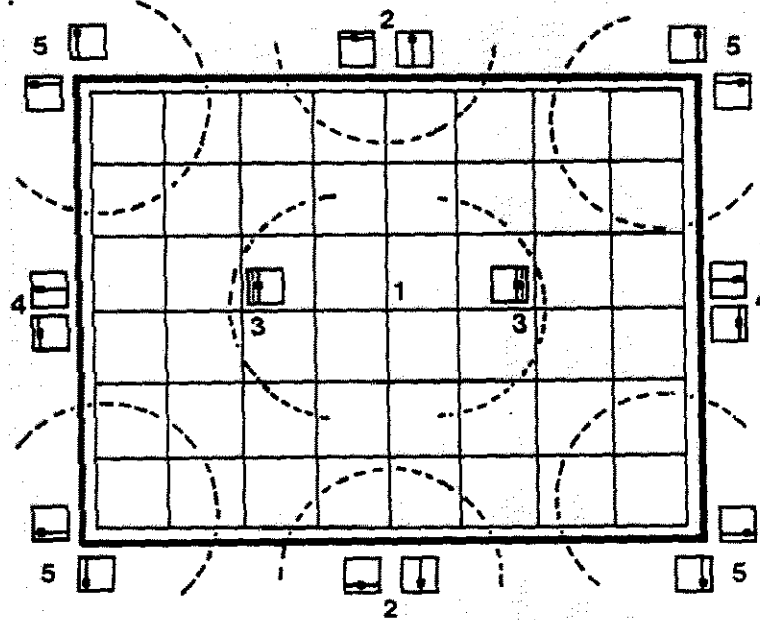
Important : Adjust the horizontal left and right convergence control for Red until correct convergence is obtained for the vertical lines on approx. 1/4 picture width distance from the outsides of the picture.

5 Corner convergence
  Vert.   Hor.
      for RED

3 Vert & Hor
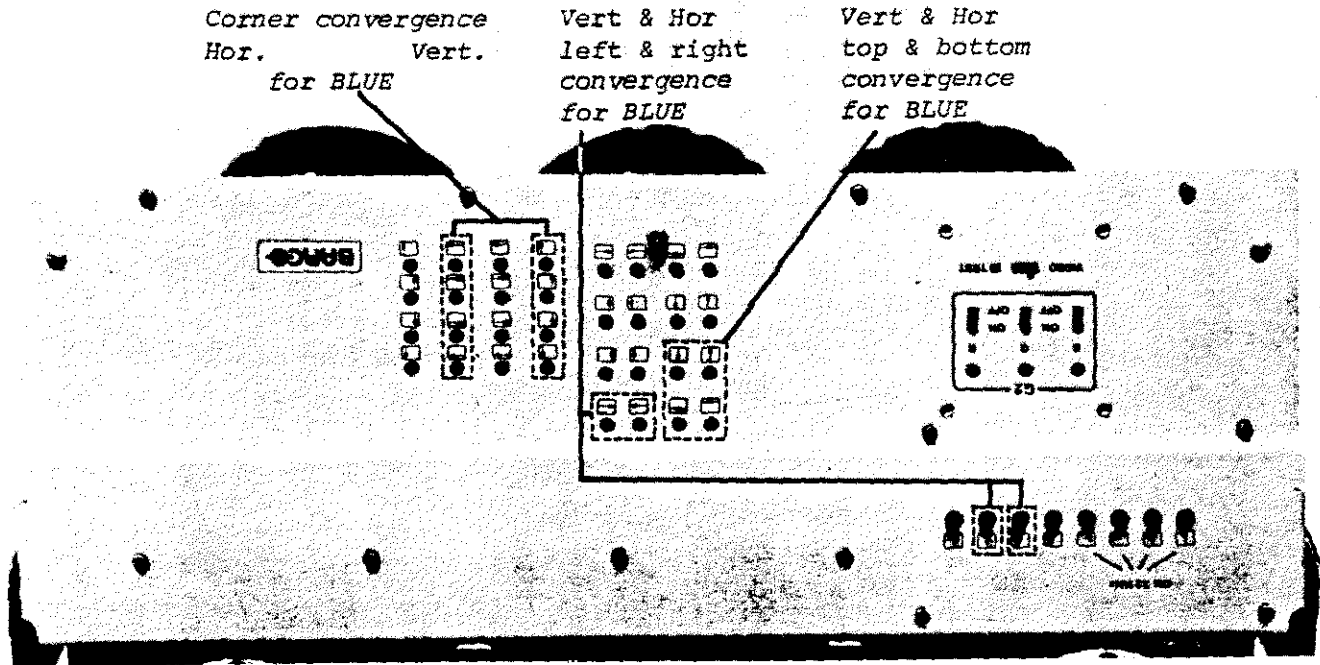4 left & right
  convergence
  for RED

2 Vert & Hor
  top & bottom
  convergence
  for RED

2. *Vertical and horizontal convergence of the Blue and Green picture.*

   - switch OFF the Red picture (corresponding G2-switch in the OFF
     position).

   - converge the Blue picture on the Green picture in the same manner
     as preceding, using the blue dynamic convergence controls.

   Important : Adjust the horizontal left and right convergence control
               for Blue until correct convergence is obtained for the
               vertical lines on approx. 1/4 picture width distance from
   the outsides of the picture.

Corner convergence   *Vert & Hor*   *Vert & Hor*
Hor.   Vert.   *left & right*   *top & bottom*
     for BLUE   *convergence*   *convergence*
                          for BLUE   *for BLUE*

   - switch ON the Red picture.

3. *Additional convergence for the vertical lines of Red and Blue on the
   left and right outside of the picture.*
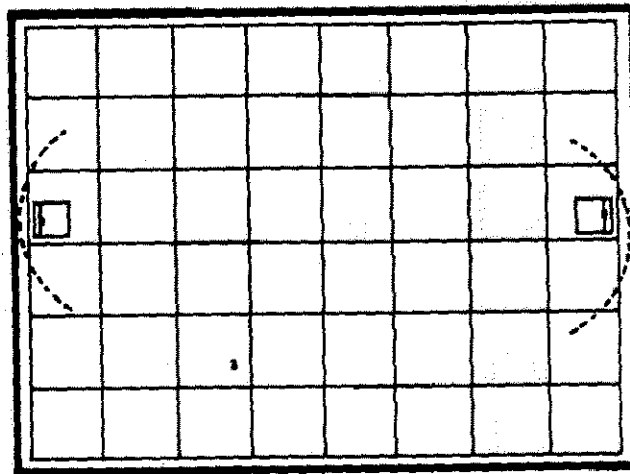
   Converge the red and blue vertical lines on the left and right outside
   of the picture by means of the corresponding controls.

4 HOR. CONVERGENCE VERTICAL LINES
ON THE LEFT AND THE RIGHT SIDE
BLUE   RED
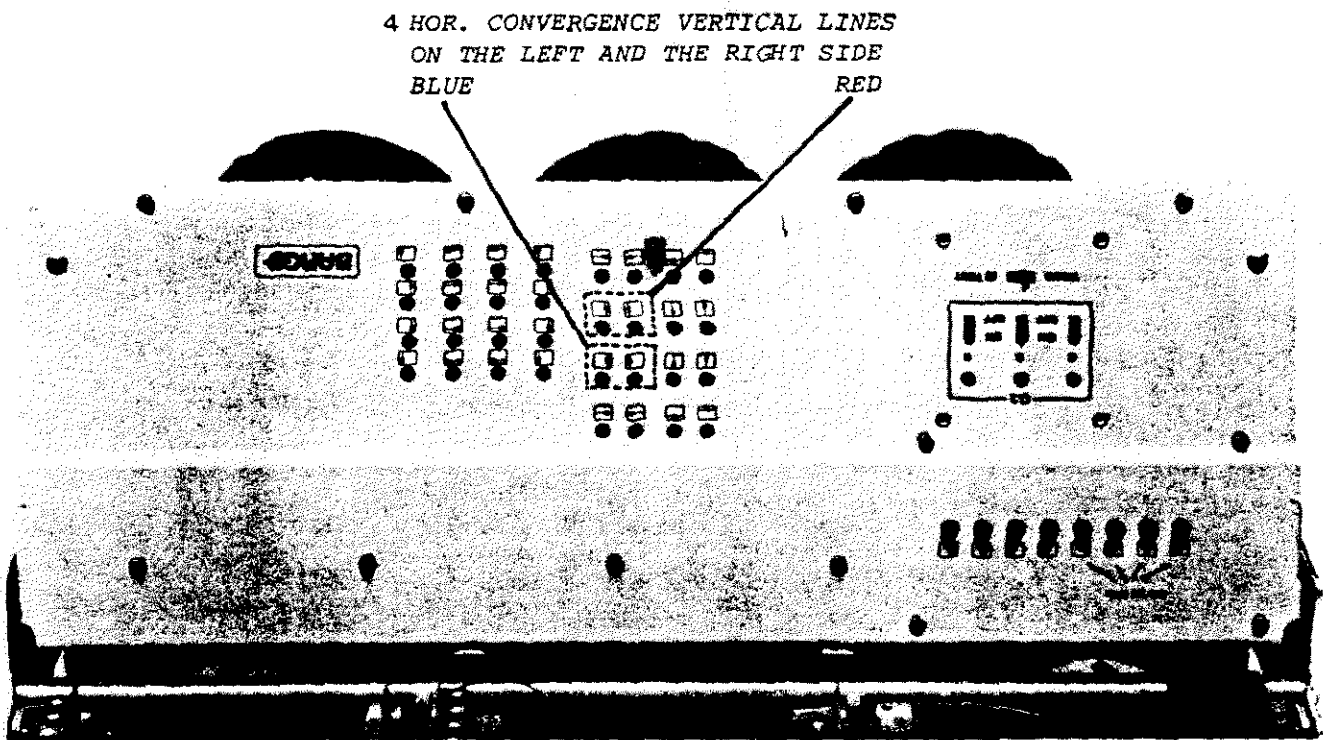
4. *Additional convergence for Red and Blue when operating on high line frequency (switch Fstd/Fadj in the Fadj position).*
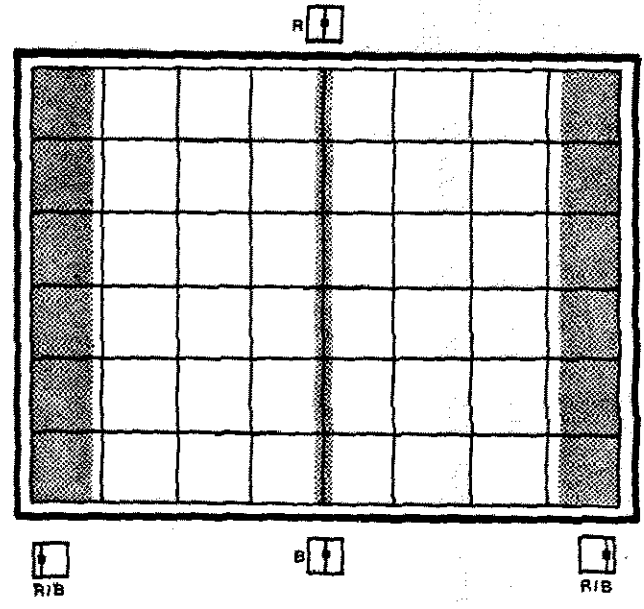

a) *Hor. static control for Blue and Red*

Adjust the Hor. static control for Blue and Red, so that respectively the red vertical and blue vertical center line converges with the green vertical center line.

b) *Hor. dynamic control for Red/Blue at the most left and right side of the picture.*

This convergence controls converge the Red/Blue vertical lines on this of green at the most left and right side of the picture.

ADDITIONAL RED-BLUE CONVERGENCE
WHEN OPERATING ON THE HIGHEST
LINE FREQUENCY ($\approx$ 32 kHz)
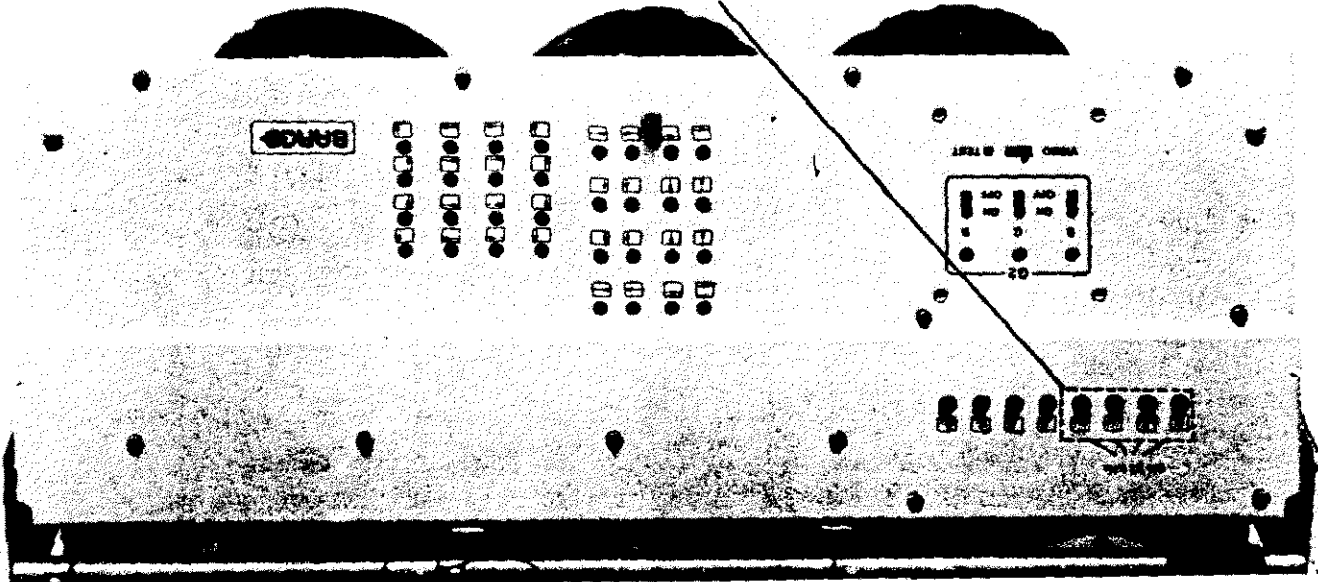
E. CUT-OFF ADJUSTMENT (GREY SCALE BALANCE)

- place the switch VIDEO/TEST in the position VIDEO.
- put in a standard colour bar test pattern signal to the video input of the projector, e.g. from a test pattern generator.
- place the brightness and contrast control in their mid-position.
- place the colour saturation control in its minimum position.
- switch OFF the blue and the red gun (G2-switches).
- adjust G2 green control until the response of the black bar is black.
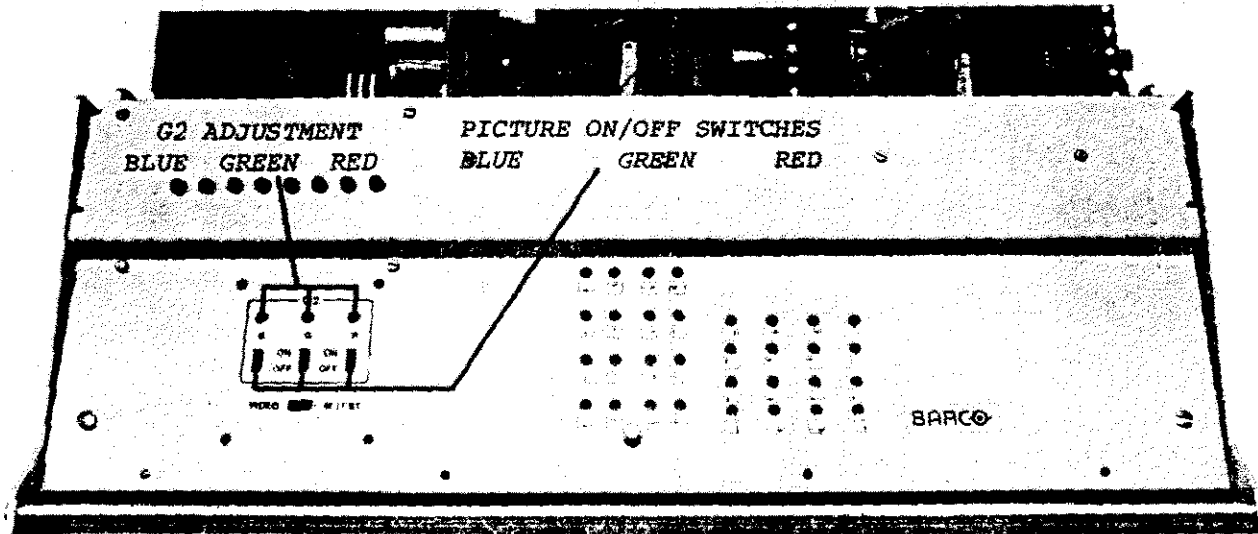
Important : The first green bar (A) must be distinguishable from the black bar.
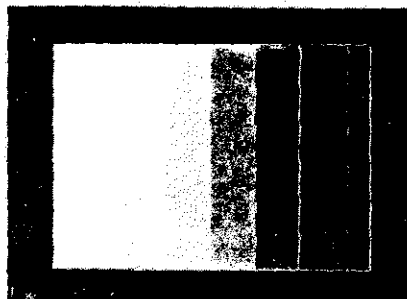
B(D2b)

On the VIDEO INPUT/CROSS-HATCH GENERATOR BOARD 76 12135 a second cross-hatch generator can be brought into operation by :

    - moving the slide switch in the position (*SYNC ON INPUT SIGNAL*)

    - changing the following connection (see fig.)
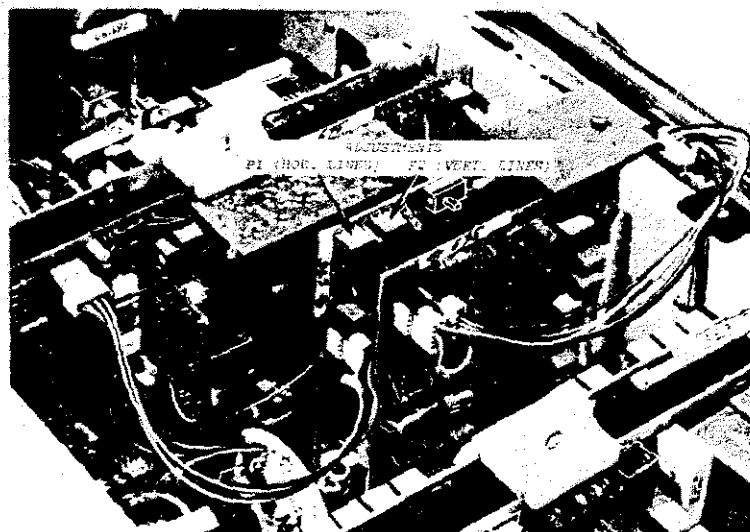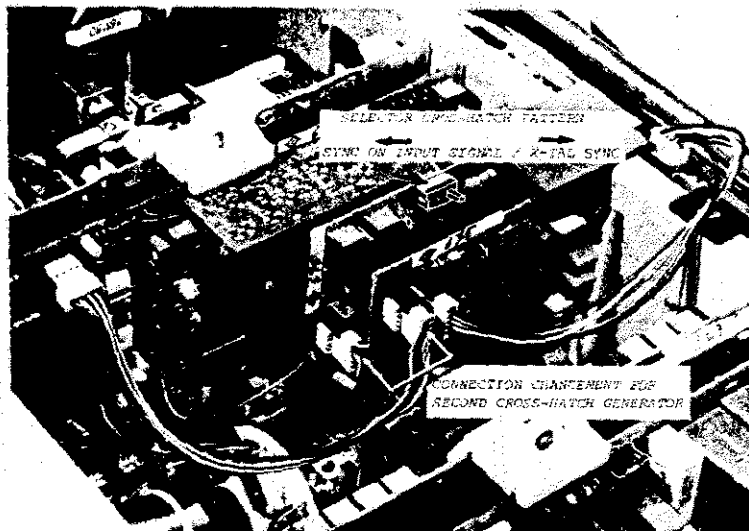
In this position a cross-hatch pattern will be displayed on the screen, SYNCHRO-NISED on the selected RGB Analog or RGB TTL input source.

Adjustments :   Pot. P2 (VERT. LINES) : allows adjustment of the number of the lines.

                Pot. P1 (HOR. LINES) : allows adjustment of the number of the lines.

VERY IMPORTANT : This generator can ONLY be used to adjust convergences and is not usable for picture geometry adjustments.