SERVICE MANUAL

Color Video Monitor

ZVM-1380 Series

ZVM 138 E

Zenith data systems

Warnings and Cautions

WARNING: Removing or lifting the ground from the AC power source may present a potentially lethal shock hazard. Do not use an AC two-to-three wire adapter plug with this unit.

WARNING: The switch-mode power supply contains circuits that generate dangerous high-frequency, high-amplitude, quasi-square wave signals that present a potentially lethal shock hazard. Exercise extreme caution when adjusting or working near this unit.

WARNING: The anode of the CRT retains a potentially lethal voltage when the monitor is turned off. Perform repairs only after the CRT has been properly discharged. Refer to the following procedure to discharge the anode:

1. Connect a clip lead or heavy gauge wire to chassis ground.

2. Connect the other end of the lead to the stem of a flat-blade screwdriver that has an insulated handle.

3. Insert the blade of the screwdriver under the rubber insulation that covers the anode lead on the CRT and make contact with the anode terminal. Depending on the quantity of charge present on the anode, a distinct snap may be heard as the CRT discharges.

WARNING: Operation of the CRT at voltages highe than 25 kV may produce X-rays. Always verify tha the anode voltage is at normal levels when servicin the monitor. Do not operate the monitor with excessively high voltage any longer than is necessary t locate the cause of the excessive voltage.

WARNING: Parts of the power supply circuitry are not isolated. To prevent both personal injury and equipment damage, an isolation transformer must be used while troubleshooting this monitor.

CAUTION: Under no circumstances should the original design be modified or altered without permission from Zenith Electronics Corporation. All components should be replaced only with types identical to those in the original circuit, and their physical location, wiring, and lead dress must conform to the original layout upon completion of repairs.

Contents

Chapter 1

Introduction

The Zenith Data Systems ZVM-1380-C is a high-resolution 13-inch color video monitor that can operate in either of two video modes. Mode 1 video can display up to 16 colors when used with computers that supply an RGBI video signal, such as the Z-150 and Z-200 Series. Mode 2 video can display up to 64 colors when used with computers that supply an enhanced RGB (RGBrgb) video output and that support an enhanced graphics adapter card, such as the Z-158 and Z-241 computers. The ZVM-1380-C is illustrated in Figure 1-1.

Related publications include the ZVM-1380-C Dual Frequency Color Video Monitor User's Guide (595-3846).

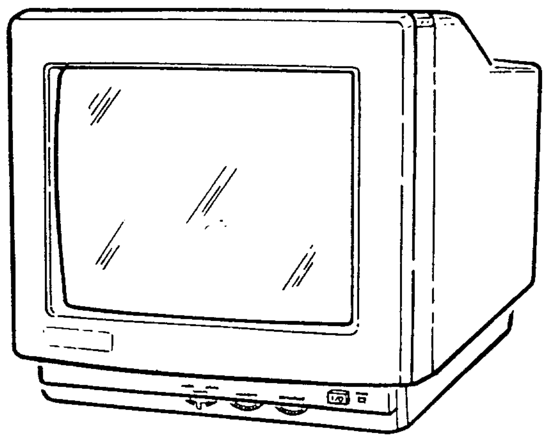


Figure 1-1. ZVM-1380-C Color Video Monitor

Specifications

CRT	13-inch (330 mm) diagonal. Dark tint (46% transmission). 0.31 mm pitch. Dot mask. Non-glare chemical etch.
Display Area	250 mm (width) × 170 mm (height) (approximate active area).
Convergence Error	0.5 mm maximum within display area.
Video Inputs	Mode 1: RGB, RGBI positive TTL. Mode 2: RGBrgb positive TTL.
Sync Signals	
Horizontal	15.75 kHz, ±300 Hz, mode 1, 21.85 kHz, ±300 Hz, mode 2, positive TTL, autoswitching by TTL.
Vertical	47-63 Hz, positive TTL, mode 1. 47-63 Hz, negative TTL, mode 2.
Signal Connector	9-pin D-type connector.
Display Colors	16 colors (15.75 kHz, mode 1). 64 colors (21.85 kHz, mode 2).
Resolution	
Horizontal	640 dots.
Vertical	Mode 1: 200 scan lines, noninterlaced. Mode 2: 350 scan lines, noninterlaced.
Text Display	2000 characters, 80 × 25 (mode 1: 8 × 8 dot matrix mode 2: 8 × 14 dot matrix).
Display Time	
Horizontal	44.4 μs (mode 1). 39.37 μs (mode 2).
Vertical	12.58 ms (mode 1). 16.01 ms (mode 2).

Retrace Time

Horizontal	6.0 μs (mode 1 and mode 2).
Vertical	1.2 ms (mode 1). 0.6 ms (mode 2).

User Controls . . . . Power, brightness, amber-normal-green switch, V. Size 1 and 2 (vertical size, mode 1 and 2), H. Phase 1 and 2 (horizontal phase 1 and 2), and 115/220V selector.

Environmental

Operation	50 °F to 95 °F (10 °C to 35 °C) ambient.
Storage	−40 °F to 122 °F (−40 °C to 50 °C).
Humidity	50% to 80% (noncondensing).
Altitude	<7000 feet above sea level.

Dimensions . . . . 14.6″ wide × 13″ high × 15.2″ deep (36.5 cm × 32.6 cm × 38.1 cm).

Weight . . . . 26.4 lbs (12 kg).

Zenith Data Systems reserves the right to discontinue products and to change specifications at any time without incorporating these changes into products previously sold.

Chapter 2

Installation

This chapter provides basic installation and set-up information for the ZVM-1380-C color video monitor. If further adjustment or servicing information is required, refer to the appropriate chapters which follow.

Controls and Connections

The various monitor controls and connectors are illustrated in Figures 2-1 and 2-2. Each control and connector is explained individually in the following paragraphs.

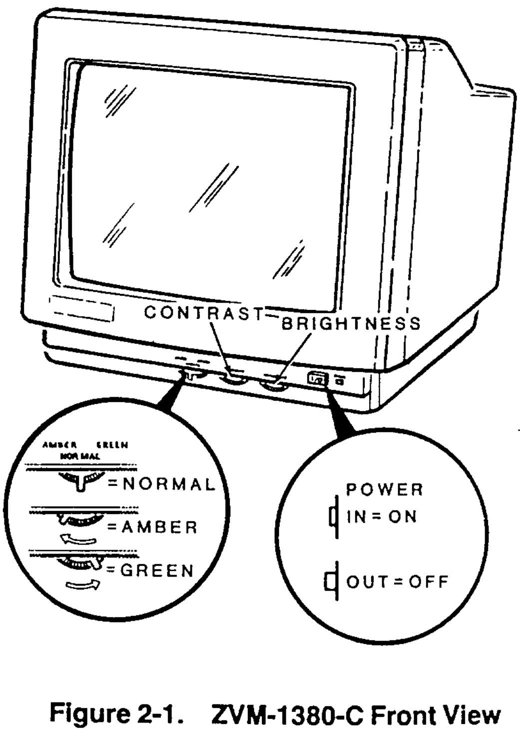


Figure 2-1. ZVM-1380-C Front View

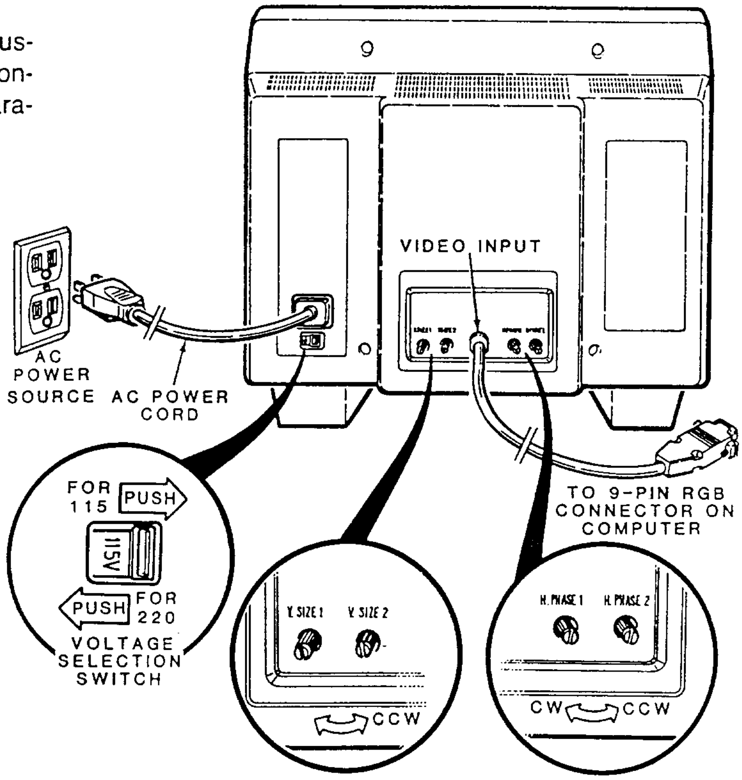


Figure 2-2. ZVM-1380-C Rear View

Power — The push-type power switch turns the monitor on (switch in) or off (switch out).

Power-On Indicator — A green LED lights when power is applied to the monitor.

Brightness — The brightness control sets the overall or average intensity of illumination of the display.

Contrast — The contrast control sets the intensity of the intensified data displayed.

115/220V Selector — The 115/220V selector switch configures the monitor for operation from the appropriate AC power source.

V. Size (1 and 2) — The vertical size adjustments (mode 1 and mode 2) set the amount of vertical (top to bottom) raster deflection.

H. Phase (1 and 2) — The horizontal phase adjustments (mode 1 and mode 2) set the horizontal (left to right) position of the display within the raster area.

Power Input Jack — A 3-pin, grounded-type power jack is located on the rear panel.

Power Cord — A 6-foot, 3-wire grounded line cord supplies power to the monitor.

Video Signal Cable — A 4-foot cable, terminated with a 9-pin, D-type connector, supplies video and sync signals to the monitor. The cable is attached to the monitor and is not detachable. Figure 2-3 illustrates the D-type connector. Table 1-1 lists the connector signals for each mode of operation.

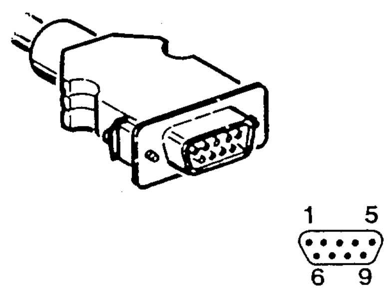


Figure 2-3. D-Type Signal Connector

Table 2-1. Video Cable Connector Signals

PIN	MODE 1	MODE 2
1	Ground	Ground
2	Reserved	r (secondary)
3	Red	R (primary)
4	Green	G (primary)
5	Blue	B (primary)
6	Intensity	g (secondary)
7	Reserved	b (secondary)
8	H sync	H sync
9	V sync	V sync

Set-Up and Operation

Perform the following steps to set up and operate the monitor.

1. Place the monitor on a flat surface near the computer and near an AC power outlet. Be certain that the ventilation slots in the cabinet are not blocked.

2. Connect the video signal cable from the monitor to the computer.

3. Plug the power cord into the monitor and then into an AC outlet. Be certain that the 115/220V selector switch on the rear panel is set to the proper position.

   WARNING: Removing or lifting the ground from the AC power source may present a potentially lethal shock hazard. Do not use an AC two-to-three wire adapter plug with this unit.

4. Turn on the computer and the monitor. The front panel power indicator should light. The system prompt for the computer should be displayed.

5. Adjust the front panel brightness and contrast controls to obtain a comfortable display.

Initial Tests

To assess the monitor's operation, perform the color bar test and the fill screen test. Both tests are ROM-based.

Color Bar Test

The color bar test displays sixteen different colors in the form of a bar graph. (If the monitor is used with a computer that does not have color capabilities, a gray scale is displayed instead.) Using a Z-100 series PC, perform the color bar test as follows:

1. Press the CTRL, ALT, and INS keys in sequence, hold them, and then release them.
2. After the prompt appears on the monitor, type C and press RETURN. Color bars should now be displayed.

Fill Screen Test

The fill screen test fills the display with any character entered from the keyboard. Using this test, the dimensions, size, focus, convergence, and other qualities of the display may be assessed. Using a Z-100 PC Series computer, perform the fill screen test as follows:

1. Press the CTRL, ALT and INS keys in sequence, hold them, and then release them.
2. After the prompt appears on the monitor, type TEST and press RETURN. The TEST menu should now be displayed.
3. Select the keyboard test by pressing the 2 key.
4. Press any displayable key to fill the screen with that character. (A display filled with capital Z's will show abnormalities more readily than other characters.)
5. To exit from this test, press the DEL (delete) key to return to the TEST menu. Press the 5 key to return to the prompt.

Chapter 3
Disassembly

This chapter provides instructions for both disassembly and reassembly of the monitor. Each section has detailed illustrations showing you how to disassemble the parts. Use the exploded view of the monitor in Chapter 7 to see the relative location of major assemblies. For reassembly, perform the steps in the reverse order except when instructed to do otherwise.

WARNING: To avoid shock hazard, make sure that the power switch is off and that the power and video cables are disconnected.

Cabinet Back

The cabinet back must be removed prior to all other disassembly.

1. Refer to Figure 3-1 and remove the two 5/8-inch phillips thread-forming screws labeled A, the two 1/2-inch phillips machine screws labeled B, and washers labeled C.

2. Pull the cabinet back toward the rear until it is clear of the monitor. Feed the video cable through the opening in the cabinet back to completely free the cabinet back.

During reassembly the cabinet back must be aligned as shown in the inset of Figure 3-1 when it is slid onto the monitor.

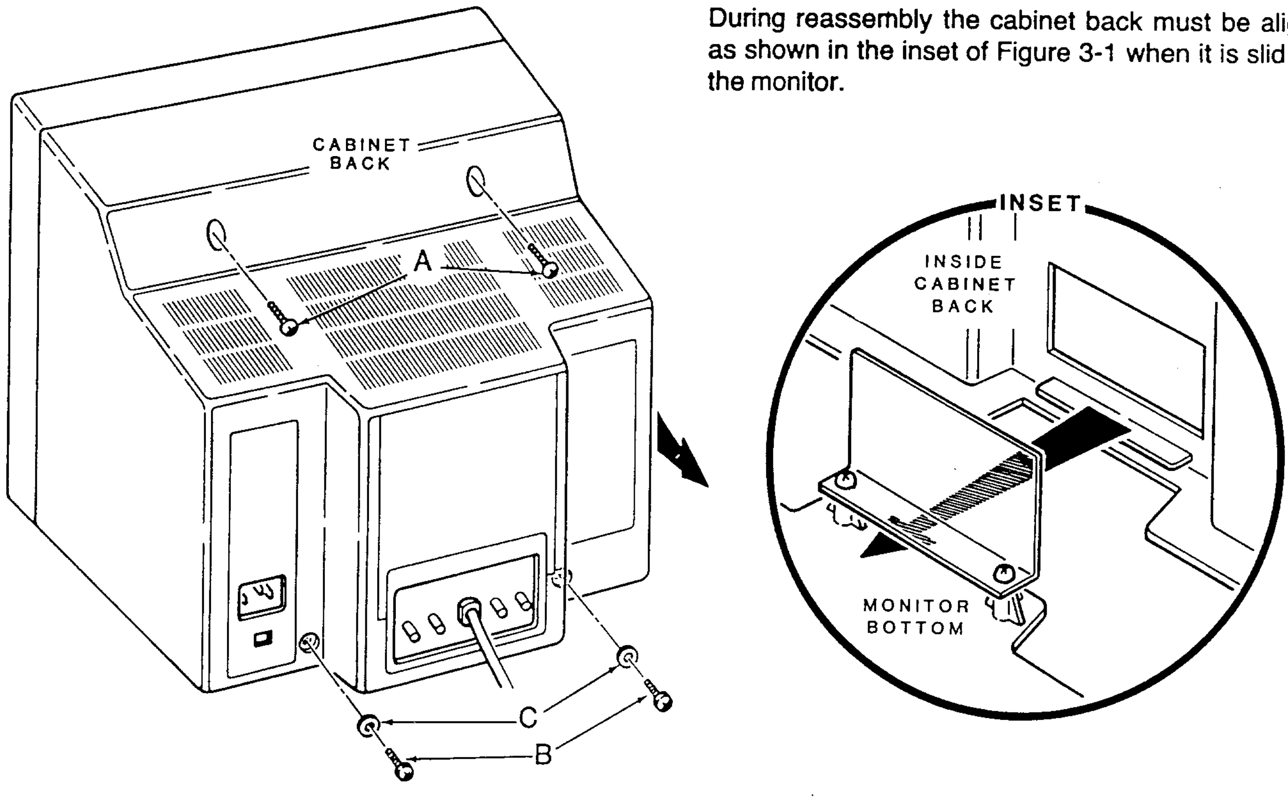
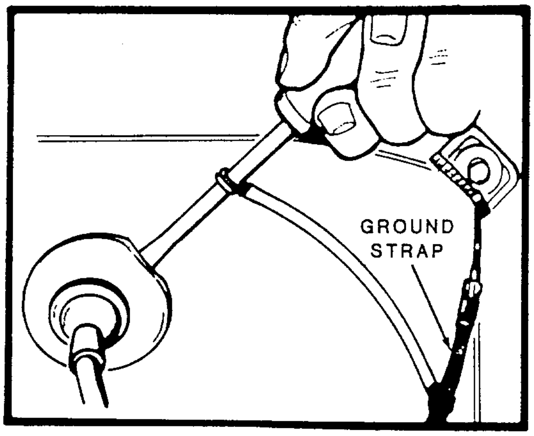


Figure 3-1. Cabinet Back Removal

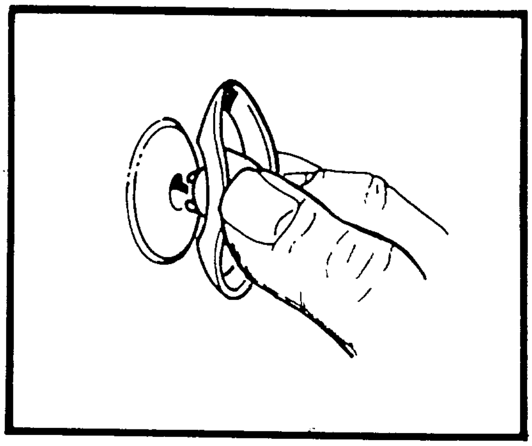
CRT Drive Board

WARNING: Discharge the high voltage at the anode lead of the CRT using a jumper lead connected between the chassis and a screwdriver; otherwise, shock or injury may result (refer to Figure 3-2).

1. Discharge the high voltage and disconnect the high voltage lead from the CRT, as shown in Figure 3-2.



1. CAREFULLY SLIDE A GROUNDED FLAT SCREWDRIVER TIP UNDER THE LIP OF THE ANODE LEAD.



2. AFTER DISCHARGING THE VOLTAGE, DISCONNECT THE ANODE LEAD FROM THE CRT.

Figure 3-2. Discharging High Voltage

2. Wiggle the CRT drive board from side to side while pulling it straight back and off the neck of the CRT, as shown in Figure 3-3. Lay the board down so that the cabling holds it with its component side up, as shown in Figure 3-4. During reassembly the lead dress must be as shown in Figure 3-4.

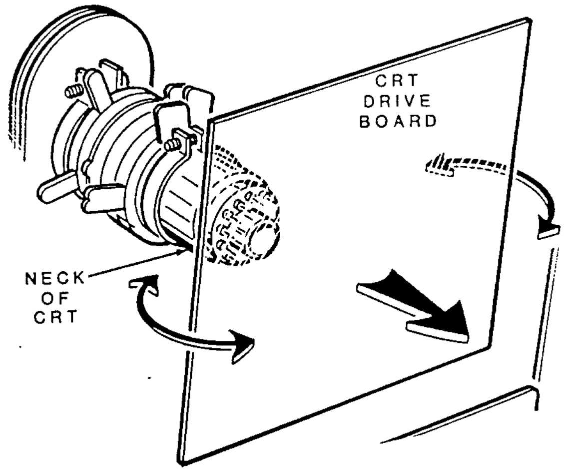


Figure 3-3. CRT Drive Board Removal

3. Cut the cable tie that secures the cabling to the corner of the CRT drive board, as shown in Figure 3-4.

4. Unwrap the cable tie that extends from the top of the power supply assembly, as shown in Figure 3-4.

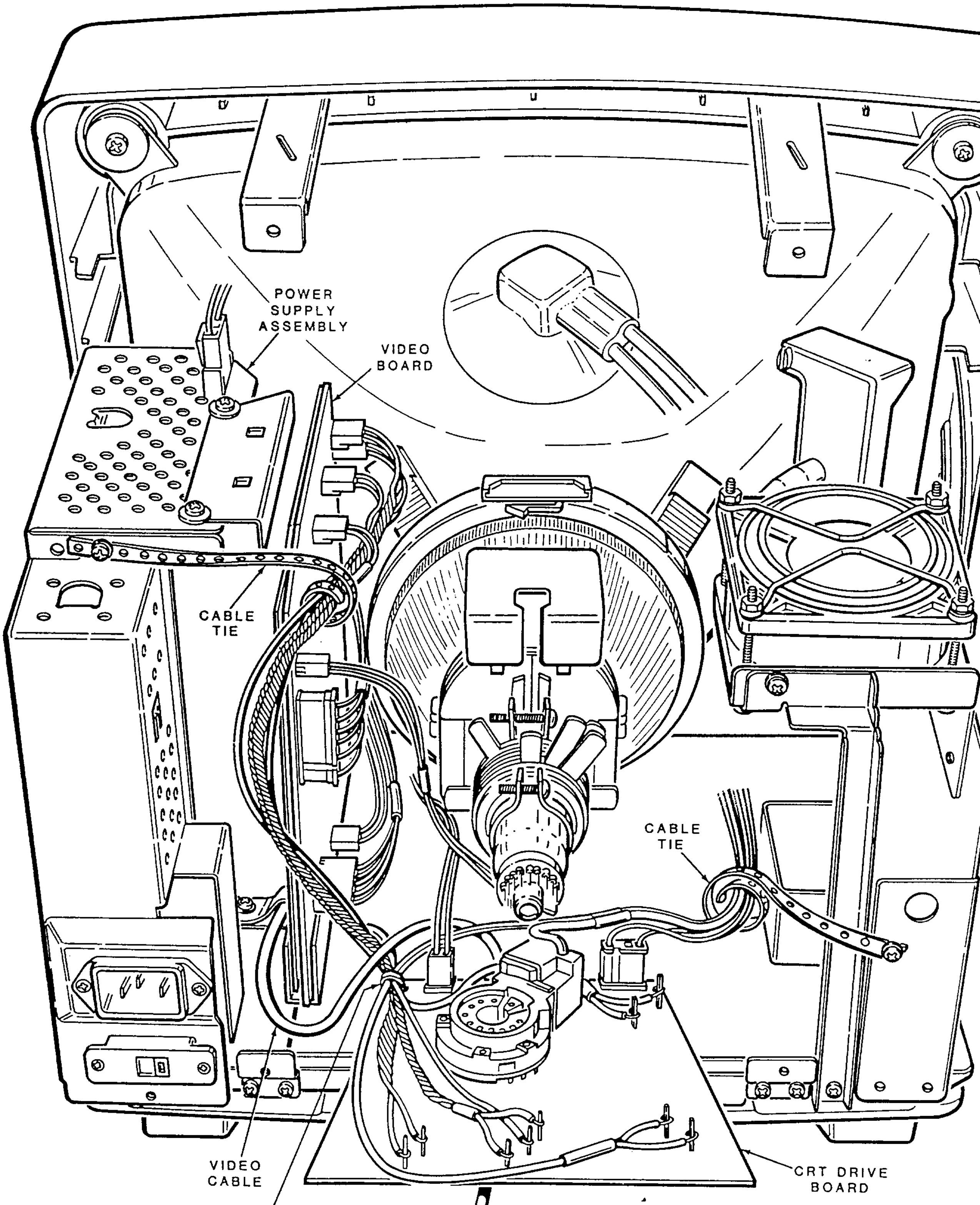


Figure 3-4. Lead Dress

5. Disconnect cable connectors P202A (3-pin, 2-wire), P207 (2-pin, 2-wire), P208 (2-pin, 2-wire), and P209 (2-pin, 2-wire) from the video board, as shown in Figure 3-5. During reassembly, be sure that all connectors are connected to the correct cables. The 2-pin connectors and color identifications must match: red-to-red (P209), green-to-green (P208), and blue-to-blue (P207). Also during reassembly be sure that the connectors are fully mated, as shown in the inset of Figure 3-5.

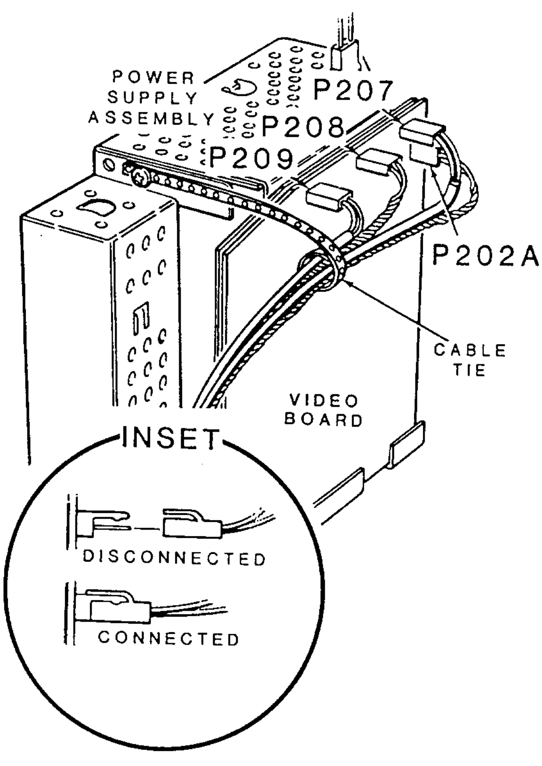


Figure 3-5. Disconnecting P202A, P207, P208, and P209

6. Use Figure 3-6 to locate the cables that are still holding the CRT drive board to the monitor. Label these wires and the CRT drive board terminals so that they can be identified during reassembly. Remove these wires from the CRT drive board terminals. Be sure to route the wires and attach them to the original locations during reassembly.

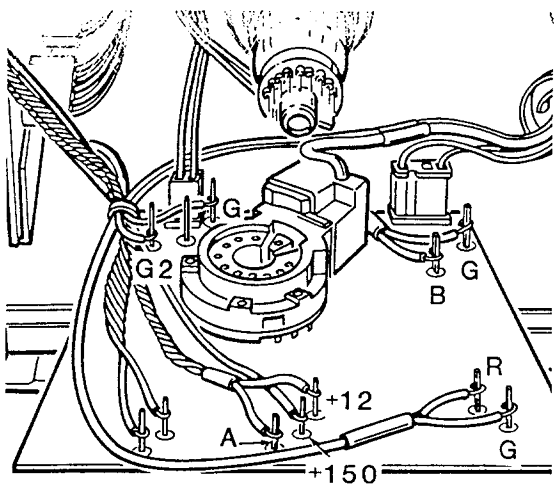


Figure 3-6. CRT Drive Board Wire Disconnects

7. Disconnect cable connectors P901 (3-pin, 2-wire) and P902 (2-pin, 2-wire) from the CRT drive board, as shown in Figure 3-7.

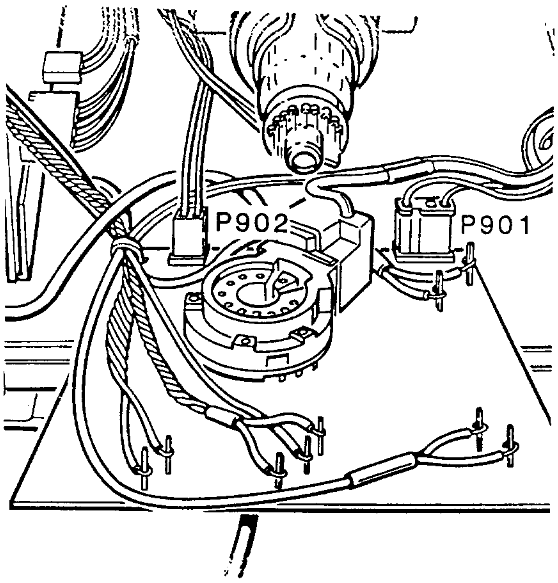


Figure 3-7. Disconnecting P901 and P902

8. Slide the rubber boot to expose the focus pot terminal of the focus and G2 control assembly, as shown in Figure 3-8.

9. Unsolder the focus lead and free the lead from the cable ties. Remove the CRT drive board from the monitor and set it to one side.

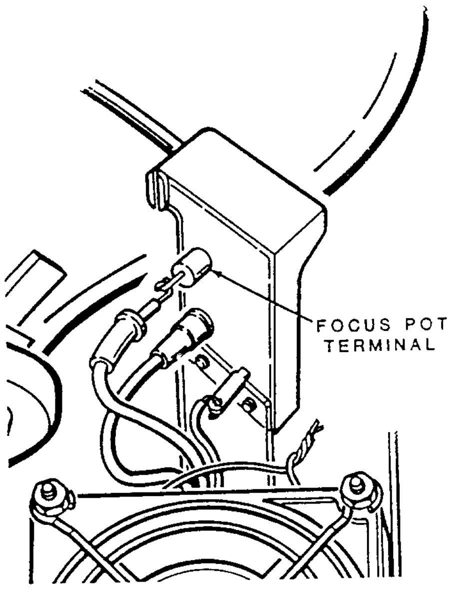


Figure 3-8. Disconnecting the Focus Cable

Video Board

1. Remove the CRT drive board from the neck of the CRT and disconnect connectors P202A, P207, P208, and P209 from the video board, as shown in Figure 3-9. During reassembly, be sure that the connectors are fully mated, as shown in the inset of Figure 3-9.

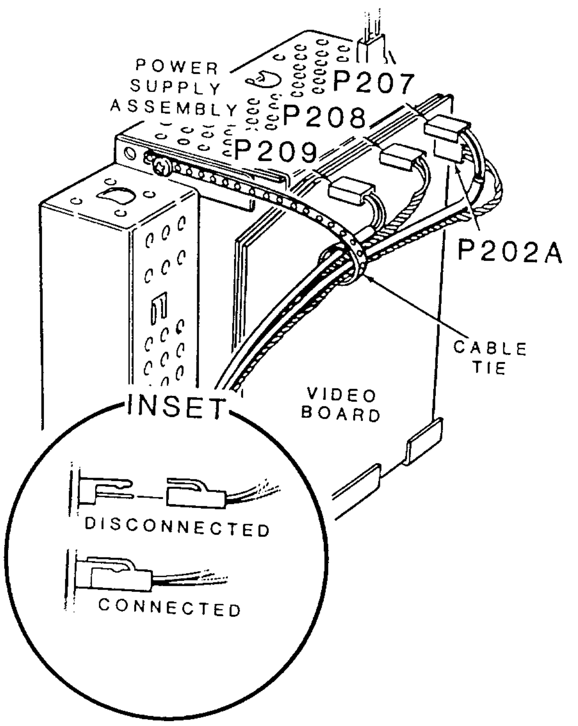


Figure 3-9. Disconnecting the CRT Drive Board Cables

2. Remove connector P405A (2-pin, 2-wire) from the back of the video board, as shown in Figure 3-10. Be sure to reattach this cable to the same connector during reassembly. The cable has one black wire and one red wire. During reassembly be sure that P405A is fully mated, as shown in Figure 3-10.

3. Remove connector P402A (6-pin, 6-wire), as shown in Figure 3-10.

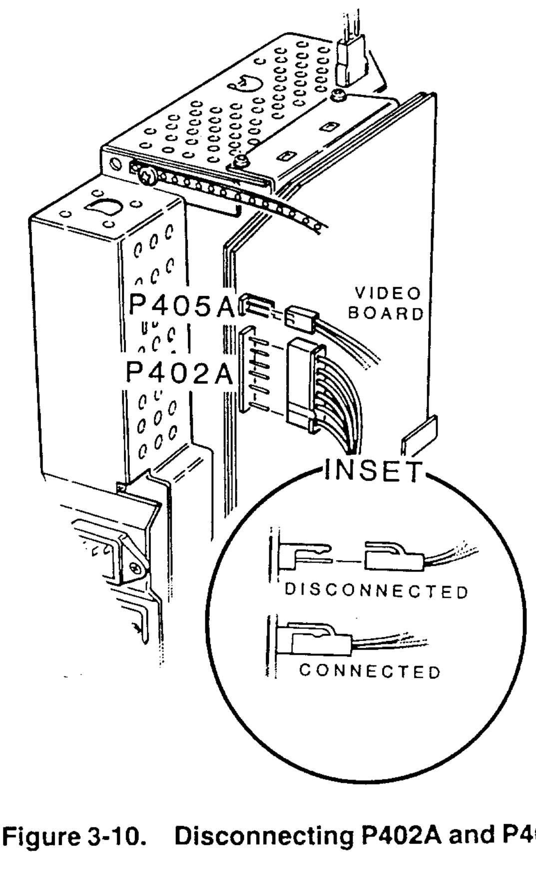


Figure 3-10. Disconnecting P402A and P405A

4. Refer to Figure 3-11 and remove the 1/2-inch, phillips thread-forming screws labeled A, the insulating spacers labeled B, and the shield labeled C. During reassembly, be sure that the shield, insulating spacers, and video board are positioned as shown in the inset of Figure 3-11.

5. Lift the video board and remove connectors P206 (3-pin, 3-wire), P205 (4-pin, 3-wire), P201 (4-pin, 4-wire), and P204 (9-pin, 9-wire) as shown in Figure 3-12. During reassembly, be sure that the connectors are fully mated, as shown in the inset of Figure 3-12.

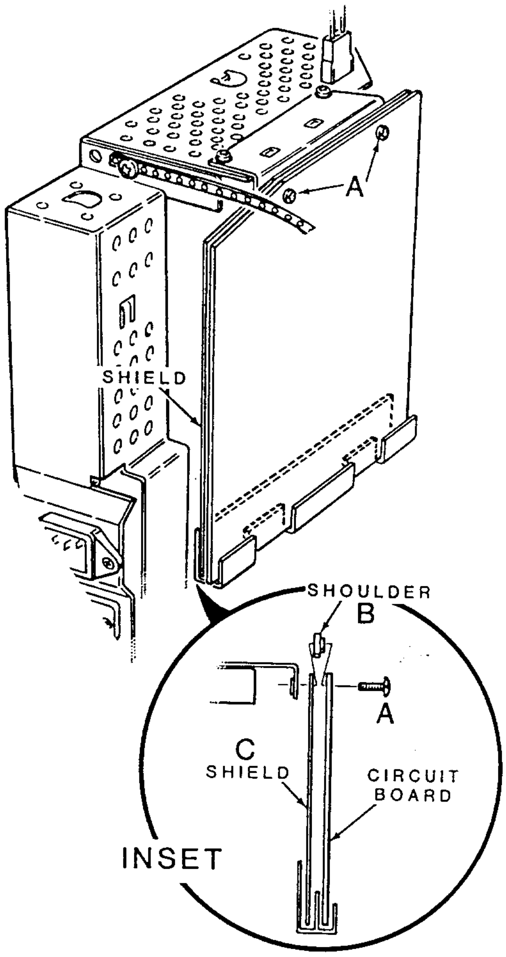


Figure 3-11. Video Board Screws

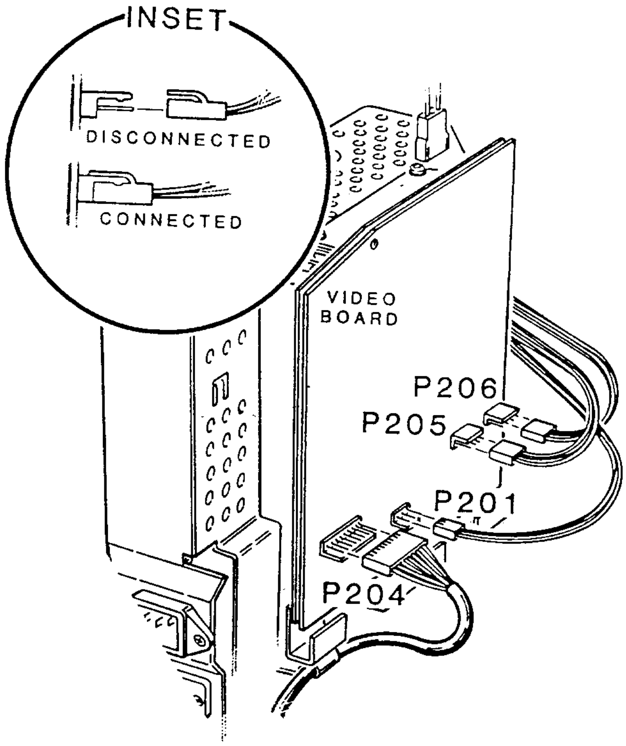


Figure 3-12. Disconnecting P201, P204, P205, and P206

Input Power Assembly

1. Remove the three 3/8-inch, phillips thread-forming screws that are labeled A in Figure 3-13.

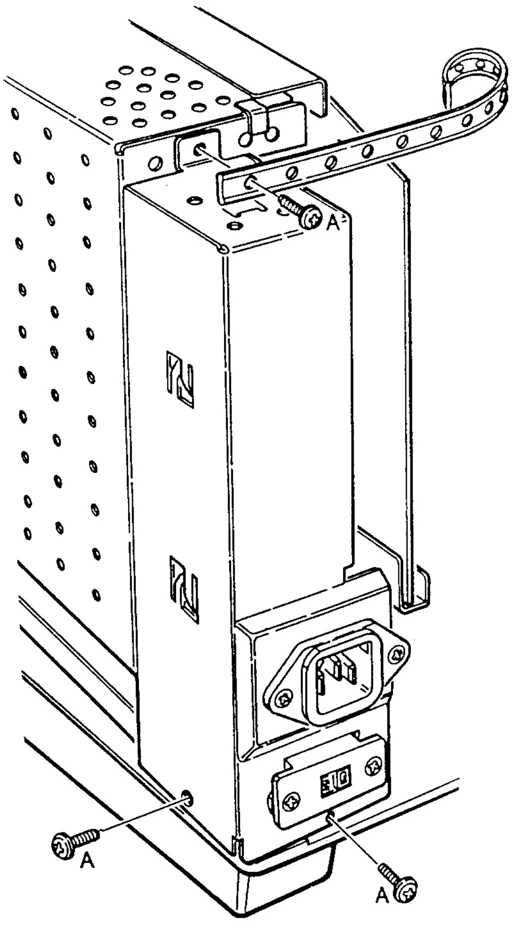


Figure 3-13. Input Power Assembly Screws

2. Carefully pull the input power assembly back and away from the power supply assembly and disconnect connector AC IN (3-pin, 2-wire), at the back of the power supply assembly, as shown in Figure 3-14.

3. Disconnect the 2-pin, 2-wire connector that connects the 115V/230V switch to the power supply assembly, as shown in Figure 3-14.

4. Remove the 7/16-inch, phillips thread-forming screw labeled A in the inset of Figure 3-14. Set the input power assembly to one side. Be sure to install the star washer labeled B between the green wire ground lug and the metal base of the monitor during reassembly, as shown in the inset of Figure 3-14.

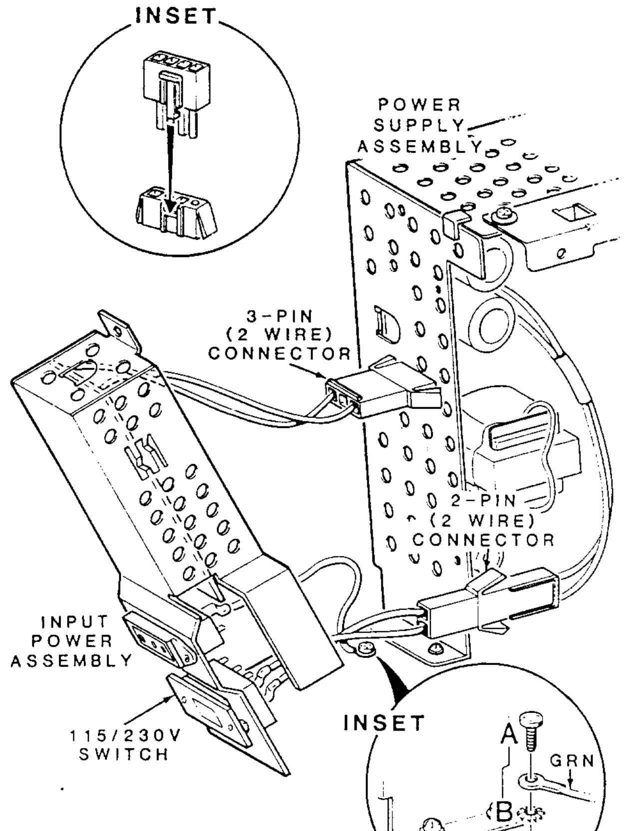


Figure 3-14. Input Power Assembly Connectors

Power Supply Assembly Removal

1. Remove the input power assembly.

2. Disconnect connector P101 (2-pin, 2-wire) from the top of the power supply assembly and the 3-pin, 2-wire and 4-pin, 4-wire connectors from the front of the power supply assembly, as shown in Figure 3-15.

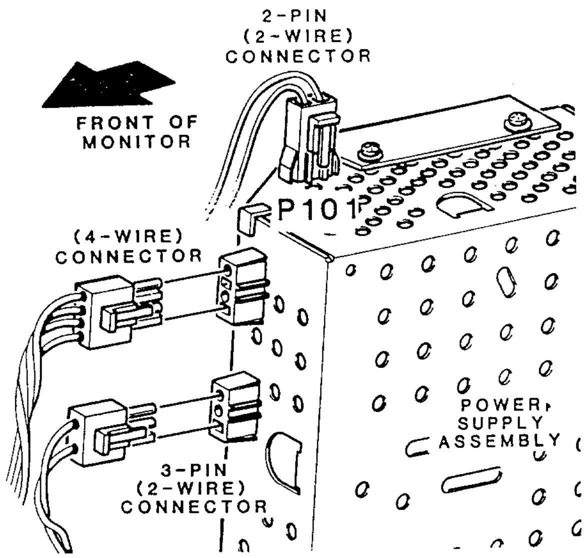


Figure 3-15. Power Supply Assembly Connectors

3. Cut the cable ties and disconnect cable connector P403 from the main board, as shown in Figure 3-16.

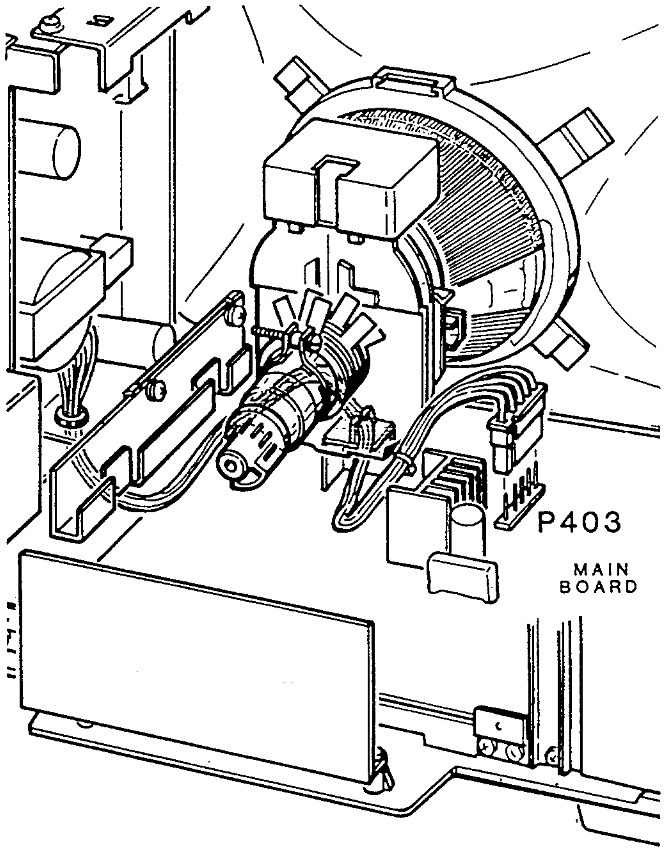


Figure 3-16. Disconnecting P403

4. Remove the four 3/8-inch, phillips thread-forming screws labeled A in Figure 3-17.

5. Refer to Figure 3-18 and remove the cable ties that secure the power supply assembly cable P901 (3-pin, 2-wire) to the other cabling.

6. Remove the power supply assembly from the monitor and set it to one side.

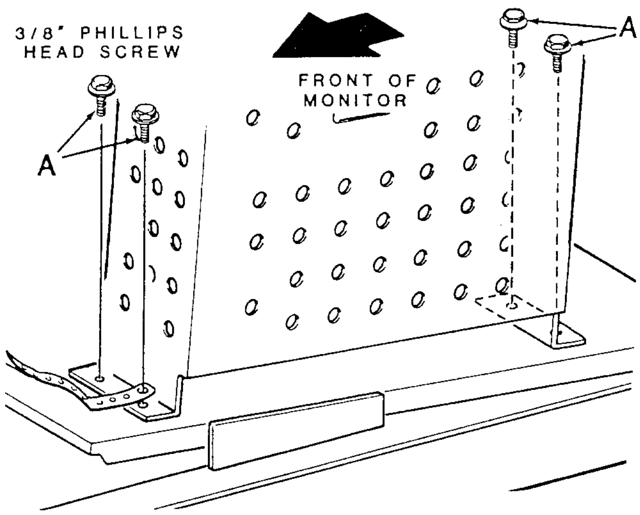


Figure 3-17. Power Supply Assembly Screws

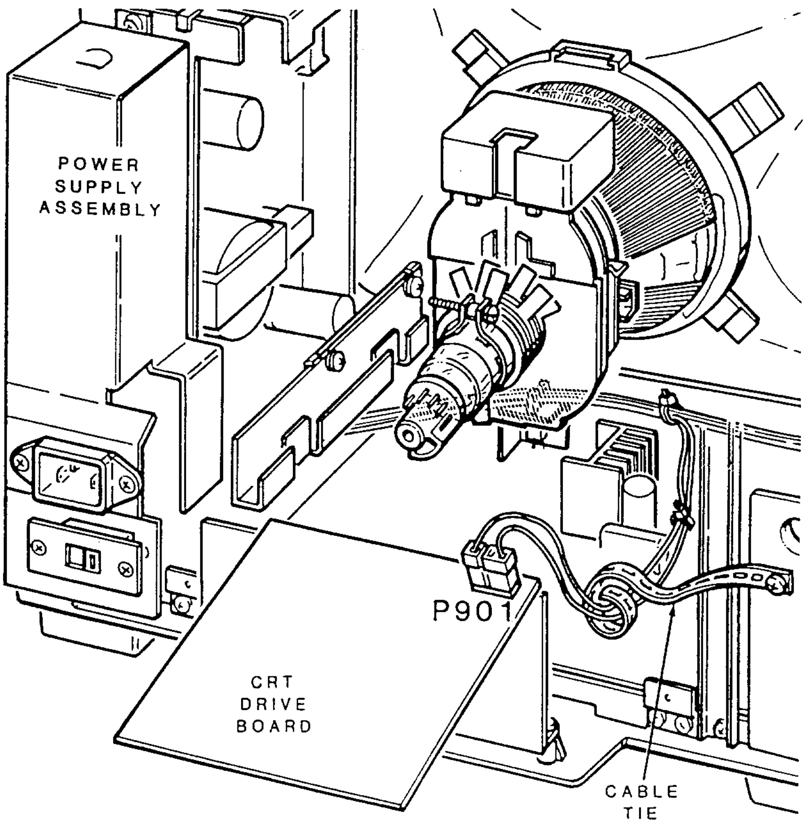


Figure 3-18. CRT Drive Board Cable P901

Monitor Front

1. Remove the video board. The CRT drive board has to be disconnected from the neck of the CRT.

   WARNING: Discharge the high voltage at the anode lead of the CRT using a jumper lead connected between the chassis and a screwdriver; otherwise, shock or injury may result (refer to Figure 3-2).

2. Discharge the high voltage and disconnect the high voltage anode lead from the CRT, as shown in Figure 3-2.

3. Disconnect yoke connector P401 (6-pin, 4-wire) from the main board, as shown in Figure 3-19.

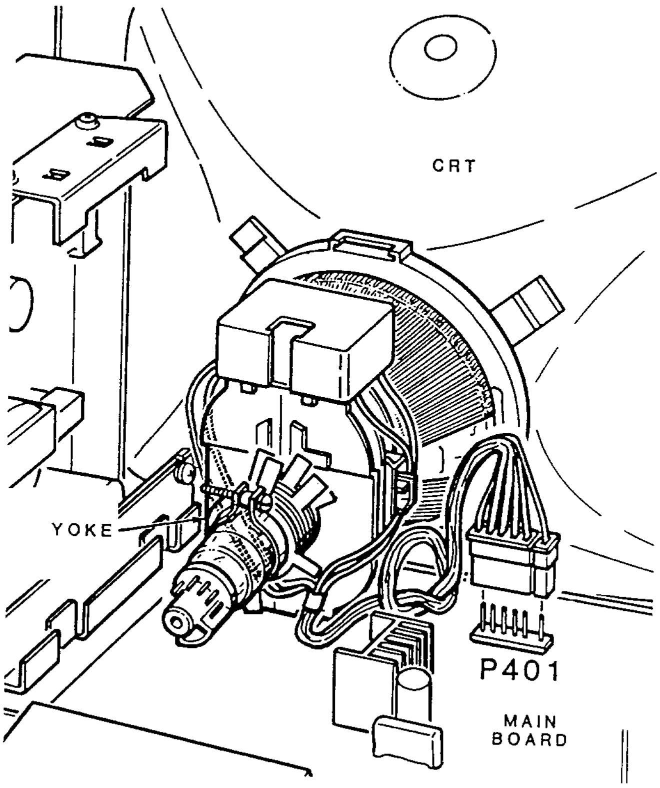


Figure 3-19. Disconnecting Yoke Connector P401

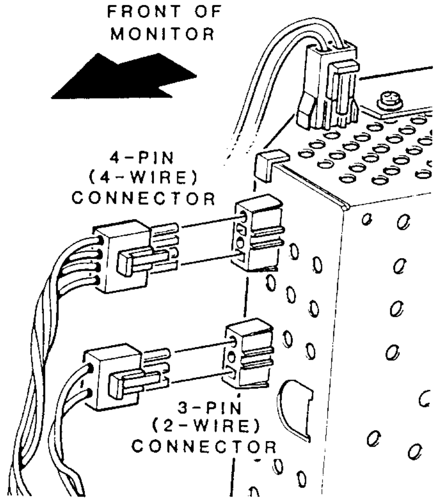


Figure 3-20. Disconnecting Power Supply Assembly Connectors

4. Disconnect the 3-pin, 2-wire and the 4-pin, 4-wire connectors from the front of the power supply assembly, as shown in Figure 3-20.

5. Disconnect DAG ground connector P902 (2-pin, 2-wire) from the CRT drive board, as shown in Figure 3-21.

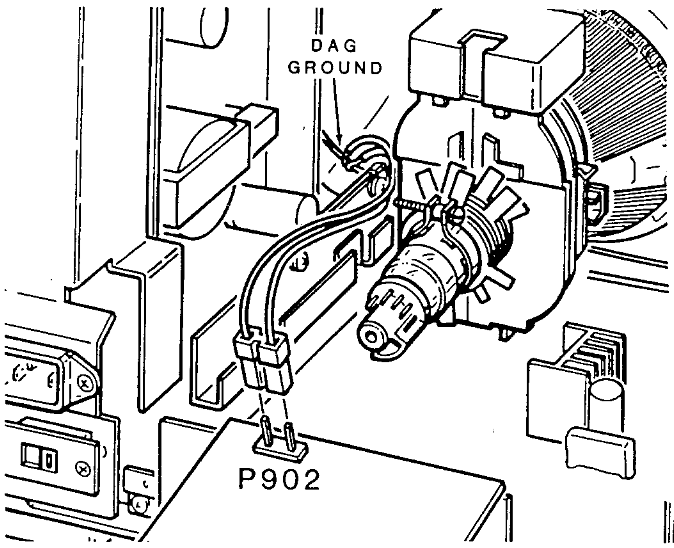


Figure 3-21. Disconnecting P902

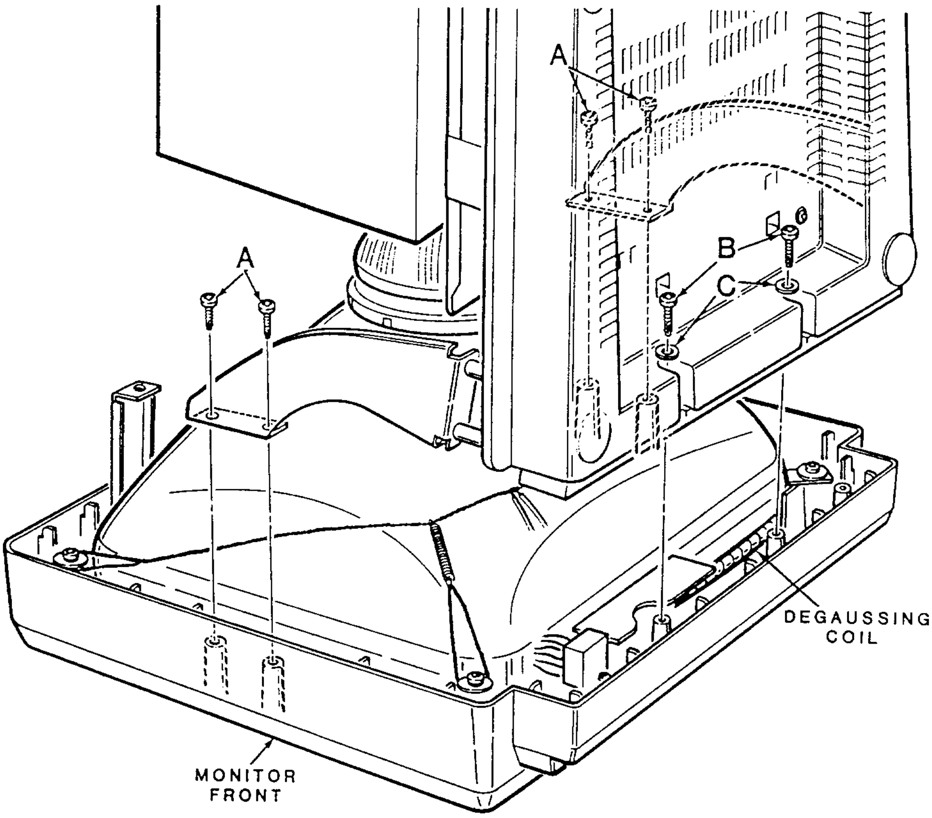


Figure 3-22. Monitor Front Removal

6. Place the monitor face down on a soft horizontal surface.

7. Remove the four 1/2-inch phillips thread-forming screws labeled A, the two 1/2-inch phillips thread-forming screws labeled B, and flat washers labeled C in Figure 3-22.

8. Lift the monitor straight up and away from the monitor front, as shown in Figure 3-22, and set the monitor down next to the monitor front.

9. Disconnect power LED cable connector P406 (2-pin, 2-wire) from the main board, as shown in Figure 3-23.

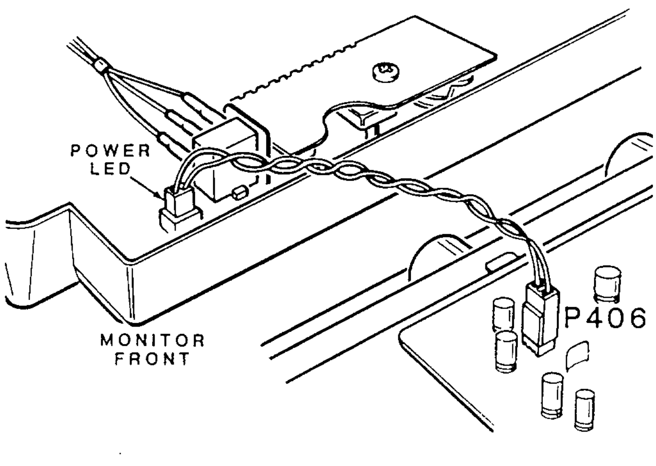


Figure 3-23. Disconnecting P406

Control Board (Front Panel Controls)

1. Remove the monitor front.

2. Refer to Figure 3-24 and remove the 7/8-inch phillips thread- forming screw labeled A that secures the control board to the monitor front.

3. Spring the retaining bracket away from the control board tab, as shown in the inset of Figure 3-24. Remove the control board and set it to one side.

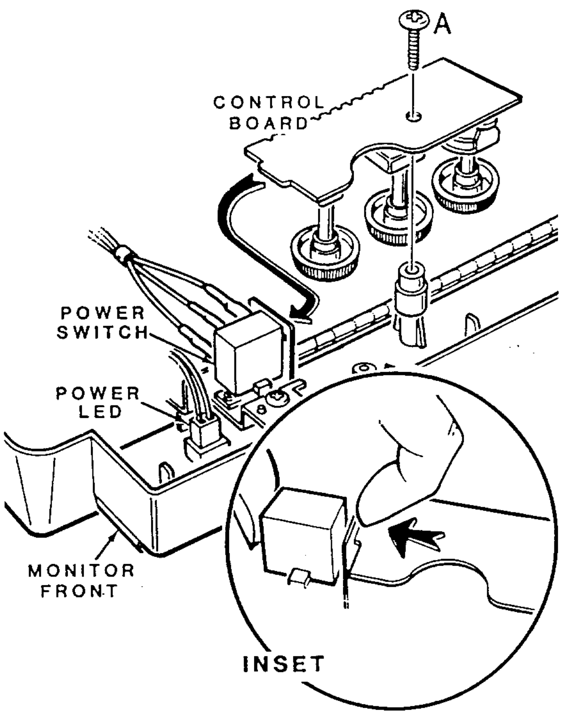


Figure 3-24. Control Board Removal

CRT and Yoke Assembly

1. Remove the monitor front.

2. Refer to Figure 3-25 and remove the four 7/8-inch phillips thread-forming screws labeled A, the four lock washers labeled B, the four flat metal washers labeled C, and the four rubber washers labeled D.

3. Carefully lift the CRT and yoke assembly up and away from the monitor front and set the assembly on a clean, soft surface.

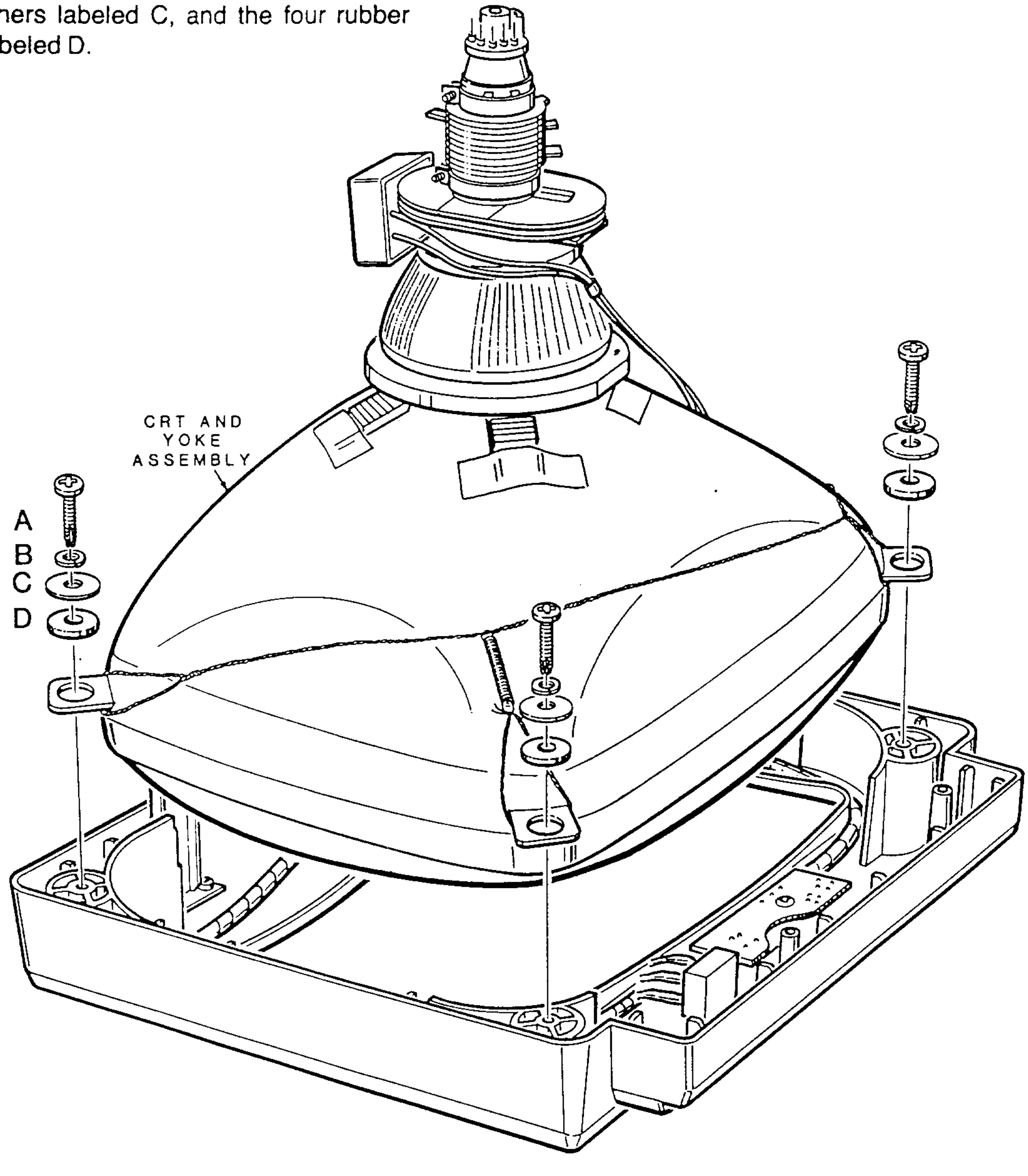


Figure 3-25. CRT and Yoke Assembly Removal

Main Board

1. Remove the monitor front.
2. Remove the HOT bracket assembly.
3. Disconnect connector P403 (5-pin, 5-wire) from the main board, as shown in Figure 3-26.
4. Release the cabling from the clamp mounted on heat sink Q307 on the main board (see Figure 3-26).

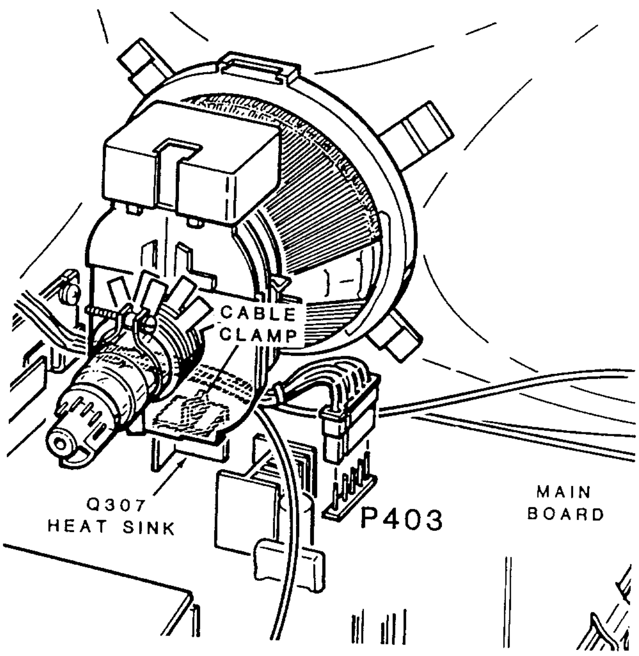


Figure 3-26. Disconnecting P403

5. Slide back the rubber boot and disconnect the wires from the focus and G2 control assembly, as shown in Figure 3-27.
6. Remove the cable tie and the two 5/16-inch phillips thread-forming screws labeled A that secure the focus and G2 control to its bracket (see Figure 3-27).

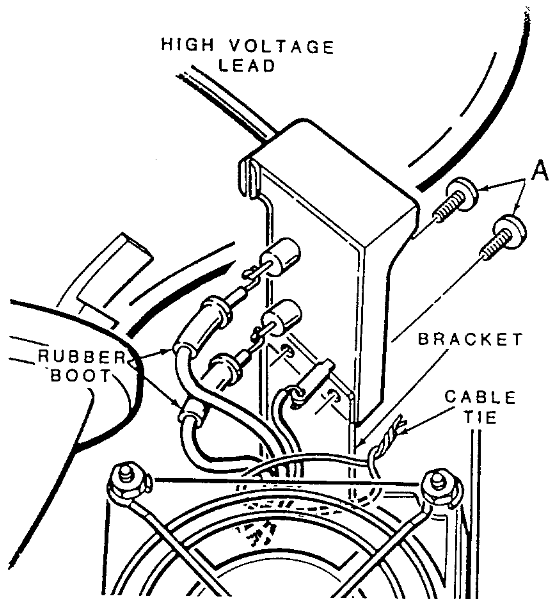


Figure 3-27. Focus and G2 Control Assembly Removal

7. Refer to Figure 3-28 to locate the cables that are still holding the main board to the monitor. Label these wires and the main board terminals so that they can be identified during reassembly. Remove these wires from the main board terminals. Be sure to route these wires and attach them to the original locations during reassembly.

8. Remove the six 3/8-inch phillips thread forming-screws labeled A that secure the main board to the monitor bottom, as shown in Figure 3-29.

9. Slide the main board toward the front of the monitor until the rear controls are clear of the back bracket. Next slide it to the right (away from the power supply assembly) until it is free from the bracket tab, as shown in the inset of Figure 3-29.

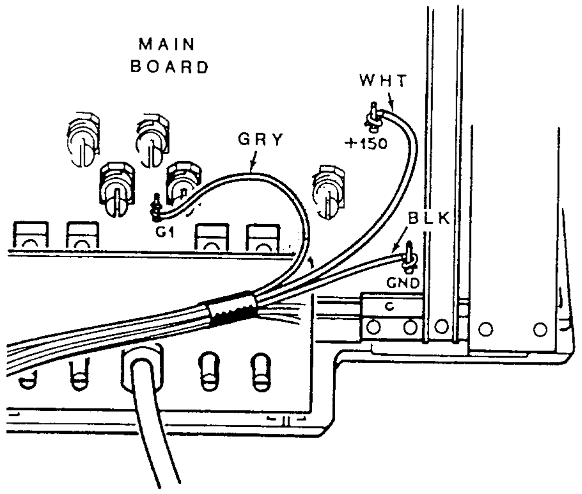


Figure 3-28. Main Board Wire Disconnects

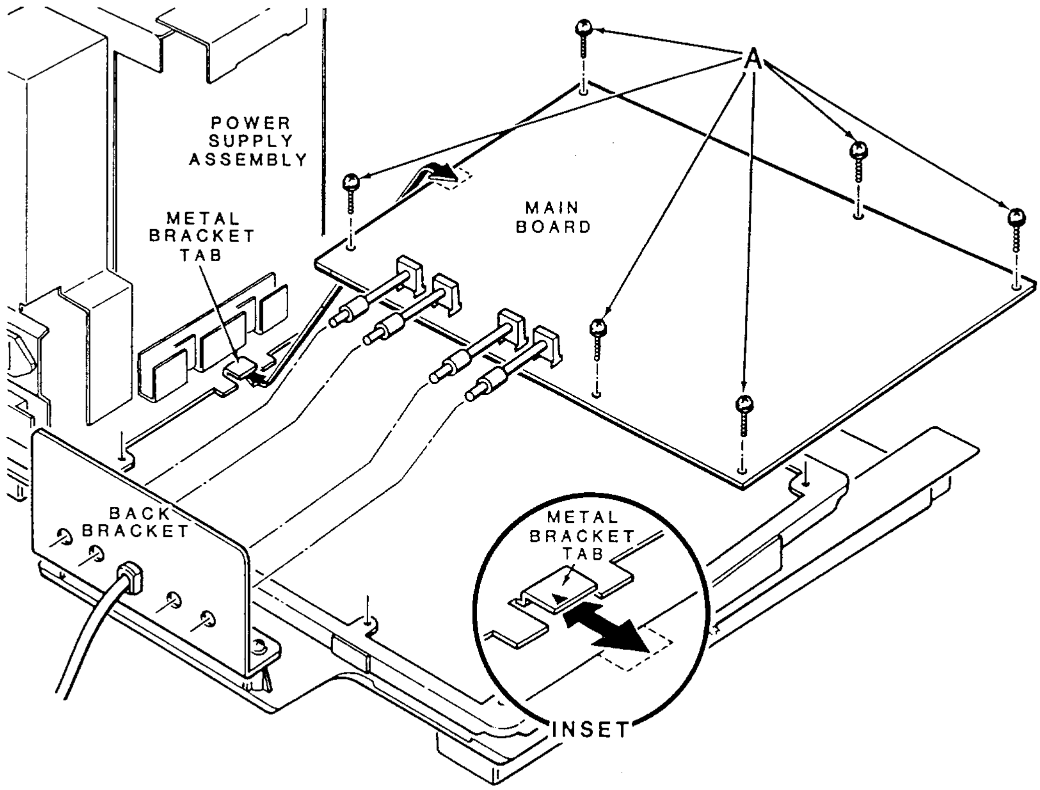


Figure 3-29. Main Board Screws

HOT Bracket Assembly

1. Remove the four 3/8-inch phillips thread-forming screws labeled A in Figure 3-30. The bracket that surrounds the horizontal output transformer is now free and can be left resting on top of the main board. Be sure to secure the wire tie in the upper hole at the back of the bracket during reassembly.

2. Remove the three 3/8-inch phillips thread-forming screws labeled B that secure the the HOT bracket assembly to the fan bracket.

3. Remove the three 3/8-inch phillips thread-forming screws labeled C in Figure 3-30.

4. Disconnect transistor Q405, labeled D in Figure 3-31, by removing the nut labeled E from the screw labeled F. During reassembly, be sure that transistor D, nut E, screw F, clip G, shouldered spacer H, and insulating strip I are positioned as shown in the inset of Figure 3-30.

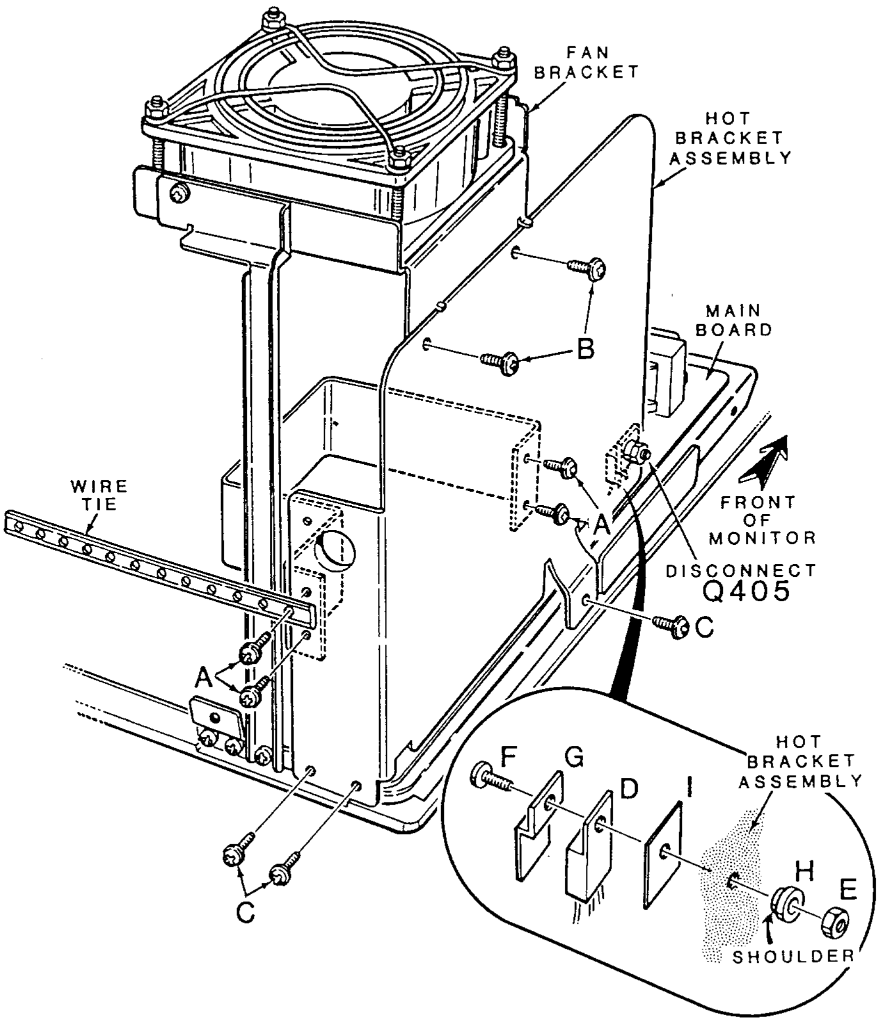


Figure 3-30. HOT Bracket Assembly Screws and Disconnecting Q405

5. Disconnect HOT cable connector P404 (3-pin, 3-wire) from the main board, as shown in Figure 3-31.

6. Refer to Figure 3-31 and tilt the top of the HOT bracket assembly to allow access to the Q403 leads.

7. Label the Q403 leads so that they can be identified during reassembly.

8. Unsolder the Q403 leads, remove the HOT bracket assembly from the monitor, and set it to one side.

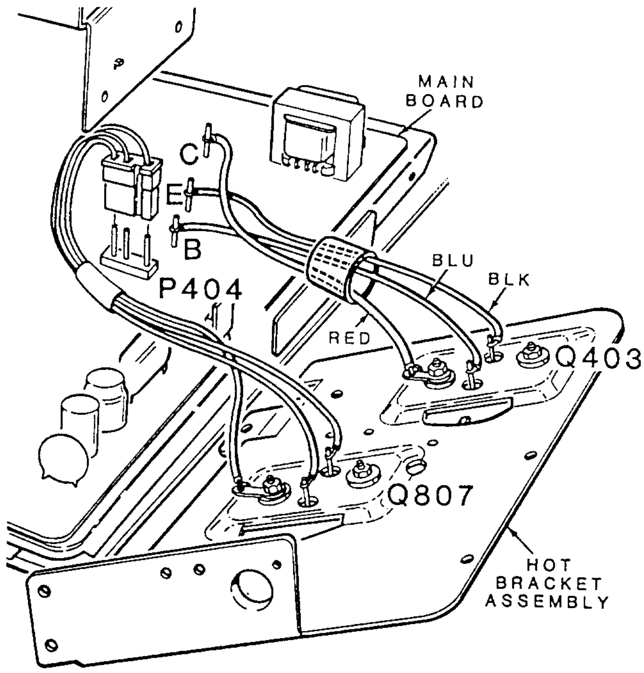


Figure 3-31. HOT Connector P404 and Q403 Leads

Fan

1. Refer to Figure 3-32 and disconnect fan cable connector P101 from the top of the power supply assembly.

2. Pull the fan cable toward the fan so that the splices in the cable are accessible. This may require loosening cable ties that secure the fan cable to other cables. Cut the fan cable wires at the splices.

3. Refer to Figure 3-33 and remove the four 1.75-inch phillips machine screws labeled A, the lockwashers labeled B, the nuts labeled C, and the star washers labeled D that secure the fan to the fan bracket. During reassembly, be sure that the fan guard labeled E is positioned with its screw holes flat against the fan housing.

4. Remove the 3/8-inch phillips thread-forming screw labeled F in Figure 3-33. Lift the fan out of the fan bracket and set it to one side. During reassembly, be sure to connect the red fan cable wire to the positive (+) fan wire and insulate the cable splices with tape or heat-shrink tubing.

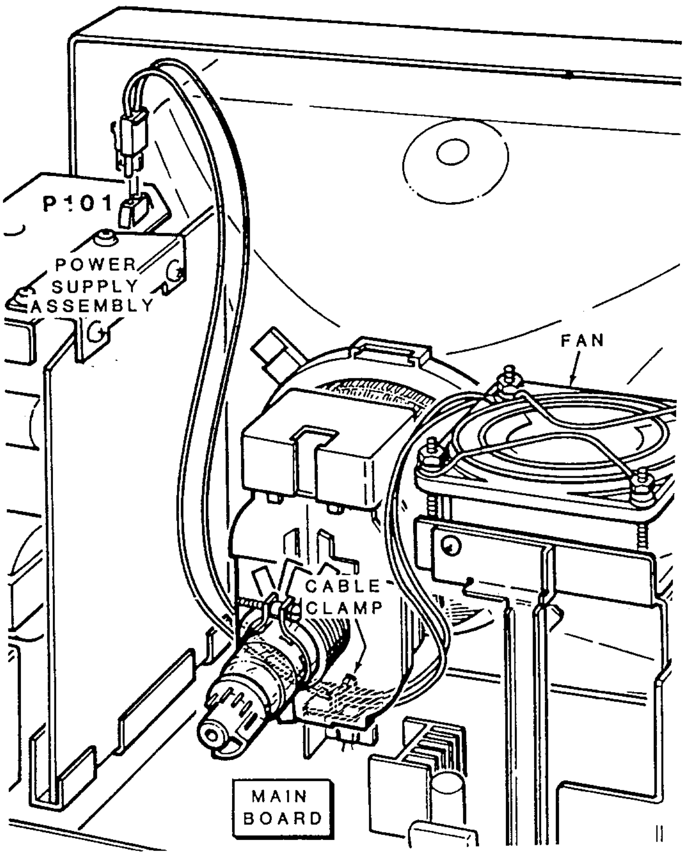


Figure 3-32. Fan Cable Connector and Ties

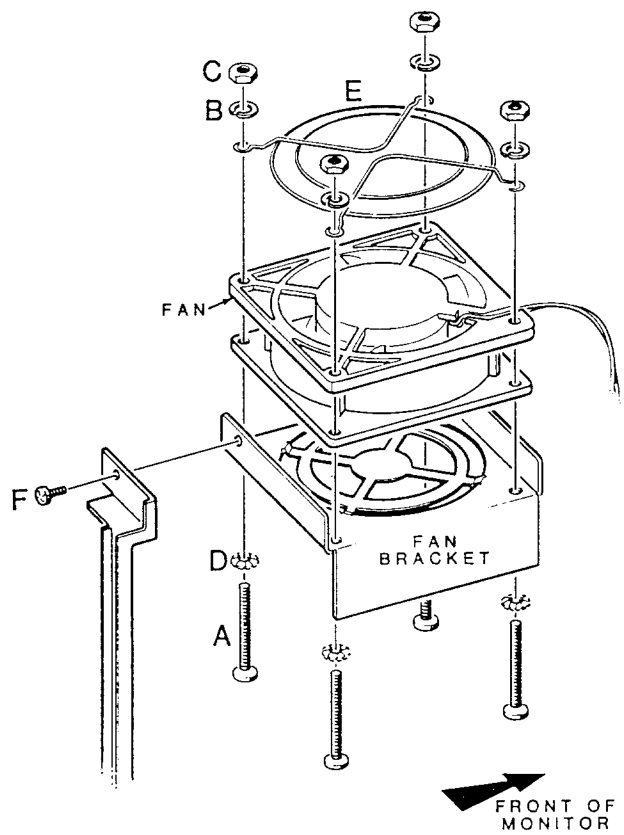


Figure 3-33. Fan Screws

Chapter 4
Adjustments

This chapter contains instructions for performing the various monitor adjustments. Because these adjustments are performed while the monitor is on, observe proper precautions to avoid personal injury. Specific warnings are included where necessary.

Table 4-1 lists the various adjustment devices and their component numbers. They are arranged according to the circuit board or location where they can be found. Specific adjustment procedures follow Table 4-10. If a particular adjustment does not correct a problem, refer Chapters 5 and 6 to for additional information.

Refer to Figures 4-1, 4-2 and 4-3 to locate these adjustments on the video board, the CRT board, and the main board as indicated.

Table 4-1. Monitor Adjustment Devices

DEVICE	DESCRIPTION
External	
R208	Front panel brightness control
R209	Front panel contrast control
Video Board	
R526	Primary red drive
R527	Secondary red drive
R566	Primary green drive
R567	Secondary green drive
CRT Board	
R523	Red cutoff
R563	Green cutoff
R593	Blue cutoff
Main Board	
R309	Vertical hold
R306	Vertical size, mode 1 (rear panel)
R366	Vertical size, mode 2 (rear panel)
R326	Vertical centering
R409	Horizontal hold, mode 1
R469	Horizontal hold, mode 2
R433	Horizontal width, mode 1
R493	Horizontal width, mode 2
R413	Horiz. Phase, mode 1 (rear panel)
R473	Horiz. Phase, mode 2 (rear panel)
R435	Horizontal centering
R333	E-W Pincushion
R907	Sub-brightness
R451	22.5 kV high voltage
Power Supply	
VR1	B+, 12.75 V
Other	
Focus VR	High voltage resistor block
G2 VR	High voltage resistor block

VIDEO BOARD

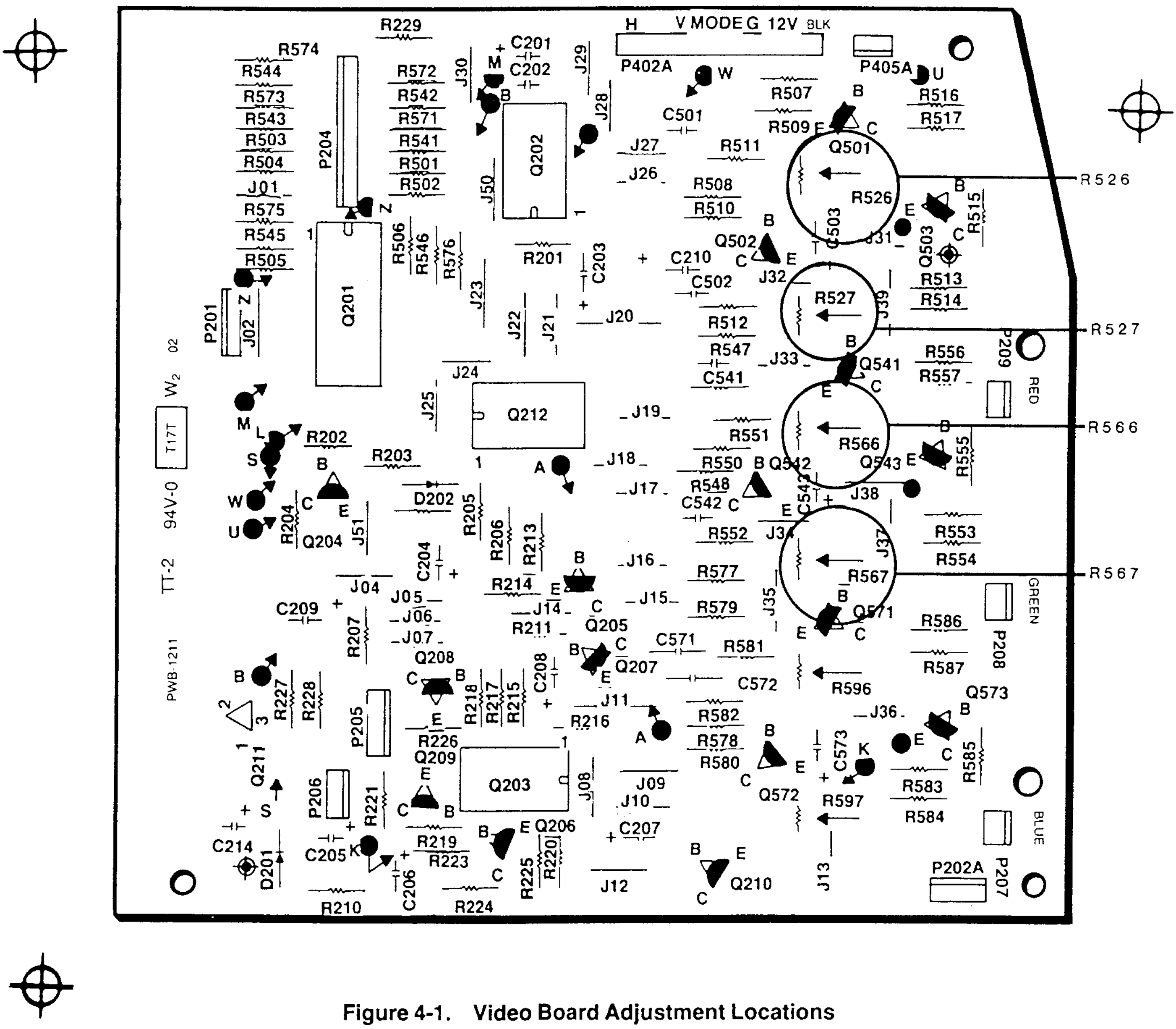


Figure 4-1. Video Board Adjustment Locations

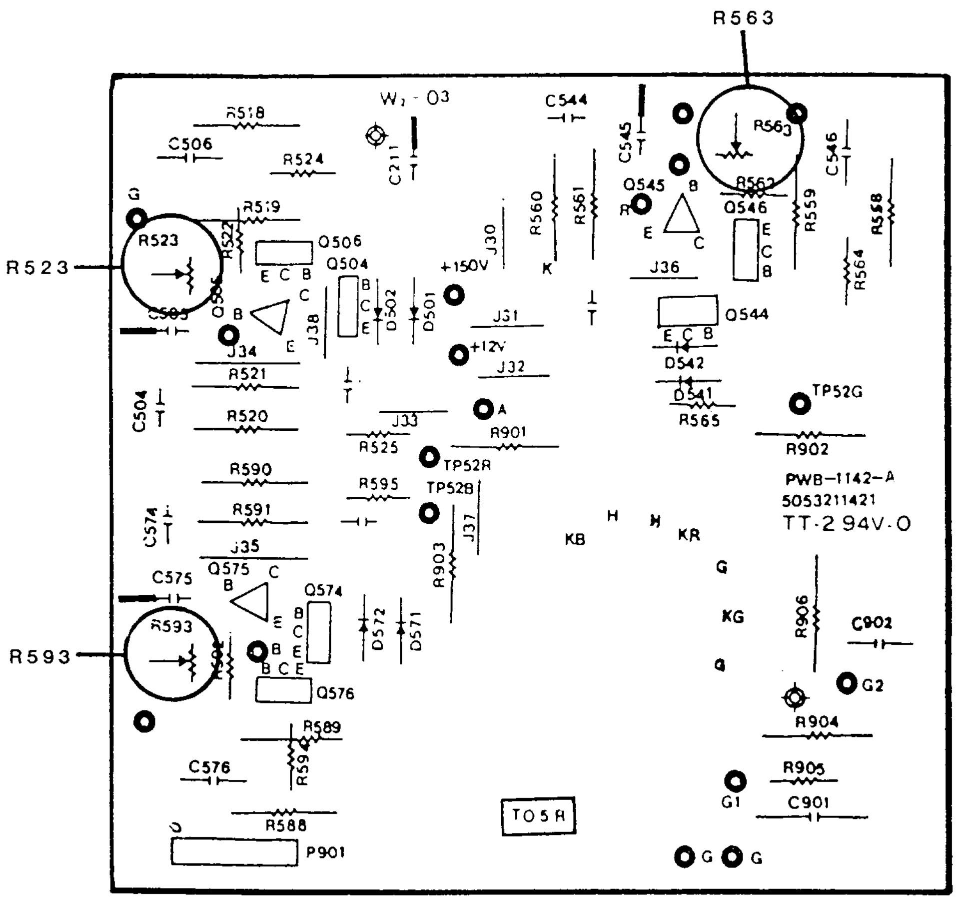


Figure 4-2. CRT Board Adjustment Locations

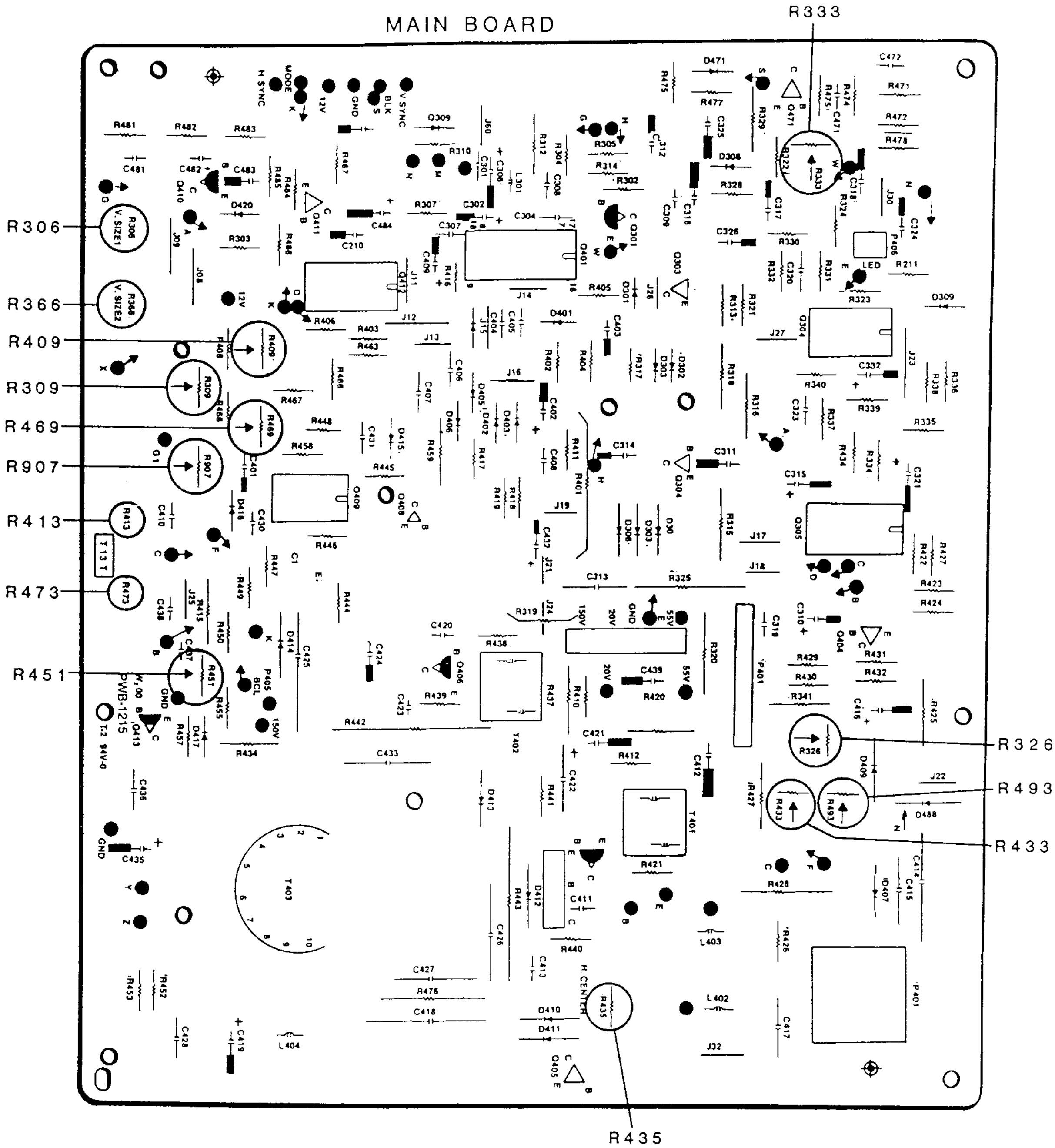


Figure 4-3. Main Board Adjustment Locations

Preparation

Perform the following steps to prepare the monitor for adjustment.

1. Remove the cabinet back to access internal adjustments.

2. Turn the monitor on and allow it to warm up for approximately 30 minutes.

3. Prepare the computer to run the disk-based diagnostics (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure). They will be used to generate test patterns required for specific adjustments. Be certain that the computer is functioning properly by first connecting it to a known good monitor.

4. Read each adjustment procedure before performing it.

B+ Adjustment

The switch-mode power supply has a B+ output voltage adjustment located within the unit. Variable resistor VR1 sets the 12.75 VDC output.

WARNING: The switch-mode power supply contains circuits that generate dangerous high-frequency, high-amplitude, quasi-square wave signals that present a potentially lethal shock hazard. Exercise extreme caution when adjusting or working near this unit.

Using a DVM, measure the 12.75 V B+ voltage and adjust VR1 to obtain a reading of 12.75 V, ±0.05V. The B+ voltage can be measured on the main board at either of two points marked "12 V" in the lower left portion of the board (looking in from the rear). VR1 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.

Vertical Hold

The vertical hold adjustment prevents the display from rolling upwards or downwards. Adjust R309 to stabilize the display by turning it first to one extreme and then backing off until the display just stabilizes. Repeat this procedure from the opposite extreme until the display just stabilizes. Set R309 midway between the two settings that stabilize the display.

Vertical Size

The vertical size adjustment sets the amount of vertical (top to bottom) raster deflection. The vertical size adjustments for both mode 1 and mode 2 are located externally on the rear panel. To adjust vertical size:

1. Turn the G2 control clockwise until the raster just appears.

2. Adjust R306 (V. Size 1) and R366 (V. Size 2) for a raster height of 170mm ±2mm in each mode.

3. Turn the G2 control counterclockwise until the raster just disappears.

Vertical Centering

The vertical centering adjustment shifts the whole display up or down within the raster. To adjust centering:

1. Verify that the vertical size is correct. Adjust it if necessary.

2. Turn the G2 control clockwise until the raster just appears.

3. Adjust R326, the vertical centering pot, so that the display is centered from top to bottom within the raster.

4. Turn the G2 control counterclockwise until the raster just disappears.

Horizontal Hold

The horizontal hold adjustment prevents the display from shifting horizontally and tearing apart in diagonal segments. To adjust the horizontal hold:

1. Connect a jumper from test point TP22 to ground.

2. Adjust R408 (mode 1) or R468 (mode 2) to eliminate horizontal tearing and restore horizontal hold.

3. Remove the jumper from TP22.

Horizontal Width

The horizontal width adjustment sets the amount of horizontal (left to right) raster deflection. To adjust horizontal width:

1. Turn the G2 control clockwise until a raster just appears.

2. Adjust R433 (mode 1) or R493 (mode 2) so that the display width is 250 mm ±2 mm in each mode.

3. Turn the G2 control counterclockwise until the raster just disappears.

Horizontal Phase

The horizontal phase adjustment sets the left-to-right position of the display within the raster area. To adjust horizontal phase:

1. Turn the G2 control clockwise until the raster just appears.

2. Adjust R413 (mode 1) or R473 (mode 2) to center the display from left to right within the raster.

3. Turn the G2 control counterclockwise until the raster just disappears.

Horizontal Centering

The horizontal centering adjustment shifts the whole raster from left to right for mode 2. This adjustment is only present for mode 2. To adjust horizontal centering:

1. Turn the G2 control clockwise until the raster just appears.

2. Adjust R435 to center the raster from left to right for mode 2.

3. Turn the G2 control counterclockwise until the raster just disappears.

RGB Drive

The red and green driver adjustments set the amplitudes of the red and green CRT drive voltages relative to the blue drive voltage. (There is no blue drive adjustment). When set properly, all three (RGB) drive voltages will be the same. To adjust the red and green drive voltages:

1. Display a white field (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure).

2. Set the front panel contrast and brightness controls to maximum, and the amber-normal-green switch to the normal position.

3. Using an oscilloscope, measure and record the amplitude of the blue drive voltage at TP52B on the CRT drive board. This value should be approximately 60 V p-p (refer to waveform 15 in Chapter 8).

4. Next, measure the amplitude of the red drive voltage at TP52R. If necessary, adjust the two red (R and r) drive ports (R526 and R527) so that the amplitude of the red drive voltage matches that of the blue drive voltage recorded in step 2.

5. Measure the amplitude of the green drive voltage at TP52G. If necessary, adjust the two green (G and g) drive pots (R566 and R567) so that the amplitude of the green drive voltage matches that of the blue drive voltage recorded in step 2.

Horizontal Line Precision

The horizontal line precision adjustment sets the relative contributions of the R, G, and B bias controls to produce a white horizontal line. This adjustment should be performed under low light. To adjust the horizontal line precision:

1. Remove the input signal from the monitor. (Disconnect video cable from the computer.)

2. Set the front panel contrast control to maximum and the front panel brightness control to minimum.

3. Set the R, G, and B cutoff controls (R523, R563, and R593) to mid-position.

4. Set sub-brightness control R907 to its mid-position.

5. Adjust G2 for 500 VDC. G2 voltage may be measured from the foil side of the CRT drive board.

6. Connect a jumper between points M and N on the main board.

7. Turn the R cutoff control (R523) counterclockwise until a red horizontal line just appears.

8. Turn the G and B controls (R563 and R593) counterclockwise until a white line is displayed.

9. Remove jumper connecting points M and N.

10. Perform the brightness level adjustment procedure in the following section.

Brightness Level

The sub-brightness control (R907) sets the threshold for the front panel brightness control. This control should be adjusted with the monitor in mode 2. Adjustment should be performed under low light. To adjust the brightness level:

1. Display a white field on the entire screen (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure).

2. Set the front panel brightness control to minimum.

3. Adjust R907 so that the display just disappears.

E-W Pincushion

The E-W pincushion adjustment reduces the horizontal pincushion distortion of the raster. (Pincushion distortion is characterized by sides of the display which bow inward, especially toward the center of the display.) This control should be adjusted with the monitor in mode 2. To adjust the E-W pincushion:

1. Display a crosshatch pattern (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure).

2. Adjust R333 so that any horizontal pincushion distortion is corrected.

Focus

The focus adjustment (the upper control on high-voltage resistor block) varies the focus voltage to produce the sharpest display detail. To adjust the focus:

1. Display a dot test pattern (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure).

2. Set the front panel contrast and brightness controls for a comfortable display.

3. Adjust the focus control for best overall focus. Check the center, top center, bottom center, left center, and right center areas of the display for good focus.

4. Verify acceptable overall focus using the fill screen test with such characters as @ and #.

Static Convergence

Static convergence adjustment refers to setting each electron beam so that all three beams (red, green and blue) hit the same spot. When all three beams hit the same spot on the CRT mask with equal intensity, a white dot appears on the screen. This adjustment should be performed under low light.

NOTE: Read the entire procedure thoroughly before performing this adjustment.

To adjust static convergence:

1. Locate the convergence magnets on the neck of the CRT. Refer to Figure 4-4 and identify the 4-pole, 6-pole and purity magnets.

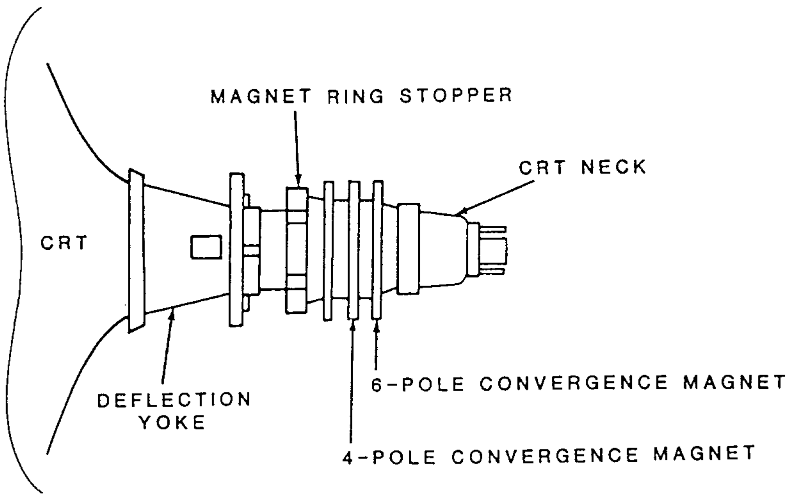


Figure 4-4. CRT Convergence Magnet Assembly

Final Checks

Before returning the monitor to service, perform the following final checks:

1. Perform the AC leakage test as described in the "Safety Guidelines" section of Chapter 6.
2. Make sure that all circuit boards and modules are properly installed.
3. Make sure that all connectors are securely installed and that all cables are properly routed to avoid pinching or excessive heat.
4. Make sure that all mounting hardware, barriers, and screws are properly installed.
5. Check the display and verify that the monitor is adjusted and functioning properly.
6. Make sure that the cooling fan is working before reassembling the monitor.
7. Leave the monitor turned on for approximately one hour and check for intermittent or thermal problems.

Cleaning Procedure

NOTE: Unplug the monitor before cleaning. Be sure that the monitor is completely dry before plugging in the unit.

- Clean the cabinet with a lint-free cloth, lightly dampened with a mild cleaning solution. Do not spray liquids directly on the monitor or use a wet, saturated cloth.
- Clean the screen with a good quality glass cleaner.

2. Mark the present position of the magnets by drawing a pencil line along the sides of all the magnets. This will give you a reference point in case the adjustment becomes difficult.

3. Carefully remove the clear adhesive glue which holds the magnets in place. The glue is brittle and may be scraped away. Be careful not to damage the CRT neck.

4. Rotate the 4-pole and 6-pole magnets slightly to loosen them. Do not force them; slowly work them back and forth until they can be moved with only moderate effort. Do not rotate the purity magnet.

5. Turn the monitor on and allow it to warm up for approximately 30 minutes.

6. Display a crosshatch pattern (refer to the "Inspection and Preparation" section of Chapter 6 for the procedure).

7. Separate the three colors (red, green, and blue) horizontally and vertically. This is accomplished by rotating the 4-pole and 6-pole magnets until the three colors are visible. The resulting display shows three distinct horizontal lines (red, green, and blue) instead of one white horizontal line throughout the display. Similarly, the white vertical lines are now split into three distinct vertical lines (red, green, and blue).

8. Superimpose the red and blue horizontal lines at the center of the screen. This is accomplished by rotating both tabs of the 4-pole magnets simultaneously until the red and blue lines overlap to form one magenta line. Use a 10X or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.

9. Superimpose the red and blue vertical lines at the center of the screen. This is accomplished by changing the angle between the 4-pole magnets until the red and blue lines overlap to form one magenta line. Use a 10X or better magnifier to more precisely adjust the overlap once the line appears magenta to the unaided eye.

10. Verify that the red and blue horizontal and vertical lines are now superimposed and appear magenta. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.

11. Superimpose the magenta and green horizontal lines at the center of the screen. This is accomplished by rotating both tabs of the 6-pole magnets simultaneously until the magenta and green lines overlap to form one white line. Use a 10X or better magnifier to more precisely adjust the overlap once the line appears white to the unaided eye.

12. Superimpose the magenta and green vertical lines at the center of the screen. This is accomplished by changing the angle between the 6-pole magnets until the magenta and green lines overlap to form one white line. Use a 10X or better magnifier to moer precisely adjust the overlap once the line appears white to the unaided eye.

13. Verify that the magenta and green horizontal and vertical lines are now superimposed and appear white. Because these adjustments are magnetic in nature, they are somewhat interactive. Repeat the previous two steps if necessary.

14. Verify overall convergence by once again examining the crosshatch pattern. Check the horizontal and vertical lines at the center of the sreen for proper convergence. Repeat any steps as necessary.

15. Apply an RTV-type sealer to the loosened magnets after these adjustments are completed.

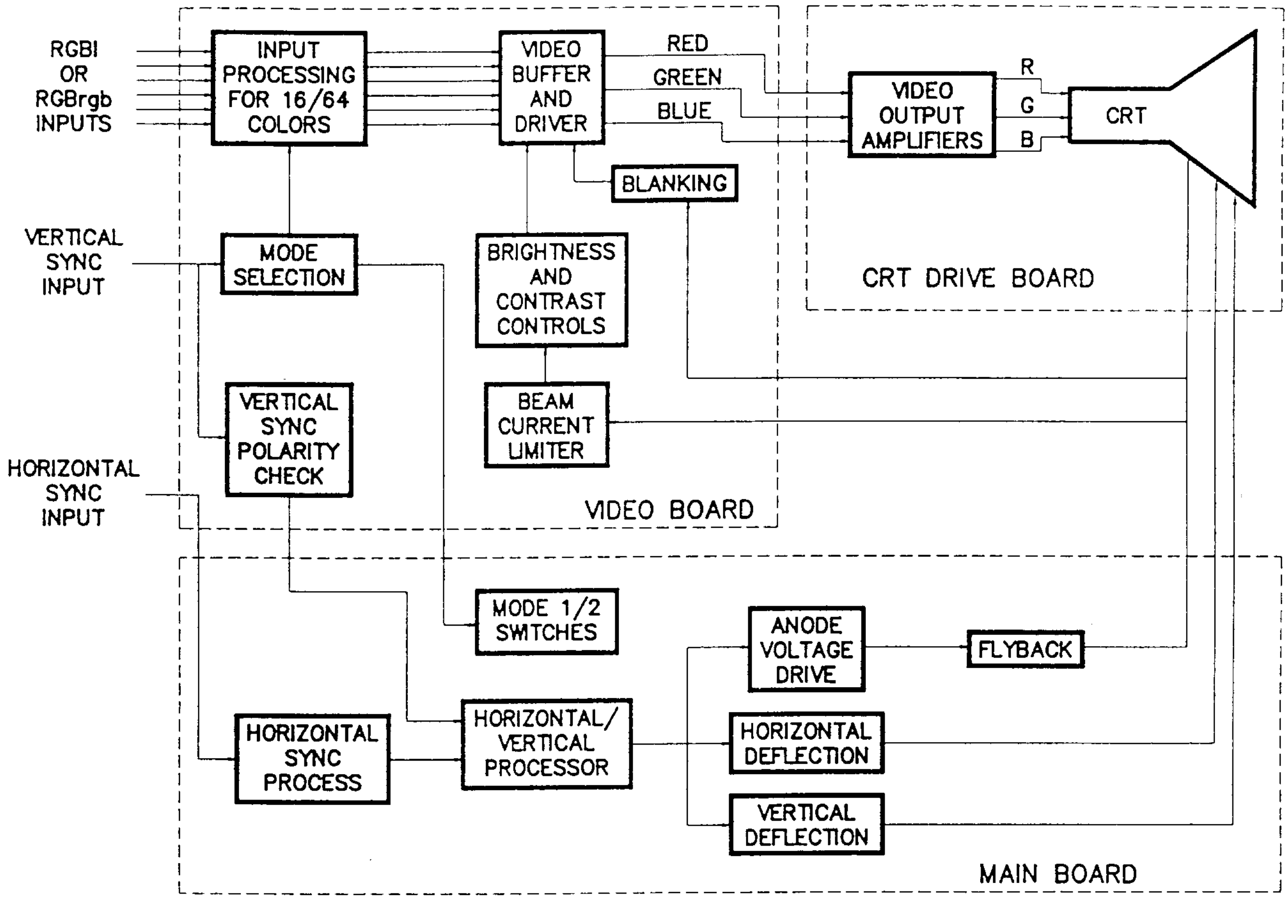


Figure 5-1. ZVM-1380-C Block Diagram

Chapter 5

Circuit Descriptions

This chapter provides descriptions of the major circuits in the ZVM-1380-C color video monitor. This text should be used in conjunction with the troubleshooting and adjustment information provided elsewhere in this manual.

Refer to the appropriate schematics located in Chapter 8 of this manual when reviewing component level circuit descriptions. Refer to the block diagram in Figure 5-1 when reviewing the overall operation of the monitor. Refer to the waveform photographs included in Chapter 8 where noted. Where appropriate, partial schematics are included within the circuit descriptions for clarity.

Modes of Operation

The ZVM 1380 color monitor may operate in either of two video modes. Mode 1 can display up to 16 colors, while mode 2 can display up to 64 colors. In each instance, the RGBI inputs to the monitor are TTL-level digital signals supplied by the computer. A D-type connector couples these signals to the monitor. Table 2-1 lists pin numbers and input signals for the connector in each video mode. Each mode is described individually in the following paragraphs.

Mode 1 Video

For mode 1 operation, a 15.75 kHz horizontal sync signal is supplied by the computer. (IBM-compatible color graphics adapters (CGA) provide a 15.75 kHz horizontal sync signal.) The RGB (primary red, green, and blue) signals contain the primary color information. In mode 1, the intensity signal is used to enhance the hue of a particular color by providing additional drive to that color. In this way, up to 16 colors may be displayed.

Mode 2 Video.

For mode 2 operation, a 21.85 kHz horizontal sync signal is supplied by the computer. (IBM compatible enhanced graphics adapters (EGA) provide a 21.85 kHz horizontal sync signal.) The RGB (primary red, green and blue) signals contain the primary color information. In mode 2, additional color information is contained in the rgb (secondary red, green and blue) signals. These secondary signals are used to enhance the hue of a primary color by providing additional drive to that primary color signal, much as the intensity signal enhances the hue in mode 1. In this fashion, up to 64 colors may be displayed.

Mode selection occurs automatically based on the polarity of the incoming vertical sync signal. A positive polarity directs the monitor into mode 1, while a negative polarity directs the monitor into mode 2. This selection process is discussed in detail in a later section.

Functional Overview

This section provides a brief explanation of the key functional blocks of the monitor. Each of the three circuit boards within the monitor is discussed individually. Refer to the block diagram in Figure 5-1 while reading the explanation that follows.

Regardless of the mode of operation, the output signals from the PROM each enter a buffer (Q212). Note that these are inverting buffers. These six buffers operate in "pairs". In mode 1, the pairs are RI, GI and BI. Thus, in mode 1, the primary colors (RGB) and the intensity signal can combine to form up to 16 colors. In mode 2, the pairs are Rr, Gg and Bb. Thus, in mode 2, the primary colors (RGB) and the secondary colors (rgb) can combine to form up to 64 colors.

The 16 colors and the bit combinations required to generate them in both modes, as well as the 64 possible combinations for mode 2, are listed in Table 5-2.

Table 5-2. Color Bit Combinations

COLOR	MODE 1 R G B I	MODE 2 R G B r g b
Black	0 0 0 0	0 0 0 0 0 0
		0 0 0 0 0 1
		0 0 0 0 1 0
		0 0 0 0 1 1
		0 0 0 1 0 0
		0 0 0 1 0 1
		0 0 0 1 1 0
Gray	0 0 0 1	0 0 0 1 1 1
Blue	0 0 1 0	0 0 1 0 0 0
		0 0 1 0 0 1
		0 0 1 0 1 0
		0 0 1 0 1 1
		0 0 1 1 0 0
		0 0 1 1 0 1
		0 0 1 1 1 0
Light Blue	0 0 1 1	0 0 1 1 1 1
Green	0 1 0 0	0 1 0 0 0 0
		0 1 0 0 0 1
		0 1 0 0 1 0
		0 1 0 0 1 1
		0 1 0 1 0 0
		0 1 0 1 0 1
		0 1 0 1 1 0
Light Green	0 1 0 1	0 1 0 1 1 1

Table 5-2 (Cont'd.) Color Bit Combinations

COLOR	MODE 1 R G B I	MODE 2 R G B r g b
Cyan	0 1 1 0	0 1 1 0 0 0
		0 1 1 0 0 1
		0 1 1 0 1 0
		0 1 1 0 1 1
		0 1 1 1 0 0
		0 1 1 1 0 1
		0 1 1 1 1 0
Light Cyan	0 1 1 1	0 1 1 1 1 1
Red	1 0 0 0	1 0 0 0 0 0
		1 0 0 0 0 1
		1 0 0 0 1 0
		1 0 0 0 1 1
		1 0 0 1 0 0
		1 0 0 1 0 1
		1 0 0 1 1 0
Light Red	1 0 0 1	1 0 0 1 1 1
Magenta	1 0 1 0	1 0 1 0 0 0
		1 0 1 0 0 1
		1 0 1 0 1 0
		1 0 1 0 1 1
		1 0 1 1 0 0
		1 0 1 1 0 1
		1 0 1 1 1 0
Light Magenta	1 0 1 1	1 0 1 1 1 1
Brown	1 1 0 0	1 1 0 0 0 0
		1 1 0 0 0 1
		1 1 0 0 1 0
		1 1 0 0 1 1
		1 1 0 1 0 0
		1 1 0 1 0 1
		1 1 0 1 1 0
Light Yellow	1 1 0 1	1 1 0 1 1 1
White	1 1 1 0	1 1 1 0 0 0
		1 1 1 0 0 1
		1 1 1 0 1 0
		1 1 1 0 1 1
		1 1 1 1 0 0
		1 1 1 1 0 1
		1 1 1 1 1 0
Intense White	1 1 1 1	1 1 1 1 1 1

The video board contains input processing circuitry, RGB drivers, brightness and contrast controls, and mode selection circuitry. TTL digital signals containing color information are supplied to the monitor by the computer along with horizontal and vertical sync signals. The monitor may operate in one of two video modes. Mode 1 video is capable of displaying up to 16 colors, while mode 2 can produce up to 64 colors. Mode selection occurs automatically based on the polarity of the incoming vertical sync signal. A PROM (programmable read-only-memory) configures the TTL signals based on the mode of operation and then passes these signals on to buffer and video driver stages. Brightness and contrast controls affect the driver stage along with beam current limiting circuitry to limit brightness. Video blanking for horizontal and vertical retrace controls the driver stage to shut off the CRT during retrace times.

The CRT drive board contains the video output amplifiers. These amplifiers activate the appropriate red, green or blue guns of the CRT, allowing information to be displayed.

The main board contains the sync processing, high voltage, horizontal and vertical deflection, and associated feedback circuitry. A number of functions formerly performed by discrete circuitry are combined onto one integrated circuit, the horizontal/vertical processor chip. This chip conditions the incoming horizontal and vertical sync signals for use by the deflection circuitry. Horizontal deflection amplifiers provide the current required to move the electron beam in the CRT from left to right. Similarly, vertical deflection circuitry provides the current required to move the beam from top to bottom. The high voltage needed for the anode of the CRT is also generated on this board. Feedback-type circuitry includes the anode voltage regulator, power regulation for pincushion correction, beam current limiting, and blanking pulses.

Video Input Processing

The RGBI or RRGBrgb digital signals enter the video board at connector P204. The vertical sync and horizontal sync signals also enter at this connector.

The color signals enter IC Q201, a PROM (Programmable Read-Only-Memory). This device processes the input signals based on a signal from the mode selection circuitry. If this mode selection signal indicates mode 1 video operation, the PROM accepts input signals configured for mode 1 operation. It then produces output signals at pins 6-12 containing RGBI signals as described in the mode 1 video explanation. If the mode selection signal indicates mode 2 video operation, the PROM accepts input signals configured for mode 2 operation. It then produces output signals at pins 6-12 containing RGBrgb signals as described in the mode 2 video explanation.

Switch S201 (amber-normal-green) directs the PROM to provide output signals corresponding to the position of the switch. To obtain a green display, the RrBb data is set to zero, resulting in a green-only display. To obtain an amber display, the rGBb data is set to zero and the Rg data is set to one, resulting in an amber-only display. Switch S201 positions and the corresponding voltage levels at pins 5 and 16 of PROM Q201 are listed in Table 5-1.

Table 5-1. S201 Settings

S201 POSITION	PIN 5	PIN 16
Normal	0 V	0 V
Amber	0 V	5 V
Green	5 V	0 V

Contrast

Potentiometer R209 is the front panel contrast control. It functions in the same way as the brightness control to provide collector voltage to driver transistors Q502, Q542, and Q572 from the emitter of Q208. The range of this control is governed by the brightness setting. This is because the voltage produced at the emitter of Q207 is used as one extreme of the range over which R209 operates. The range of R209 is thus about 4.5 V to the present setting of the brightness control.

Circuit parameters are set such that when the constrast control is set to its minimum postion, transistors Q502, Q542, and Q572 are saturated (that is, their output is logic low). This limits the number of colors that may be displayed to eight. When the contrast control is set above the minimum position, transistors Q502, Q542, and Q572 are driven as a function of their respective collector voltges. This allows the full set of available colors to be displayed with varying degrees of contrast.

Beam Current Limiter

Transistor Q205 and its associated sensing circuitry (R454, R455, and D416 on the main board) serve to limit the anode or beam current. This circuit is also referred to as an automatic brightness limiter.

The anode of diode D416 is kept at approximately 12 VDC. A cathode voltage of slightly over 12 VDC will cause the diode to conduct, while anything less keeps the diode from conducting. If the CRT anode current (sensed by R454 and R455) is about 293 μA, the voltage drop on R455 is about 12 V. As the anode current increases, the drop on R455 increases and the voltage at the anode of D416 decreases, keeping the diode off. That voltage is then applied to the base of transistor Q205. This transistor responds by changing the voltage at IC Q203, pin 3, thus controlling the brightness. As the anode current decreases from 293 μA, the voltage drop on R455 decreases and the voltage at the anode of D416 increases, turning the diode on. In this case, Q205 does not affect the brightness voltage.

Fusible resistor R454 also protects against excessive anode current. A fusible resistor is a combination fuse and surge limiting resistor. When this resistor is open, brightness is shut off by Q205, eliminating beam current.

Blanking

In order to prevent horizontal and vertical retraces from being displayed on the CRT, video blanking (keying the CRT off during retrace time) is required. An example of the video blanking circuit is shown in the partial schematic in Figure 5-4. Transistors Q503, Q543, and Q573 act as switches to perform this function. The blanking signal (developed elsewhere) is applied to the base of each transistor. When the signal is positive, the B-E junction is forward-biased, causing the transistor to conduct and bringing the R, G, and B signals to ground through resistors R515, R555, and R585. With no color signals present, the CRT is blanked. In the absence of blanking signals, the three transistors are off and the processed R, G, and B signals are passed on to the video amplifiers.

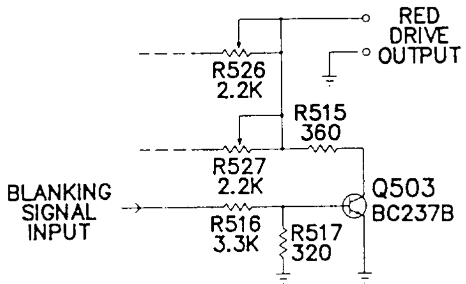


Figure 5-4. Video Blanking Partial Schematic

Video Drivers

An example of a video driver stage is shown in the partial schematic in Figure 5-2. The buffered color signals are coupled to driver transistors Q501/Q502, Q541/Q542 and Q571/Q572. Refer to waveforms 10 through 13 and 22 through 27. These transistors are in a common-emitter configuration. Consequently, the output at the collector will be inverted with respect to the input. Because the inputs to these transistors arrive from inverting buffers, their outputs are now in phase with the original color signals leaving the PROM.

Variable resistors R526/R527 and R566/R567 control the relative contributions of their respective R and G signals. The B signals serve as the reference against which the R and G signals are set, and consequently, no variable resistors are present for the B signals. It is at this point that the "pairs" of color signals described earlier are combined to form the processed R, G, and B signals to be amplified and displayed. Refer to waveform 14 in Chapter 8.

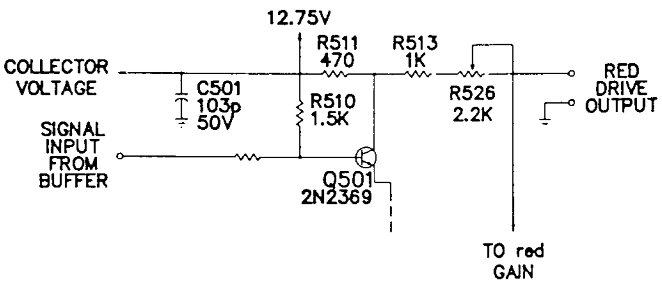


Figure 5-2. Video Driver Partial Schematic

Brightness/Contrast

The brightness/contrast circuitry includes the front panel brightness and contrast controls and their associated circuitry (Q203, Q207, and Q208), the beam current limiting control (Q205), and Q206, Q209, and Q210. A partial schematic of the brightness/contrast circuitry is shown in Figure 5-3.

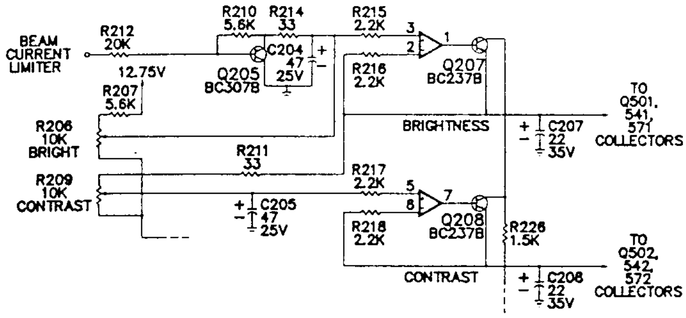


Figure 5-3. Brightness/Contrast Partial Schematic

Brightness

Potentiometer R206 is the front panel brightness control. It acts as a voltage divider operating over a range of about 4.5-9.5 V. The voltage at the wiper of R206 is applied through R215 to pin 3 of IC Q203. The output of this op-amp is applied to the base of Q207. This arrangement functions as a voltage follower which provides collector voltage to driver transistors Q501, Q541, and Q571 from the emitter of Q207, thus controlling brightness by changing the gain of these driver transistors.

Note that the voltage present at the emitter of Q207 is used as one of the extremes of the contrast potentiometer. When the brightness is increased, this voltage rises and alters the contrast to conform to the new brightness setting, keeping the two settings in proportion.

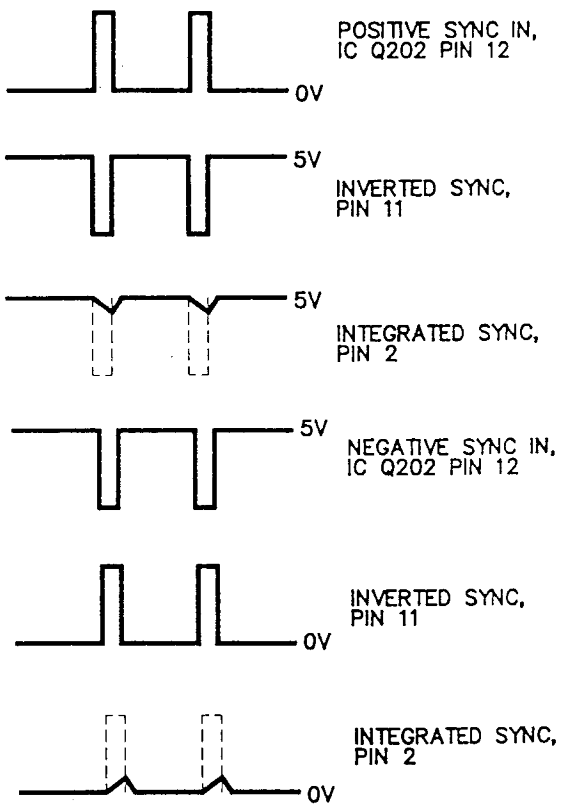


Figure 5-6. Mode Selection/Vertical Sync Pulses

The voltage at the mode line controls electronic switch IC's Q305 and Q412. These SPDT electronic switches change between circuitry associated with mode 1 and mode 2 operation, such as trimmer resistor adjustments which differ depending on the mode of operation.

The output of gate 2 at pin 3 is also brought up to PROM Q201, pin 4. This provides the PROM with a mode signal to be used in configuring the input processing for 16 or 64 color operation. In this case, the PROM receives a low signal to direct it into mode 2 and a high signal to direct it into mode 1.

Vertical Sync

Once the mode of operation has been determined, the vertical sync signal must be passed on to the horizontal/vertical processor, IC Q401. This device requires a positive polarity sync signal, regardless of the polarity of the vertical sync signal as it enters the monitor. Gates 3 and 4 of IC Q202 ensure that a positive polarity sync signal is passed on to Q401 (refer to waveforms 5 and 6 in Chapter 8).

Consider a positive polarity incoming sync signal. In this case, pin 3 of IC Q202 is high, as is pin 4. Pin 5 is held at 5 V. The output of this gate is low at pin 6. The incoming positive sync signal is applied to gate 4, pin 9, along with the low signal at pin 10 (from pin 6). The output at pin 8 is high when a sync pulse is present and low between pulses. In this way, the positive incoming vertical sync signal is reproduced.

Similarly, for a negative polarity sync pulse, pin 4 is low and pin 5 is high. Pin 6 is thus high. Pin 9 receives the incoming sync signal and pin 10 is high. Thus, when a negative pulse occurs, the output is high at pin 8, otherwise it remains low. In this way, the negative incoming vertical sync signal is reproduced as a positive signal.

RGB Amplifiers

The processed color signals developed on the video board must be amplified and applied to the red, green, and blue guns of the CRT in order to produce a display. Transistors Q504, Q505, and Q506 and their associated circuitry form the red amplifier. The green and blue amplifiers are identical. Refer to the CRT drive board schematic in Chapter 8.

Input signals are applied to the base of Q505. Transistor Q504 provides current gain, while Q506 provides the required voltage gain needed to produce the approximately 60 V p-p signal that drives the color gun. Cutoff controls R523 (R), R563 (G) and R593 (B) adjust the gain of each amplifier so that all three are equal (refer to waveform 15 in Chapter 8). R520 and R521 feed back part of the output signal to the base of Q505.

Mode Selection

As noted earlier, the ZVM-1380 monitor may operate in one of two video modes. In mode 1, a 15.75 kHz horizontal sync signal is supplied by the computer, while mode 2 uses a 21.85 kHz sync signal. The monitor automatically sets up for the proper mode based on the polarity of the incoming vertical sync signal. Positive vertical sync signal polarity directs the monitor into mode 1, while negative polarity directs it into mode 2. IC Q202 and transistor Q204 make up the mode selection circuitry.

The main functions of the mode selection circuitry are to (1) provide a signal at the mode line to control various electronic switches throughout the monitor, and (2) to pass the vertical sync signal on to the horizontal/vertical processor, IC Q401. Each function is described in turn. Figure 5-5 contains a partial schematic of the mode selection circuitry.

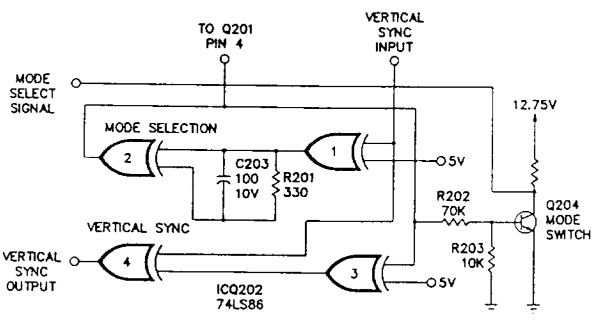


Figure 5-5. Mode Selection Partial Schematic

Mode Signal

Gates 1 and 2 of IC Q202, along with transistor Q204, produce an output voltage at the mode line of either 0 V (mode 1) or 12.6 V (mode 2) based on the polarity of the incoming vertical sync signal. IC Q202 is a quad exclusive-OR gate. An exclusive-OR truth table is listed in Table 5-3.

Table 5-3. Exclusive-OR Truth Table

INPUT X	INPUT Y	OUTPUT Z
0	0	0
0	1	1
1	0	1
1	1	0

NOTE: Logic 1 = High
Logic 0 = Low

For mode 1, a positive polarity vertical sync signal is input to gate 1 at pin 12 along with a fixed 5 V at pin 13. The output at pin 11 is thus high. In the steady state (that is, after the RC combination of R201 and C203 integrates this signal), the output at pin 11 is applied to gate 2 at pin 2. Pin 1 is at 0 V (ground). The output at pin 3 is thus high.

Mode selection is based on the signal present at pin 3. For mode 1, pin 3 is high. This high output forward-biases the B-E junction of transistor Q204, turning it on and bringing the mode line (the collector of Q204) to ground. In a similar manner, a negative polarity vertical sync signal causes the output of gate 2 to go low, shutting off transistor Q204 and bringing the mode line up to 12.75 V through R204, indicating mode 2 (refer to Figure 5-6).

Horizontal Driver

Transistor Q402 is the horizontal deflection driver. This driver acts as a buffer or isolation stage to prevent the horizontal output circuit from changing the oscillator frequency. The horizontal oscillator output voltage is applied to the base of Q402 (refer to waveforms 16 and 19 in Chapter 8). The output, taken at the collector, is applied to the interstage transformer T401 (refer to waveforms 17 and 20 in Chapter 8). The transformer steps down the voltage drive to match the low impedance of the horizontal output amplifier (refer to waveforms 18 and 21 in Chapter 8).

Horizontal Output

Transistor Q403 and diode D407 are the essential parts for horizontal deflection. Q403 is the horizontal power amplifer while D407 is a damper diode used to increase efficiency. Immediately after flyback, diode D407 conducts to serve as a low shunt resistance that stops the ringing resulting from the inductance of the horizontal output circuit. Damping is needed because the oscillations produce white vertical bars at the left side of the raster. For greater efficiency, this damped output current is also used to produce part of the trace at the left side of the raster.

Refer to the following parts of Figure 5-8 while reading this circuit description. Figure 5-8a shows the output voltage waveform from R421. The corresponding amplifier current in Figure 5-8b shows that Q403 is cut off during retrace plus a part of the trace at the left side of the raster. D407 conducts during this time, producing part of the trace at the left side of the raster and reducing the average amplifier current (thus increasing efficiency). Figure 5-8c illustrates this damper current. Combining Figures 5-8b and 5-8c yields the sawtooth current needed for a complete trace from left to right, as shown in Figure 5-8d.

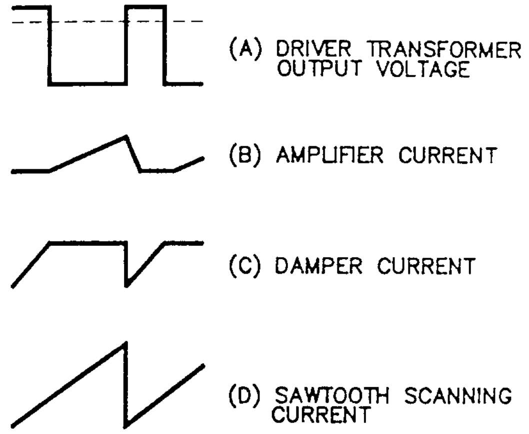


Figure 5-8. Horizontal Output Amplifier Waveforms

In summary, the resulting current waveshape is related to horizontal scanning as follows:

1. Damped current produces the left side of a trace.
2. As the damped current diminishes and the output stage begins to conduct, the beam is at the center.
3. Current from the output amplifier produces the remainder of the trace.

Series peaking coil L402 provides high-frequency gain compensation. Shunt damping resisotr R428 prevents ringing in the coil, which might occur iwth fast changes in signal.

Horizontal Sync Input

Horizontal sync is supplied to the monitor at connector P204 on the video board. It is passed on to connector P402 on the main board, where it is amplified and conditioned before entering Q401, the horizontal/vertical processor (refer to waveforms 1 through 4 in Chapter 8).

The horizontal sync signal is applied to the base of Q410. A sync pulse forward-biases the B-E junction of Q410, causing it to conduct and producing an output voltage at the collector for the duration of the pulse. Diode D402 raises the threshold voltage at which Q410 will turn on, thus providing protection from voltage spikes or noise which might otherwise turn Q410 on. The pulse is coupled to the base of Q411, where it is further amplified and finally coupled through C484 to Q401, the horizontal/vertical processor. While the incoming sync pulses may be in the 1.5-3 V range, the sync signals applied to Q401 are 9-10 V pulses. These pulses are also lengthened somewhat before being applied to Q401.

Horizontal/Vertical Processor IC

IC Q401 is the horizontal/vertical processor. This IC and its associated circuitry provide the horizontal and vertical sync pulses and form the vertical pre-driver and X-ray protection circuitry. The functions of the principal external components associated with this IC are outlined in the following paragraphs.

The horizontal sync pulses are input to IC Q401 at pin 16. Pin 10 is the output pin for the horizontal section (refer to waveform 16 in Chapter 8). Pin 13 is the phase detector input, while pin 14 is the phase detector output. The horizontal phase controls (R413 and R473) interact with the phase detector circuitry to determine the horizontal position of the display within the raster area. Pin 12 is connected to the horizontal oscillator. The horizontal hold controls (R408 and R468) allow control over the horizontal oscillator frequency.

The vertical sync pulses are input to IC Q401 at pin 7 through coupling capacitor C302. Pin 2 is the output pin for the vertical section (refer to waveform 7 in Chapter 8). Pin 3 is the feedback pin for the vertical AC/DC output voltage. The vertical size controls interact with this feedback circuitry to determine the amount of vertical raster deflection. The external resistor at pin 4 (R305) and the capacitor at pin 5 (C306) determine the vertical oscillator discharging time constant. Control over the vertical oscillator frequency is accomplished at pin 8 through the vertical hold control (R309). Capacitor C307 eliminates any horizontal sync components which might be present and performs integration of the composite vertical sync pulse.

X-ray protection is acomplished at pin 9. The anode voltage is sensed at pin 9 through R459, R419, and the associated circuitry. If the anode voltage becomes excesive, the flyback pulse will also be larger. This larger pulse, applied eventually to pin 9, causes IC Q401 to shut down the horizontal oscillator, resulting in no brightness. The anode voltage cannot be generated when the horizontal oscillator is disabled.

Horizontal Deflection Circuits

The horizontal deflection circuitry is responsible for generating the scanning current needed in the horizontal deflection coils to fill the width of the raster. Three main stages are found here: the horizontal driver, horizontal output and horizontal pincushion correction circuits. Each is discussed in turn. A partial schematic of the horizontal deflection circuit is shown in Figure 5-7.

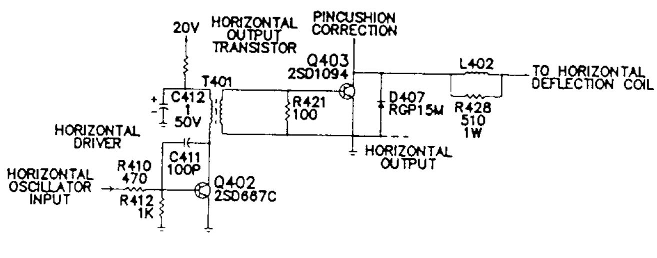


Figure 5-7. Horizontal Deflection Partial Schematic

Vertical Deflection Circuits

The vertical output circuitry provides the power needed for vertical deflection. Current flow is directed through the vertical coil in order to deflect the electron beam from top to bottom. Transistors Q301, Q302, and Q303 accomplish this. The vertical deflection circuitry is shown in the partial schematic in Figure 5-10 (refer to waveforms 8 and 9 in Chapter 8).

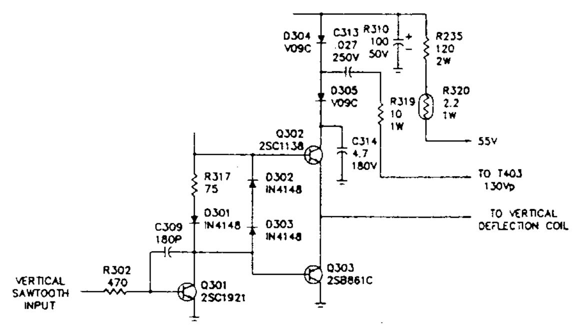


Figure 5-10. Vertical Deflection Partial Schematic

Transistor Q301 is the vertical driver transistor. The vertical sawtooth waveform is applied to the base of Q301 through R302. Because this is a common-emitter configuration, the output at the collector of Q301 is inverted with respect to the input.

This output is applied to the input of the complementary-symmetry amplifier formed by Q302 and Q303. Note that Q302 is an NPN-type transistor, while Q303 is PNP. The complementary-symmetry, or push-pull, action of these two transistors occurs as follows. For a positive-going sawtooth at the input of Q301, a negative-going drive is applied at the base of Q303, increasing its collector current. The same negative-going drive applied at the base of Q302 reduces the forward voltage at the base, resulting in less collector current for this NPN transistor.

Similarly, when a negative-going sawtooth is applied to the base of driver Q301, a positive-going drive is applied at the base of Q302 through diodes D302 and D303, increasing its collector current. In a like manner, less collector current results in Q303. Thus, each output transistor (Q202 and Q203) supplies one-half of the AC sawtooth cycle. In a push-pull vertical output stage, one transistor is effective in scanning the top half of the raster and the remaining transistor produces the bottom half.

Vertical Centering

The vertical centering control electrically centers the display within the raster area. R341, R326, and R327 form a voltage divider. Electrical centering is accomplished by supplying direct current (from the wiper of R326) through the vertical deflection coil.

Vertical Blanking

Vertical blanking pulses are generated to blank out the scanning beam during vertical retraces. The vertical blanking circuit is shown in the partial schematic in Figure 5-11. The circuit consisting of C316, R328, D308, and R329 senses the vertical flyback pulse and transfers it to the blanking line through diode D308 (refer to waveform 31 in Chapter 8). The horizontal blanking pulse (developed elsewhere) is also applied to the blanking line.

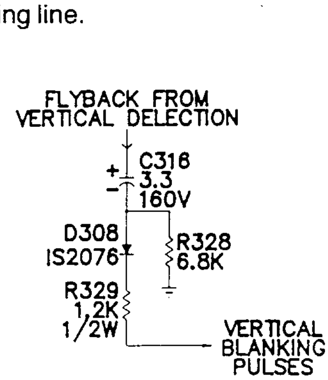


Figure 5-11. Vertical Blanking Partial Schematic

Horizontal Pincushion Correction

Because the corners of the screen are farther from the point of deflection than the center, some form of correction must be made for the shape of the CRT in order to prevent a pincushion-shaped raster. Horizontal pincushion correction prevents the left and right sides of the raster from bowing inward at the center. In order to accomplish this, more scanning current is needed for the horizontal lines produced around the middle of the raster. To produce this current, the horizontal deflection current at 15.75 kHz (mode 1) or 21.85 kHz (mode 2) is modulated at the vertical scanning rate of 60 Hz.

The vertical sawtooth signal at R322 is applied to IC Q304, where it is integrated and shaped into a parabola by the time it reaches pin 8 of this IC. This wave modulates the base of transistor Q404, which drives Q405 and controls the collector voltage bias of horizontal output transistor Q403. The result is a parabolic waveform which increases the width of the horizontal lines in the middle of the vertical scan while not affecting the start and finish.

The E-W pincushion control (R333) adjusts the amount of pincushion correction. Electronic switch Q305 adds or removes resistor R334 to adjust the amount of pincushion correction depending on the video mode. Associated controls R433 and R493 allow control over the raster width.

Anode Voltage

The high voltage required by the anode is developed from the horizontal oscillator output. This signal is applied to the base of transistor Q406, which in turn feeds transformer T402, stepping up the voltage. This voltage is in turn is applied to driver transistor Q407, which feeds the flyback transformer to produce the anode voltage of approximately 22.5 kV at the cathode of the high-voltage rectifier.

The anode voltage is dynamically regulated by IC Q409, transistor Q408, and their associated circuitry. Current in the high-voltage resistor block is sensed by R449, and a corresponding voltage is applied to IC Q409, pin 10. This signal is buffered, applied to pin 13 of the following stage and amplified. The resulting voltage at pin 14 controls transistor Q408, the anode voltage regulator. This voltage feedback serves to dynamically regulate the anode voltage.

The focus and G2 voltages are developed from the anode voltage in the high-voltage resistor block. Electrostatic focusing directs the electron beam to form a small spot on the screen. To do this, voltage is applied to the focusing electrode of the electron gun, forcing the electrons to converge to a point using an electric field. R451 is the 22.5 kV high-voltage control.

Horizontal Blanking

Horizontal blanking pulses are generated to blank out the retrace from right to left after each horizontal scan line is displayed. The horizontal blanking circuitry is shown in the partial schematic in Figure 5-9 (refer to waveforms 28 through 30 in Chapter 8). Horizontal flyback pulses are coupled to the horizontal blanking circuitry at the R478/C471 junction. These pulses are applied to the base of transistor Q471 through R474. When a pulse is present, Q471 is turned on, producing a pulse at the emitter. This pulse is coupled through diode D471 to the blanking line along with the vertical blanking pulse developed elsewhere. D471 prevents the vertical blanking pulse from being fed into the horizontal blanking circuitry.

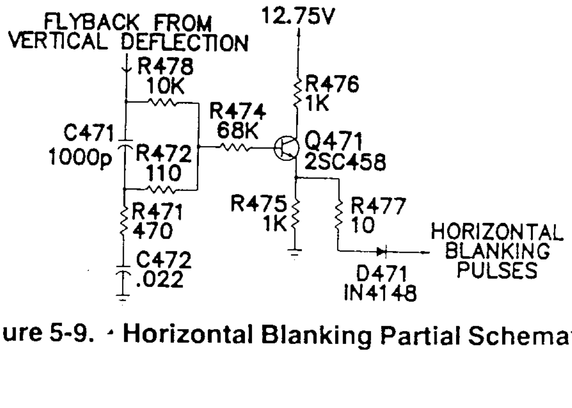


Figure 5-9. · Horizontal Blanking Partial Schematic

Degaussing Coil

Degaussing refers to demagnetizing the iron and steel parts of the picture tube, in particular the steel shadow mask and frame inside the CRT. This is necessary because a steady magnetic field magnetizes these parts and affects the beam register on the color phosphors, resulting in poor purity.

A degaussing coil is wrapped around the CRT and controlled by a positive temperature coefficient thermistor in the power supply. When the monitor is first turned on, current flows through the thermistor and activates the degaussing coil. As the thermistor heats up, its resistance becomes very high and the degaussing coil is deactivated.

WARNING: Operation of the CRT at voltages higher than 25 kV may produce X-rays. Always verify that the anode voltage is at normal levels when servicing the monitor. Do not operate the monitor with excessively high voltage any longer than is necessary to locate the cause of the excessive voltage.

WARNING: The switch-mode power supply contains circuits that generate dangerous high-frequency, high-amplitude quasi-square wave signals that present a potentially lethal shock hazard. Do not attempt to troubleshoot the power supply. If the power supply requires service, return it to the manufacturer.

WARNING: Parts of the power supply circuitry are not isolated. To prevent both personal injury and equipment damage, an isolation transformer must be used while troubleshooting this monitor.

CAUTION: Under no circumstances should the original design be modified or altered without permission from Zenith Electronics Corporation. All components should be replaced only with types identical to those in the original circuit, and their physical location, wiring and lead dress must conform to the original layout upon completion of repairs.

AC Leakage Test

The repair and reassembly of the monitor can inadvertently cause a loss of electrical isolation between the AC power wires and the exposed metal parts of the monitor. If this isolation is lost or significantly reduced, electrical shock can result.

Any AC voltage leak that exceeds 0.75 V rms (0.5 mA) constitutes a potential shock hazard and must be corrected. To prevent electrical shock after reassembly, perform an AC leakage test on all exposed metal parts of the monitor using the following procedure (do not use an isolation transformer during this test):

1. Construct an AC leakage voltmeter circuit as shown in Figure 6-2 using the following parts:
   - AC voltmeter with an internal impedance of 5kΩor more. The overall range of the meter is not critical but the zero to 0.75 V range must be easy to read accurately.
   - AC type 0.15 μF capacitor.
   - 1500 Ω, 10 watt resistor.
2. Connect one side of the test circuit to a good earth ground, such as a water pipe, and the other side to an exposed metal part of the monitor. Verify that any AC voltage leakage is less than 0.75 V rms (0.5 mA).
3. With the monitor turned on, measure the voltage leak between the earth ground and the monitor.
4. Reverse the meter leads and repeat the measurement.
5. Repeat steps 3 and 4 until all exposed metal parts are verified to have AC leakage levels less than 0.75 V rms (0.5 mA).

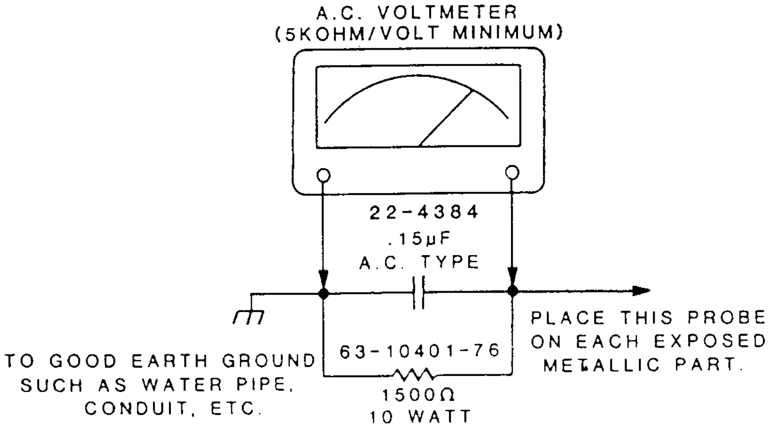


Figure 6-2. AC Leakage Voltmeter Circuit

Chapter 6
Troubleshooting

This chapter provides information on troubleshooting the ZVM-1380-C color video monitor. Enough information is included to assist in diagnosing most faults to the major component level.

Organization

General troubleshooting information is included in beginning sections of this chapter. Read these sections before proceeding. They contain safety guidelines, tests and diagnostics, and other important information.

Following this general information is a series of troubleshooting flowcharts. These charts are designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will direct you to an adjustment or to a more detailed chart.

Waveform photographs are included in Chapter 8. Refer to these as directed when troubleshooting or performing adjustments.

Safety Guidelines

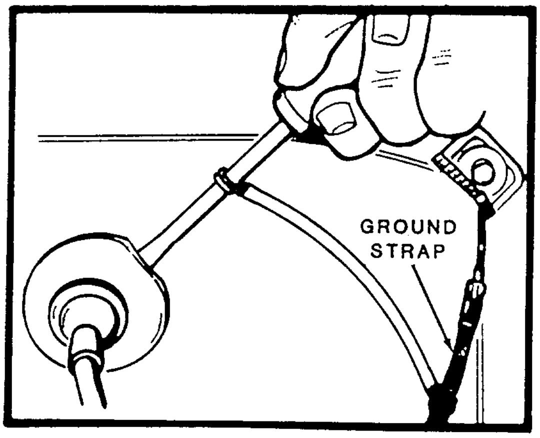
Read the following safety notes carefully before attempting to troubleshoot or repair this monitor.

WARNING: The anode of the CRT retains a potentially lethal voltage when the monitor is turned off. Perform repairs only after the CRT has been properly discharged. Refer to Figure 6-1 and the following procedure to discharge the CRT anode:

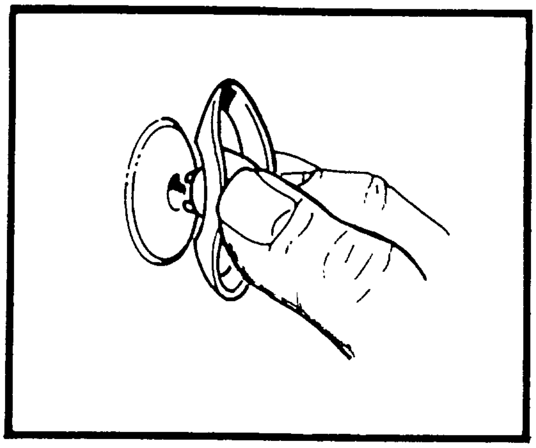
1. Connect a clip lead or heavy gauge wire to chassis ground.

2. Connect the other end of the lead to the stem of a flat blade screwdriver that has an insulated handle.

3. Insert the blade of the screwdriver under the rubber insulation that covers the anode lead on the CRT and make contact with the anode terminal. Depending on the quantity of charge present on the anode, a distinct snap may be heard as the CRT discharges.



1. CAREFULLY SLIDE A GROUNDED FLAT SCREWDRIVER TIP UNDER THE LIP OF THE ANODE LEAD.



2. AFTER DISCHARGING THE VOLTAGE, DISCONNECT THE ANODE LEAD FROM THE CRT.

Figure 6-1. CRT Anode Discharging

Fill Screen Test

1. Press the CTRL, ALT, and INS keys simultaneously.
2. After the prompt appears, type TEST and then press ENTER.
3. Select the fill screen test.
4. Press any displayable key to fill the screen with that character.

White Field Test

1. Boot GW BASIC.
2. Load the following program:

```
100 COLOR 0,7
200 KEY OFF
300 CLS
400 END
```

This program changes the background color of the screen to white, thus displaying a white field.

3. Type RUN and press ENTER. A white field should now be displayed.

Disk-Based Diagnostics

The disk-based diagnostics can be used to generate a number of test patterns, such as a crosshatch pattern for adjusting convergence. The diagnostics are menu driven. A general procedure for using the diagnostics is given below. Consult the diagnostics manual for further instruction.

1. Boot the disk-based diagnostics.
2. Use the arrow keys to select the computer configuration you are using.
3. Select NO when prompted for the fast test.
4. The diagnostic test menu will now be displayed.
   - Use the arrow keys to choose the single test.
   - Use the arrow keys to choose the video diagnostic menu.
5. The video diagnostic menu will now be displayed.
   - Use the arrow keys to choose the single test.
   - Use the arrow keys to choose the video patterns.
   - Use the arrow keys to select the coarse grid (for convergence adjustment) or the focus pattern (to adjust overall focus).

Troubleshooting Charts

This section contains a series of troubleshooting charts designed to assist in diagnosing faults to the major component level. Always begin with the General Troubleshooting Chart. This chart will then direct you to check a particular item, perform an adjustment or consult a more detailed chart. The charts are:

General Troubleshooting Chart (Figure 6-3)
Power Supply Troubleshooting Chart (Figure 6-4)
Video Board Troubleshooting Chart (Figure 6-5)
CRT Board Troubleshooting Chart (Figure 6-6)
Main Board Troubleshooting Chart (Figure 6-7)

A number of waveforms are also included in Chapter 8. The waveforms are numbered and labeled individually. When a particular waveform is called for in a troubleshooting step, its number appears in the lower right corner of the troubleshooting block.

Sometimes a particular block of the chart requires additional explanation. In this case, a number is placed in the lower left corner of the block. Following the chart, a corresponding series of numbered notes provides the additional information needed. Always refer to these notes before performing a step.

NOTE: Always refer to the appropriate schematic as you work through the steps of a troubleshooting chart. These charts are designed to assist in diagnosing faults, but they cannot substitute for the information contained in the schematics.

Suggested Tools and Equipment

The following tools and supplies are recommended for servicing the monitor.

- Flat-blade screwdriver, 1/4-inch blade
- Phillips screwdrivers, No. 1 and No. 2 tips
- Plastic alignment tools
- Diagonal cutters
- Wire strippers
- Long nose pliers
- Soldering iron, 25 to 40 watt
- Solder, 60/40
- Desoldering braid (HE-490-185)

The following equipment is recommended for troubleshooting the monitor as described in this chapter:

- Z-100 PC computer or equivalent
- Z-100 Disk-Based Diagnostics (CB-5063-28)
- GW "TM"—Basic Interpreter (MS-5063-13)
- CGA and EGA video cards
- Oscilloscope: DC to 100MHz, dual trace triggered sweep. (Tektronix Model 2235 or equivalent)
- Oscilloscope probe: low capacitance, 4 ns rise time (Heath Model PKW-105 or equivalent)
- Digital voltmeter: high impedance input, zero to 1000 volts, zero to 1 megohm (Heath Model SM-2215 or equivalent)
- High-voltage probe: zero to 40 kV (Heath Model IM-5215 or equivalent)
- 10X magnifier (or better)
- Isolation transformer

Inspection and Preparation

Before turning the monitor on, inspect the power cord, video cable, and all connectors for damaged insulation or loose prongs.

Inspect the exterior of the monitor for signs of damage. If physical damage is evident, remove the cabinet back and inspect further before proceeding.

If these preliminary checks do not indicate a problem, proceed as follows:

1. Connect the video cable from the monitor to the computer.
2. Turn computer and monitor on. Observe display for faults and refer to the troubleshooting section only after reading the remaining procedures in this section.
3. Allow the monitor to warm up for approximately 30 minutes, unless a fault diagnosed in step 2 prevents this.
4. Perform the ROM-based color bar test and other tests as necessary. The instructions for performing these tests are included here for convenience and are not repeated later.

Color Bar Test

1. Press the CTRL, ALT, and INS keys simultaneously.
2. After the prompt appears, press C and ENTER.
3. Color bars should now be displayed.

Use this test in conjunction with the troubleshooting charts which follow this section.

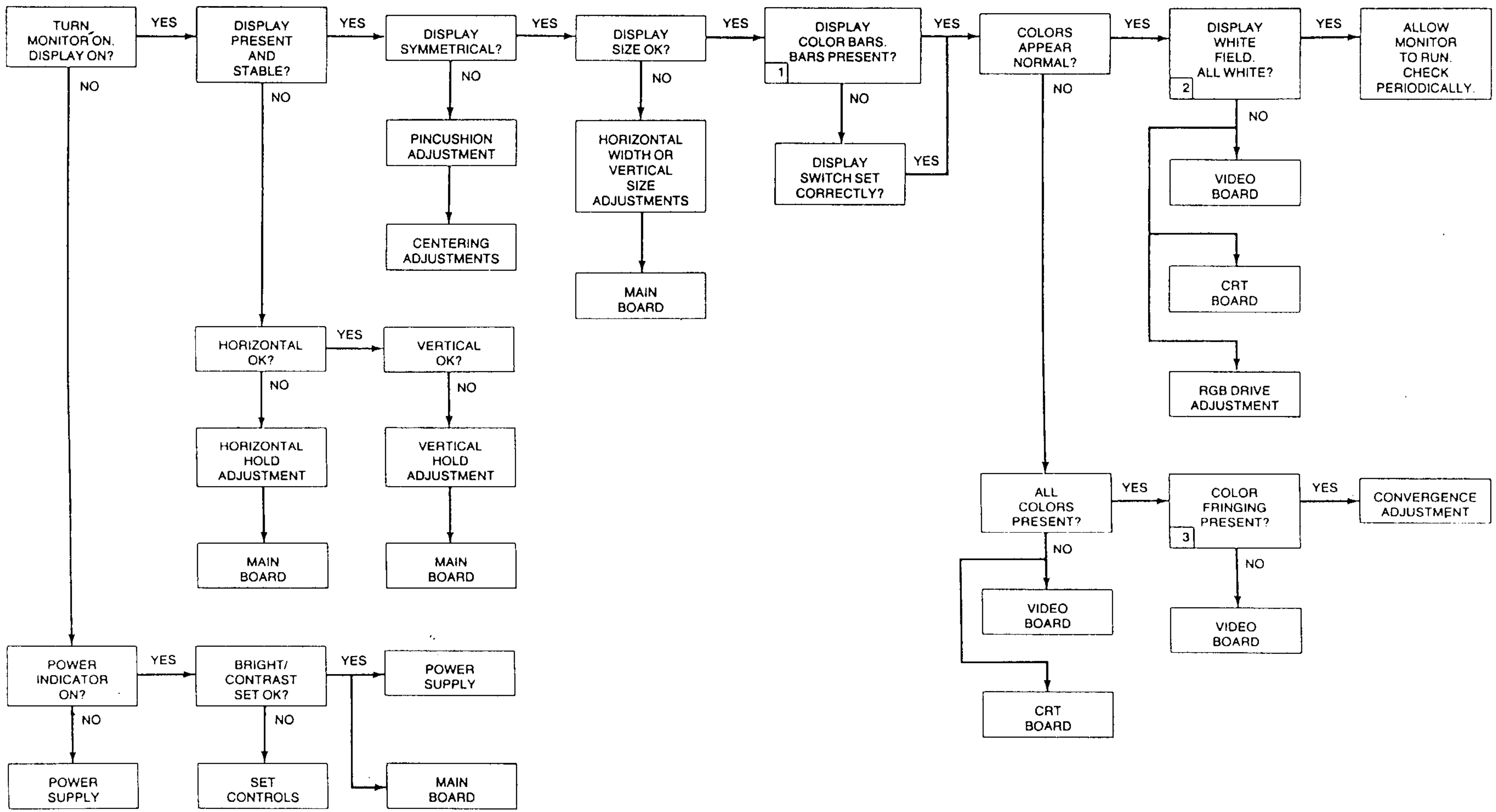


Figure 6-3. General Troubleshooting Chart

Notes

1. Refer to the "Inspection and Preparation" section of this chapter for color bar test procedure.
2. Refer to the "Inspection and Preparation" section of this chapter for the white field display test.
3. Color fringing is most noticeable with text around the edges of letters. Display text to verify this condition.

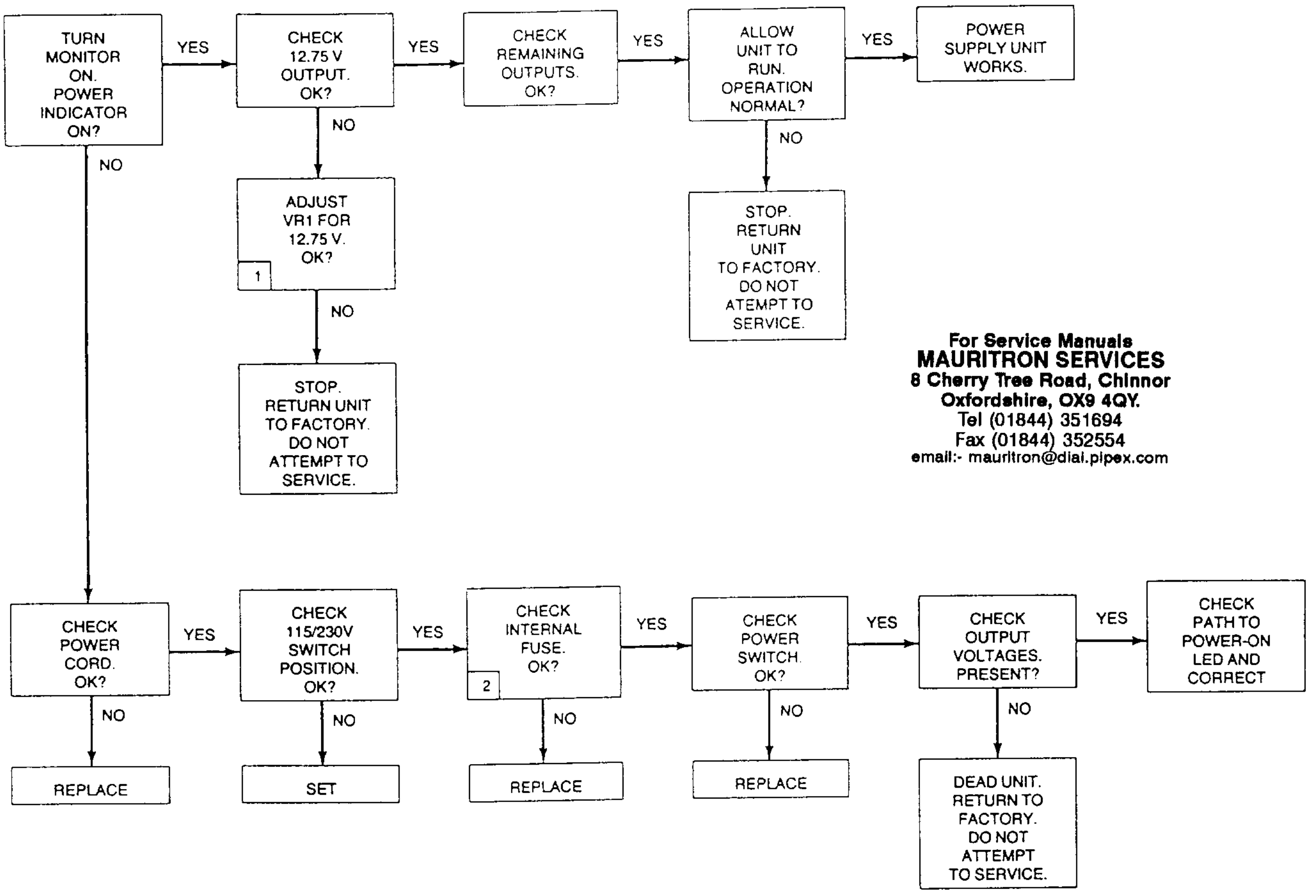


Figure 6-4. Power Supply Troubleshooting Chart

NOTES

1. VR1 may be accessed through a hole labeled B-ADJ in the side of the power supply enclosure.

2. The video board must be removed to access the internal fuse. The fuse is located below and to the left of VR1.

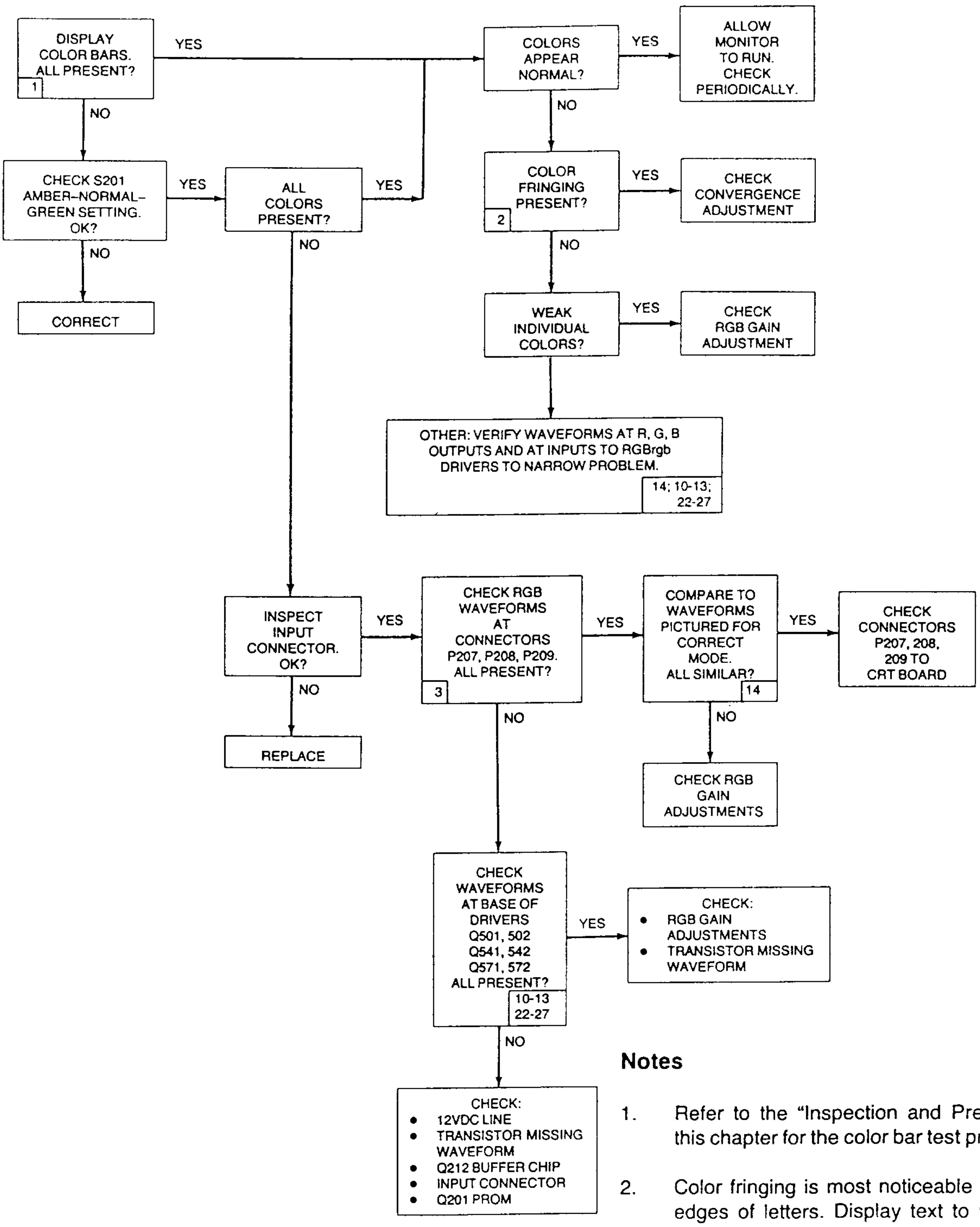


Figure 6-5. Video Board Troubleshooting Chart

Notes

1. Refer to the "Inspection and Preparation" section of this chapter for the color bar test procedure.

2. Color fringing is most noticeable with text around the edges of letters. Display text to verify this condition.

3. Sample these waveforms at the leads of R514, R544, and R584 nearest the top of the video board.

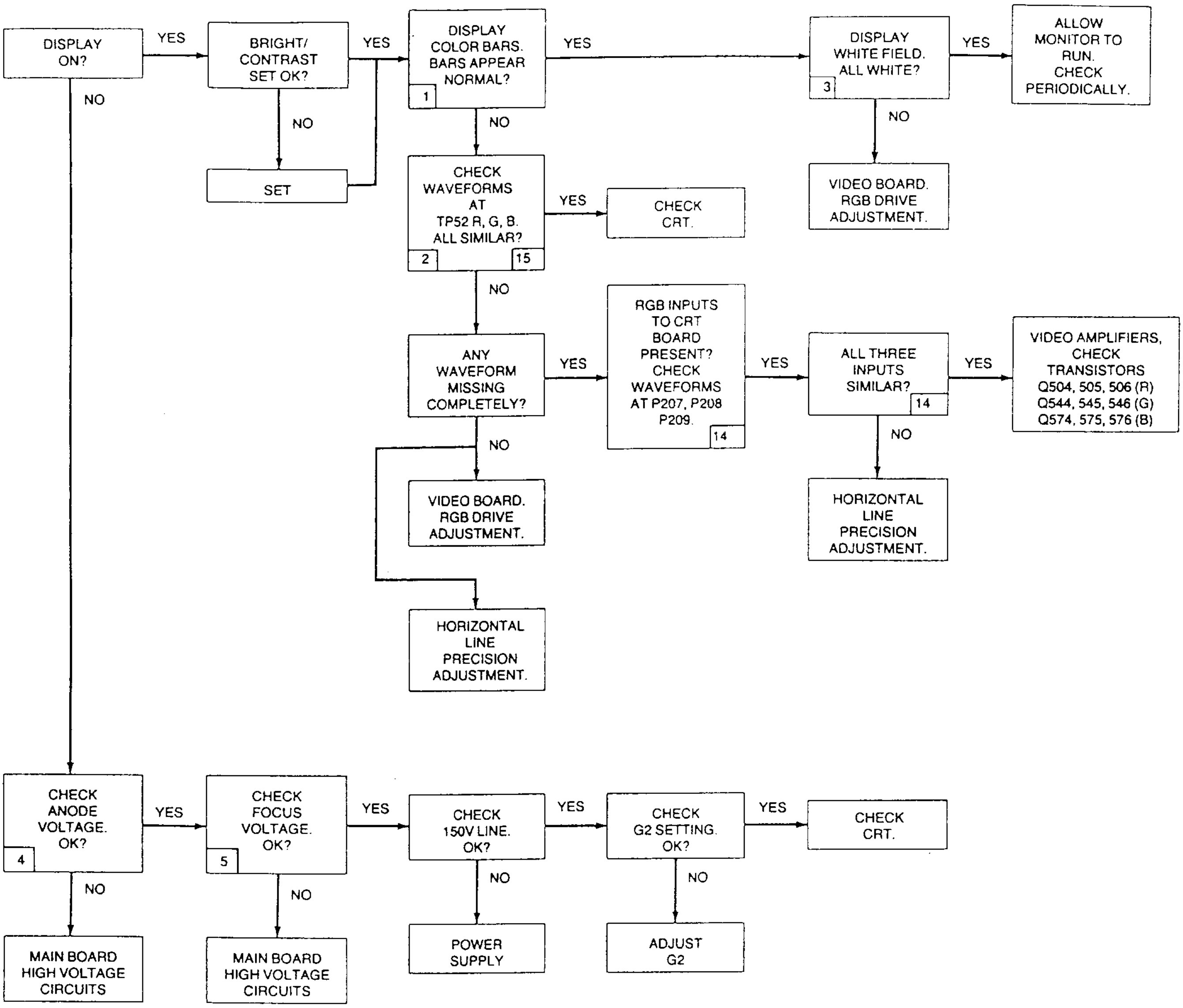


Figure 6-6. CRT Board Troubleshooting Chart

Notes

1. Refer to the "Inspection and Preparation" section of this chapter for the color bar test procedure.

2. These test points can be easily accessed from the foil side of the CRT board or at test points on the component side.

3. Refer to the "Inspection and Preparation" section of this chapter for the white field display test.

4. The anode voltage should be approximately 22.5 kV and must be measured with a high-voltage probe. Any voltage above 25 kV is considered excessive and should be corrected.

5. The focus voltage must be measured with a high-voltage probe.

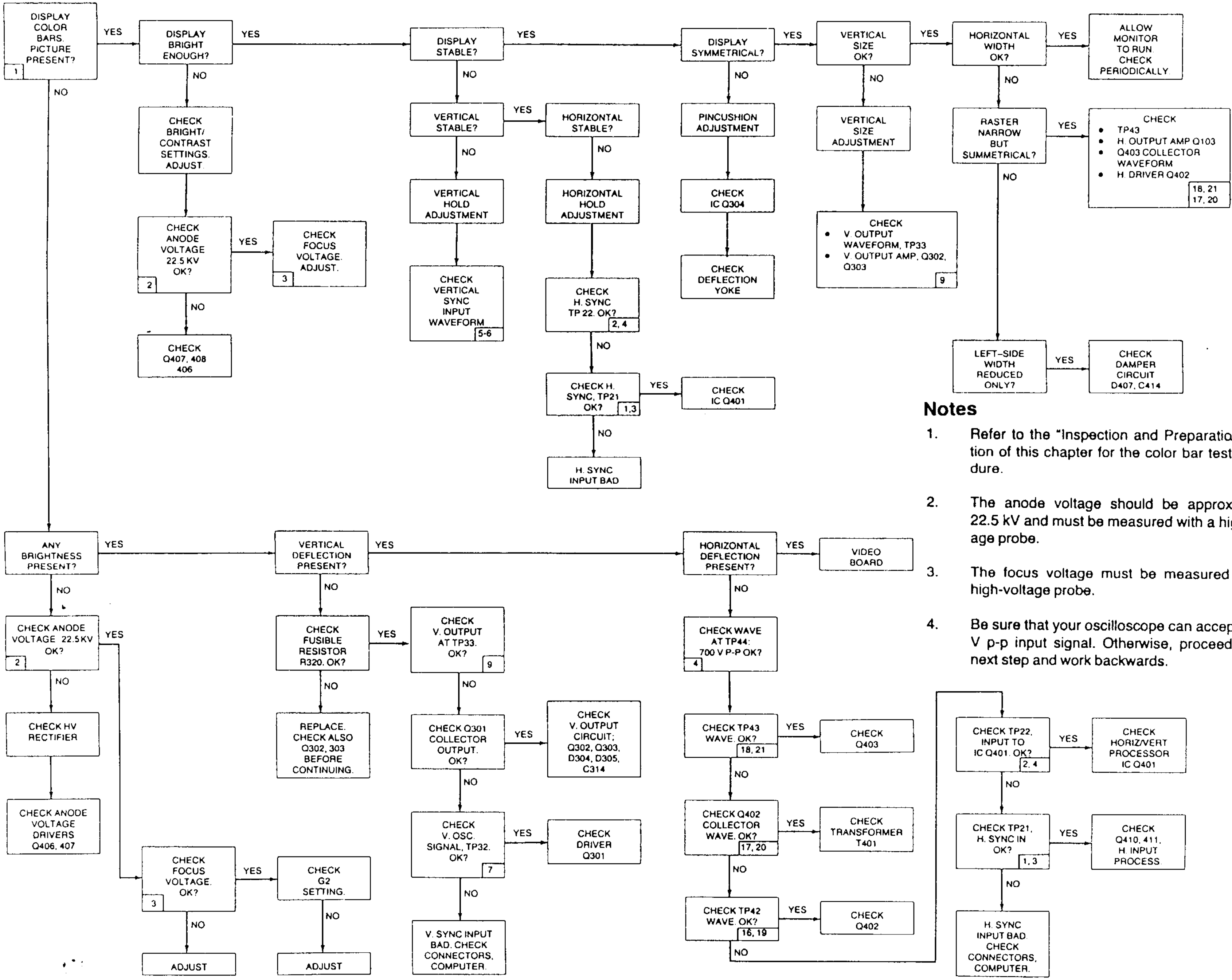


Figure 6-7. Main Board Troubleshooting Chart

Notes

1. Refer to the "Inspection and Preparation" section of this chapter for the color bar test procedure.
2. The anode voltage should be approximately 22.5 kV and must be measured with a high-voltage probe.
3. The focus voltage must be measured with a high-voltage probe.
4. Be sure that your oscilloscope can accept a 700 V p-p input signal. Otherwise, proceed to the next step and work backwards.

Table 7-2 (Cont'd.) Video Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
R212	N/A	10 KΩ 1/4W
R213	N/A	5.6 KΩ 1/4W
R214	N/A	33 Ω 1/4W
R215	N/A	2.2 KΩ 1/4W
R216	N/A	2.2 KΩ 1/4W
R217	N/A	2.2 KΩ 1/4W
R218	N/A	2.2 KΩ 1/4W
R219	N/A	2.2 KΩ 1/4W
R220	N/A	2.2 KΩ 1/4W
R221	N/A	33 Ω 1/4W
R223	N/A	820 Ω 1/4W
R224	N/A	1.5 KΩ 1/4W
R225	N/A	1 KΩ 1/4W
R226	N/A	1.5 KΩ 1/4W
R227	N/A	33 Ω 1/2W
R228	N/A	33 Ω 1/2W
R229	N/A	1.2 KΩ 1/4W
R501	N/A	680 Ω 1/4W
R502	N/A	680 Ω 1/4W
R503	N/A	1.2 KΩ 1/4W
R504	N/A	1.2 KΩ 1/4W
R505	N/A	100 Ω 1/4W
R506	N/A	100 Ω 1/4W
R507	N/A	470 Ω 1/4W
R508	N/A	470 Ω 1/4W
R509	N/A	1.5 KΩ 1/4W
R510	N/A	1.5 KΩ 1/4W
R511	N/A	470 Ω 1/4W, metal film
R512	N/A	470 Ω 1/4W, metal film
R513	N/A	1 KΩ 1/4W
R514	N/A	1 KΩ 1/4W
R515	N/A	560 Ω 1/4W
R516	N/A	3.3 KΩ 1/4W
R517	N/A	820 Ω 1/4W
R526	N/A	2.2 KΩ 1/2W trimmer
R527	N/A	2.2 KΩ 1/2W trimmer
R541	N/A	680 Ω 1/4W
R542	N/A	680 Ω 1/4W
R543	N/A	1.2 KΩ 1/4W

Table 7-2 (Cont'd.) Video Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors (Cont'd).		
R544	N/A	1.2 KΩ 1/4W
R545	N/A	100 Ω 1/4W
R546	N/A	100 Ω 1/4W
R547	N/A	470 Ω 1/4W
R548	N/A	470 Ω 1/4W
R549	N/A	1.5 KΩ 1/4W
R550	N/A	1.5 KΩ 1/4W
R551	N/A	470 Ω 1/4W, metal film
R552	N/A	470 Ω 1/4W, metal film
R553	N/A	1 KΩ 1/4W
R554	N/A	1 KΩ 1/4W
R555	N/A	560 Ω 1/4W
R556	N/A	3.3 KΩ 1/4W
R557	N/A	820 Ω 1/4W
R566	N/A	2.2 KΩ 1/2W trimmer
R567	N/A	2.2 KΩ 1/2W trimmer
R571	N/A	680 Ω 1/4W
R572	N/A	680 Ω 1/4W
R573	N/A	1.2 KΩ 1/4W
R574	N/A	1.2 KΩ 1/4W
R575	N/A	100 Ω 1/4W
R576	N/A	100 Ω 1/4W
R577	N/A	470 Ω 1/4W
R578	N/A	470 Ω 1/4W
R579	N/A	1.5 KΩ 1/4W
R580	N/A	1.5 KΩ 1/4W
R581	N/A	470 Ω 1/4W, metal film
R582	N/A	470 Ω 1/4W, metal film
R583	N/A	1 KΩ 1/4W
R584	N/A	1 KΩ 1/4W
R585	N/A	560 Ω 1/4W
R586	N/A	3.3 KΩ 1/4W
R587	N/A	820 Ω 1/4W

Chapter 7
Parts Lists

This chapter contains the replacement parts list for the ZVM-1380-C color video monitor. An exploded view of the monitor follows the parts list tables.

Major assemblies and mechanical parts are included in the first list. Individual boards are broken down to the component level in the remaining lists.

Table 7-1. Major Assemblies Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
PWB-1211	969-501	Video board
PWB-1212	969-503	CRT drive board
PWB-1214	969-502	Control board
PWB-1215	969-500	Main board
	969-504	Power supply assembly
	969-505	CRT
	234-875	Retrofit overlay

Table 7-2: Video Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Capacitors		
C201	N/A	22 μF, 35V electrolytic
C202	N/A	10000 pF, 50V ceramic
C203	N/A	100 μF, 16V electrolytic
C204	N/A	47 μF, 25V electrolytic
C205	N/A	47 μF, 25V electrolytic
C206	N/A	10 μF, 35V electrolytic
C207	N/A	22 μF, 35V electrolytic
C208	N/A	22 μF, 35V electrolytic
C209	N/A	100 μF, 16V electrolytic
C210	N/A	100 μF, 16V electrolytic
C501	N/A	10000 pF, 50V ceramic
C502	N/A	10000 pF, 50V ceramic
C503	N/A	10 μF, 35V electrolytic
C541	N/A	10000 pF, 50V ceramic
C542	N/A	10000 pF, 50V ceramic
C543	N/A	10 μF, 35V electrolytic
C571	N/A	10000 pF, 50V ceramic
C572	N/A	10000 pF, 50V ceramic
C573	N/A	10 μF, 35V ceramic

Table 7-2 (Cont'd.) Video Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Diodes		
D201	N/A	1S2076 switching
D202	N/A	1S2076 switching
Integrated Circuits		
Q201	N/A	74S472N, TBP28S42N
Q202	N/A	HD74LS86, digital
Q203	N/A	LM324N, linear
Q211	N/A	7805, voltage regulator
Q212	N/A	SN74LS05N, digital
Transistors		
Q204	N/A	BC237B, NPN
Q205	N/A	BC307B, PNP
Q206	N/A	BC237B, NPN
Q207	N/A	BC237B, NPN
Q208	N/A	BC237B, NPN
Q209	N/A	BC307B, PNP
Q210	N/A	BC307B, PNP
Q501	N/A	2N2369, 2SC642K, NPN
Q502	N/A	2N2369, 2SC641K, NPN
Q503	N/A	BC237B, NPN
Q541	N/A	2N2369, 2SC642K, NPN
Q542	N/A	2N2369, 2SC641K, NPN
Q543	N/A	BC237B, NPN
Q571	N/A	2N2369, 2SC642K, NPN
Q572	N/A	2N2369, 2SC641K, NPN
Q573	N/A	BC237B, NPN
Resistors		
R201	N/A	330 Ω 1/4W
R202	N/A	10 KΩ 1/4W
R203	N/A	10 KΩ 1/4W
R204	N/A	22 KΩ 1/4W
R205	N/A	1.2 KΩ 1/4W
R206	N/A	3.3 KΩ 1/4W
R207	N/A	5.6 KΩ 1/4W
R210	N/A	56 KΩ 1/4W
R211	N/A	33 Ω 1/4W

Table 7-4: Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Capacitors		
C301	N/A	33000 pF, 50V polyester
C302	N/A	1 µF, 50V electrolytic
C303	N/A	100 pF, 50V ceramic
C304	N/A	680 pF, 50V ceramic
C305	N/A	150 pF, 50V ceramic
C306	N/A	1.5 µF, 35V tantalum
C307	N/A	4700 pF, 50V ceramic
C308	N/A	330 µF, 16V electrolytic
C309	N/A	180 pF, 500V ceramic
C310	N/A	100 µF, 50V electrolytic
C311	N/A	10 µF, 35V electrolytic
C312	N/A	10 µF, 16V electrolytic
C313	N/A	27000 pF, 250V polypropylene
C314	N/A	4.7 µF, 160V electrolytic
C315	N/A	220 µF, 50V electrolytic
C316	N/A	3.3 µF, 160V electrolytic
C317	N/A	4.7 µF, 50V electrolytic
C318	N/A	10 µF, 35V electrolytic
C319	N/A	4700 pF, 500V ceramic
C320	N/A	47000 pF, 100V metallized polyester
C321	N/A	4.7 µF, 50V electrolytic
C322	N/A	47 µF, 50V electrolytic
C323	N/A	33000 pF, 50V ceramic
C324	N/A	10 µF, 35V electrolytic
C325	N/A	100 µF, 16V electrolytic
C326	N/A	2.2 µF, 50V electrolytic
C401	N/A	47 µF, 16V electrolytic
C402	N/A	1 µF, 50V electrolytic
C403	N/A	22 µF, 16V electrolytic
C404	N/A	15000 pF, 50V polyester
C405	N/A	15000 pF, 50V polyester
C406	N/A	1000 pF, 50V polyester
C407	N/A	4700 pF, 630V polypropylene
C408	N/A	2700 pF, 50V polyester
C409	N/A	47 µF, 16V electrolytic
C410	N/A	6800 pF, 50V polyester
C411	N/A	100 pF, 50V ceramic
C412	N/A	1 µF, 50V electrolytic
C413	N/A	4700 pF, 50V ceramic
C414	N/A	9500 pF, 1600V metallized polypropylene
C415	N/A	0.1 µF, 250V metallized polyester
C416	N/A	22 µF, 100V electrolytic
C417	N/A	1 µF, 100V metallized polyester
C418	N/A	2.7 µF, 250V metallized polyester
C419	N/A	22 µF, 160V electrolytic
C420	N/A	100 pF, 50V ceramic
C421	N/A	1 µF, 50V electrolytic
C422	N/A	22000 pF, 250V polypropylene

Table 7-4 (Cont'd.) Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Capacitors (Cont'd.)		
C423	N/A	4700 pF, 50V ceramic
C424	N/A	47 µF, 200V electrolytic
C425	N/A	2.2 µF, 250V metallized polyester
C426	N/A	2200 pF, 1600V metallized polypropylene
C427	N/A	0.47 µF, 100V metallized polyester
C428	N/A	10000 pF, 500V ceramic
C430	N/A	2200 pF, 50V ceramic
C431	N/A	0.1 µF, 100V polyester
C432	N/A	22 µF, 50V electrolytic
C433	N/A	3300 pF, 1600V metallized polypropylene
C435	N/A	47 µF, 35V electrolytic
C436	N/A	0.22 µF, 50V polyester
C437	N/A	4700 pF, 50V polyester
C438	N/A	2700 pF, 50V polyester
C439	N/A	220 µF, 63V electrolytic
C471	N/A	1000 pF, 50V polyester
C472	N/A	22000 pF, 50V polyester
C481	N/A	330 pF, 50V ceramic tubular
C482	N/A	82 pF, 50V ceramic
C483	N/A	1 µF, 50V electrolytic
C484	N/A	1 µF, 50V electrolytic
Diodes		
D301	N/A	1S2076 switching
D302	N/A	1S2076 switching
D303	N/A	1S2076 switching
D304	N/A	V09C switching
D305	N/A	V09C switching
D306	N/A	V06E, 400V, 1A rectifier
D307	N/A	HZ-11A-2, 9.7-10.1V zener
D308	N/A	1S2076 switching
D309	N/A	HZ6C-2LTE, 6.2V zener
D401	N/A	1S2076 switching
D402	N/A	1S2076 switching
D403	N/A	1S2076 switching
D404	N/A	1S2076 switching
D405	N/A	HZ12A1, 12V, 1/2W zener
D406	N/A	V19E, RGP10G rectifier
D407	N/A	RGP15M, 1000V rectifier
D408	N/A	V19E, RGP10G rectifier
D409	N/A	V19E, RGP10G rectifier
D410	N/A	V19E, RGP10G rectifier
D411	N/A	V19E, RGP10G rectifier
D412	N/A	V19E, RGP10G rectifier
D413	N/A	RGP15M, 1000V rectifier
D414	N/A	V19E, RGP10G rectifier
D415	N/A	HZ5C-2TE, 4.8-5.1V zener

Table 7-3. CRT Drive Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Capacitors		
C211	N/A	2.2 μF, 250V electrolytic
C504	N/A	22000 pF, 50V polyester
C505	N/A	22 μF, 35V electrolytic
C506	N/A	33000 pF, 250V polypropylene
C544	N/A	22000 pF, 50V polyester
C545	N/A	22 μF, 35V electrolytic
C546	N/A	33000 pF, 250V polypropylene
C574	N/A	22000 pF, 50V polyester
C575	N/A	22 μF, 35V electrolytic
C576	N/A	33000 pF, 250V polypropylene
C901	N/A	22000 pF, 630V polypropylene
C902	N/A	330 pF, 2kV ceramic
Diodes		
D501	N/A	1S2076 switching
D502	N/A	1S2076 switching
D541	N/A	1S2076 switching
D542	N/A	1S2076 switching
D571	N/A	1S2076 switching
D572	N/A	1S2076 switching
Transistors		
Q504	N/A	2SC1507, 2SC1514 NPN
Q505	N/A	2N2369, 2SC1906 NPN
Q506	N/A	2SC1507, 2SC1514 NPN
Q544	N/A	2SC1507, 2SC1514 NPN
Q545	N/A	2N2369, 2SC1906 NPN
Q546	N/A	2SC1507, 2SC1514 NPN
Q574	N/A	2SC1507, 2SC1514 NPN
Q575	N/A	2N2369, 2SC1906 NPN
Q576	N/A	2SC1507, 2SC1514 NPN

Table 7-3 (Cont'd.) CRT Drive Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors		
R518	N/A	2.7 KΩ 2W metal film
R519	N/A	2.7 KΩ 2W metal film
R520	N/A	6.8 KΩ 2W metal film
R521	N/A	6.8 KΩ 2W metal film
R522	N/A	330 Ω 1/4W
R523	N/A	500 Ω 1/2W trimmer
R524	N/A	100 Ω 1/4W
R525	N/A	68 Ω 1/4W
R558	N/A	2.7 KΩ 2W metal film
R559	N/A	2.7 KΩ 2W metal film
R560	N/A	6.8 KΩ 2W metal film
R561	N/A	6.8 KΩ 2W metal film
R562	N/A	330 Ω 1/4W
R563	N/A	500 Ω 1/2W trimmer
R564	N/A	100 Ω 1/4W
R565	N/A	68 Ω 1/4W
R588	N/A	2.7 KΩ 2W metal film
R589	N/A	2.7 KΩ 2W metal film
R590	N/A	6.8 KΩ 2W metal film
R591	N/A	6.8 KΩ 2W metal film
R592	N/A	330 Ω 1/4W
R593	N/A	500 Ω 1/2W trimmer
R594	N/A	100 Ω 1/4W
R595	N/A	68 Ω 1/4W
R901	N/A	330 Ω 1/2W
R902	N/A	330 Ω 1/2W
R903	N/A	330 Ω 1/2W
R904	N/A	1 KΩ 1/2W
R905	N/A	150 KΩ 1/4W
R906	N/A	330 KΩ 1/2W metal film

Table 7-4 (Cont'd.) Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors (Cont'd.)		
R410	N/A	470 Ω 1/4W
R411	N/A	22 KΩ 1/4W
R412	N/A	1 KΩ 1/4W
R413	N/A	10 KΩ trimmer
R415	N/A	1.5 KΩ 1/2W
R416	N/A	4.7 KΩ 1/4W
R417	N/A	1 KΩ 1/4W
R418	N/A	620 Ω 1/4W
R419	N/A	1.5 KΩ 1/4W
R420	N/A	270 Ω 2W metal film
R421	N/A	100 Ω 1/4W
R422	N/A	2.2 KΩ 1/4W
R423	N/A	2.2 KΩ 1/4W
R424	N/A	330 Ω 1/4W
R425	N/A	220 Ω 1/2W
R426	N/A	100 Ω 1/4W
R427	N/A	56 KΩ 1/4W
R428	N/A	510 Ω 1W metal film
R429	N/A	100 kΩ 1/4W
R430	N/A	3.3 KΩ 1/4W
R431	N/A	100 KΩ 1/4W
R432	N/A	1 KΩ 1/4W
R433	N/A	5 KΩ 1/2W trimmer
R434	N/A	1 KΩ 1/4W
R435	N/A	60 Ω 3W wirewound
R436	N/A	56 Ω 2W metal film
R437	N/A	270 Ω 2W metal film
R438	N/A	1 KΩ 1/4W
R439	N/A	180 Ω 1/4W
R440	N/A	180 Ω 1/4W
R441	N/A	27 Ω 1/4W
R442	N/A	1.8 KΩ 5W metal oxide
R443	N/A	1.8 KΩ 5W metal oxide
R444	N/A	10 Ω 1W metal film
R445	N/A	470 Ω 1/4W
R446	N/A	56 KΩ 1/4W
R447	N/A	1 KΩ 1/4W
R448	N/A	1 KΩ 1/4W
R449	N/A	10 KΩ 1/4W
R450	N/A	39 KΩ 1/4W
R451	N/A	22 KΩ 1/2W trimmer
R452	N/A	2 KΩ 1/4W
R453	N/A	2 KΩ 1/4W
R454	N/A	2.2 Ω 1/2W fusible
R455	N/A	470 KΩ 1/4W
R456	N/A	100 Ω 1/4W
R457	N/A	10 KΩ 1/4W

Table 7-4 (Cont'd.) Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors (Cont'd.)		
R459	N/A	2.2 KΩ 1W metal film
R463	N/A	56K Ω 1/4W
R466	N/A	4.3 KΩ 1/4W
R467	N/A	3 KΩ 1/4W
R468	N/A	2.4 KΩ 1/4W
R469	N/A	5 KΩ 1/2W trimmer
R471	N/A	470 Ω 1/4W
R472	N/A	110 Ω 1/4W
R473	N/A	10 K trimmer
R474	N/A	68 KΩ 1/4W
R475	N/A	1 KΩ 1/4W
R476	N/A	1 KΩ 1/4W
R477	N/A	wire, tin coated soft copper, 0.6mm
R478	N/A	10 KΩ 1/4W
R481	N/A	1 KΩ 1/4W
R482	N/A	100 Ω 1/4W
R483	N/A	39 KΩ 1/4W
R484	N/A	15 KΩ 1/4W
R485	N/A	1 KΩ 1/4W
R486	N/A	680 KΩ 1/4W
R487	N/A	5.6 KΩ 1/4W
R493	N/A	5 KΩ 1/2W trimmer
R907	N/A	10 KΩ 1/2W trimmer
Transformers		
T401	N/A	TLN-125A
T402	N/A	TLN-125A
T403	N/A	TFB-176G

Table 7-5. Control Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors		
R208	N/A	10 KΩ potentiometer (brightness)
R209	N/A	10 KΩ potentiometer (contrast)
Switch		
S201	N/A	DP3T rotary switch, 30VDC, 0.3A (amber-normal-green)

Table 7-4 (Cont'd.) Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Diodes (Cont'd.)		
D416	N/A	1S2076 switching
D417	N/A	1S2076 switching
D420	N/A	1S2076 switching
D471	N/A	1S2076 switching
Coils		
L401	N/A	TCH-141
L402	N/A	TLH-140
L403	N/A	TCH-139
L404	N/A	TSH-138
Transistors		
Q301	N/A	2SC1921, NPN
Q302	N/A	2SD1138C, NPN
Q303	N/A	2SB861C, PNP
Q402	N/A	2SD667C, NPN
Q403	N/A	2SD1094, NPN
Q404	N/A	2SD667C, NPN
Q405	N/A	2SB856, PNP
Q406	N/A	2SD667C, NPN
Q407	N/A	BU208, NPN
Q408	N/A	2SC2898, NPN
Q410	N/A	2SC458C, NPN
Q411	N/A	2SA844E, PNP
Q413	N/A	2SC458C, NPN
Q471	N/A	2SC458C, NPN
Integrated Circuits		
Q304	N/A	LM324N linear
Q305	N/A	HD14053BP digital HEF4053BP CMOS
Q401	N/A	HA11235 linear
Q409	N/A	LM324N linear
Q412	N/A	HD14053BP digital HEF4053BP CMOS
Resistors		
R302	N/A	470 Ω 1/4W
R303	N/A	270 Ω 1/4W
R304	N/A	2 KΩ 1/4W
R305	N/A	15 KΩ 1/4W

Table 7-4 (Cont'd.) Main Board Parts List

REFERENCE NUMBER	PART NUMBER	DESCRIPTION
Resistors (Cont'd.)		
R306	N/A	1 KΩ trimmer
R307	N/A	10 KΩ 1/4W
R309	N/A	5 KΩ 1/2W trimmer
R310	N/A	27 KΩ 1/4W
R312	N/A	120 Ω 1/2W
R313	N/A	11 KΩ 1/4W
R314	N/A	9.1 KΩ 1/4W
R315	N/A	1.2 KΩ 1/2W metal film
R316	N/A	1.2 KΩ 1/2W metal film
R317	N/A	75 Ω 1/4W
R318	N/A	1.5 Ω 1/2W
R319	N/A	10 Ω 1W metal film
R320	N/A	2.2 Ω 1W fusible
R321	N/A	2 Ω 1/4W
R322	N/A	4.7 Ω 1/4W
R323	N/A	33 KΩ 1/4W
R324	N/A	10 KΩ 1/4W
R325	N/A	120 Ω 2W, metal film
R326	N/A	10 KΩ 1/2W trimmer
R327	N/A	1 KΩ 1/2W
R328	N/A	6.8 KΩ 1/4W
R329	N/A	1.2 KΩ 1/2W
R330	N/A	100 KΩ 1/4W
R331	N/A	1 MΩ 1/4W
R332	N/A	10 KΩ 1/4W
R333	N/A	10 KΩ 1/2W trimmer
R334	N/A	10 KΩ 1/4W
R335	N/A	100 KΩ 1/4W
R336	N/A	100 KΩ 1/4W
R337	N/A	1 MΩ 1/4W
R338	N/A	820 Ω 1/4W
R339	N/A	10 KΩ 1/4W
R340	N/A	82 KΩ 1/4W
R341	N/A	1 KΩ 1/2W
R345	N/A	1 KΩ 1/4W
R366	N/A	1 KΩ trimmer
R401	N/A	2.4 KΩ 3W metal film
R402	N/A	6.8 KΩ 1/4W
R403	N/A	68 KΩ 1/4W
R404	N/A	6.8 KΩ 1/4W
R405	N/A	5.6 KΩ 1/4W
R406	N/A	5.6 KΩ 1/4W
R407	N/A	5.6 KΩ 1/4W
R408	N/A	2.4 KΩ 1/4W
R409	N/A	5 KΩ 1/2W trimmer

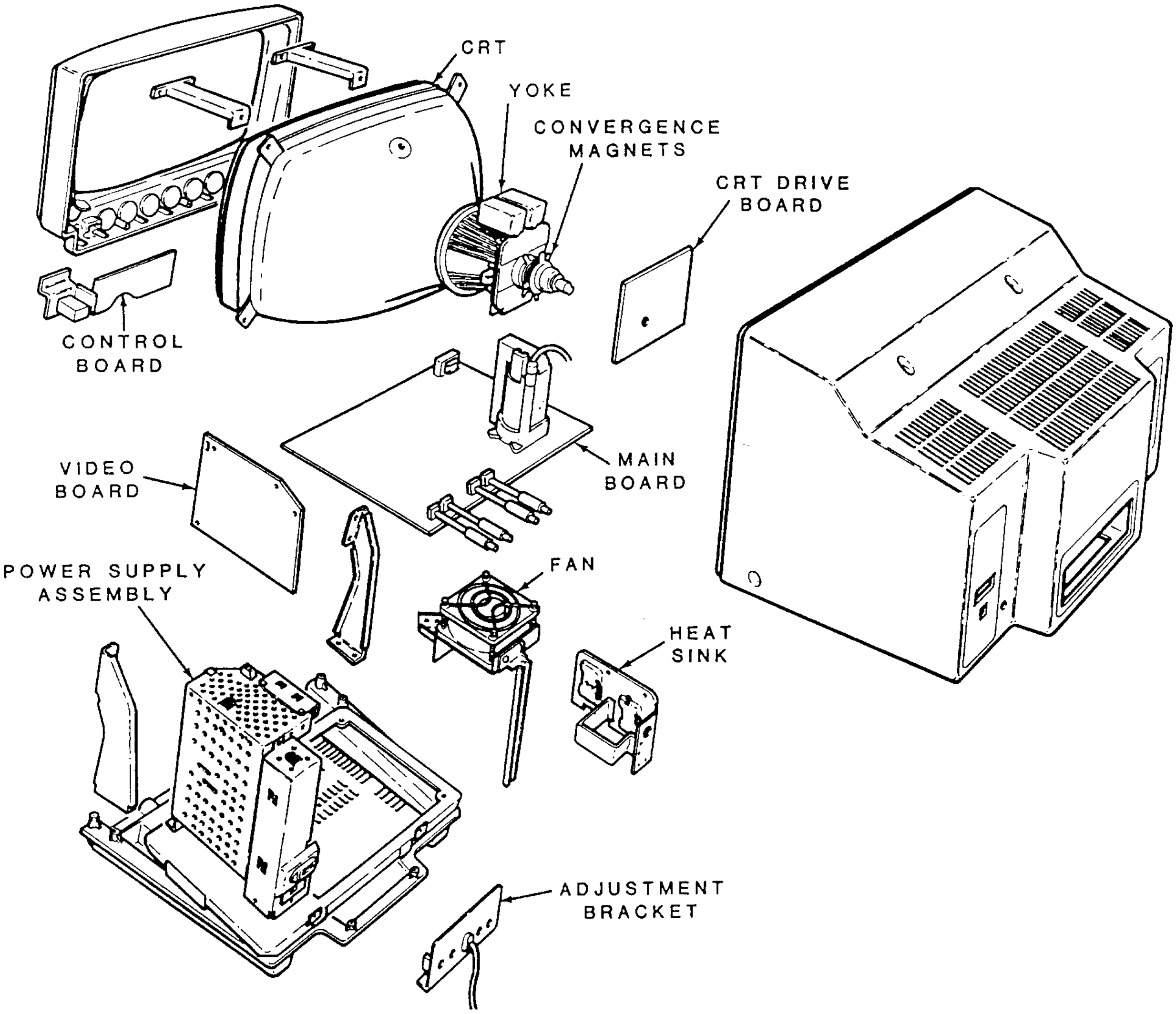


Figure 7-1. Exploded View

Chapter 8
Schematics

This chapter contains complete schematics for the ZVM-1380-C color video monitor. Where appropriate, waveform test points are designated on the schematics. Refer to the appropriate numbered waveform photograph (also included in this chapter) when troubleshooting this monitor. Component views of the individual circuit boards are also included here. Adjustment device locations are highlighted in these views.

Waveforms

This section contains all waveforms referred to throughout the manual. Each waveform is numbered and labeled with a brief identifying note. All waveforms are AC only and referenced about the center line. The waveforms were taken on a Tektronix Model 2445 150 MHz Oscilloscope. Refer to Figure 8-1 and the following notes to interpret the information on the waveform photographs.

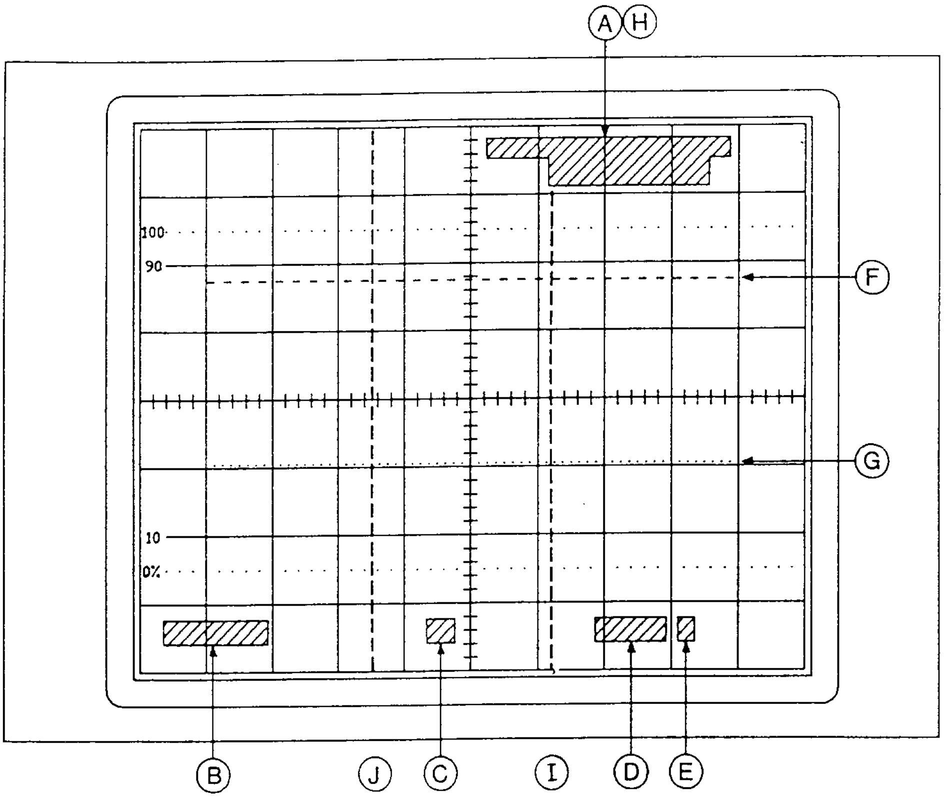


Figure 8-1. Oscilloscope Display Information

(A) The delta voltage established between the variable reference cursor (dotted line G) and the variable data cursor (dotted line F). This value, when displayed, indicates the peak-to-peak voltage of the waveform.

(B) The channel 1 scale factor in volts (volts/division).

(C) 20 MHz bandwidth limitation indicator.

(D) Sweep time base in seconds (seconds/division).

(E) Holdoff indicator (holdoff refers to the amount of time between the end of the sweep and the time that a triggering signal can initiate the next sweep).

(F) Data cursor that can be varied on the vertical axis to measure delta voltage.

(G) Data cursor that can be varied on the vertical axis to provide a reference for the delta voltage.

(H) The delta time established between the variable reference cursor (dotted line J) and the variable data cursor (dotted line I). This value, when displayed, indicates the period of the waveform.

(I) Data cursor that can be varied on the horizontal axis to measure delta time.

(J) Data cursor that can be varied on the horizontal axis to provide a reference for the delta time.

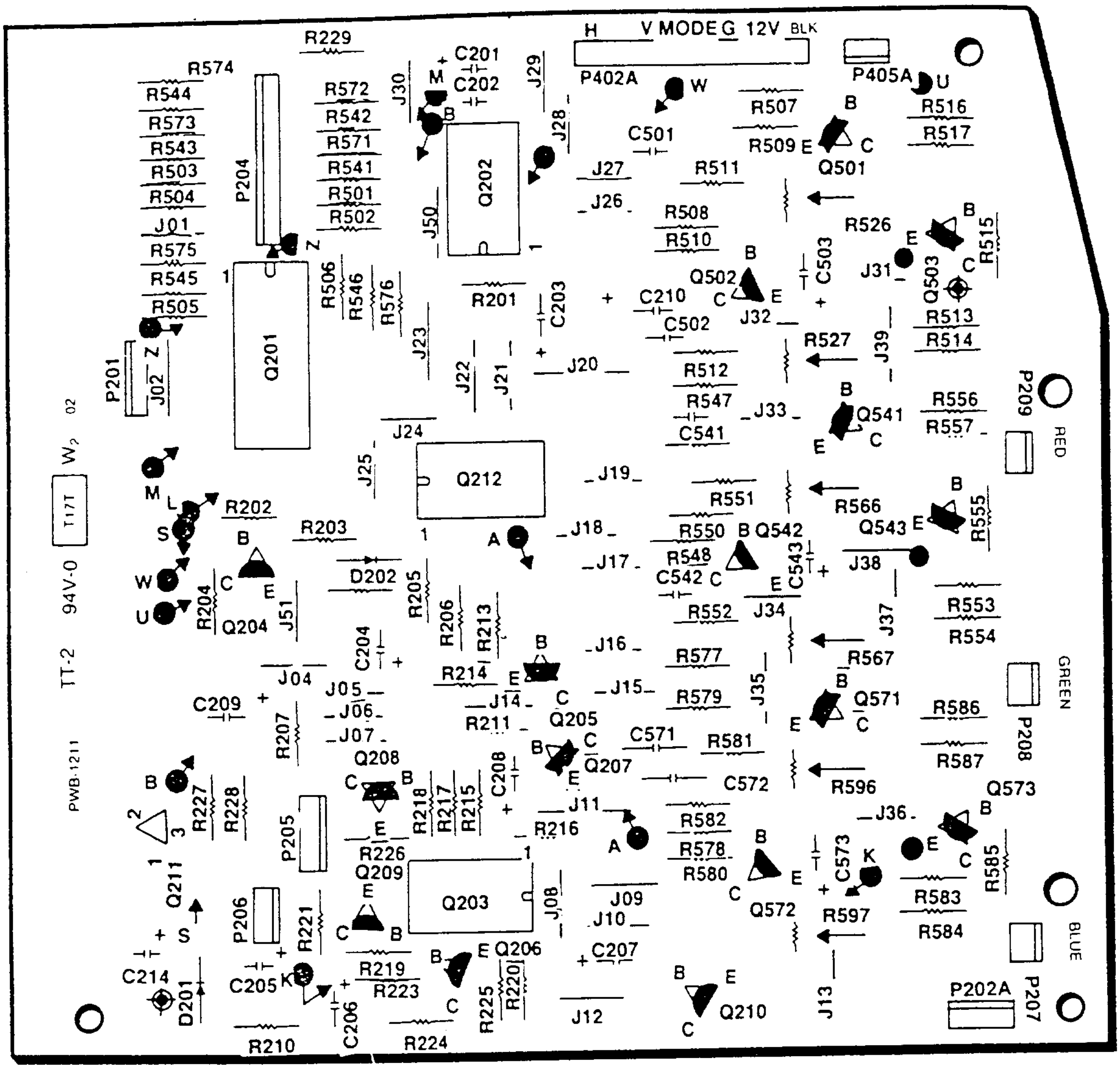


Figure 8-2. Video Board Component View

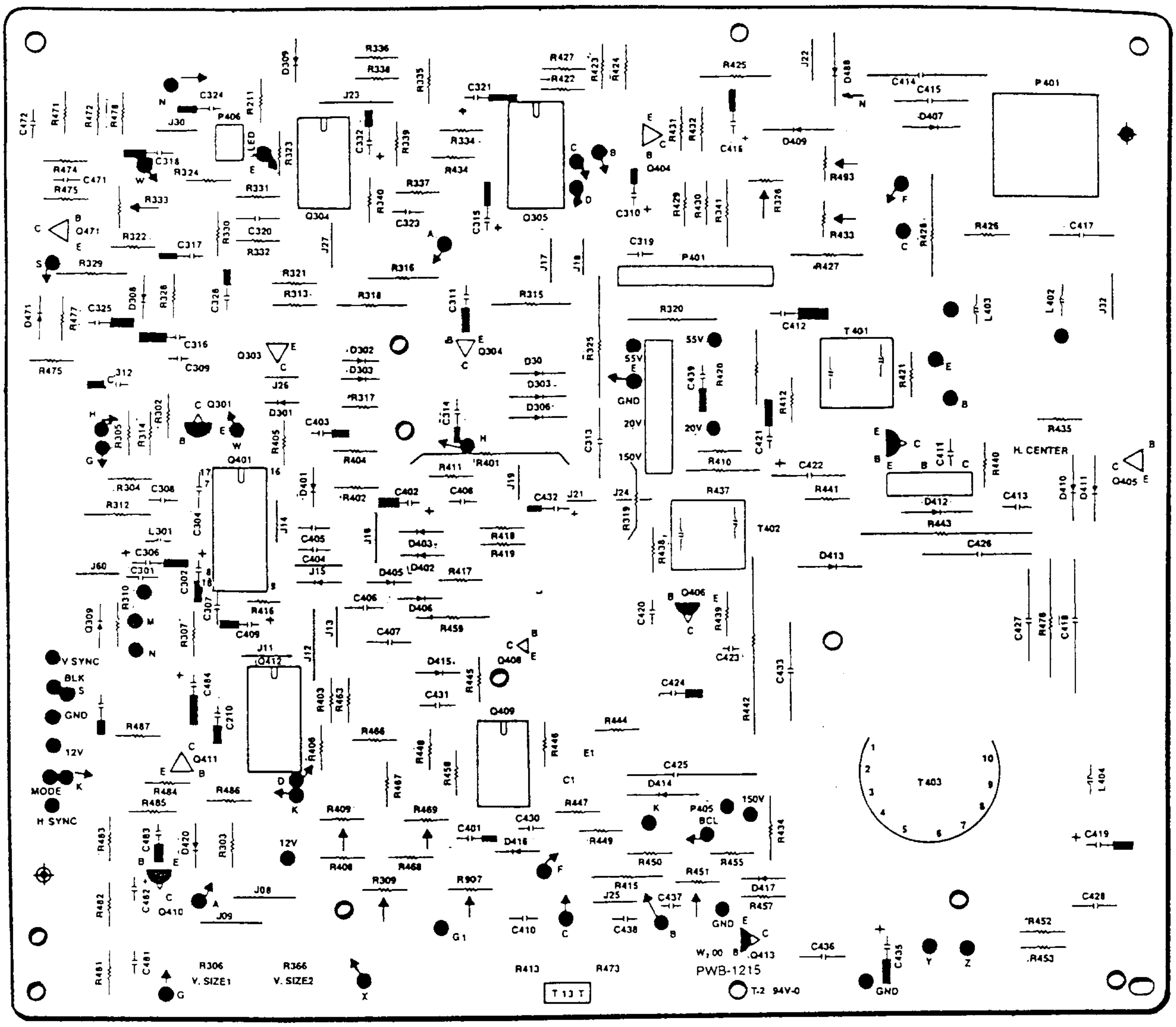


Figure 8-6. Main Board Component View

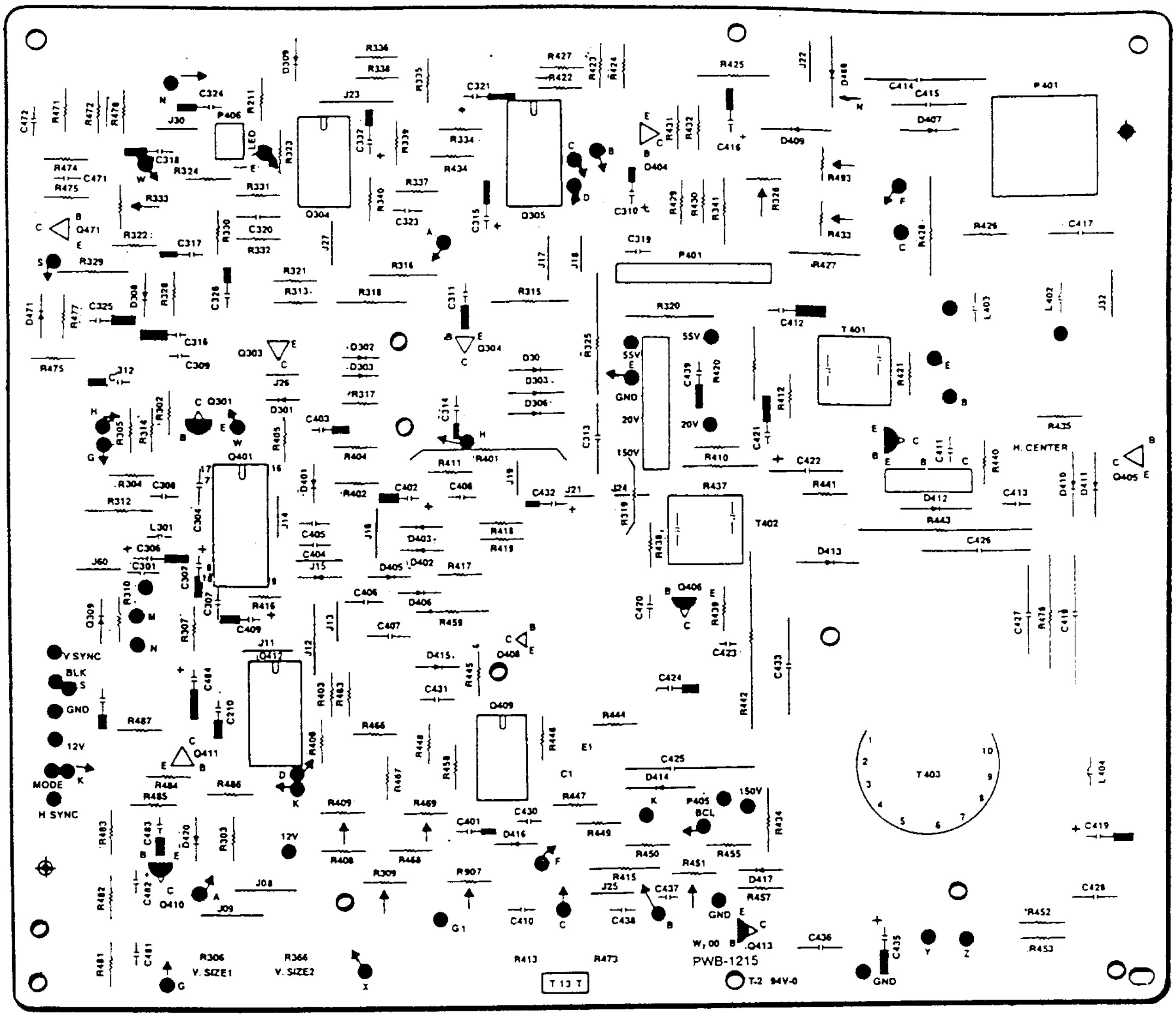
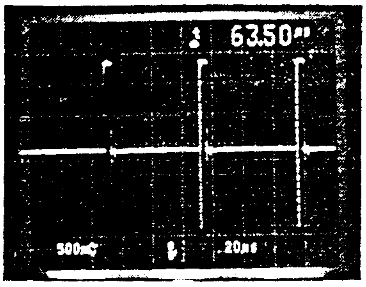
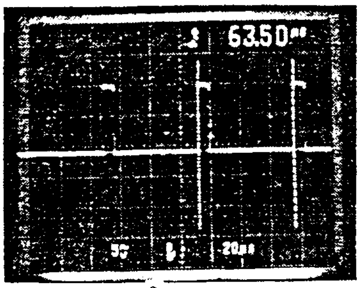


Figure 8-6 (repeat). Main Board Component View



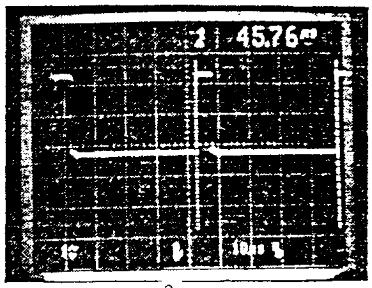
1

1: HORIZONTAL SYNC SIGNAL INPUT, MODE 1



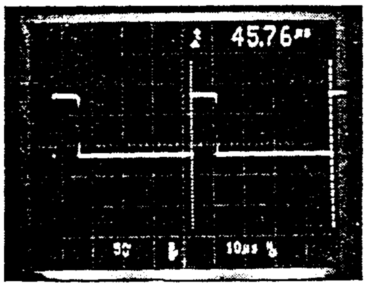
2

2: HORIZONTAL SYNC AT TP-22, MODE 1



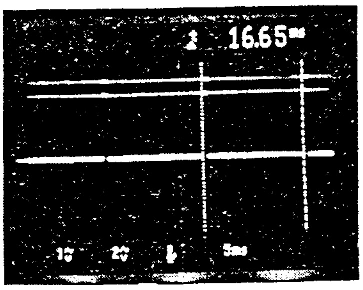
3

3: HORIZONTAL SYNC SIGNAL INPUT, MODE 2



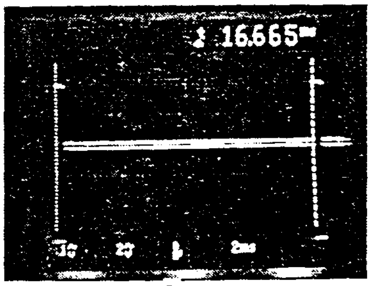
4

4: HORIZONTAL SYNC AT TP-22, MODE 2



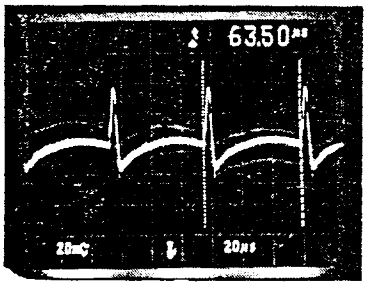
5

5: VERTICAL SYNC, MODE 1;
TOP: V. SYNC INPUT
BOTTOM: IC Q202, PIN 3



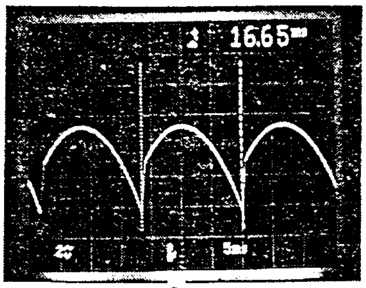
6

6: VERTICAL SYNC, MODE 2;
TOP: IC Q202, PIN 3
BOTTOM: V. SYNC INPUT



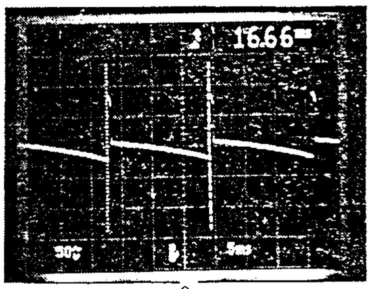
7

7: VERTICAL OSCILLATOR OUTPUT, TP-32



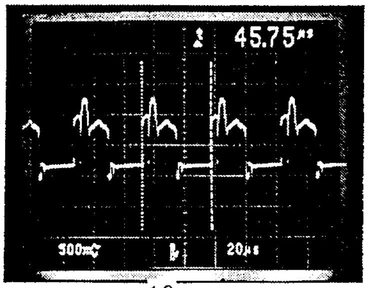
8

8: R326 WIPER, VERTICAL DEFLECTION CIRCUITRY



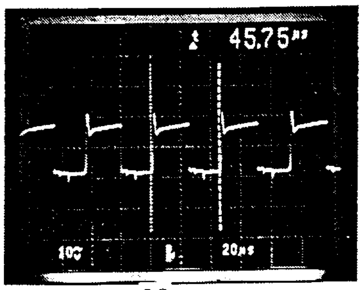
9

9: TP-33, VERTICAL DEFLECTION CIRCUITRY



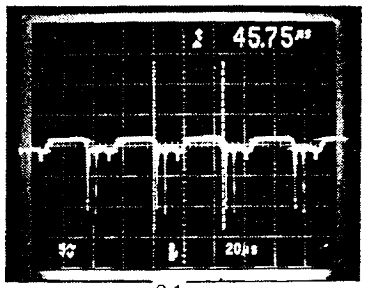
19

19: HORIZ. OSICILLATOR SIGNAL, Q402 BASE, MODE 2



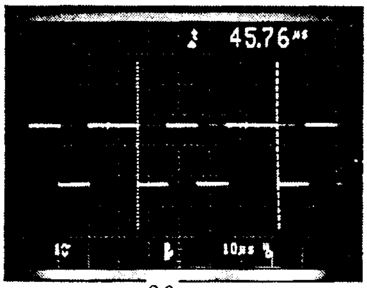
20

20: HORIZ. DRIVER OUTPUT , Q402 COLLECTOR, MODE 2



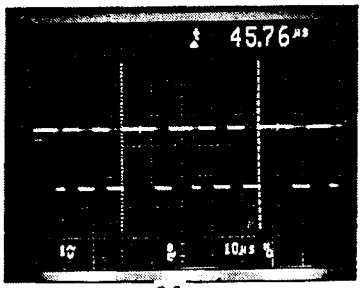
21

21: TP-43, Q403 BASE, INPUT TO HORIZ. OUTPUT TRANSISTOR



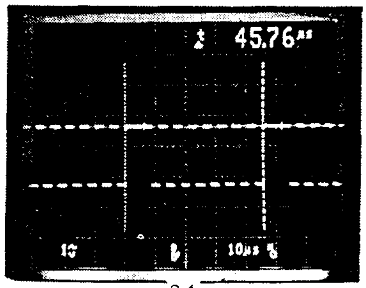
22

22: Q501 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



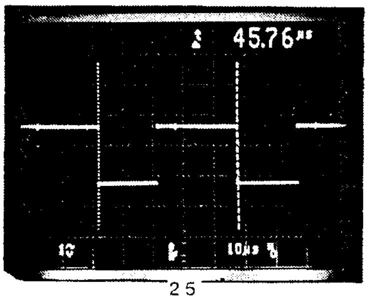
23

23: Q541 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



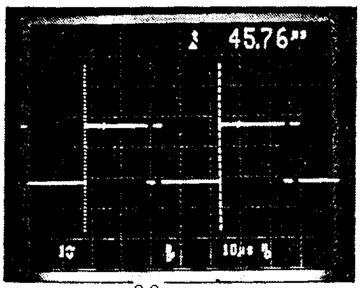
24

24: Q571 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



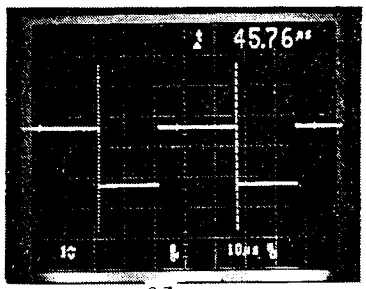
25

25: Q502 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



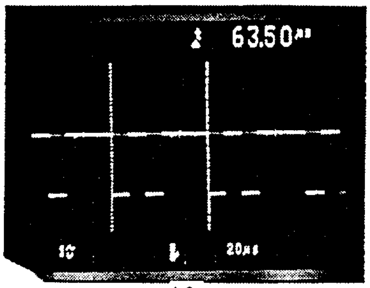
26

26: Q542 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



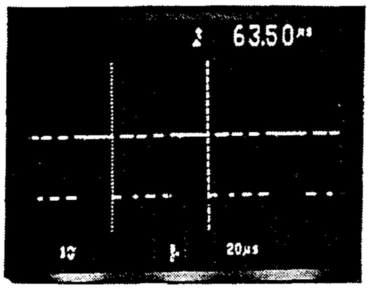
27

27: Q572 BASE, MODE 2, VIDEO DRIVER TRANSISTOR (COLOR BARS)



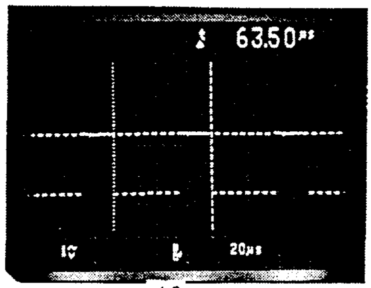
10

10: Q501 BASE, MODE 1, VIDEO DRIVER TRANSISTOR (COLOR BARS)



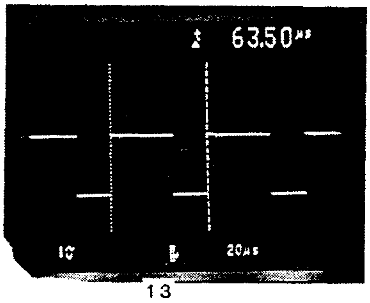
11

11: Q541 BASE, MODE 1, VIDEO DRIVER TRANSISTOR (COLOR BARS)



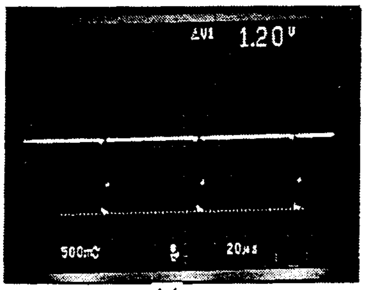
12

12: Q571 BASE, MODE 1, VIDEO DRIVER TRANSISTOR (COLOR BARS)



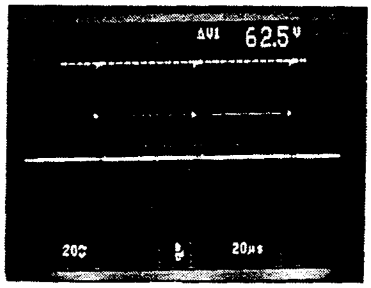
13

13: Q512 BASE, MODE 1, VIDEO DRIVER TRANSISTOR (COLOR BARS; Q502, Q542 SIMILAR)



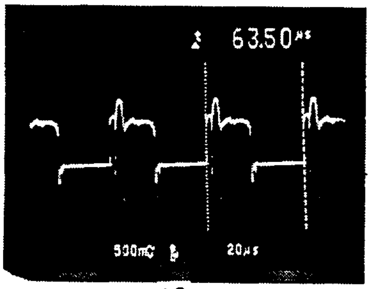
14

14: P207, MODE 1, BLUE DRIVER OUTPUT (WHITE FIELD: RED, GREEN SIMILAR)



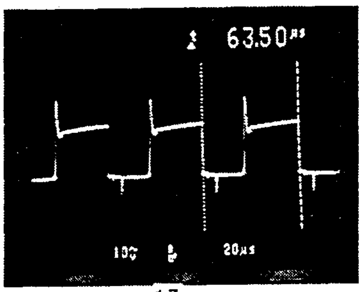
15

15: TP52B, MODE 1, VIDEO AMPLIFIER OUTPUT (WHITE FIELD; RED, GREEN SIMILAR)



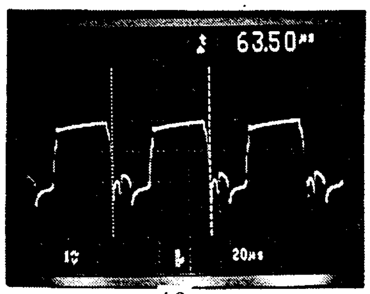
16

16: HORIZ. OSCILLATOR SIGNAL, Q402 BASE, MODE 1



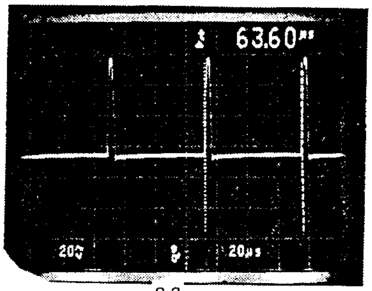
17

17: HORIZ. DRIVER OUTPUT, Q402 COLLECTOR, MODE 1



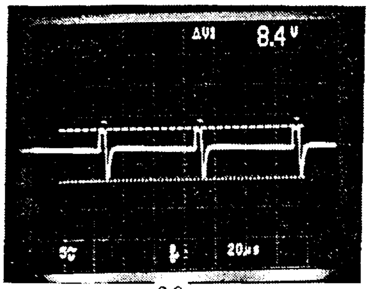
18

18: TP-43, Q403 BASE, INPUT TO HORIZ. OUTPUT TRANSISTOR, MODE 1



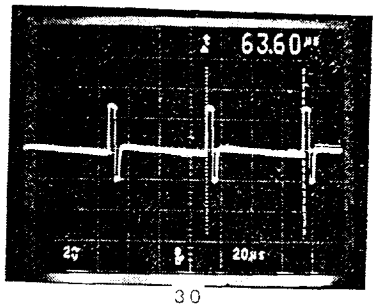
28

28: HORIZ. BLANKING CIRCUIT INPUT, R478, MODE 1



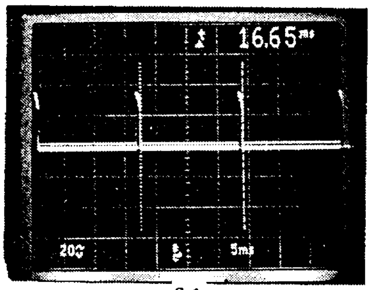
29

29: Q471 BASE, HORIZ. BLANKING TRANSISTOR, MODE 1



30

30: HORIZ. BLANKING PULSE, Q471 EMITTER, MODE 1



31

31: VERTICAL BLANKING PULSE, MODE 1

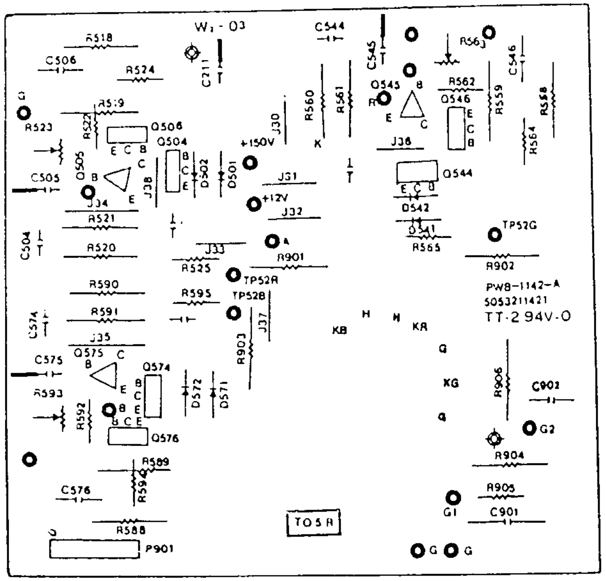


Figure 8-4. CRT Drive Board Component View

For Service Manuals
MAURITRON SERVICES
8 Cherry Tree Road, Chinnor
Oxfordshire, OX9 4QY.
Tel (01844) 351694
Fax (01844) 352554
email:- mauritron@dial.pipex.com

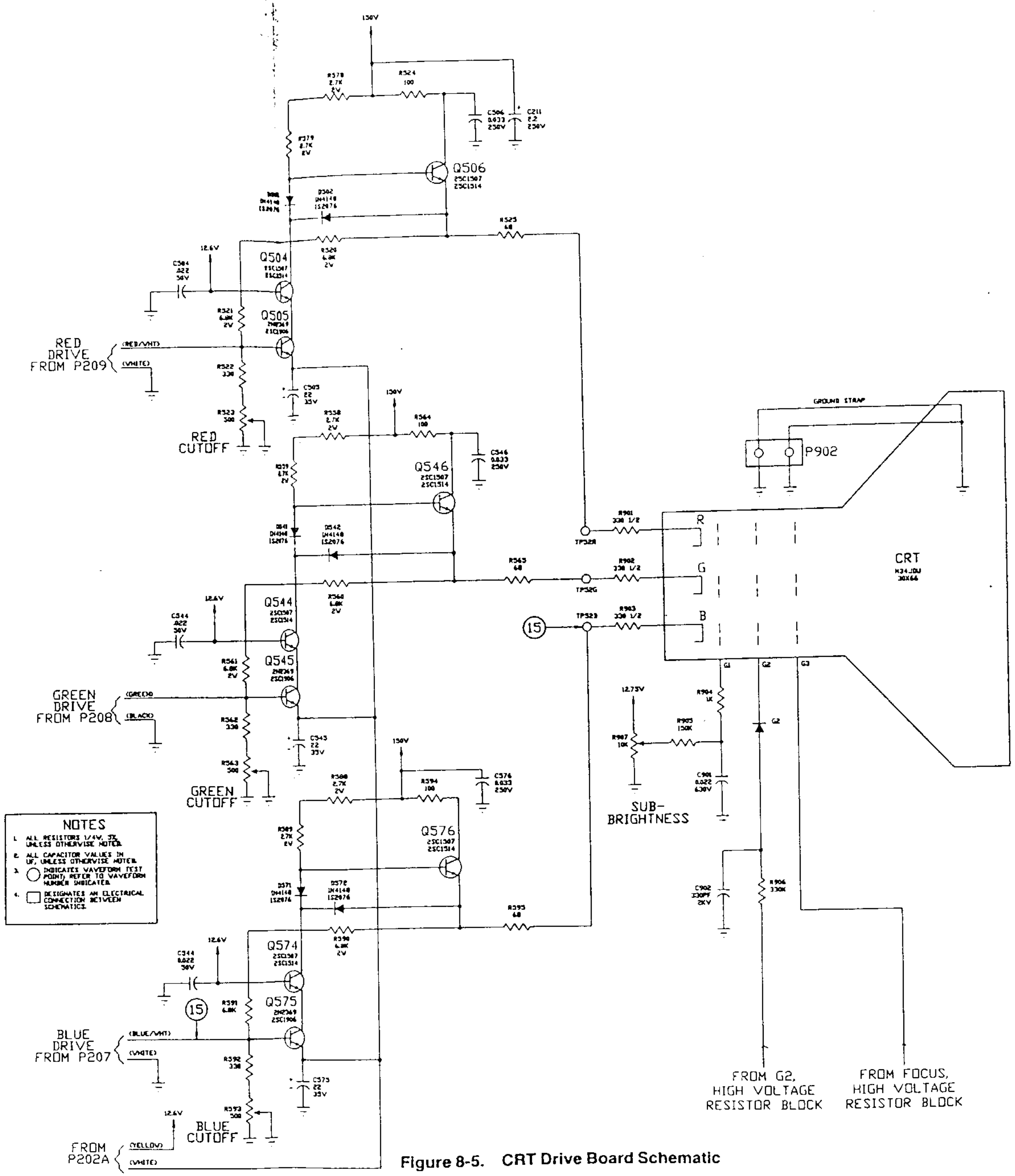
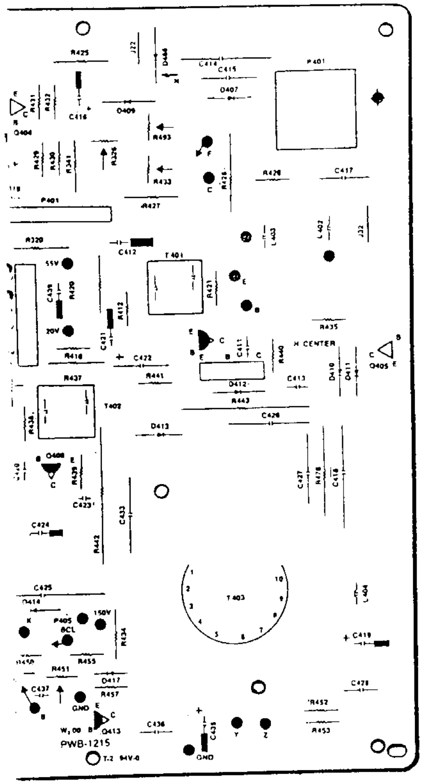


Figure 8-5. CRT Drive Board Schematic



omponent View

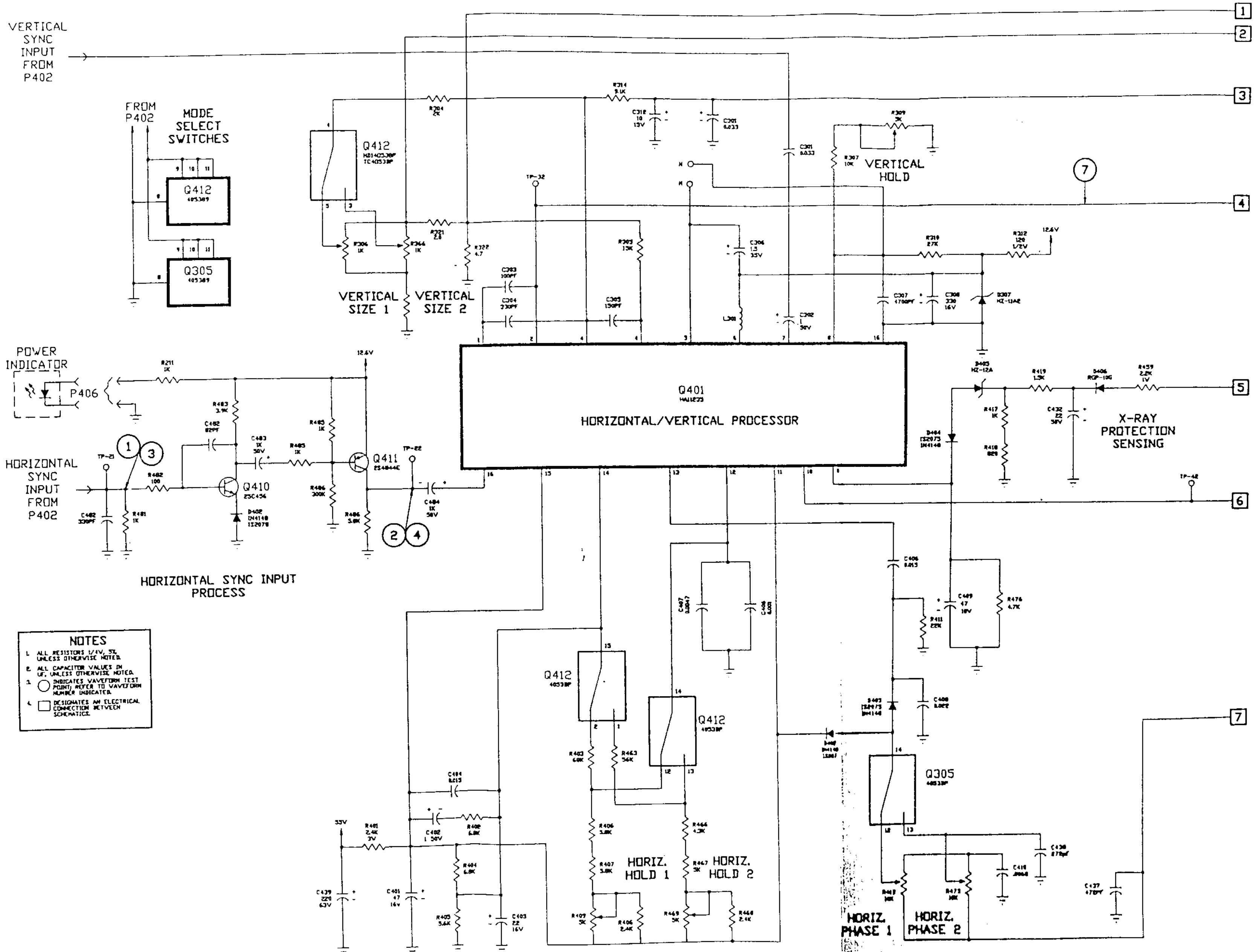
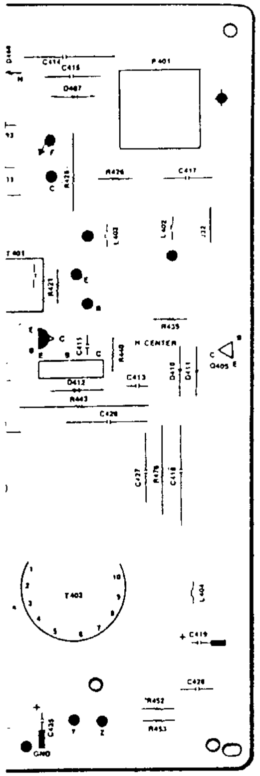


Figure 8-7. Main Board Schematic (1 of 2)



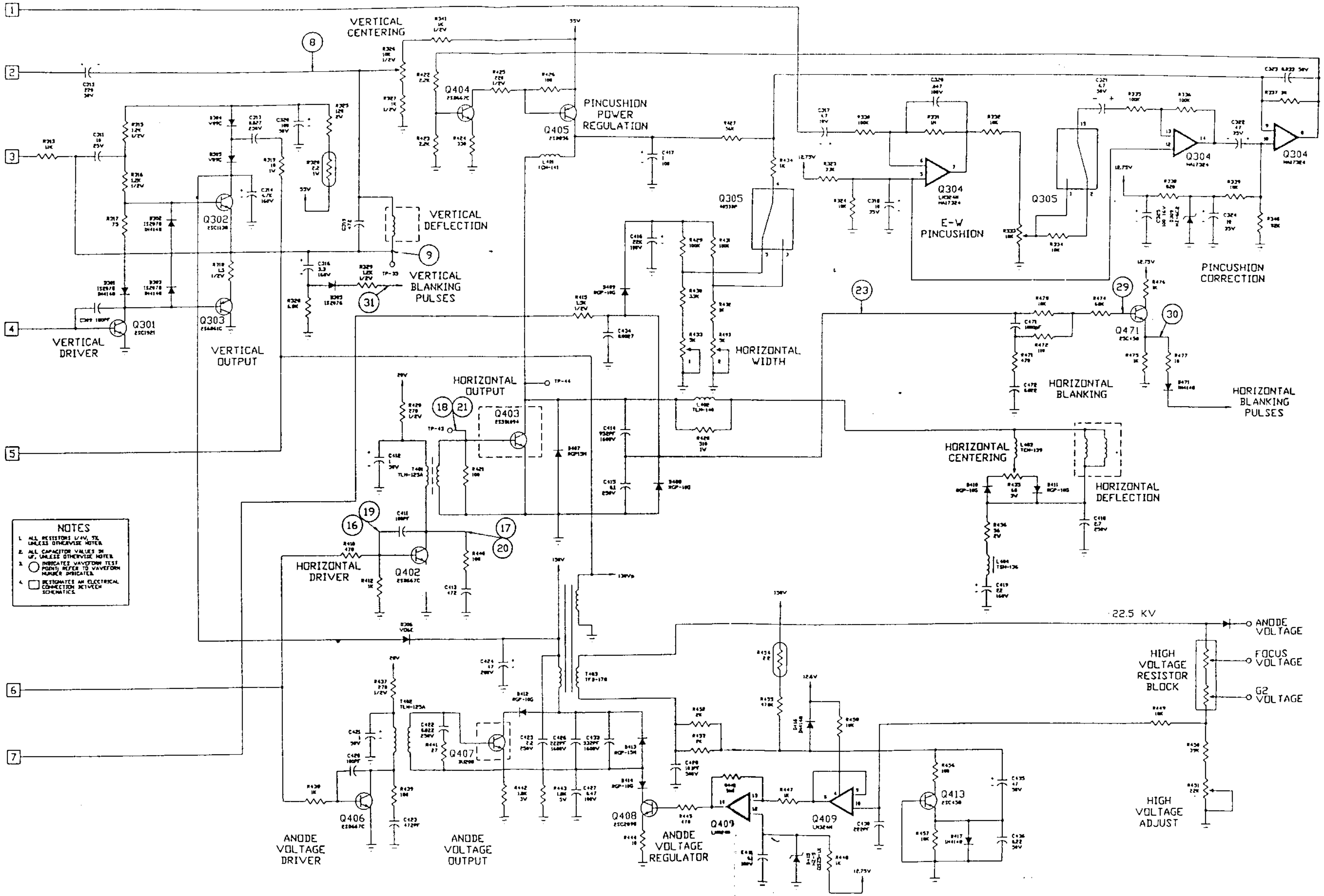


Figure 8-8. Main Board Schematic (2 of 2)

/iew

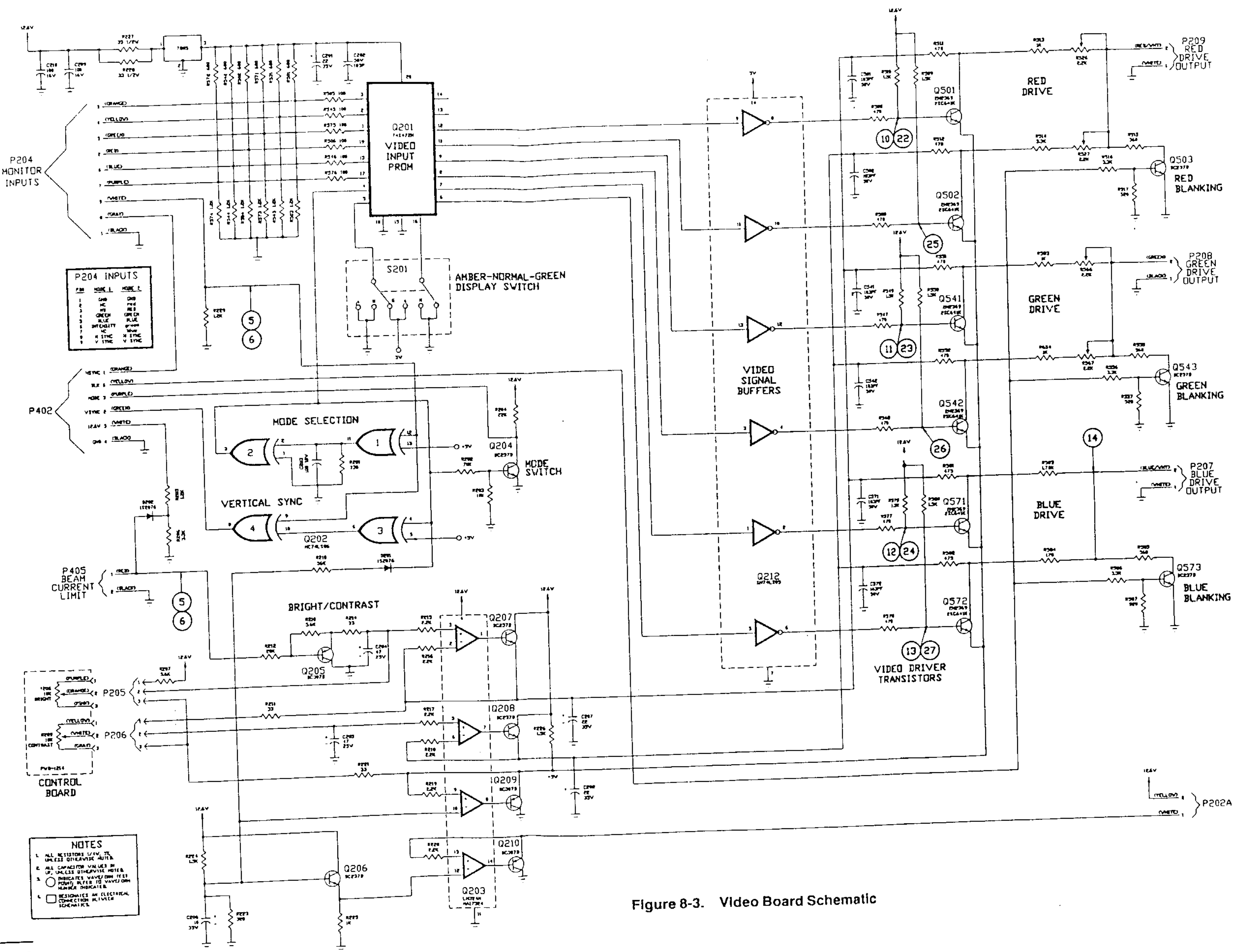


Figure 8-3. Video Board Schematic

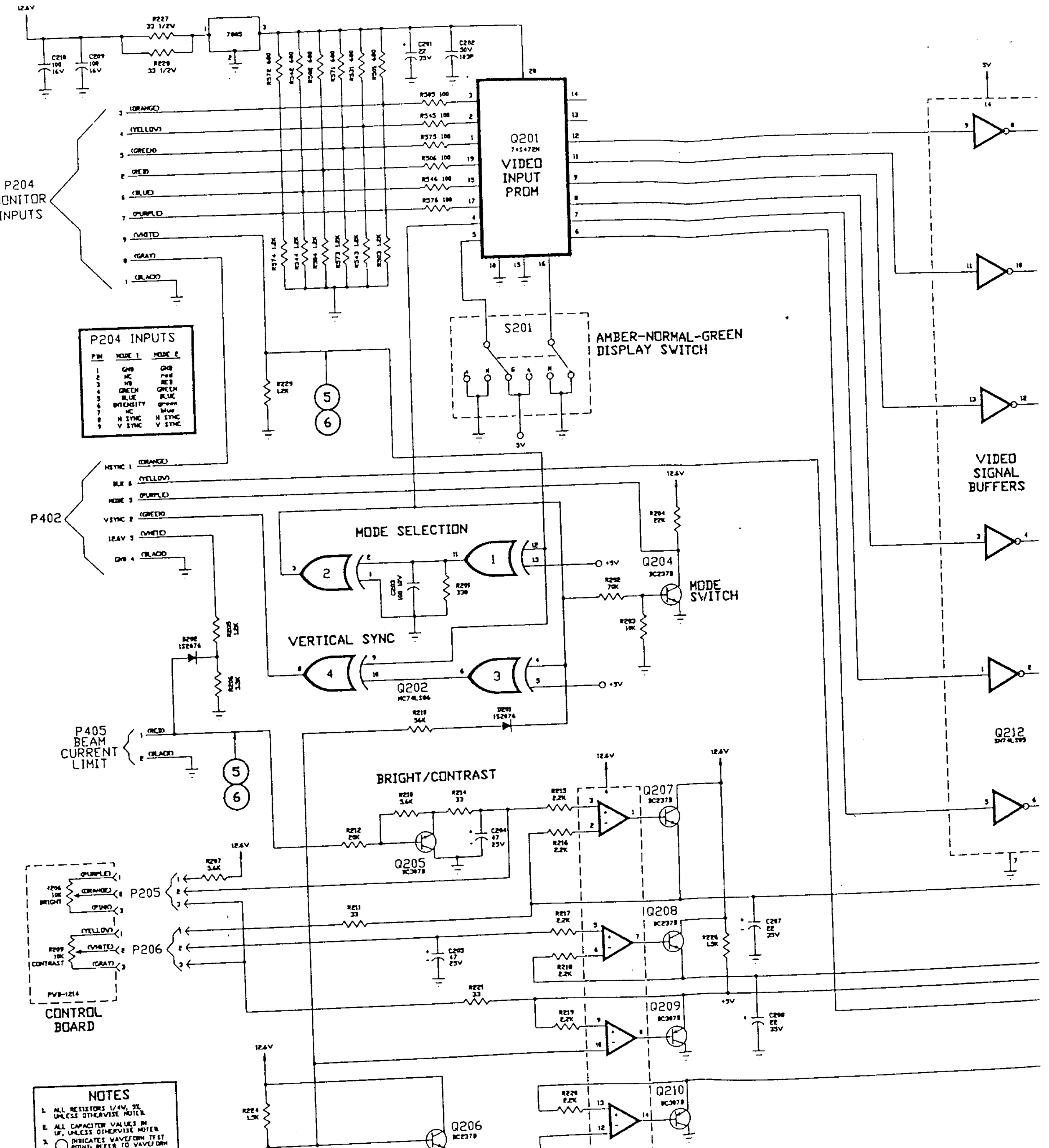


Figure 8-3. Video Boa

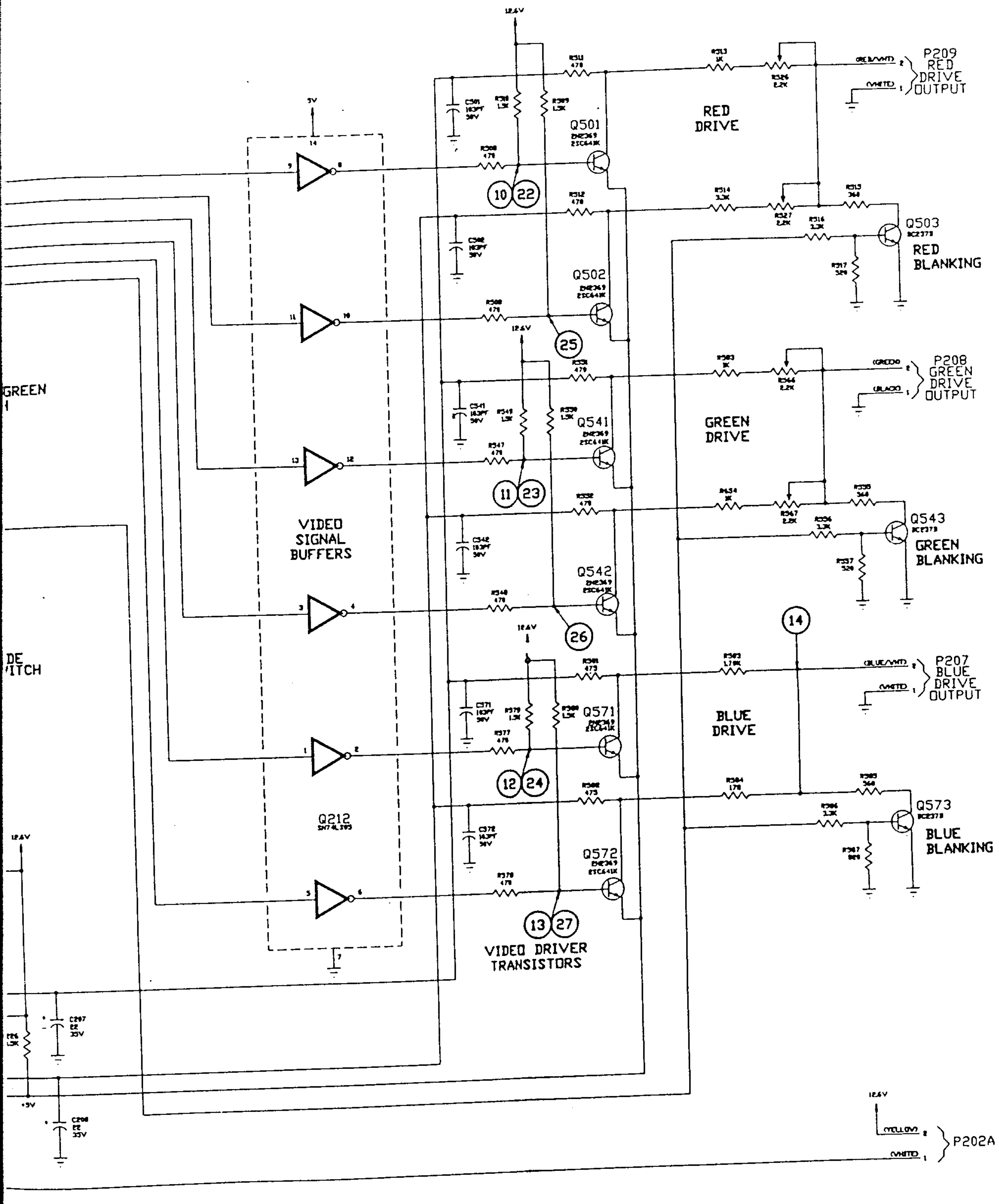
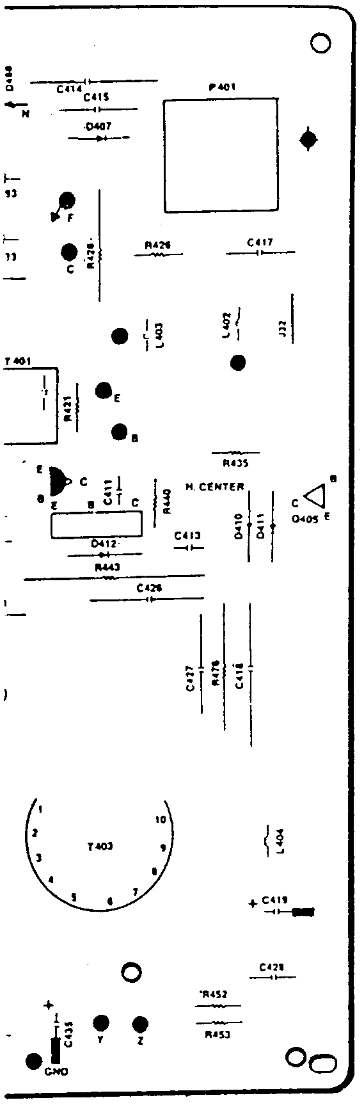
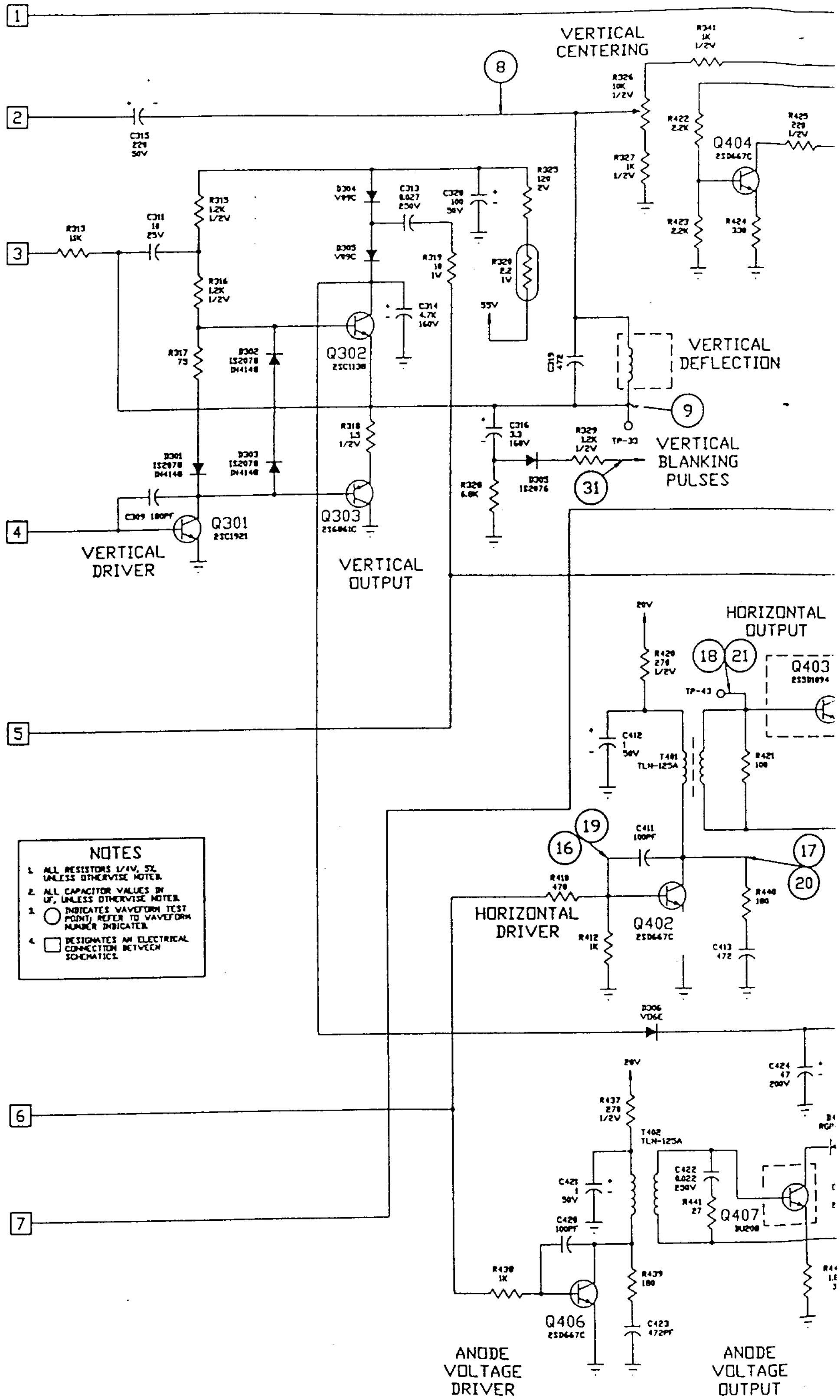


Figure 8-3. Video Board Schematic


P401
T401
T403
H. CENTER
Q405
D412
C413
C426
C427
C416
C419
C428
R452
R453
C435
GND


1
2
3
4
5
6
7
VERTICAL CENTERING
Q404
VERTICAL DEFLECTION
VERTICAL BLANKING PULSES
Q302
Q303
Q301
VERTICAL DRIVER
VERTICAL OUTPUT
HORIZONTAL OUTPUT
Q403
HORIZONTAL DRIVER
Q402
Q407
Q406
ANODE VOLTAGE DRIVER
ANODE VOLTAGE OUTPUT
NOTES
1. ALL RESISTORS 1/4W, 5% UNLESS OTHERWISE NOTED.
2. ALL CAPACITOR VALUES IN UF, UNLESS OTHERWISE NOTED.
3. INDICATES WAVEFORM TEST POINT; REFER TO WAVEFORM NUMBER INDICATED.
4. DESIGNATES AN ELECTRICAL CONNECTION BETWEEN SCHEMATICS.

/iew

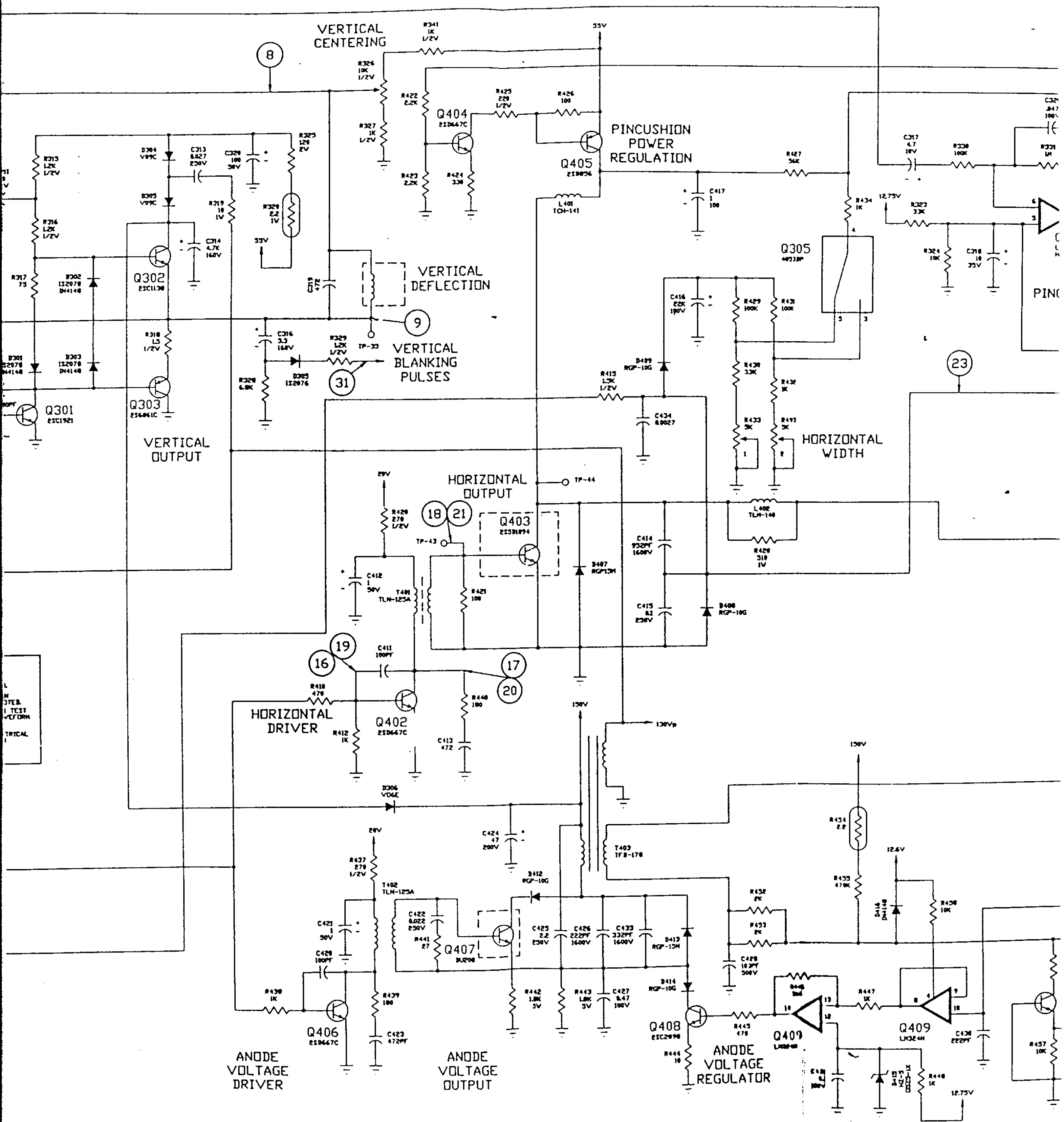


Figure 8-8. Main Board Schematic (2 of 2)

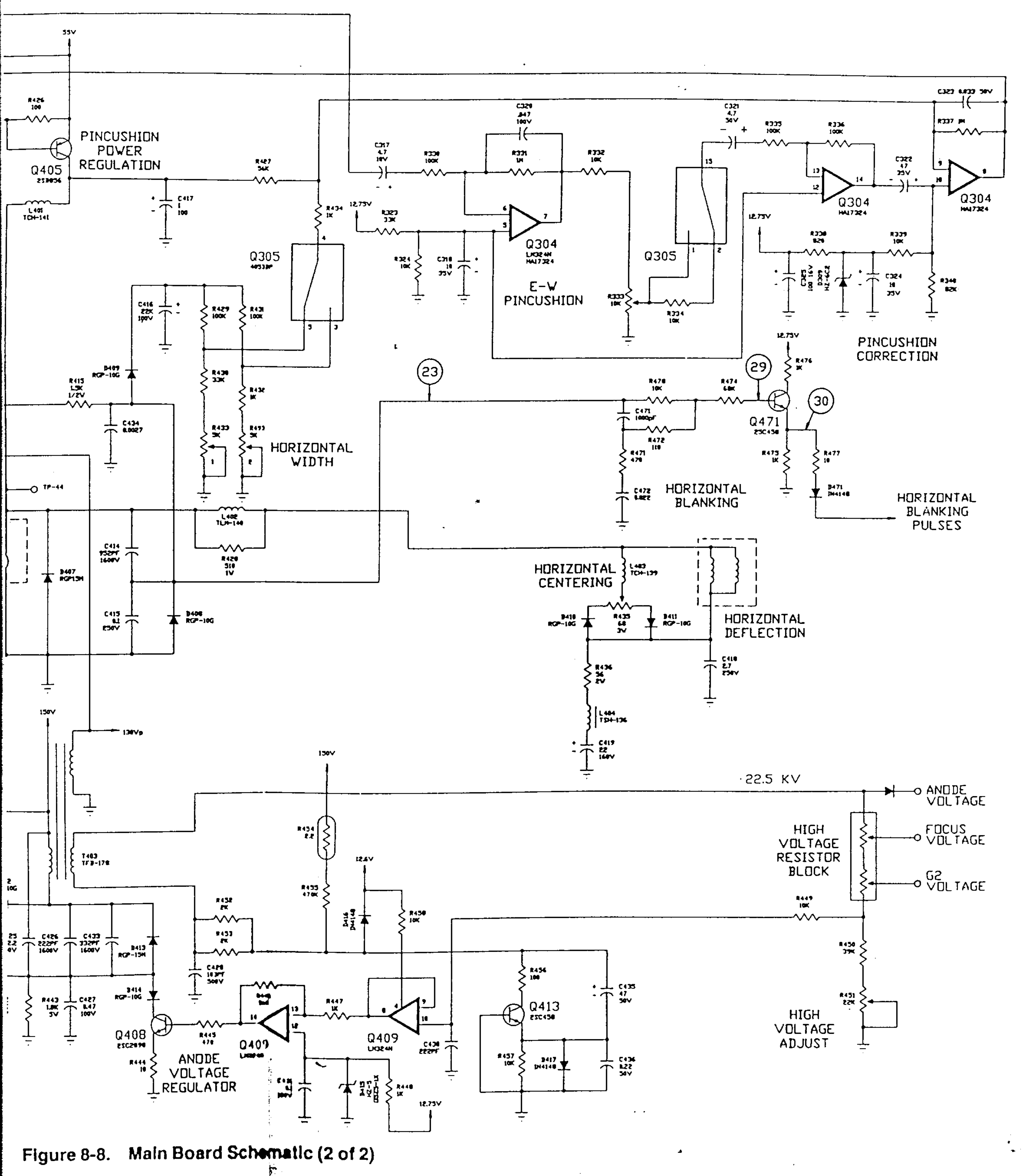
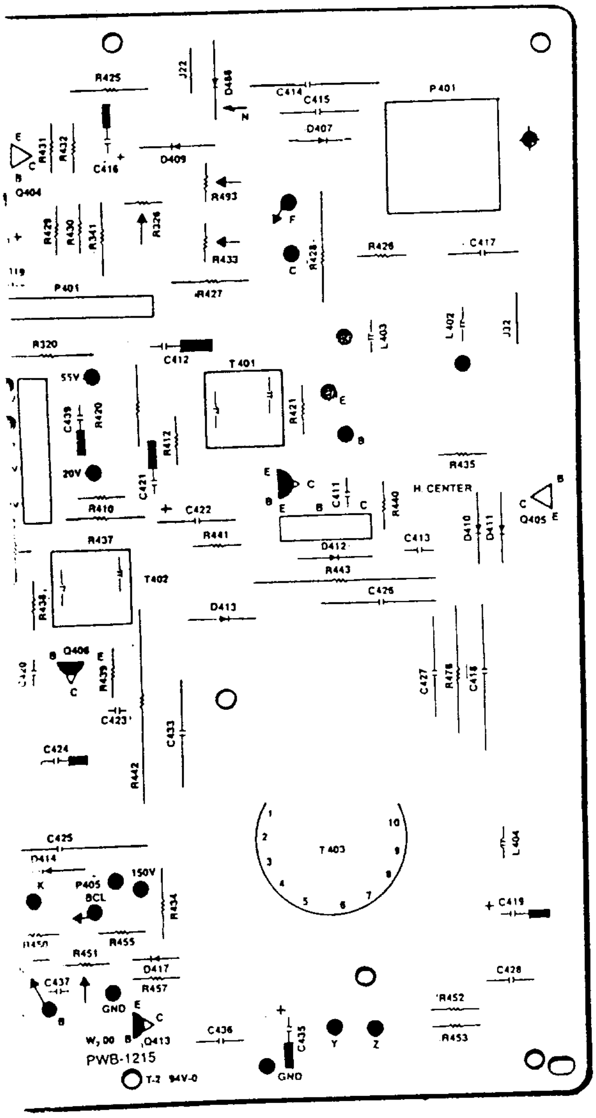
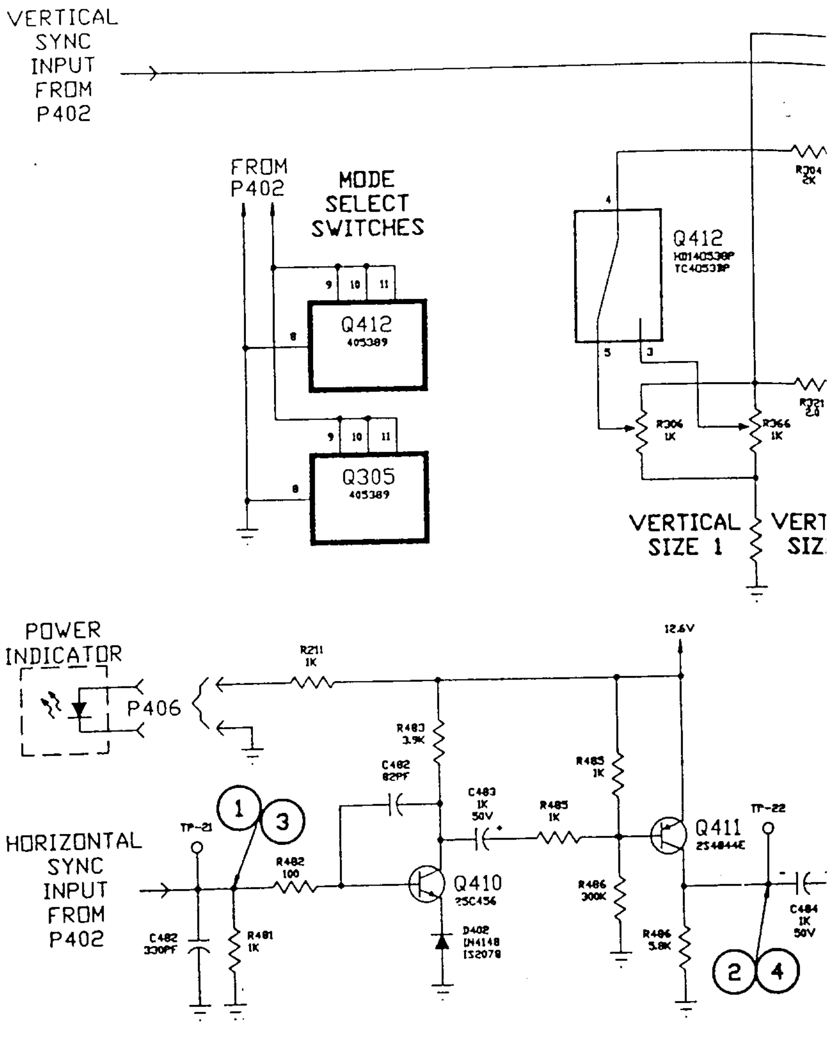


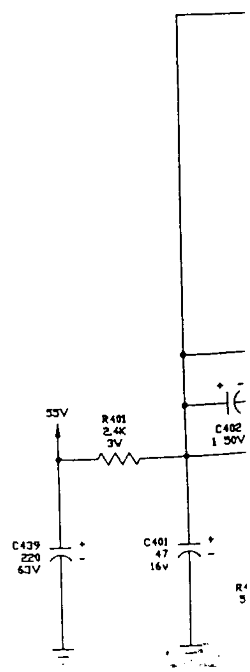
Figure 8-8. Main Board Schematic (2 of 2)



omponent View



HORIZONTAL SYNC INPUT PROCESS



NOTES

1. ALL RESISTORS 1/4W, 5% UNLESS OTHERWISE NOTED.
2. ALL CAPACITOR VALUES IN UF, UNLESS OTHERWISE NOTED.
3. ◯ INDICATES WAVEFORM TEST POINT; REFER TO WAVEFORM NUMBER INDICATED.
4. ☐ DESIGNATES AN ELECTRICAL CONNECTION BETWEEN SCHEMATICS.

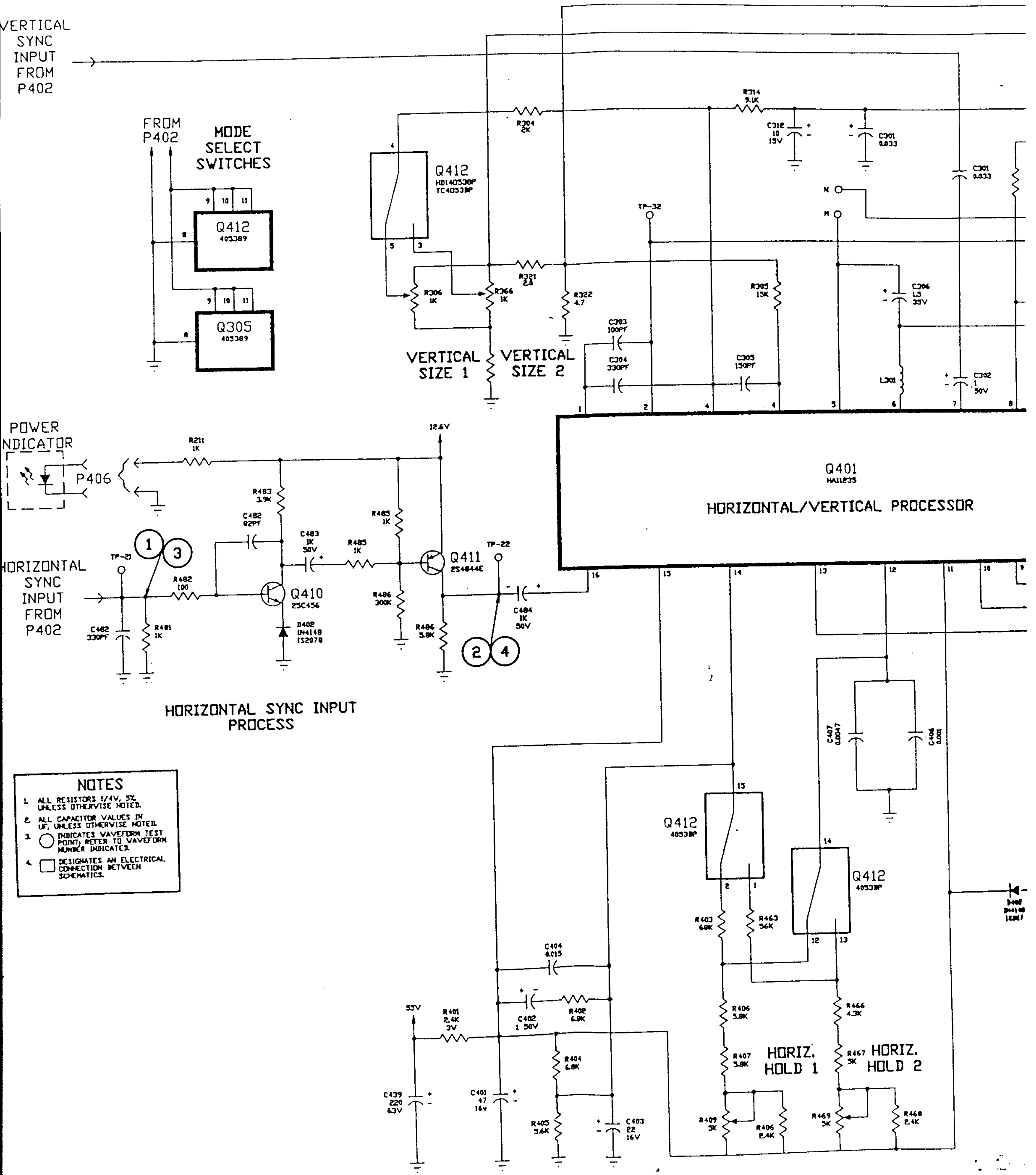


Figure 8-7. Main Board Schematic (1

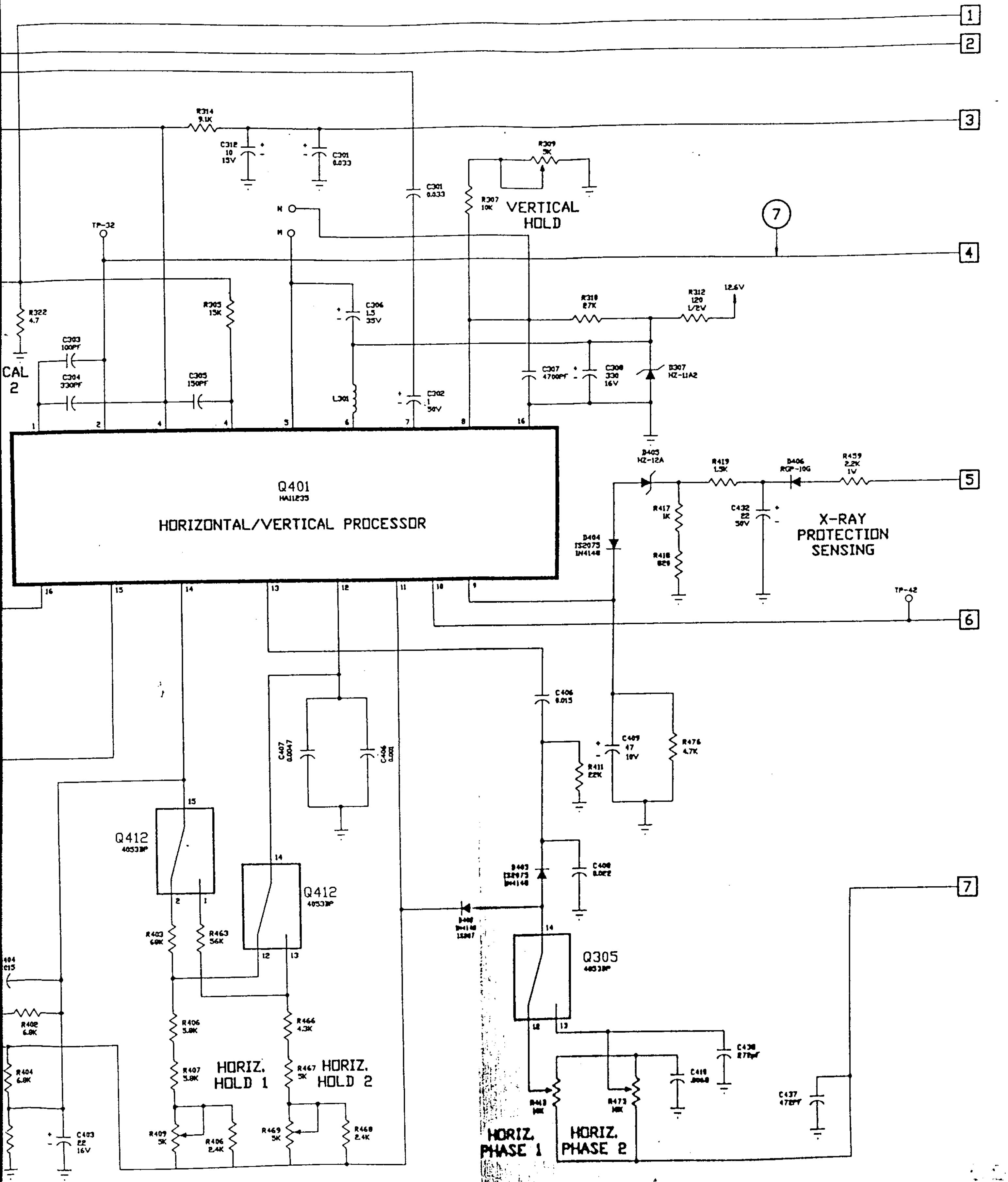


Figure 8-7. Main Board Schematic (1 of 2)

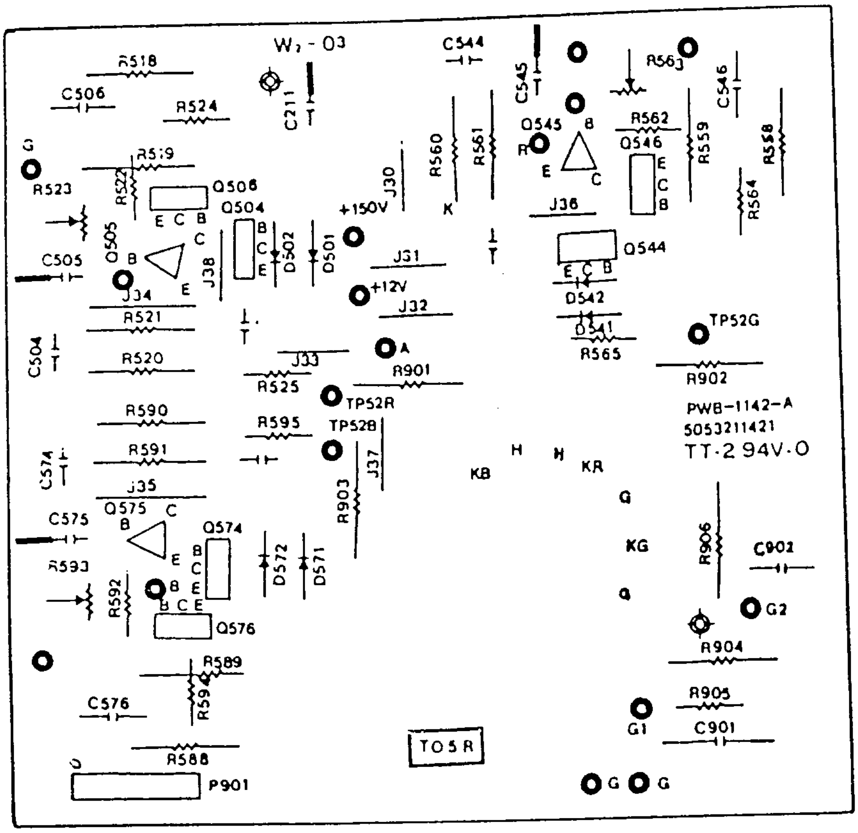
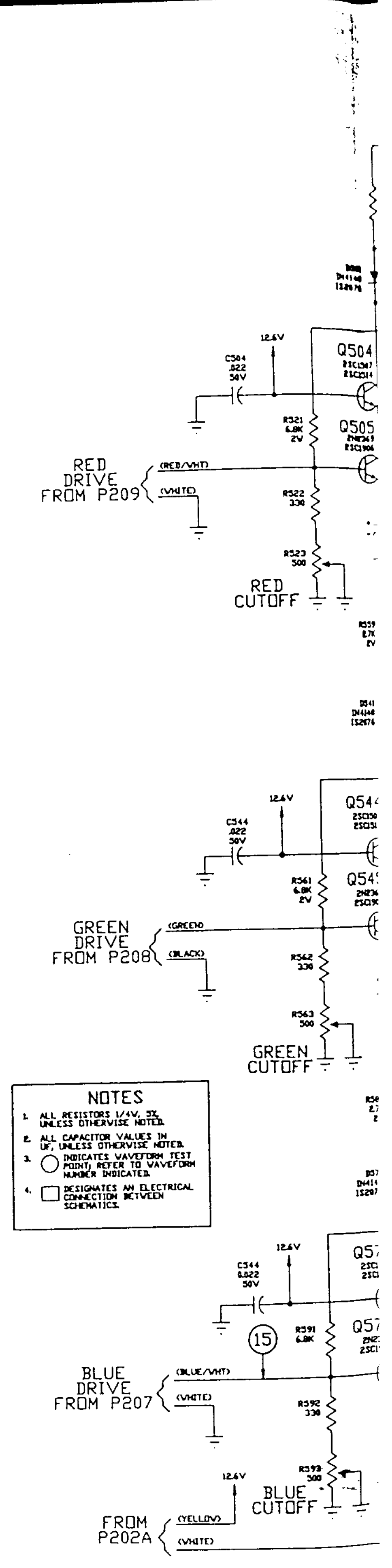
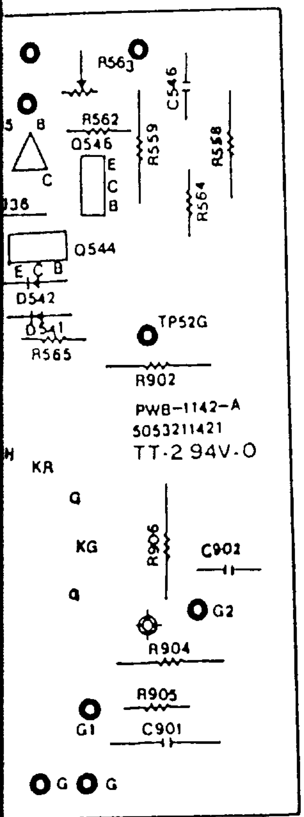


Figure 8-4. CRT Drive Board Component View





onent View

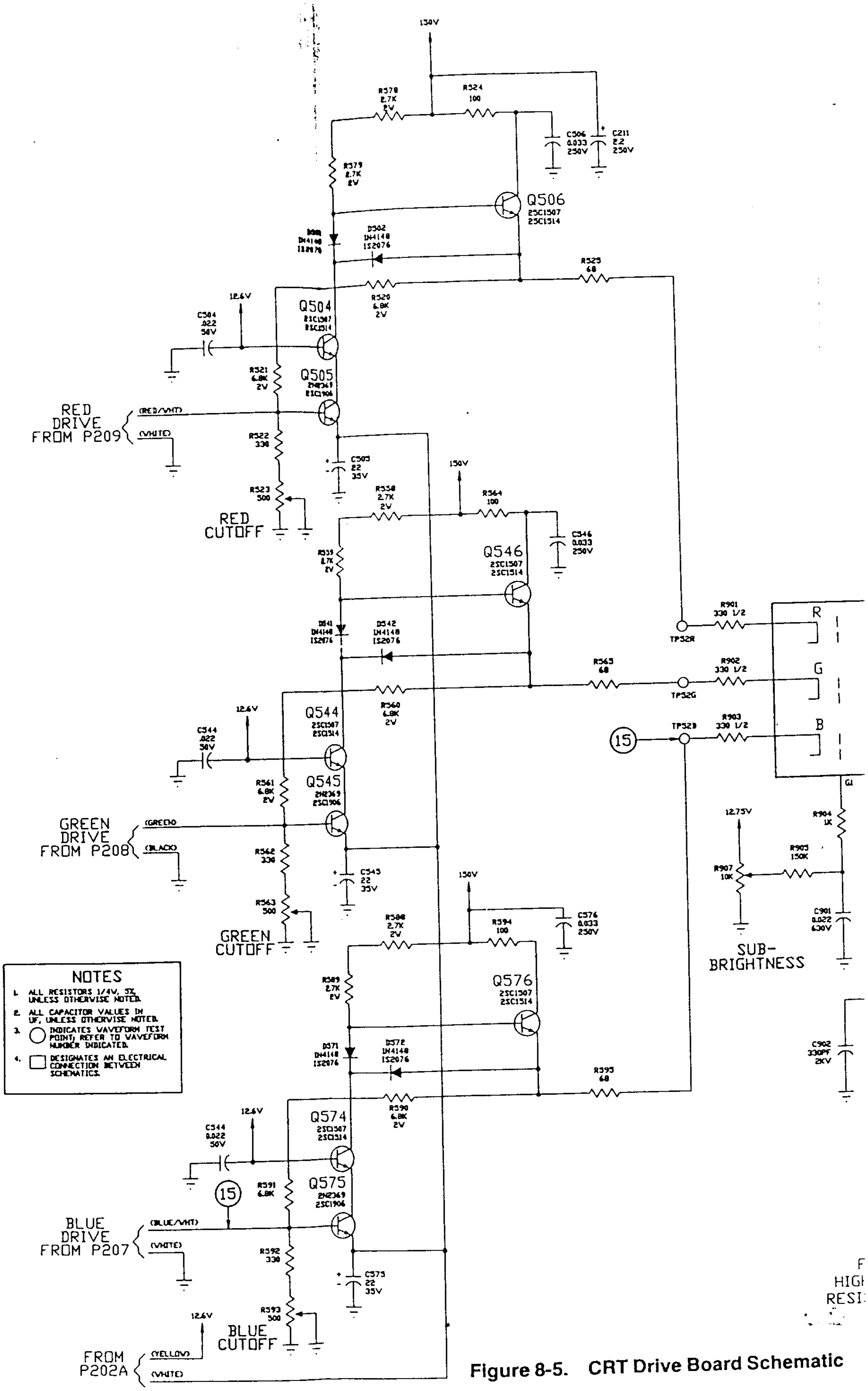


Figure 8-5. CRT Drive Board Schematic

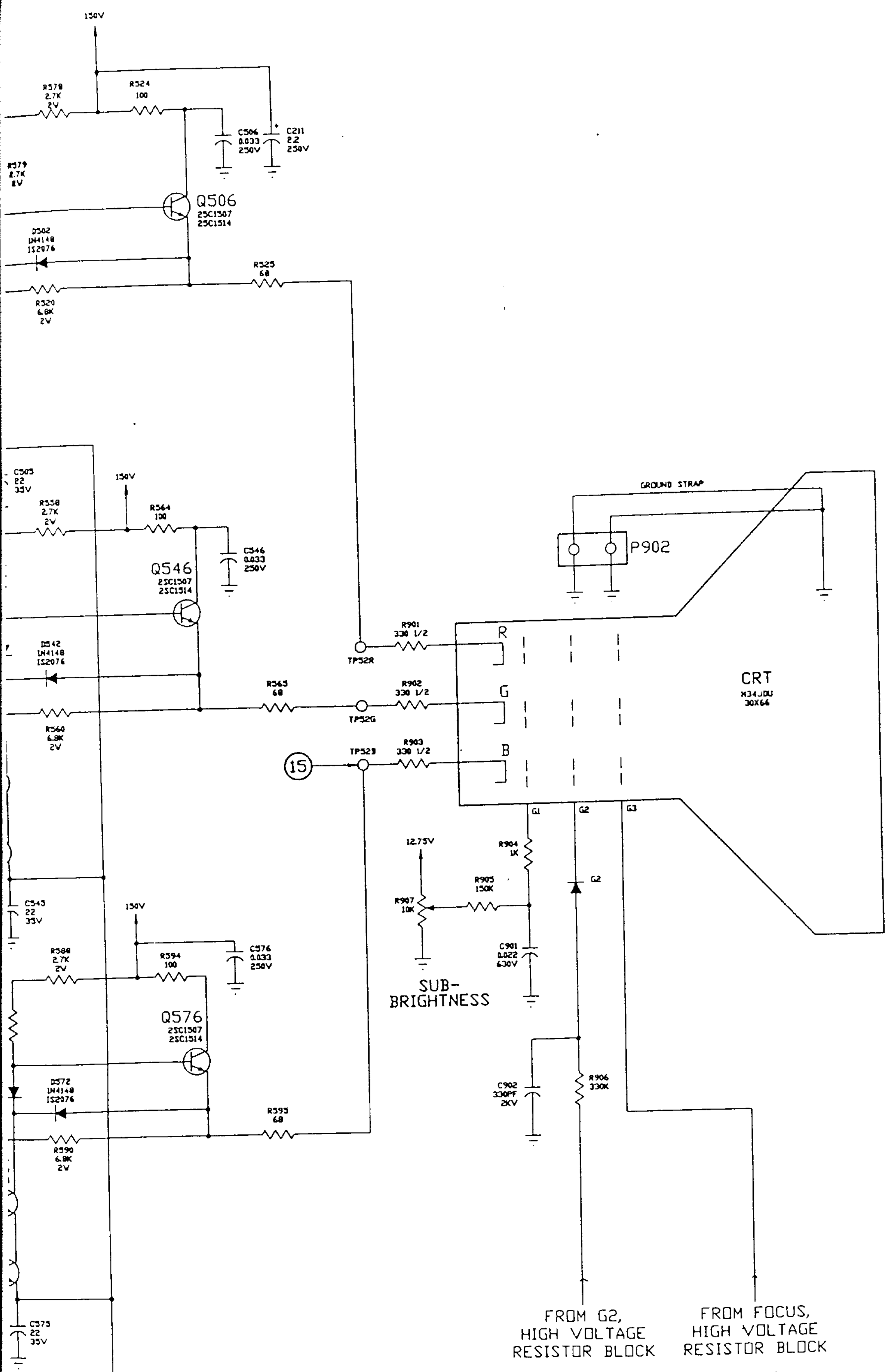


Figure 8-5. CRT Drive Board Schematic