

# 14" COLOUR DISPLAY UNIT CDU 1458MS/HA71

This display is manufactured by Hantarex.

## CHARACTERISTICS

VGA-compatible analog color video.

- Screen dimensions: 14"  
Horizontal dimension: 240 mm  $\pm$ 4mm  
Vertical dimension: 180 mm  $\pm$ 4 mm
- Mains voltage: 220 V: 180 - 264 Vac  
110 V: 90 - 132 Vac  
Mains frequency: 50 - 60 Hz: 48 - 62 Hz
- Input signals:  
Video: R, G, B (Red, Green, Blue)  
Signal: 63 voltage steps of 11 mV  
Level: 0 - 700 mV  
Polarity: Positive

| RESOLUTION        | VGA    |       |       | VGA ERGO |      | SVGA   | XGA    | VGA PLUS |        |       |
|-------------------|--------|-------|-------|----------|------|--------|--------|----------|--------|-------|
| HORIZONTAL        | 640    |       |       | 640      | 640  | 800    | 1024   | 1024     | 1024   | 1024  |
| FREQUENCY (KHz)   | 31.469 |       |       | 37.86    | 39.4 | 48.077 | 35.524 | 48.363   | 56.476 | 58.14 |
| VERTICAL          | 350    | 400   | 480   | 480      | 480  | 600    | 768    | 768      | 768    | 768   |
| FREQUENCY (Hz)    | 70.08  | 70.08 | 59.95 | 72.8     | 75   | 72.190 | 87     | 60.08    | 70.07  | 72.13 |
| INTERLACED        | NO     | NO    | NO    | NO       | NO   | NO     | YES    | NO       | NO     | NO    |
| V/H SYNC POLARITY | -/+    | +/-   | -/-   | -/-      | -/-  | +/+    | +/+    | +/+      | -/-    | +/+   |

- Synchronism signals:  
Horizontal sync signals: H. SYNC  
Vertical sync signals: V. SYNC  
Level: TTL
- External controls:  
CONTRAST  
BRIGHTNESS  
VERTICAL SHIFT  
HORIZONTAL SHIFT  
VERTICAL SIZE  
HORIZONTAL SIZE  
PINCUSHION

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## VIDEO CASING REMOVAL

1. Switch off the monitor and the system it is connected to; disconnect the signals cable and the power cord.
2. Place the monitor face down on the work bench after first laying down a sponge cloth to prevent scratching of the screen, remove the plastic covering (A) by pressing in the direction shown in the figure and unscrew the two screws securing the casing (B).

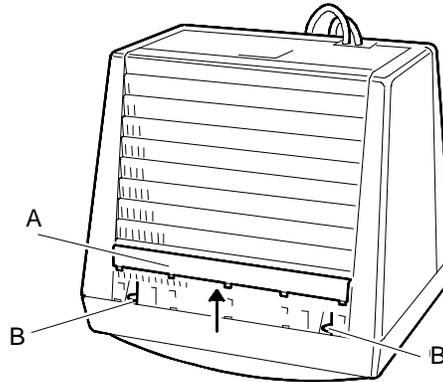


Fig. 18-1 Video Cover Screws

3. Unscrew the other four screws (C and D) which secure the casing.
4. Press the catch on the cable inlet support block in the direction shown in the figure. Release the block and push it into the video casing.
5. Lift the monitor cover upwards and push the video signals and power cables through the slot in the casing.
6. Unscrew the screw in the cable support block (E) to separate the video signals cable from the power cord.

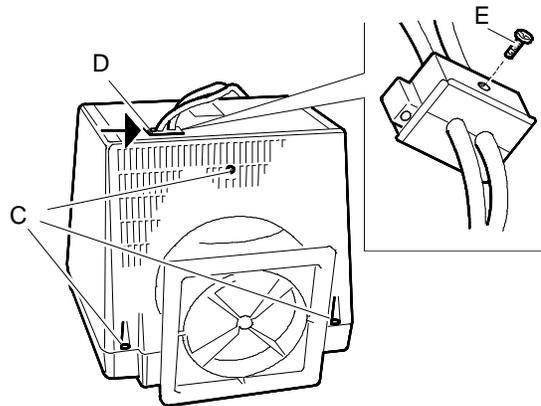


Fig. 18-2 Video Cover Screws and Input Cable Support Block

## DISCHARGING THE HIGH VOLTAGE

After removing the video cover and before attempting any other work on the boards and cables of the video, the EHT must be discharged (25 KV voltage on the anode). This should be done using a screwdriver, connected by a lead to the video frame ground.

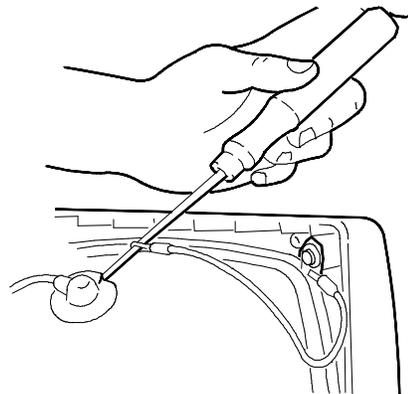


Fig. 18-3 High Voltage Discharge

## REMOVING THE FUSE

- Replace the blown 250 V 3.15 A fuse F101 with another one of the same rating. The location of the fuse is illustrated in the figure on the right.

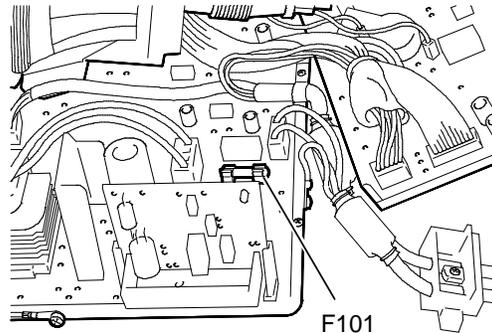


Fig. 18-4 Fuse Replacement

## REMOVING THE VIDEO AMPLIFIER BOARD

- Remove the layer of silicon adhesive (used to protect the monitor during transport) on the connection between the CRT connector and the video amplifier board connector.
- Unscrew screw (A) on the phosphor bronze ground strap (M) between the video amplifier structure and the main board structure.

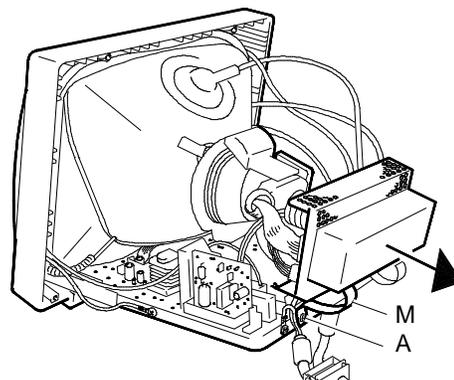


Fig. 18-5 Removal of Video Amplifier Board

- Disconnect the video amplifier board from the CRT. Disconnect the cables from their connectors J1, J2, J4, G2 and G3. To remove the cable connected on connector G3 (Focus), pull the cable firmly to dislodge it.

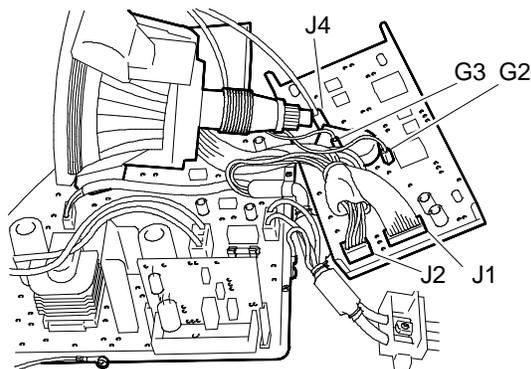


Fig. 18-6 Video Amplifier Board Connections

## REMOVING THE INPUT CABLES

11. Remove the power cord by unscrewing ground screw (F) from the metal support on the main board and remove connector J101 from the board.
12. To remove the video signals cable, remove the video amplifier board from the CRT, as described in the previous section, without disconnecting it, then unscrew screw (G) attaching the video signals cable to the metal support on the main board. Now pull the cable out of connector J106 on the main board and the cable out of connector J2 on the video amplifier board.

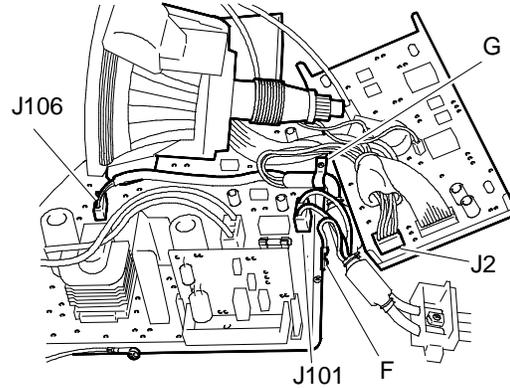


Fig. 18-7 Removal of Input Cables

## REMOVING THE METAL COVER FROM THE SOLDER SIDE OF THE MAIN BOARD

13. Desolder the strap (B) from connecting with the external digital control board.
14. To remove the metal cover from the solder side of the main board, slide upwards so that the slots and retaining screws are aligned and remove the cover from its position.
15. This enables service technicians to get at the adjustment trimmers on the main board and to desolder the automatic voltage-adaptor board.

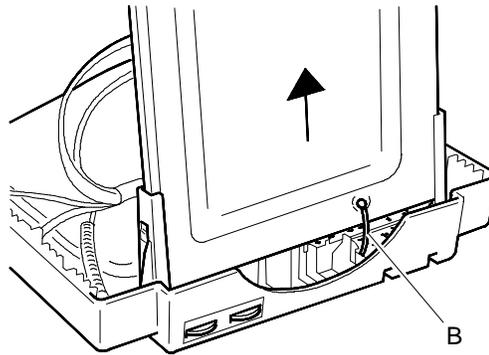


Fig. 18-8 Removal of Metal Cover on Solder Side of Main Board

## REMOVING THE DIGITAL SYNCHRONISMS ACKNOWLEDGEMENT BOARD AND THE EXTERNAL DIGITAL CONTROLS BOARD

16. Unscrew the three screws (V) from the digital sync acknowledgement board.
17. Remove the cables from their connectors J404 and J405. To remove these cables, press on the top part of the connector and the cables will be released. The grey cables must be inserted with the outermost black and red coloured wire in pin 1 of the connector. Push the cable into the connector with each wire with its own contact channel.

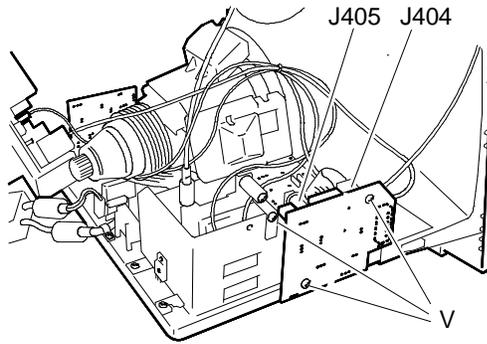


Fig. 18-9 Removal of Digital Synchronism Acknowledgement Board

18. Unscrew screw (V) and move the catch (G) on the external digital controls board.
19. Desolder the ground cable (M) connected to the main board structure.

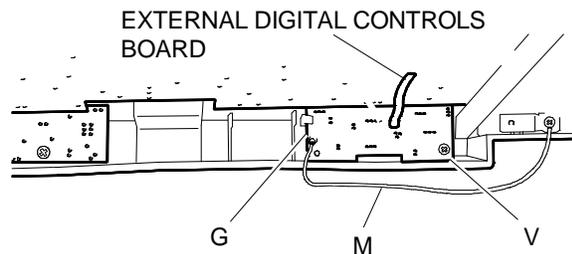


Fig. 18-10 Removal of External Digital Controls Board

20. To separate the two boards, desolder the cables from the connectors J501, J502, J401 and J402.

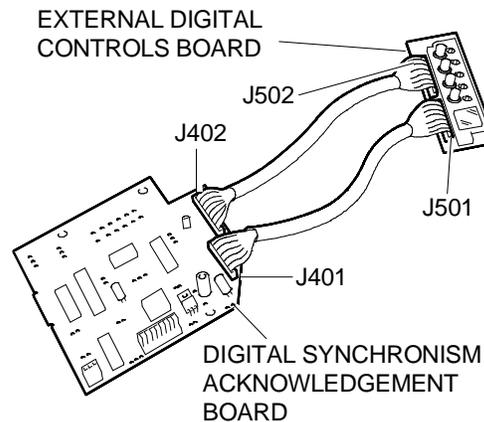


Fig. 18-11 Removal of Digital Synchronism Acknowledgement Board and External Digital Controls Board

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## REMOVING THE MAIN BOARD

21. Remove the contrast and brightness controls board.
22. Remove the degauss cable from connector J102, remove the screw (F) securing the degauss coil ground cable, connected to the metal structure of the main board.
23. Make sure you have discharged the EHT (25 KV) before removing the anode.

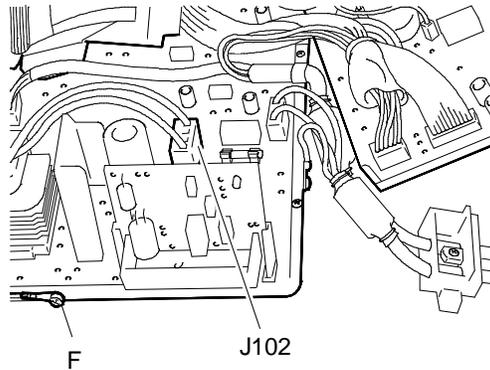


Fig. 18-12 Removal of Screw F and Connector J102

24. Remove the magnetic deflection yoke cable from connector J103.
25. To remove the anode, lift the rubber suction cap, squeeze the metal contacts with a pair of pliers and pull out of the hole in the CRT.

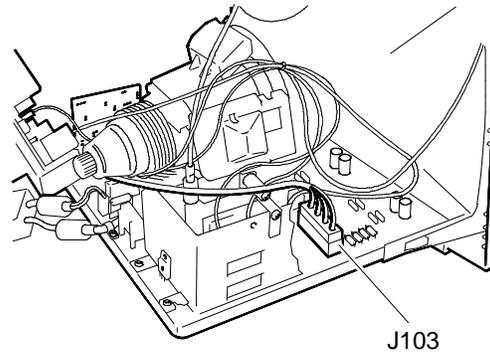


Fig. 18-13 Removal of Connector J103

26. At this point, the main board may be removed from the video structure simply by pressing on the two retaining tabs (A).

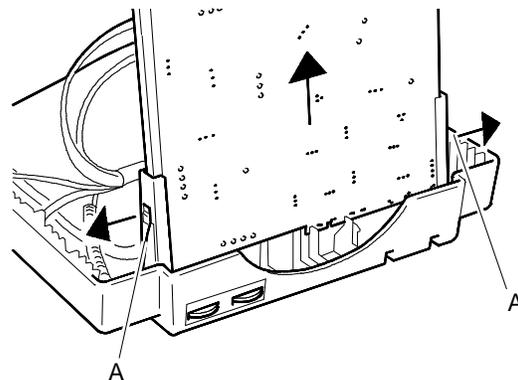


Fig. 18-14 Removal of Main Board

**NOTE:** The main board must not be separated from its support panel.

When replacing the main board, check that metal ring (C) on the anode EHT contacts (E) is tight against retaining ring (D) on the anode rubber cap, as illustrated in the figure. This ensures sound contact between all the anode connections.

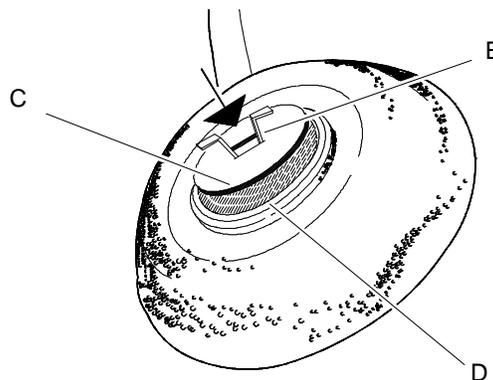


Fig. 18-15 Anode Replacement

## REMOVING THE CRT

**NOTE:** The CRT forms a single assembly with the yoke, on which the deflection windings and convergence magnets are mounted. The magnets are factory set by the tube manufacturer and the setting must not be altered and this could result in misconvergence, which is difficult to correct. Replacement tubes come with the yoke already fitted.

27. Unscrew the four screws (V) securing the CRT to the front cover.
28. Cut the two straps holding the degauss winding (D).
29. Lift the CRT from the front panel, freeing it from the degauss winding.
30. Remove the degauss winding (G) from the CRT, after removing the spring (M) from the winding.  
The ground winding must be put back in position on the new CRT.

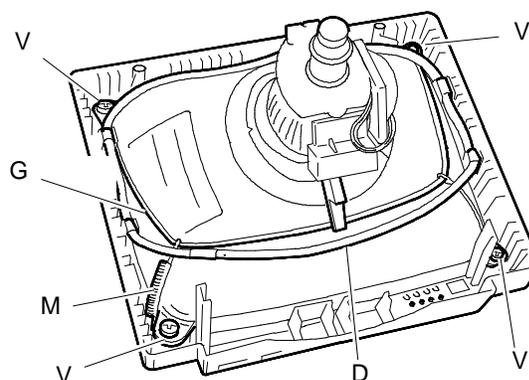


Fig. 18-16 Removal of CRT

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## REASSEMBLY PROCEDURES

To remount the video, follow the disassembly procedures in reverse order.

## EXTERNAL ADJUSTMENTS

The front panel of the CDU 1458MS display includes the following controls for the user or service technician:

- Trimmers for contrast and brightness adjustment.
- A digital control panel.

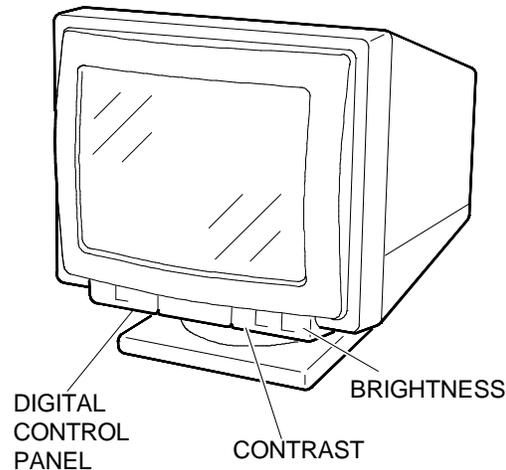


Fig. 18-17 Video External Adjustments

### CONTRAST AND BRIGHTNESS TRIMMERS

**CONTRAST** - When the trimmer knob is turned left or right, picture intensity is increased or decreased.

**BRIGHTNESS** - When the trimmer knob is turned right or left, picture brightness is increased or decreased. While the knob is being turned, there will be a click when optimum brightness is reached (the "click" point); this point may be varied to suit requirements.

### DIGITAL CONTROL PANEL

For access to the controls of the digital control panel, press lightly downwards on the cover door. The control panel comprises:

- A two-digit display indicating the video mode
- A function selection button (F)
- Two buttons for adjustment (+/-)
- A store key (M)
- Five LED lamps lighting individually to indicate the function selected.

The functions that can be adjusted and stored are as follows:

- East-West or Pincushion distortion
- Horizontal shift
- Horizontal width
- Vertical shift
- Vertical width

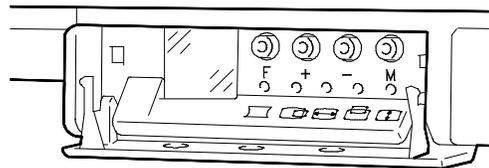


Fig. 18-18 Digital Control Panel

## ADJUSTMENT PROCEDURE

The CDU 1458MS display unit can acknowledge and set on any of the video modes included in the table below. Display of other video modes with scan frequency in the ranges 30-58 KHz horizontal and 50-90 Hz vertical is also possible. The unit has 20 memory cells, which may be produced on the display. The first 10 memory cells, numbers 0 through 9, are stored in the factory with the modes of the following table. The other 10 memory cells, numbers 10 through 19, are freely programmable by the user.

| RESOLUTION        | VGA    |       |       | VGA ERGO |      | SVGA   | XGA    | VGA PLUS |        |       |
|-------------------|--------|-------|-------|----------|------|--------|--------|----------|--------|-------|
| HORIZONTAL        | 640    |       |       | 640      | 640  | 800    | 1024   | 1024     | 1024   | 1024  |
| FREQUENCY (KHz)   | 31.469 |       |       | 37.86    | 39.4 | 48.077 | 35.524 | 48.363   | 56.476 | 58.14 |
| VERTICAL          | 350    | 400   | 480   | 480      | 480  | 600    | 768    | 768      | 768    | 768   |
| FREQUENCY (Hz)    | 70.08  | 70.08 | 59.95 | 72.8     | 75   | 72.190 | 87     | 60.08    | 70.07  | 72.13 |
| INTERLACED        | NO     | NO    | NO    | NO       | NO   | NO     | YES    | NO       | NO     | NO    |
| V/H SYNC POLARITY | -/+    | +/-   | -/-   | -/-      | -/-  | +/+    | +/+    | +/+      | -/-    | +/+   |
| VIDEO MODE        | 0      | 1     | 2     | 4        | 5    | 6      | 3      | 7        | 8      | 9     |

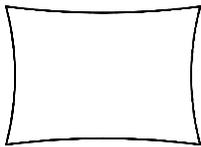
After the monitor is connected to the computer and switched on, the display shows the number corresponding to the video mode currently on the signals cable, provided it is one of the video modes stored by the manufacturer. If the memory fails to acknowledge any of the video modes listed in the table above, the display automatically posts number 19, indicating that this new video mode can be stored. The display will also set automatically on memory cell 19, in cases where the cable from the monitor is disconnected from the computer.

### FUNCTION BUTTON F

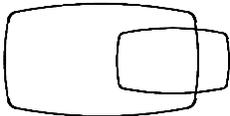
When this button is pressed, one of the five functions to be adjusted is selected and the corresponding LED comes on. If the button is pressed for more than one second, the functions are scanned in sequence.

### BUTTONS +/-

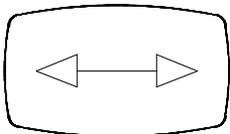
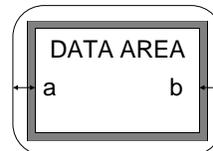
These two buttons allow adjustment of the function selected.

**EAST-WEST OR PINCUSHION DISTORTION**

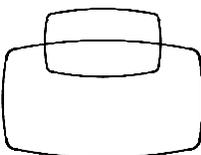
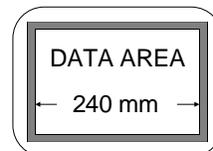
Press button "F" until the LED corresponding to function "East-West or Pincushion Distortion" comes on. Press the buttons (+) and/or (-) until the picture is corrected as required.

**HORIZONTAL SHIFT**

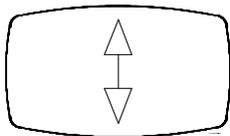
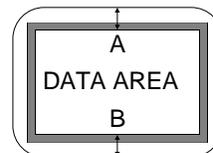
Press button "F" until the LED corresponding to function "Horizontal Shift" comes on. Press buttons (+) and/or (-) until the picture is in the centre of the screen horizontally.  
 $|a-b| < 4$  mm.

**HORIZONTAL WIDTH**

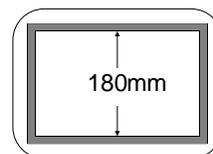
Press button "F" until the LED corresponding to function "Horizontal Width" comes on. Press buttons (+) and/or (-) until a picture width of  $240 \text{ mm} \pm 2 \text{ mm}$  is obtained.

**VERTICAL SHIFT**

Press button "F" until the LED corresponding to function "Vertical Shift" comes on. Press buttons (+) and/or (-) until the picture is in the centre of the screen vertically.  $|A-B| < 4$  mm.

**VERTICAL WIDTH**

Press button "F" until the LED corresponding to function "Vertical Width" comes on. Press buttons (+) and/or (-) until a picture height of  $180 \text{ mm} \pm 2 \text{ mm}$  is obtained.



**NOTE:** Any variations made using buttons (+) and (-) is stored automatically and associated with the video mode shown on the display. Adjustments such as these may be made on all 20 memory cells.

**STORE KEY M****Storing a New Video Mode**

When the monitor is presented with a new video mode, the new mode is automatically associated with memory cell 19 (posted on the display). Through buttons "F" (+) and (-), geometry of the picture can be regulated as desired. The display blinks when key "M" is pressed and the user should press buttons (+) and (-) to select another memory cell between 10 and 18. When key "M" is pressed again, the new video mode is stored in the memory cell selected.

**NOTE:** If there was another video mode in the cell selected, it will be erased and replaced by the new one.

**Transferring a Video Mode from one Memory Cell to another one**

- Press key "M" for about 8 seconds, until the display starts to blink.
- Press buttons (+) and (-) to move on to the new memory cell.
- Press key "M" to store the video mode in the new memory cell (the display will stop blinking).

## INTERNAL ADJUSTMENTS AND SETTING

### ADJUSTMENT COMPONENTS

The following is a list of the adjustment components inside the video unit used to make settings and adjustments. The adjustment procedure is described in the section that follows.

There is a degree of interplay between adjustments, so after one is made, check that the values of the others are still correct.

#### Main Board

|                           |                                 |
|---------------------------|---------------------------------|
| RV101 (V. ADJ.)           | Voltage Adjustment              |
| RV102 (EHT COMP.)         | EHT comparison                  |
| RV103 or RV111 (EHT ADJ.) | EHT adjustment                  |
| RV108 (F/V ADJ.)          | Frequency/voltage adjustment    |
| RV109 (H. FREQ.)          | Horizontal frequency adjustment |
| RV110 (BEAM LIMITER)      | Beam adjustment                 |
| L109                      | Horizontal linearity adjustment |
| SCREEN                    | Grid G2 adjustment              |
| FOCUS                     | Grid G3 adjustment              |

**NOTE:** The trimmer used to adjust the EHT may be called RV103 or RV111.

#### Video Amplifier Board

|                     |   |
|---------------------|---|
| RV1 (RED CUT OFF)   | Adjustment of the red cut-off voltage   |
| RV2 (GREEN CUT OFF) | Adjustment of the green cut-off voltage |
| RV3 (BLUE CUT OFF)  | Adjustment of the blue cut-off voltage  |
| RV4 (RED GAIN)      | Adjustment of the red gain              |
| RV5 (BLUE GAIN)     | Adjustment of the blue gain             |
| RV6 (PRES. CONT.)   | Contrast presetting                     |

### MAIN BOARD SETTING REGULATIONS

The main board setting procedures described in this section guarantee correct setting of the video unit. It is important to respect the order in which the procedures are listed for best results.

**NOTES:** In performing these settings, an **electrostatic voltmeter** and an **electronic voltmeter** must be used. In view of the high voltages being measured, proceed with extreme caution and take care at all times.

- From the Personal Computer's System Test, select the 640 BY 480 GRAPHICS subtest. Check general operation (short circuits, faults, etc.).
  - Check that horizontal width of the picture is  $240 \text{ mm} \pm 2 \text{ mm}$  as described in section "INTERNAL ADJUSTMENTS".
  - Set the external brightness control to minimum.
  - Turn RV103 anti-clockwise (solder side) to get the minimum value of the high voltage measured with an electrostatic voltmeter on the CRT anode.

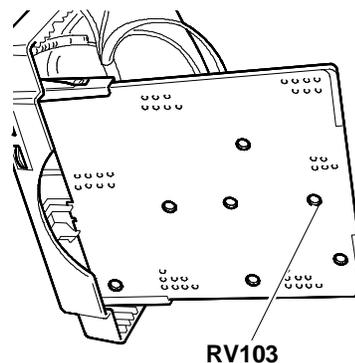


Fig. 18-19 Location of Potentiometers

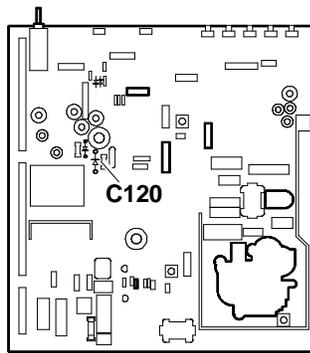


Fig. 18-20 Location of Measurement Points

- Adjust RV101 until there is a voltage of 152 V on the terminals of capacitor C120.
- Adjust RV103 until the EHT voltage is of 24 KV, measured with an **electrostatic voltmeter** on the anode of the CRT.

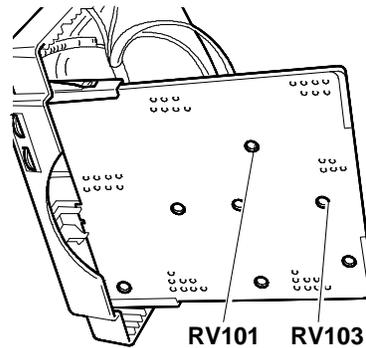


Fig. 18-21 Location of Potentiometers

- From the Personal Computer's System Test, select one of the 640 BY 480 (or 400 or 350) GRAPHICS subtests with a horizontal scan frequency of 31.5 KHz.
  - Connect a 12 K $\Omega$  resistor between pin 7 of IC108 (LM 339) and ground.
  - Connect a **voltmeter (with internal resistance  $\leq 20$  K $\Omega/V$ )** set to read a voltage of between 0 and 12 V between pin 4 of IC106 (HEF 4532) and ground.

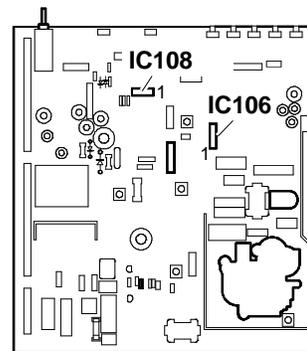


Fig. 18-22 Location of Measurement Points

- Adjust RV108 so that the voltmeter registers a voltage variation from about 0 V to about 11 V and vice versa. Alternate turning RV108 one way and then the other in steadily decreasing angles, observing the voltmeter readings and stopping when the voltage read on the voltmeter is low yet as close as possible to the trigger mark.
- Remove the resistor from pin 7 of IC108.

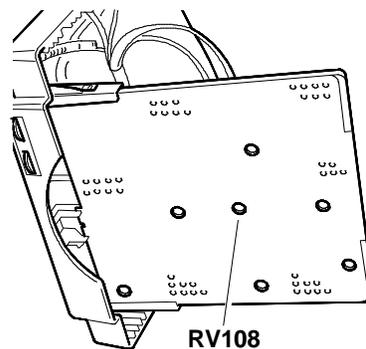


Fig. 18-23 Location of Potentiometers

**NOTE:** Remember to remove the resistor from pin 7 of IC108, as this could cause video malfunctions that are not easily identifiable.

- From the Personal Computer's System Test, select the 1024 BY 768 GRAPHICS subtest with horizontal scan frequency 48 KHz and vertical scan frequency 60 Hz.

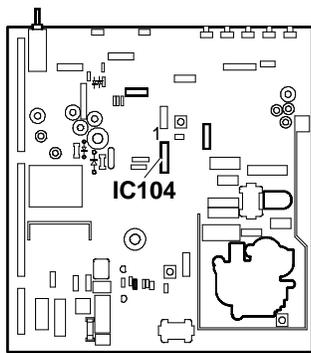


Fig. 18-24 Location of Measurement Points

- Connect the **electronic voltmeter** on pin 17 of IC104.
- Turn RV109 to produce a voltage of  $5.45\text{ V} \pm 0.02\text{ V}$ . After setting at 31.5 KHz and 58 KHz, check that the voltage remains between 5.3 V and 5.7 V.

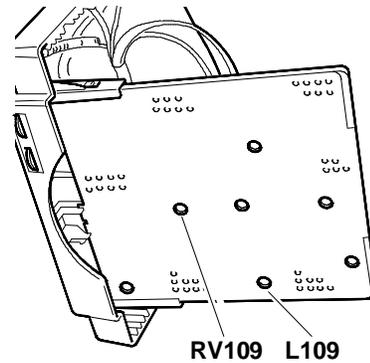


Fig. 18-25 Location of Potentiometers

- Adjust horizontal linearity with L109, still using the 48 KHz screen page.

- From the Personal Computer's System Test, select the 640 BY 480 GRAPHICS subtest with horizontal scan frequency of 31.5 KHz.

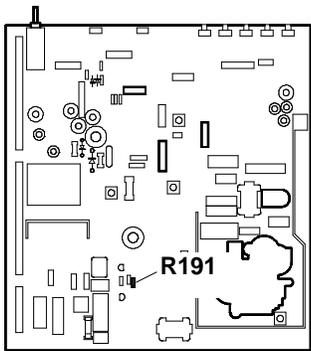


Fig. 18-26 Location of Measurement Points

- Connect an **electronic voltmeter** on the terminals of resistor R191.
- Adjust the brightness and contrast trimmers for a brightness just about visible.
- Check that the picture horizontal and vertical width is  $240\text{ mm} \times 180\text{ mm} \pm 2\text{ mm}$ , as stated in the section "INTERNAL

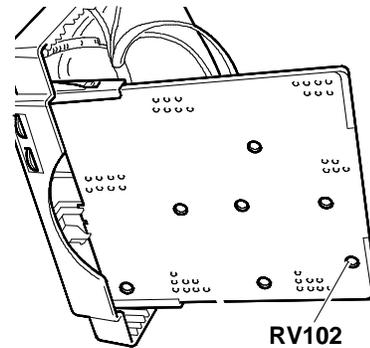


Fig. 18-27 Location of Measurement Points

#### ADJUSTMENTS".

- Adjust RV102 for a voltage reading of  $1.2\text{ V} \pm 0.2$ .
- Check horizontal width again.
- Produce a temporary short circuit on zener diode ZD110 and check that the EHT protection is triggered. Switch the monitor off and on again and check that everything is OK.

### FOCUS ADJUSTMENT

- From the Personal Computer's System Test, select the 640 BY 480 GRAPHICS subtest.
- Set the BRIGHTNESS external control trimmer in the click position, and CONTRAST to maximum.
- Adjust the focus potentiometer (FOCUS), located at the top of the row transformer TH103, to give the best focus possible.

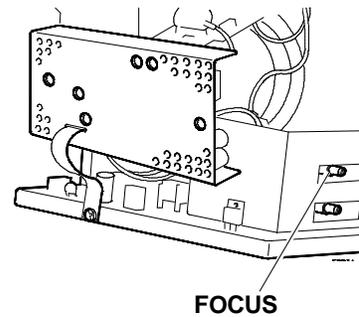


Fig. 18-28 Location of Focus Adjustment Potentiometer (FOCUS)

### TILT REGULATION

- From the Personal Computer's System Test, select the TEST PATTERNS subtest and the CROSS HATCH WITH CIRCLE IN THE CENTRE OF SCREEN page.
- Check that picture tilting is correct with the parameters shown in the figure to the side.  $|A - B| \leq 2 \text{ mm}$ .
- If the deviation in picture tilt adjustment is outside the values indicated earlier, position the CRT again by way of the securing screws shown in figure 18-15.

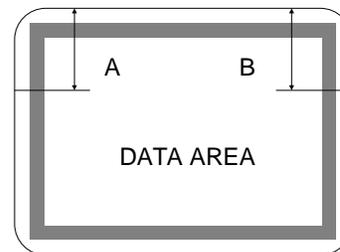
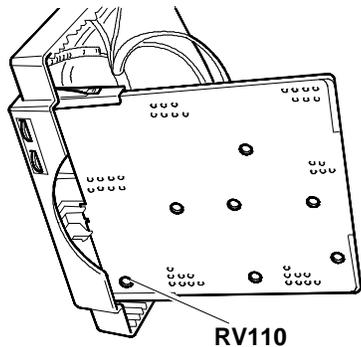


Fig. 18-29 Tilt Adjustment

## VIDEO AMPLIFIER BOARD SETTING REGULATIONS

**NOTE:** To perform settings on the video amplifier board, a **bright level tester** and **chromaticity graph paper** are required.

- Set the Personal Computer to display a screen page with a 0 mV voltage level (dark screen).



- Adjust beam limiter RV110 to exclude beam limitation.
- Set potentiometer G2 (SCREEN) on line transformer TH103 to minimum to cause the background to disappear.

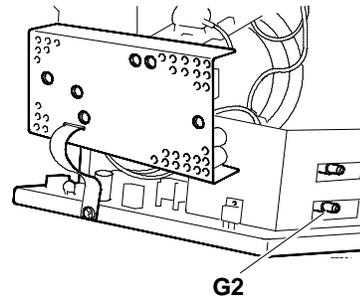


Fig. 18-30 Location of Beam Limiter RV110

Fig. 18-31 Location of Potentiometer G2

- Adjust the three cut-off potentiometers (RV1 red, RV2 green, RV3 blue) for a voltage of 70 Vdc on the respective cathodes of the CRT.
- Set the external brightness control trimmer for maximum brightness.
- Set potentiometer G2 (SCREEN) so that the raster is lit at between 8 and 10 nits, when one of the three colours is displayed.
- Adjust the cut-off trimmers (RV1 red, RV2 green, RV3 blue) of the two non-predominant colours for chromaticity coordinates of  $X=0.290$   $Y=0.280 \pm 0.020$ .
- Turn the brightness potentiometer to the "click" point.
- Adjust potentiometer G2 (SCREEN) so that the raster is just about visible  $\leq 1$  nit.

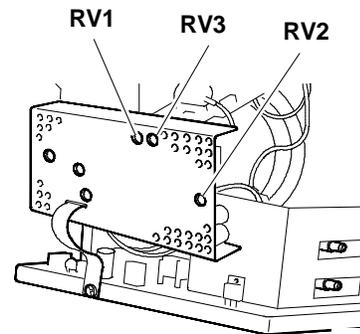


Fig. 18-32 Location of Potentiometers on Amplifier Board

- Set the Personal Computer to display a fully white screen page, with a voltage level of 700 mV. (To obtain a white page, unplug the signals cable from the video - video self-test).
  - Set the external contrast potentiometer to maximum and brightness to the click point.
  - Adjust the gain trimmers, RV5 for the blue and RV4 for the red, to produce chromaticity coordinates of  $X=0.290$   $Y=0.280 \pm 0.020$ .
  - Adjust the contrast preset trimmer RV6 to obtain a brightness value of  $100 \text{ nits} \pm 3$ .

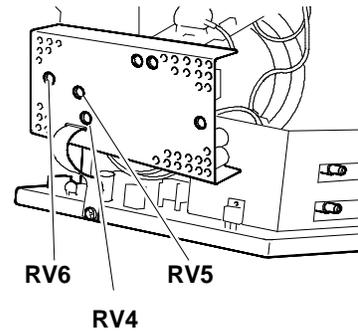


Fig. 18-33 Location of Adjustment Points on Video Amplifier Board

- Adjust beam limiter RV110 for a brightness value 4 nits lower than the preset value.

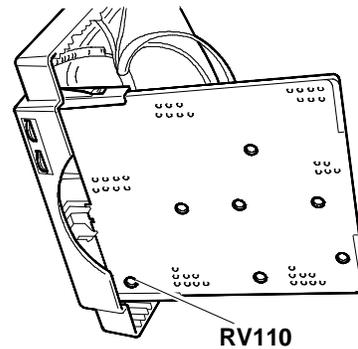


Fig. 18-34 Location of Beam Limiter RV110

- Set the Personal Computer to display a video page with a white box in the centre occupying 20% of the data area and with a voltage level of 700 mV.
  - Set the external contrast trimmer to maximum and brightness to minimum; check that the raster is not visible and that the white box is visible.
  - Set the external contrast and brightness trimmers to minimum; check that neither raster nor white box are visible.
  - Set the external brightness trimmer to click point and contrast to maximum; check that brightness is between 120 and 150 nits.
- Set the Personal Computer to display a screen page with white box in the centre occupying 20% of the data area and with a voltage level of 467 mV.
  - Set the external brightness trimmer to click point and contrast to maximum; check that brightness is between 70 and 90 nits.
- Set the Personal Computer to display a black screen page with a voltage level of 0 mV.
  - Set the external brightness trimmer to minimum and check that the raster is not visible.
  - Set the external brightness trimmer to maximum and check that the raster is visible.
- Set the Personal Computer to display a fully white screen page with a voltage level of 700 mV.
  - Set the external brightness trimmer to click point and adjust contrast for a value of 95 nits and check that the chromaticity coordinates do not deviate by  $\pm 0.020$  points from those set with a white page.
  - Adjust contrast to 17 nits and repeat the chromaticity coordinates check.
  - Set the external brightness trimmer to maximum, adjust contrast for a value of 95 nits and check that the tolerance of the chromaticity coordinates is of  $\pm 0.020$  with respect to the values set with a fully white page.
  - Set brightness to 17 nits and repeat the chromaticity coordinates check.
- Set the Personal Computer to display a fully white page with a voltage level of 467 mV.
  - Set the external brightness trimmer to click point and contrast to maximum; check that brightness is between 50 and 70 nits.

