# 14" COLOUR DISPLAY UNIT CDU 1448G/PH

This unit is manufactured by **PHILIPS** and bears the marking **CDU 1448G/PH** on the rear and **DSM 28-143/PS** on the Progetto di Gestione. There is also the **DSM 28-143/PS-2**, that use, at 1024x768 resolution, the Olivetti timing instead VESA.

**CHARACTERISTICS**

Ergonomic, high resolution, VGA-compatible, analog video.

- Screen dimensions: 14"
  Horizontal dimension: 250 mm ± 3 mm
  Vertical dimension: 188 mm ± 3 mm
- Input voltage: 100 - 120 V: 90 - 132 V c.a.
  220 - 240 V: 180 - 264 V c.a.
  Mains frequency: 50 - 60 Hz: 47 - 63 Hz
  Degauss: At power-on time
- Presetting timing

| VIDEO MODE | UNIT OF MEASURE | VGA STANDARD | | | VGA ERGO | SUPER VGA1 | SUPER VGA2 | SUPER VGA + |
|---|---|---|---|---|---|---|---|---|
| **HORIZONTAL RESOLUTION** | DOTS | 640 | | | 640 | 800 | 800 | 1024 |
| **FREQUENCY** | KHz | 31.469 | | | 37.86 | 48.077 | 37.87 | 48.363 |
| **VERTICAL RESOLUTION** | LINES | 350 | 400 | 480 | 480 | 600 | 600 | 768 |
| **FREQUENCY** | Hz | 70.08 | 70.08 | 59.95 | 72.8 | 72.19 | 60.3 | 60 |
| **V/O POLARITY** | | -/+ | +/- | -/- | -/- | +/+ | +/+ | -/- |
| **LEVEL** | | TTL | TTL | TTL | TTL | TTL | TTL | TTL |

- Input signals:
  Video: R, G, B (Red, Green, Blue) driving
  Signal: depend by the video controller (i.e.: voltage steps)
  Level: 0 - 700 mV
  Polarity: Positive
- External controls: Brightness - Contrast - Horizontal size - Vertical size - Horizontal shift - Vertical shift
- Power saving function

| VIDEO STATUS | HORIZ. SYNC. | VERT. SYNC | VIDEO | POWER. SAV. | CONSUMPTION |
|---|---|---|---|---|---|
| On | Present | Present | Active | No | 80 W |
| Stand-by | Not present | Present | Dark | Minimum | < 68 W |
| Pending | Present | Not present | Dark | Considerable | < 15 W |
| Off | Not present | Not present | Dark | Maximum | < 15 W |

## REMOVING THE CASING AND DISASSEMBLY

1. Switch the unit off by its ON/OFF button. Also switch off the system it is connected to. Disconnect the signals cable from the system and the power cord from its connector on the monitor.

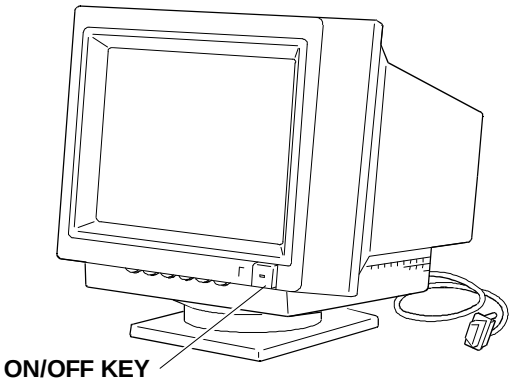



Fig. 25-1 CDU 1448G/PH Display Unit

2. Set the unit with the screen face down (after laying a sponge cloth on the work bench to prevent scoring) and unscrew the four screws securing the casing.
3. Lift the casing upwards and take the video signals cable through its hole in the cover.

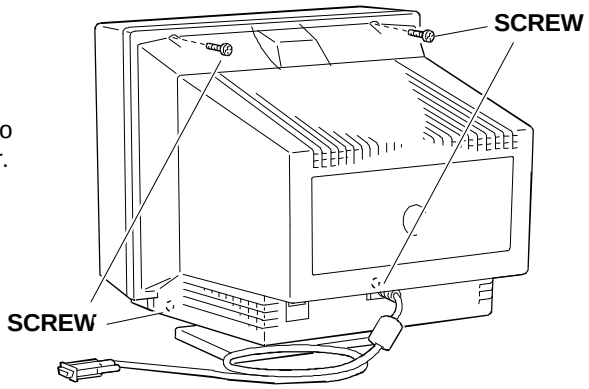



Fig. 25-2 Removal of Display Casing Fixing Screws

### HIGH VOLTAGE DISCHARGE

4. After removing the casing and before performing any work on the unit boards and cables, the extra high tension (25 KV anode voltage) must be discharged. Use a screwdriver to discharge the CRT anode through a cable to the display chassis ground.

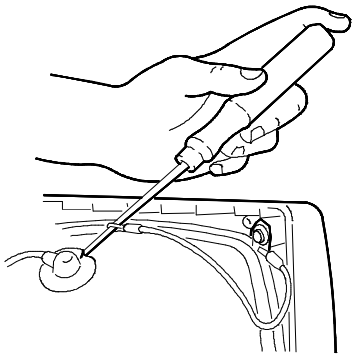


Fig. 25-3 Discharging the EHT

**REMOVING THE VIDEO AMPLIFIER BOARD AND SIGNALS CABLE**

5. Remove the layer of adhesive silicon on the connection between the CRT connector and the connector of the video amplifier board, used for monitor protection during transport.
6. Disconnect the video amplifier board from the CRT. Desolder the M702 connector providing interface to the motherboard, disconnect the M701 connector providing interface to the signals cable, disconnect the G2 (SCREEN) grid cable from M703 connector and the CRT ground cable from M704 connector).

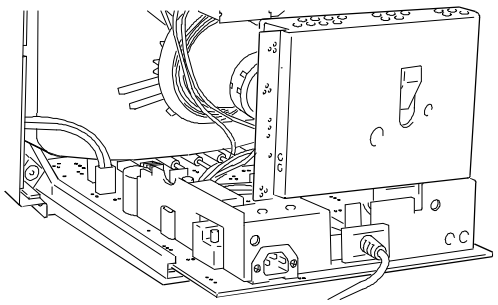


Fig. 25-4 Removing the Video Amplifier Board

7. Open the cover of grid G3 (FOCUS) and desolder the cable.
8. The video amplifier board is now free of all connectors.
9. To take the metal cover off the video amplifier board, desolder the five points where board and cover meet.

**REMOVING THE VIDEO SIGNALS CABLE**

10. To remove the video signals cable, unscrew the screw (G) fixing the metal support to the motherboard (the cable has already been removed from connector M701 on the video amplifier board).

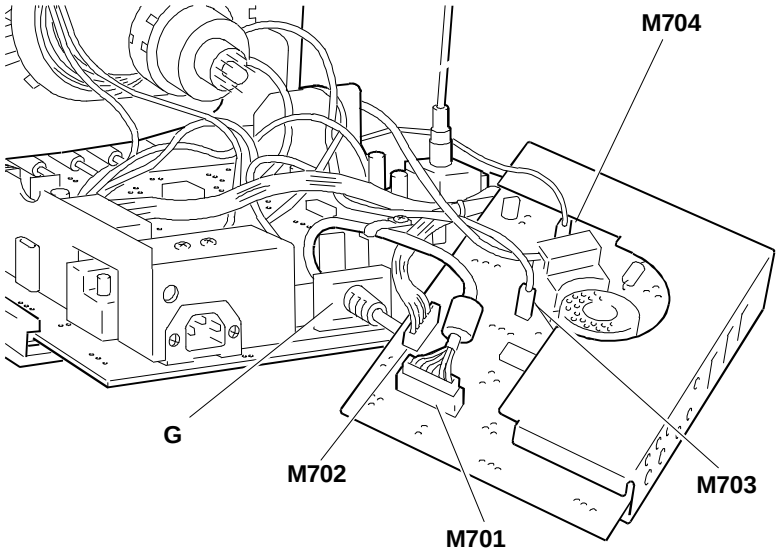



Fig. 25-5 Removing the video amplifier board, metal cover and signals cable

**REMOVING THE MAIN BOARD**

11. Be sure to discharge the EHT (25 KV) before removing the anode.
12. To remove the anode, lift up the rubber cap, squeeze the metal contacts with a pair of pliers and remove them from the hole in the CRT.
13. Remove all the cables from the motherboard connectors to free them. The connectors involved are:
    - M401 that interfaces with the deflection winding
    - F801 and F802 that interface with the video amplifier board
    - M501 that interfaces the PRESET board.

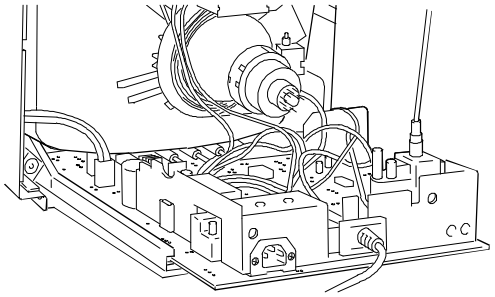


Fig. 25-6 Removing the Main Board - Phase 1

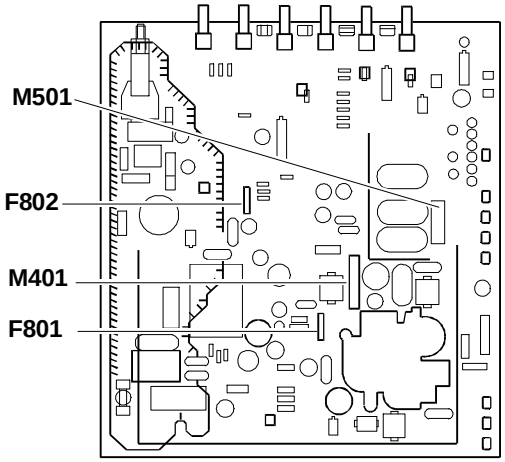



Fig. 25-7 Main Board Connectors

14. The board is now free of its connections and can be removed by sliding it along the guides in the monitor frame.

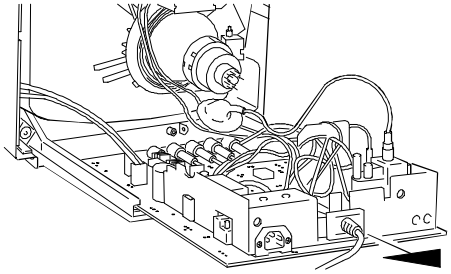


Fig. 25-8 Removing the Main Board - Phase 2

15. When replacing the motherboard, check that the metal ring (C) on the EHT anode contacts is fast against the O-ring (D) of the anode suction cap as shown in the figure to the side. This ensures sound contact between the anode connections.

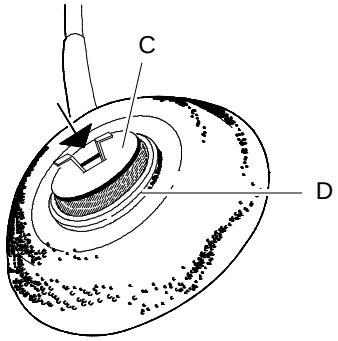



Fig. 25-9 Replacing the Anode

**REMOVING THE CRT**

**NOTE**: The CRT forms a whole with the yoke on which the deflection windings and convergency magnets are mounted. The magnets are laid on the yoke by the CRT manufacturer and must not be moved, otherwise there may be mis-convergency errors which are very difficult to correct. Spare tubes come with the yoke already assembled.

16. Unscrew the four screws (A) in the four corners securing the CRT to the front frame of the monitor.
17. Lift the CRT out of the front frame, freeing it from the degauss winding.
18. Remove the ground winding (C) from the CRT, together with its spring (D). The ground winding must be put back in place on the new CRT.

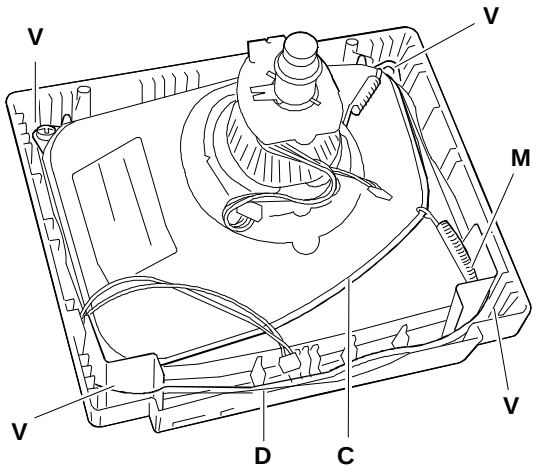



Fig. 25-10 Removing the CRT

**EXTERNAL VIDEO ADJUSTMENT**

On the CDU 1448G/PH video unit front panel there are trimmers that can be used by the user or service engineer to adjust:

- Contrast
- Brightness
- Horizontal size (H-SIZE)
- Vertical size (H-SIZE)
- Horizontal shift (H-SHIFT)
- Vertical shift (V-SHIFT)

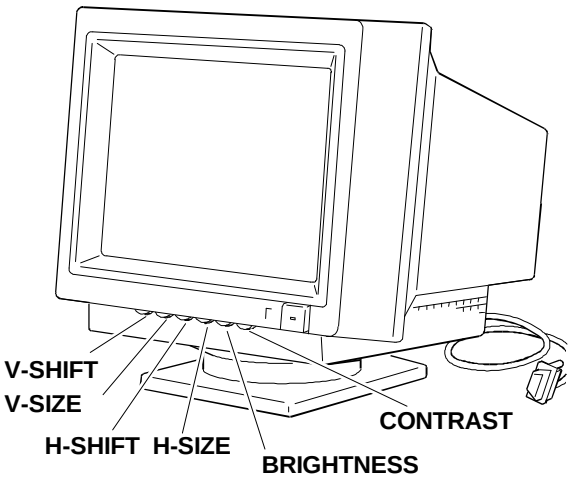
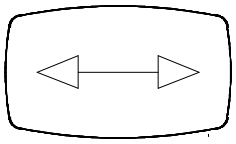


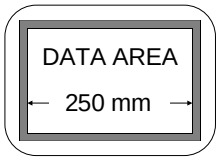

Fig. 25-11 Location of the External Control Trimmer

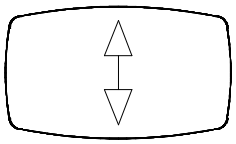
**CONTRAST** - By turning the trimmer knob to the right or the left the picture contrast is increased or decreased.

**BRIGHTNESS** - By turning the trimmer knob to the right or the left, the picture brightness is increased or decreased. When turning a "click" will be heard that indicates that the best position has been obtained (click point), if desired this point can be changed.

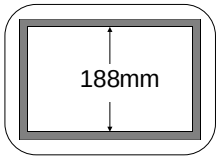


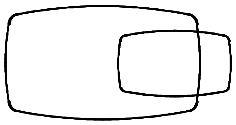
**HORIZONTAL SIZE**
Use the trimmer to obtain a picture width of 250 mm ± 3 mm.



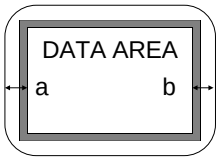



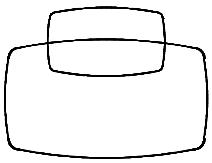
**VERTICAL SIZE**
Use the trimmer to obtain a picture height of 188 mm ± 3 mm.



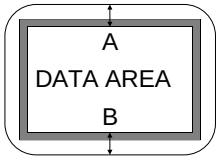



**HORIZONTAL SHIFT**
Use the trimmer to centre the picture horizontally.
|a-b|< 4 mm.



**VERTICAL SHIFT**
Use the trimmer to centre the picture vertically.
|a-b|< 4 mm.



**INTERNAL VIDEO ADJUSTMENTS**

**ADJUSTMENT TRIMMERS**

The following is a list of the trimmer to use during the video adjustments. The sequence illustrated must be followed in the order because some of the adjustments influence those coming afterwards.

**VIDEO AMPLIFIER BOARD**

| | |
|---|---|
| 3711 | Blue cut-off adjustment |
| 3741 | Red cut-off adjustment |
| 3771 | Green cut-off adjustment |
| 3763 | Green gain adjustment |
| 3703 | Blue gain adjustment |

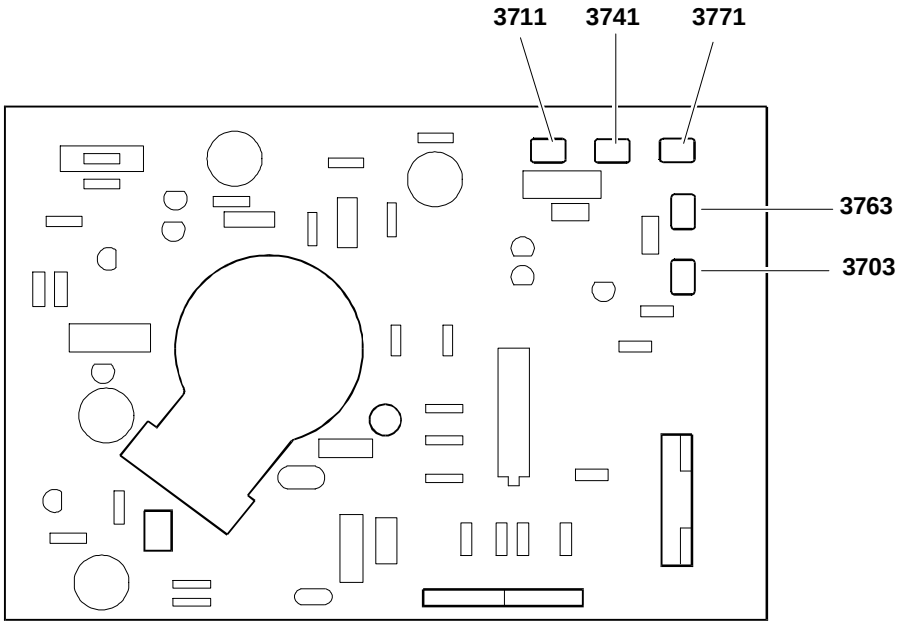



Fig. 25-12 Video Amplifier Board Adjustment

**PRESET BOARD**

| | |
|---|---|
| 3317 | Horizontal size adjustment (48,363 KHz/60 Hz 1024x768 SVGA +) |
| 3319 | Horizontal shift adjustment (48,363 KHz/60 Hz 1024x768 SVGA +) |
| 3305 | Horizontal size adjustment (37,87 KHz/60,3 Hz 800x600 SVGA2 ) |
| 3307 | Horizontal shift adjustment (37,87 KHz/60,3 Hz 800x600 SVGA2 ) |
| 3323 | Horizontal size adjustment (37,86 KHz/72,8 Hz 640x480 VGA Ergo) |
| 3325 | Horizontal shift adjustment (37,86 KHz/72,8 Hz 640x480 VGA Ergo) |
| 3329 | Horizontal size adjustment (48,077 KHz/72,19 Hz 800x600 SVGA1) |
| 3331 | Horizontal shift adjustment (48,077 KHz/72,19 Hz 800x600 SVGA1) |
| 3350 | Horizontal shift adjustment (31,469 KHz/60-70 Hz VGA Standard) |

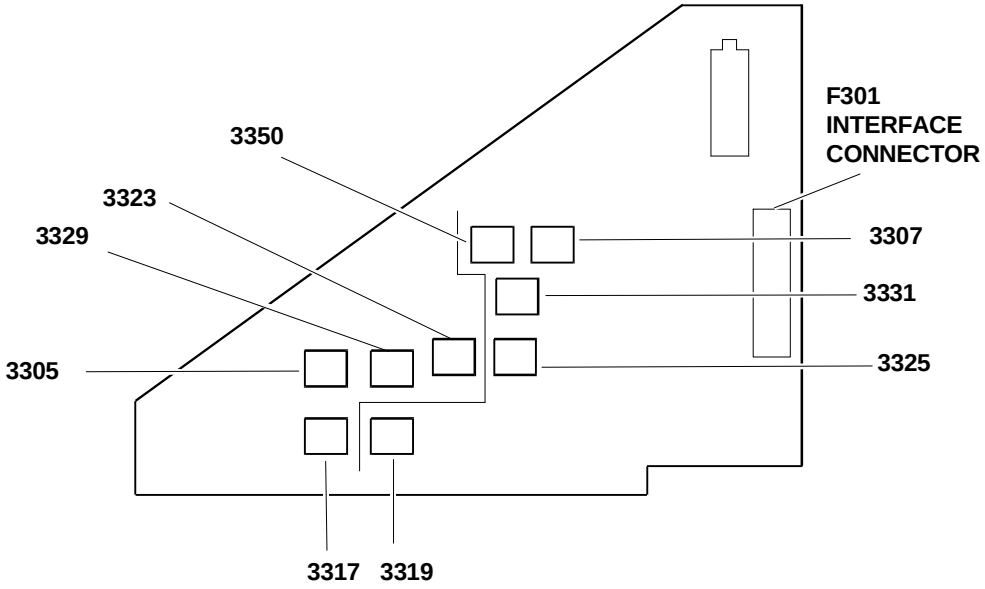



Fig. 25-13 Preset Board Adjustment

**MAIN BOARD**

| | |
|---|---|
| 3805 | Contrast adjustment (external access) |
| 3818 | Brightness adjustment (external access) |
| 3625 | Horizontal size adjustment (external access) |
| 3561 | Horizontal shift adjustment (external access) |
| 3410 | Vertical size adjustment (external access) |
| 3420 | Vertical shift adjustment (external access) |
| 3623 | Pincuschion distortion adjustment |
| 3415 | Vertical shift sub adjustment |
| 3406 | Vertical size sub adjustment |
| 3562 | Horizontal shift sub adjustment |
| 3626 | Horizontal size sub adjustment |
| 3804 | Contrast sub adjustment |
| 3836 | ABL (Automatic Beam Limiter) adjustment |
| 3920 | Raster centering adjustment |
| 3504 | Horizontal pulse size adjustment |
| 3506 | Vertical pulse size adjustment |
| 3902 | EHT voltage adjustment |
| 3123 | B+ (90 V) voltage adjustment |
| 3530 | Free frequency adjustment |

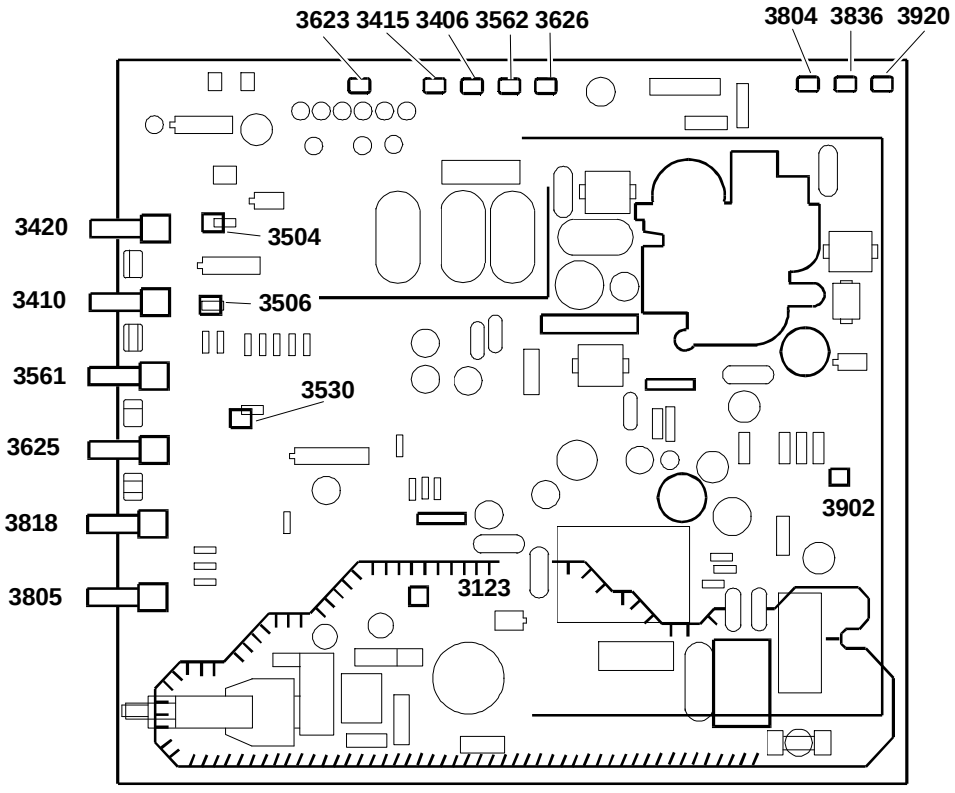



Fig. 25-14 Main Board Adjustments

## MOTHERBOARD AND PRESET BOARD ADJUSTMENTS

The adjustment procedure described here below ensures a correct video preset. To obtain good results, it is very important to follow the steps in the order they are set out.

### POWER SUPPLY B+ OUTPUT VOLTAGE ADJUSTMENT

- Set the external contrast (3805) and brightness (3818) trimmers at minimum.
- Set trimmers 3123 and 3902 in the intermediate centre position.
- Connect a voltmeter to read the direct current voltage between capacitor 2156 and ground.
- Power on the video.
- System test: 640 BY 480 GRAPHICS (VGA Standard 31.5 KHz)
- Adjust trimmer 3123 to obtain a voltage of 90 V ± 0.2 V on output B+.

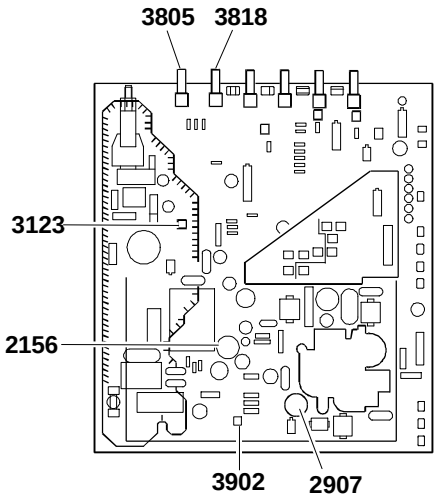



Fig. 25-15 Power Supply B+ Output Voltage Adjustment

### EHT VOLTAGE ADJUSTMENT

- Connect a voltmeter to read the voltage between capacitor 2907 and ground.
- System Test : 640 BY 480 GRAPHICS (VGA Standard 31.5 KHz).
- Adjust trimmer 3902 to obtain a voltage of 88 V ± 0.2 V on the output (B+).

### HORIZONTAL SYNCHRONIZATION ADJUSTMENT

- Set the external horizontal centering (3561) and vertical centering (3420) trimmers in the central position.
- System test: 640 BY 480 GRAPHICS (VGA Standard 31.5 KHz).
- Apply an oscilloscope or frequency meter to pin 10 on IC7502.
- Adjust trimmer 3504 to obtain a negative impulse of 11.8 μs.
- Apply an oscilloscope or frequency meter to pin 7 on IC7502.
- Adjust trimmer 3506 to obtain a positive impulse of 1.3 μs.
- Tune with trimmer 3530 until the picture is stable.
- Remove the video signals cable Apply an oscilloscope or frequency meter to pin 3 on IC7502.

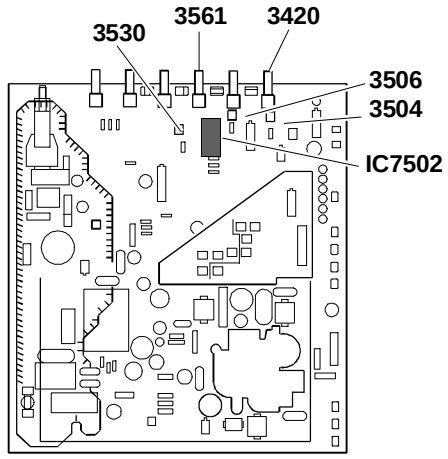



Fig. 25-16 Horizontal Synchronism Adjustment

- Adjust trimmer 3530 until the output on pin 3 reaches 27.6 KHz +/- 100 Hz.

**HORIZONTAL RASTER CENTERING**

- Set the external horizontal centering trimmer 3561 on the intermediate position (click point).
- System Test : 1024 BY 768 GRAPHICS (SVGA Plus Mode 48.3 KHz).
- Adjust trimmer 3920 to have a correct horizontal raster centering.

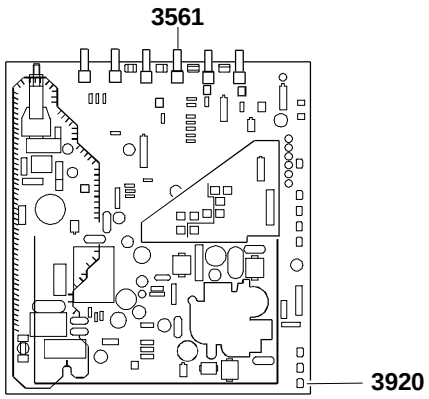



Fig. 25-17 Horizontal Raster Centering

**PICTURE GEOMETRIC ADJUSTMENT (GENERAL)**

- This adjustment must be made in VGA 31.5 KHz mode and subsequently in 37.8 KHz, 48.077 KHz and 48.3 KHz modes.
- From the Personal Computer System Test select the TEST PATTERNS sub-test and the CROSS HATCH WITH CIRCLE IN THE CENTRE OF SCREEN video page.
- Set the external horizontal centering (3561) and vertical centering (3420) trimmers to central intermediate position.
- Set the external contrast (3805) and brightness (3818) trimmers in intermediate position.

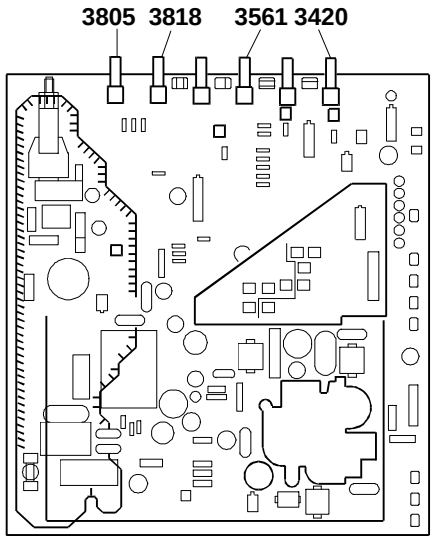
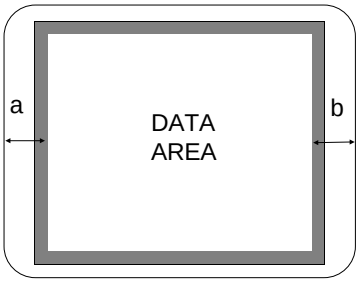



Fig. 25-18 Picture Geometry Adjustment (General)

**PICTURE GEOMETRIC ADJUSTMENT (VGA STANDARD 31.5 KHz/60 Hz MODE)**

- System Test : 640 BY 480 GRAPHICS.
- Set trimmer 3562 for **horizontal shift** to obtain a correct horizontal centering on the screen.
  |A -B| < 4 mm.



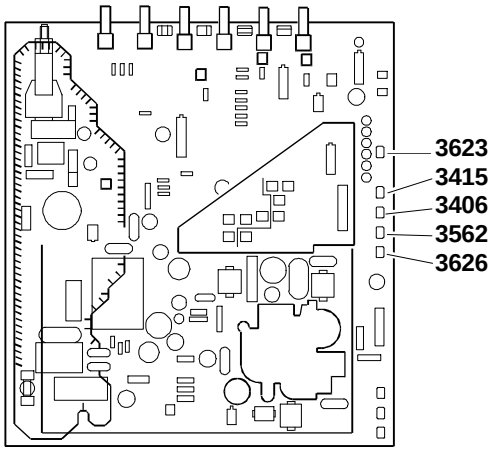
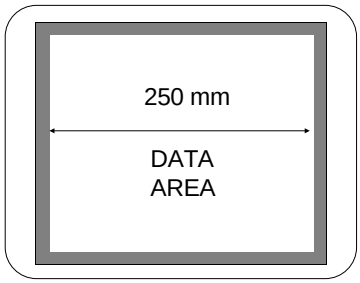
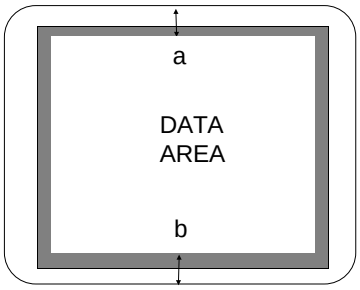




Fig. 25-19 Picture Geometry Adjustment (VGA Standard Mode) and East-West Distortion Adjustment

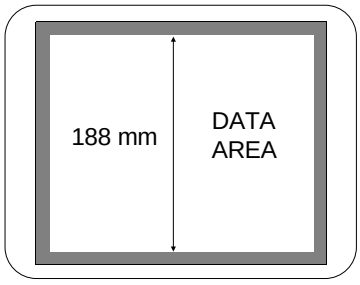
Set trimmer 3626 for **horizontal size** to obtain a horizontal picture size of 250 mm.




- Set trimmer 3415 for **vertical shift** to obtain a correct vertical centering on the screen.
  |A -B| < 4 mm.




- Set trimmer 3406 for **vertical size** to obtain a vertical picture size of 188 mm.
- Set trimmer 3623 for **East-West distorsion** to correct this distorsion. (Pincushion distortion).



**PICTURE GEOMETRIC ADJUSTMENT (VGA ERGO 37.8 KHz/72Hz MODE)**

- System Test : HIGH RESOLUTION GRAPHICS - 640 BY 480
- Set trimmer 3325 for **horizontal shift adjustment** to obtain a correct horizontal centering on the screen |A -B| < 4 mm.
- Set trimmer 3323 for **horizontal size adjustment** to obtain a horizontal picture size of 250 mm.

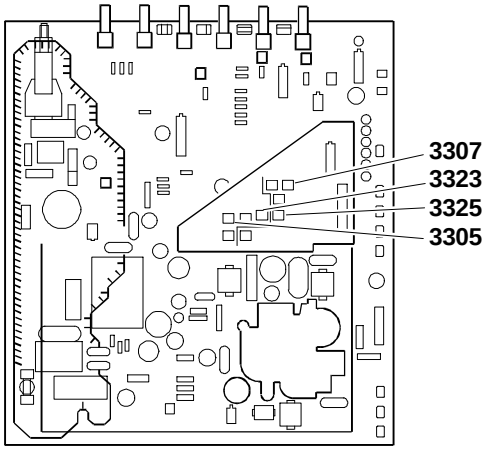



Fig. 25-20 Picture Geometric Adjustment (VGA Ergo Mode and Super VGA2 Mode)

**PICTURE GEOMETRIC ADJUSTMENT (Super VGA2 37.8 KHz/60Hz MODE)**

- System Test : HIGH RESOLUTION GRAPHICS 800 BY 600.
- Set trimmer 3307 for **horizontal shift adjustment** to obtain a correct horizontal centering on the screen |A -B| < 4 mm.
- Set trimmer 3305 for **horizontal size adjustment** to obtain a horizontal picture size of 250 mm.

**PICTURE GEOMETRIC ADJUSTMENT (Super VGA1 48.077 KHz/72.19 Hz MODE)**

- System Test : HIGH RESOLUTION GRAPHICS 800 BY 600.
- Set trimmer 3331 for **horizontal shift adjustment** to obtain a correct horizontal centering on the screen |A -B| < 4 mm.
- Set trimmer 3329 for **horizontal size adjustment** to obtain a horizontal picture size of 250 mm.

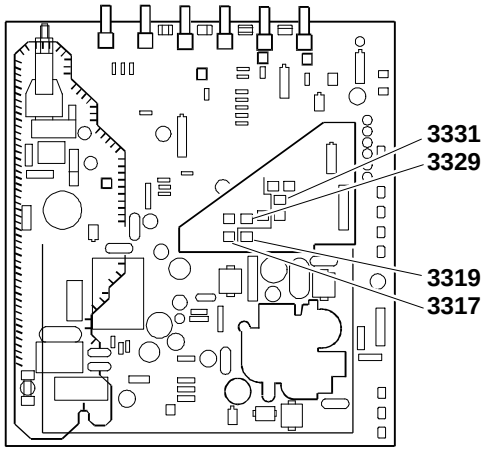



Fig. 25-21 Picture Geometric Adjustment (Super VGA1 Mode and Super VGA Plus Mode)

**PICTURE GEOMETRIC ADJUSTMENT (Super VGA Plus 48.3 KHz/60Hz MODE)**

- System Test : HIGH RESOLUTION GRAPHICS 1024 BY 768.
- Set trimmer 3319 for **horizontal shift adjustment** to obtain a correct horizontal centering on the screen |A -B| < 4 mm.
- Set trimmer 3317 for **horizontal size adjustment** to obtain a horizontal picture size of 250 mm.

**HORIZONTAL CENTERING ADJUSTMENT (VGA STANDARD 31.5 KHz/60 Hz MODE)**

- System Test : 640 BY 480 GRAPHICS
- Use trimmer 3350 for horizontal centering to perfect the horizontal centering on the screen after the picture geometric adjustments carried out previously.

**FOCUS ADJUSTMENT (Super VGA Plus 48.3 KHz/60 Hz MODE)**

- System Test: CHECK LINEARITY that displays an "H" video page.
- Set external brightness potentiometer 3818 in the central position (click point) and external contrast potentiometer 3805 to maximum.
- Adjust the focus trimmer (FOCUS) on the upper part of transformer 5901, to obtain the best possible focus.

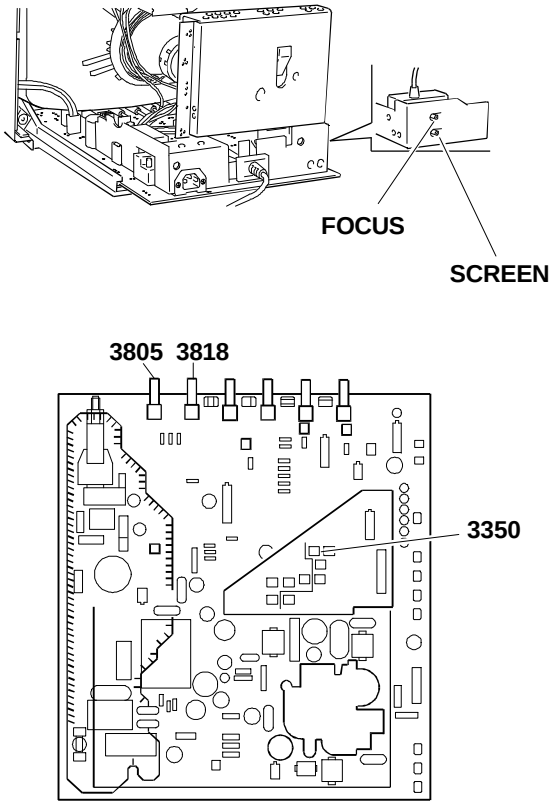
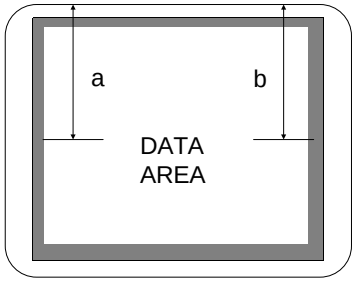



Fig. 25-22 Horizontal Centering and Focus Adjustment

**TILT ADJUSTMENT**

- From the Personal Computer System Test select the TEST PATTERNS sub-test and CROSS HATCH WITH CIRCLE IN THE CENTRE OF SCREEN video page.
- Check the correct tilt adjustment of the picture with the parameters indicated in the figure on the right. |A-B| <= 2 mm.
- If the picture tilt adjustment defect is not within these indicated values, reposition the CRT by means of the locking screws.



**VIDEO AMPLIFIER BOARD ADJUSTMENTS**

- Set the gain adjustment trimmers (3763 and 3703) in the intermediate position and the cut-off adjustment trimmers (3711, 3741 and 3771) turned fully in the clockwise direction (on the motherboard set trimmers 3804 and 3836 in central position).
- Apply a video signal in the VGA standard resolution (640 x 480 31.5 KHz/60 Hz) to obtain an completely white or completely black screen.
- Set the external brightness potentiometer 3818 in central position.
- Set the external contrast potentiometer 3805 on maximum.
- Adjust line transformer potentiometer VG2 (SCREEN) to minimum.
- Adjust potentiometer VG2 (SCREEN) to increase the VG2 (SCREEN) grid voltage until every colour between red, green and blue is only just visible (background colour).
- Adjust the cut-off trimmers for the two predominating colours (3711, 3741 and 3771) to the same output brightness, to obtain the best background colour (raster).
- Adjust the external brightness potentiometer 3818 to maximum for a further check on the background colour (raster).
- Apply a completely white pattern to the screen.
- Set the external brightness potentiometer 3818 in the central position (click point), the contrast potentiometer 3805 on maximum and contrast sub-adjustment trimmer 3804 and 3836 ABL in intermediate position.
- Set the gain adjustment trimmers 3763 and 3703 to obtain the best video colour possible.
- Display a text pattern on the screen and adjust contrast sub-adjustment trimmer 3804 to obtain the best character definition.
- Set the external contrast trimmer to maximum to make a further check on the video colour.

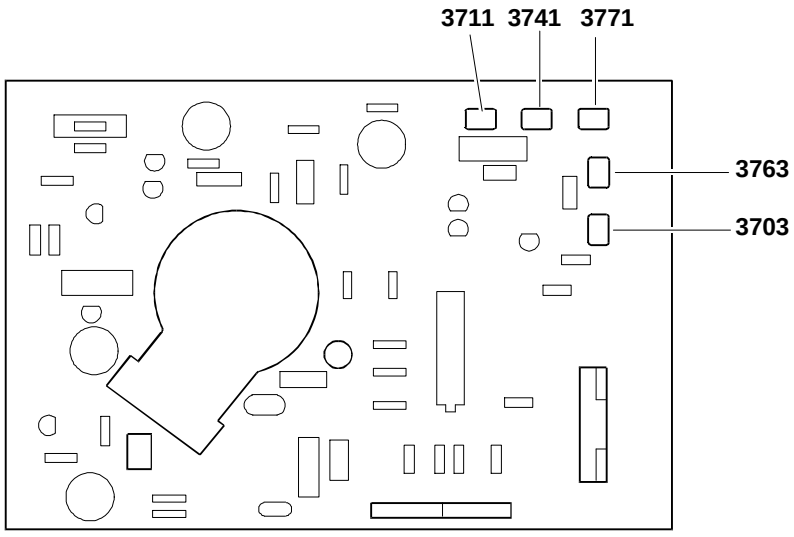



Fig. 25-23 Video Amplifier Board Adjustment

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