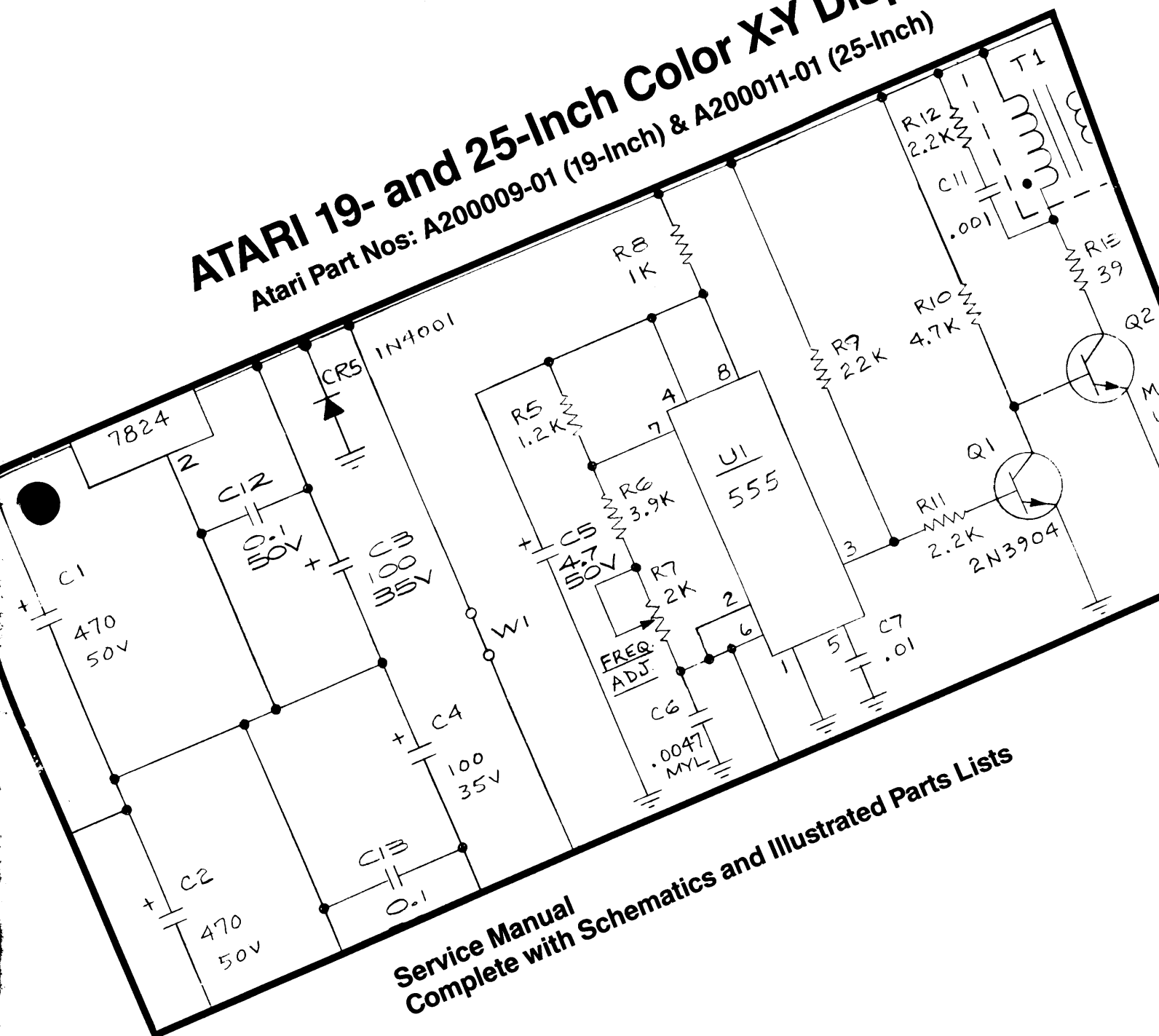


# ATARI 19- and 25-Inch Color X-Y Display

Atari Part Nos: A200009-01 (19-Inch) & A200011-01 (25-Inch)



Service Manual  
Complete with Schematics and Illustrated Parts Lists

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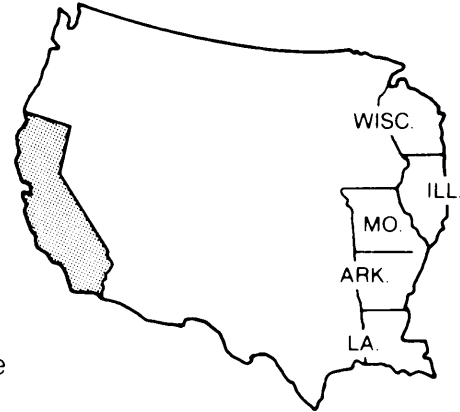
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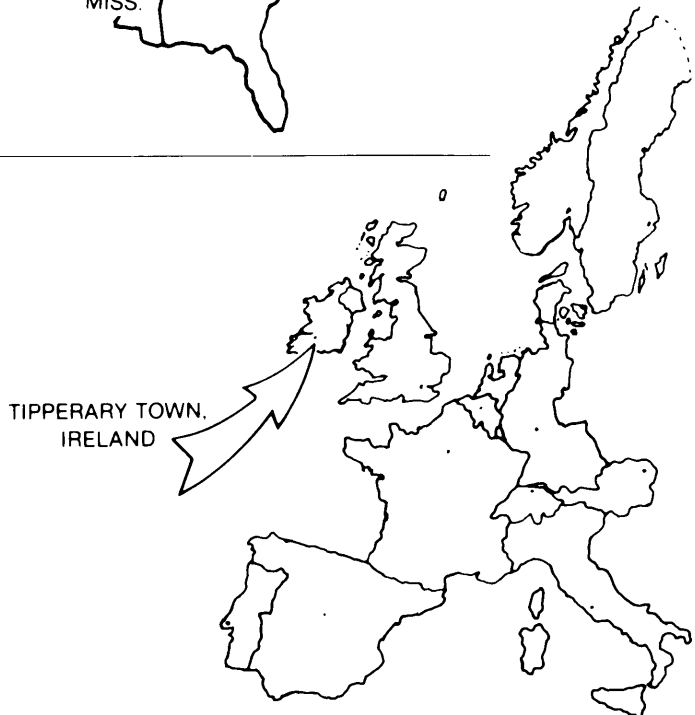
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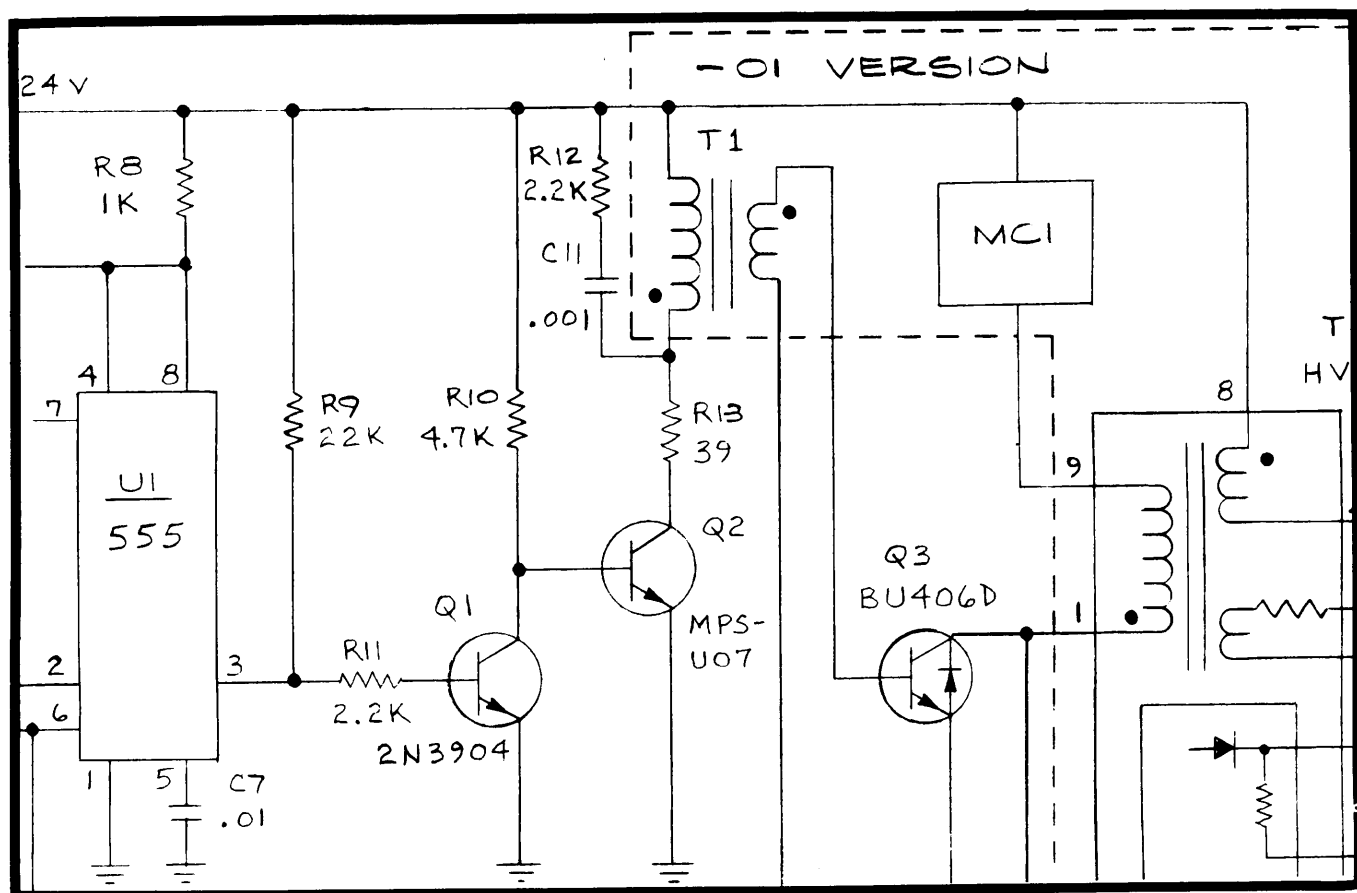
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# ATARI 19- and 25-Inch Color X-Y Display

Atari Part Nos: A200009-01 (19-Inch) & A200011-01 (25-Inch)

## Service Manual Complete with Illustrated Parts Lists



Manufactured by Amplifone, Inc., Brownsville, Texas—  
a wholly owned subsidiary of

Atari, Inc.  
790 Sycamore Drive P.O. Box 906  
Milpitas, California 95035

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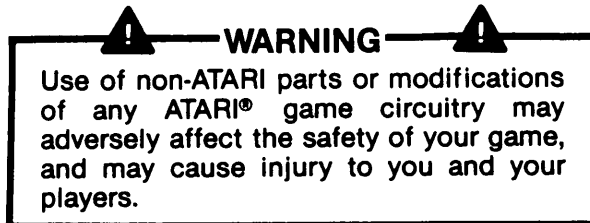
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You may void the game warranty (printed on the inside back cover of this manual) if you do any of the following:

- substitute non-ATARI parts
- modify or alter any circuits by using kits or parts *not* supplied by Atari.

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## 1 WARNINGS AND CAUTIONS

This color X-Y display has been built to Atari specifications by Amplifone, Inc. The display is not contained within a separate chassis; instead, each of the two printed-circuit boards (PCB) and the cathode-ray tube (CRT) assemblies is separately mounted inside the game cabinet. The Deflection PCB is mounted just to the right of the cathode-ray tube as viewed from the back of an upright cabinet. The High-Voltage PCB is mounted to the left of the cathode-ray tube in an upright cabinet. Input signals for the display are supplied through a 15-pin harness connector wired to the Deflection PCB.

### A. Before You Start

Never attempt to work on a display until you are familiar with servicing precautions and procedures necessary for high-voltage equipment. Remember, any video display has at least three sources of possible danger:

- Strong electric shock, due to high voltage or AC line voltage
- X-ray radiation (when the display is incorrectly adjusted)
- Implosion

Therefore, never modify any circuit in this display.

Service a video display only after you are thoroughly familiar with all warnings and safety measures given in this chapter.



WARNINGS

High Voltage

This display contains lethal high voltages. To avoid danger, do not attempt to service the chassis until you take all precautions necessary for working on high-voltage equipment.

X-Radiation

This display has been designed to minimize X-radiation hazard. However, to avoid possible exposure to soft X-radiation, never modify the high-voltage circuitry.

Implosion Hazard

If you drop the cathode-ray tube and it breaks, it will implode! Shattered glass and the yoke assembly can fly 6 feet or more from the implosion site. Use care when replacing the cathode-ray tube.

B. Safety Measures

Good safety habits will allow you to take the proper precautions automatically, even if you are rushed. Whenever you work on a display assembly, always ground it first. Also, only use one hand. This avoids the possibility of carelessly putting one hand on electrical ground and the other on an electrical connection. Doing so could cause a severe electrical shock.

If you service the Atari 19- or 25-Inch Color X-Y Display on a test bench, use only the power supply that came with the game. (Refer to the parts list in the game manual for the Atari part number of the Power Supply Assembly for Color X-Y Games.) Do not use line voltage or a power supply from a black-and-white X-Y game, because the voltages produced by those sources will damage this display.

To prevent fire or shock hazard, never expose this display to moisture.

Periodically check for frayed insulation on wires. If you find frayed wires, remove and replace them with the same gauge, insulation type,

thickness, and length of wire. Always observe the original routing and length of harness wires.

Use extra precaution in the high-voltage-circuitry areas of the display. If a short circuit occurs, remove and replace any components that indicate they may have overheated.

#### C. Handling the Cathode-Ray Tube

Wear safety goggles and heavy gloves for protection whenever you handle a cathode-ray tube. Keep other people away if they are not wearing safety goggles. Never lift the cathode-ray tube only by the neck; the neck should be used only to guide the lifting process.

Use extreme care when handling the cathode-ray tube. Rough handling may cause the tube to implode. Do not scratch the glass or subject any undue pressure upon the tube at any time.

When you are servicing the cathode-ray tube, first discharge the high voltage on the anode connection to ground—not to the cabinet or other mounting parts. When discharging the anode, use a well-insulated 18 gauge wire jumper. Allow two minutes to pass and discharge the anode again.

#### D. Replace with Proper Components

Maintain the specified values of all components within the display. If you change the values of components, you may cause an increase in the high voltages.

The cathode-ray tube of this display employs integral implosion protection. For continued safety, replace it only with a tube of the same type number. Refer to the parts lists in Chapter 6 of this manual. Use only exact replacement parts, especially for those parts identified in the parts lists with the (!) symbol and on the schematics with shading.

#### E. Final Testing Before Reinstalling Display Assemblies

Before reinstalling any assembly of this color display into the game, inspect all harness wiring within the display area. Be sure no wires or cables are pinched between the cabinet and other parts in the display.

2 SPECIFICATIONS

A. Input Information

- Input Voltage            50 VAC RMS (center tapped), within +10% and -15%.
- X-Amplifier            16 V peak-to-peak,  $\pm 8$  V, for 15 inches of deflection.  
Input Voltage
- Y-Amplifier            12 V peak-to-peak,  $\pm 6$  V, for 11.25 inches of  
Input Voltage            deflection.
- Z-Amplifier Drive    3.5 V for maximum intensity; 1.0 V for black level.
- Input Impedance:
- X/Y Amplifiers    2.0 kilohms, approx.
- Z Amplifiers      1 kilohm

B. Z Bandwidth

5 MHz at -3 dB down.

C. High Voltage

19.5 kV at 0 beam current.

D. Controls

- Factory Adjusted    Brightness, High-Voltage Adjustment, and all Bias and  
                                 Drive adjustments for the Z Amplifiers.
- Operator              Focus  
Adjustable

E. Operating Temperature and Humidity

- Ambient Temperature    0 degree to +55 degrees C (+32 degree to +131  
                                 degrees F)
- Ambient Humidity        0 to 90% non-condensing

### 3 DETAILS OF OPERATION

A block diagram of the circuitry within this display is shown in Figure 1. Refer to this illustration and the schematic diagrams while you read this chapter.

#### A. Low-Voltage Power Supply

Input voltage of 50 VAC is applied to bridge rectifier CR14-CR15-CR16-CR17 through fuses F3 and F4. The bridge rectifier converts the AC input voltage into an unfiltered DC voltage. Capacitors C17-C18 form the first stage of filtering for the  $\pm 30$  VDC provided by the bridge.

The input voltage is also applied to the degaussing circuit if resistor R74 is cool, (which occurs when power is initially applied to the display). At this time, the current flowing through the degaussing coil degausses the cathode-ray tube (CRT). However, after R74 becomes heated, current is removed from the degaussing coil, rendering it inoperative.

Prefiltered DC voltages from pins 7 and 8 of P3 are applied to pins 7 and 8 of P103. Components R1-C1 and R2-C2 provide further filtering before the +30 V and -30 V are applied to regulators VR1 and VR2. These electronic regulators provide stable DC voltages of +24 V and -24 V.

#### B. High-Voltage Power Supply

Oscillator U1 provides a 20-kHz squarewave output at pin 3. Variable resistor R7 (off pin 7 of U1) sets the operating frequency of this oscillator. The output from U1 drives current amplifiers Q1-Q2. These, in turn, drive the primary of transformer T1. T1 is a step-down transformer that is used to increase the current.

Transistor Q3 provides more amplification of the current before the 20-kHz signal is applied to the primary of high-voltage transformer T2. The outputs from the secondary of T2 provide the Video B+ of +180 volts, the CRT heater voltage, and the +19.5-kV supply for the CRT anode. The FOCUS and BRIGHTNESS adjustments are in the secondary circuit of T2.

#### C. Over-Voltage Protection

The over-voltage protection circuit monitors the voltage at pin 4 of the focus assembly. If this voltage increases, SCR Q4 fires, turning off oscillator U1. This shuts off the high-voltage power supply.

# ATARI 19- & 25-Inch Color X-Y Display

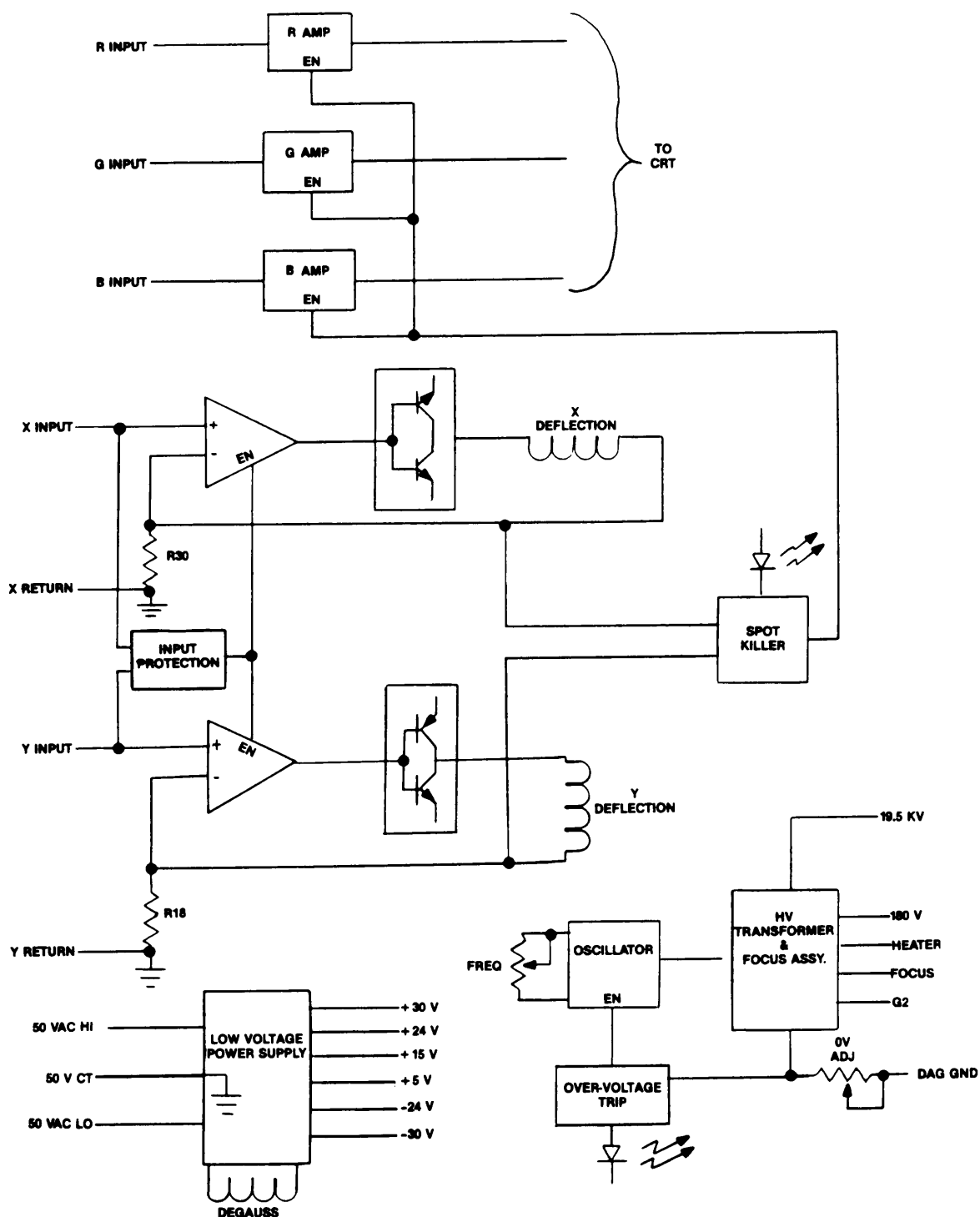


Figure 1 Block Diagram of the Display

#### D. X and Y Deflection Amplifiers

##### NOTE

Because the X and Y deflection amplifiers operate similarly, only the Y deflection amplifier is described here.

The Y deflection amplifier processes the Y video signals developed by the game circuitry. It also provides final amplification to drive the Y deflection coil of the CRT. The Y input signal is applied to the base of Q1, which is connected as a differential amplifier with transistor Q2. Constant current for this differential amplifier is supplied by Q3.

After amplification by Q1-Q2, the Y signal is applied through driver Q4 to the emitter-follower pair of Q6-Q7. The Y signal from the emitters of Q6-Q7 is then applied through fuse F1 to the Y deflection coil of the CRT. Transistor Q5 is the constant-current source for driver Q4.

#### E. Input Protection

The input protection circuit monitors the average DC level of the X and Y input signals from the game circuitry. If either of these signals is excessive, the input protection circuit turns off the X and Y deflection amplifiers, which enables the spot killer circuit to turn off the Z amplifiers.

The Y input signal is applied through R37 to the bases of Q18-Q19, and the X input signal is applied through R39 to the bases of Q20-Q21. If either vertical or horizontal deflection is excessive in average DC level, at least one of transistors Q18-Q19-Q20-Q21 turns on. This turns off Q22, which then shuts down the X and Y deflection amplifiers.

#### F. Z Amplifiers (Red, Green, and Blue)

##### NOTE

Because the red, green, and blue amplifiers operate similarly, only the red amplifier is described in this manual.

Transistor Q23 is a common-emitter amplifier that provides the final amplification for the red intensity signal from the game circuitry. Variable resistor R46 is the RED DRIVE adjustment and sets the amount of gain in this stage. Variable resistor R49 is the RED BIAS adjustment and is used to set the cutoff characteristics of this stage. The amplified signal from the collector of Q23 is applied across R67 to the red cathode gun of the CRT.

When the spot killer is turned on, transistor Q26 turns off the Z amplifiers.

#### G. Spot Killer (Blanking)

The spot killer circuit turns off all three of the Z amplifiers whenever deflection is not occurring. This prevents the electron beams from burning the phosphor on the inside of the CRT.

The input signals to the spot killer circuit are taken off the X and Y deflection amplifiers from current-sensing resistors R6 and R26. These sample deflection voltages are rectified and filtered by components CR6-CR7-C9-C7 (for the Y signal) and by components CR9-CR8-C10-C7 (for the X signal). Then they are applied to the bases of Q9 and Q10.

Anytime either deflection amplifier is not driving current through the CRT deflection coils, then that side of the spot killer does not receive a sample signal. This lack of signal on the base of either Q9 or Q10 turns on that transistor. When either Q9 or Q10 conducts, Q8 also conducts. The signal at the emitter of Q8 causes CR23 to illuminate, indicating that the spot killer is on. From the cathode of CR23, the spot killing signal is applied to the base of Q26. When Q26 turns off, the Z amplifiers are turned off.

## 4 REPAIR

**WARNING**

Before removing or installing any component of this display, always disconnect the power source! Take the precautions regarding high voltages and cathode-ray tube handling when servicing this display.

Tools Required to Replace the Display Assemblies: 7/16-inch hex socket wrench, Phillips-head screwdriver, and a soldering iron.

A. Replacing the Cathode-Ray Tube**NOTE**

You must readjust the BRIGHTNESS control, R, G and B Bias and Drive whenever you replace the cathode-ray tube.

1. Disconnect the 15-pin video-signal connector, which is wired to the Deflection PCB.
2. Discharge the high voltage from the cathode-ray tube as follows:
  - a. Attach one end of a well-insulated 18-gauge wire jumper to the DAG spring.
  - b. Momentarily touch the free end of the jumper to the anode by sliding it under the anode cap.
  - c. Wait two minutes.
  - d. Discharge the anode again.
  - e. CAREFULLY remove the large high-voltage anode connector from the cathode-ray tube.



3. Unplug the socket from the rear of the cathode-ray tube.
4. Unplug the degaussing coil 2-pin connector from the Deflection PCB.
5. Unplug the 5-wire connector from the Deflection PCB.
6. Unhook the spring that runs across the back of the cathode-ray tube.
7. Unplug the 2-pin connector to the DAG spring that runs across the back of the cathode-ray tube.
8. Refer to the game manual for detailed instructions on removing the cathode-ray tube from the game cabinet.
9. Place the cathode-ray tube on a soft mat in a protected location.
10. To install a cathode-ray tube, reverse the order of this procedure.

B. Replacing the Yoke

NOTE

You must readjust the purity and reconverge the picture whenever you replace the yoke.

1. Disconnect the 15-pin video-signal connector, which is wired to the Deflection PCB.
2. Discharge the high voltage from the cathode-ray tube using the procedure given in step 2 under "Replacing the Cathode-Ray Tube."
3. Unplug the socket from the rear of the cathode-ray tube.
4. Use a thin knife or a single-edged razor blade to carefully loosen the rubber wedges, which are under the yoke, from the cathode-ray tube surface.
5. Loosen the screws that are used to tighten the convergence-magnet assembly and yoke assembly clamps around the neck of the cathode-ray tube.

6. Slide the convergence-magnet assembly and the yoke assembly off the end of the cathode-ray tube.
7. To replace a yoke assembly, reverse the order of this procedure.

C. Replacing the High-Voltage PCB

1. Discharge the high voltage from the cathode-ray tube using the procedure given in step 2 under "Replacing the Cathode-Ray Tube."
2. Unplug the socket from the rear of the cathode-ray tube.
3. Unplug the 9-pin connector that is wired to the Deflection PCB.
4. Unplug the 2-pin connector from the DAG spring.
5. Refer to the game manual for detailed instructions on removing the High-Voltage PCB from the game cabinet.
6. To install a High-Voltage PCB, reverse the order of this procedure.

D. Replacing the Deflection PCB

1. Unplug the four connectors from the Deflection PCB.
2. Refer to the game manual for detailed instructions on removing the Deflection PCB from the game cabinet.
3. To install the Deflection PCB, reverse the order of this procedure.

E. Replacing the High-Voltage Transformer

1. Remove the High-Voltage PCB from the game as previously described under "Replacing the High-Voltage PCB."
2. Unsolder the white wire at the very top of the focus assembly.
3. Remove the two small hex nuts that secure the transformer to the High-Voltage PCB.

4. Unsolder the 7 transformer connections on the bottom side of the High-Voltage PCB.
5. Lift the transformer off the High-Voltage PCB.
6. Replace the transformer by reversing this procedure. Be sure to check the picture for sharpness. If appropriate, adjust FOCUS.

## 5 CONTROL ADJUSTMENTS

**WARNING**

Remember to take the precautions regarding high voltages when making adjustments on this display!

A. Adjusting the Focus

Adjust the FOCUS control if the screen image is not sharply defined. Figure 2 shows the location of the FOCUS control above the high-voltage transformer. Turn this control until you get optimum screen sharpness. This is the only control not preset by the factory.

B. Adjusting the Brightness

The BRIGHTNESS control is set at the factory and then sealed. Do not adjust the BRIGHTNESS control unless you replace the cathode-ray tube. Figure 2 shows the location of the BRIGHTNESS control above the high-voltage transformer. To adjust:

1. Turn on the display. Allow it to warm up at least 5 minutes.
2. Place the game in the attract or play mode.
3. Use a screwdriver to adjust the display for a pleasing level of brightness or adjust as indicated in the color-level test given in the game manual.

C. Adjusting the Purity**NOTE**

You must adjust the convergence after adjusting the purity.

1. Remove power from the display.
2. Loosen the screws that are used to tighten the deflection yoke and convergence-magnet assembly clamps to the neck of the cathode-ray tube.
3. Remove any glue that may be holding the purity magnets in place.
4. Use a razor blade or thin knife to carefully loosen the glue holding the three rubber wedges beneath the yoke collar. Remove these wedges.
5. Position the game so that the cathode-ray tube faces either north or south.
6. Degauss the cathode-ray tube with a hand-held degaussing coil.
7. Apply power to the display.
8. Position the convergence-magnet assembly so that the purity rings shown in Figure 3 are positioned directly over the gap in the cathode-ray tube gun assembly. This is about two inches forward from the start of the neck glass.
9. Secure the convergence-magnet assembly in position by tightening the neck-clamp mounting screw.
10. Set the game to display the self-test diagnostic pattern that shows a vertical and horizontal crosshatch with all three colors. This may appear as a white crosshatch pattern on the screen. (Refer to the Self-Test Procedures within the game manual for the details on selecting self-test diagnostic patterns.)
11. Preset the convergence magnets to superimpose the red, blue, and green lines at the center of the screen.
12. Set the game to display only the green crosshatch diagnostic pattern.
13. Slide the deflection yoke toward the magnet assembly to produce a vertical green band within the center of the crosshatch pattern.
14. Adjust the purity rings of the magnet assembly shown in Figure 3 so that the width of the green band is horizontally equal to the red and blue bands on either side.

**NOTE**

The purity rings must only affect the horizontal centering of the display. If they have a vertical or a diagonal centering effect, rotate the entire magnet assembly so that the purity rings affect ONLY the horizontal centering.

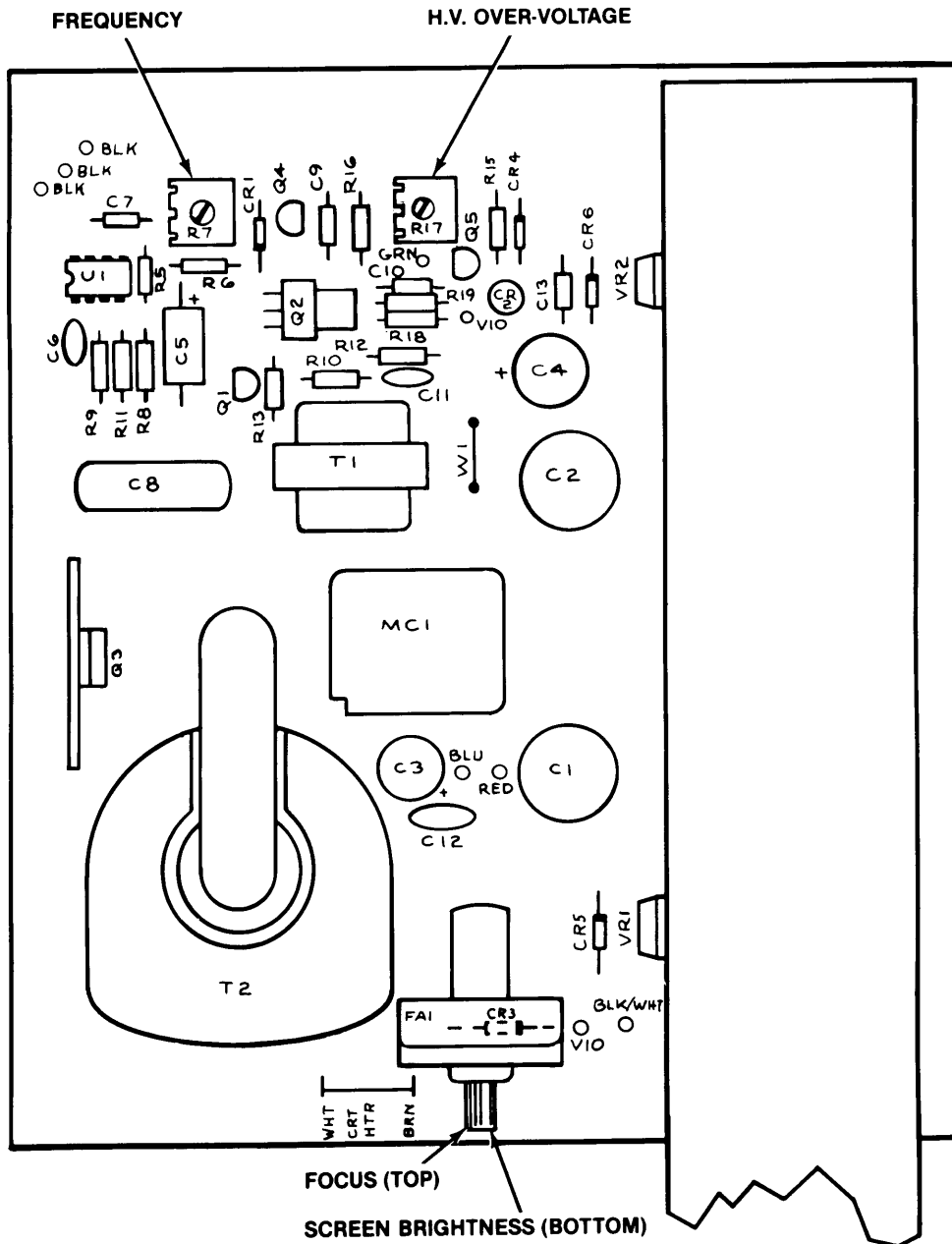


Figure 2 Adjustable Controls on the High-Voltage PCB

15. Slide the deflection yoke forward until the crosshatch pattern is all green. Continue the forward movement of the yoke until other colors just begin to show on the display. This is the forward purity-adjustment limit of the yoke.
16. Slide the yoke back toward the magnet assembly, through the position for a pure green display, to the point where the display again begins to show other colors. This is the rear purity-adjustment limit of the yoke.
17. Position the deflection yoke at the middle of the forward and rear purity-adjustment limits. Tighten the yoke-mounting screw.
18. Set the game to display the red and blue crosshatch diagnostic patterns.
19. Check the display for good overall purity.
20. Adjust the convergence.

D. Adjusting the Convergence

NOTE

If the Purity Adjustments have been performed, you must also perform the entire Convergence Adjustments procedure.

1. Adjust for static convergence, which aligns the registration of all three colors over the entire screen area, as follows:
  - a. Set the game to display the self-test diagnostic pattern that shows a magenta (both red and blue) crosshatch. (Refer to the Self-Test Procedures within the game manual for the details on selecting self-test diagnostic patterns.)
  - b. Adjust the angle of the tabs of the red and blue convergence magnets to superimpose the red and blue vertical lines in the center of the screen area. This will produce magenta vertical lines at screen center. These magnets are shown in Figure 3.

NOTE

Do not attempt to adjust the convergence of the outer areas of the screen at this time.

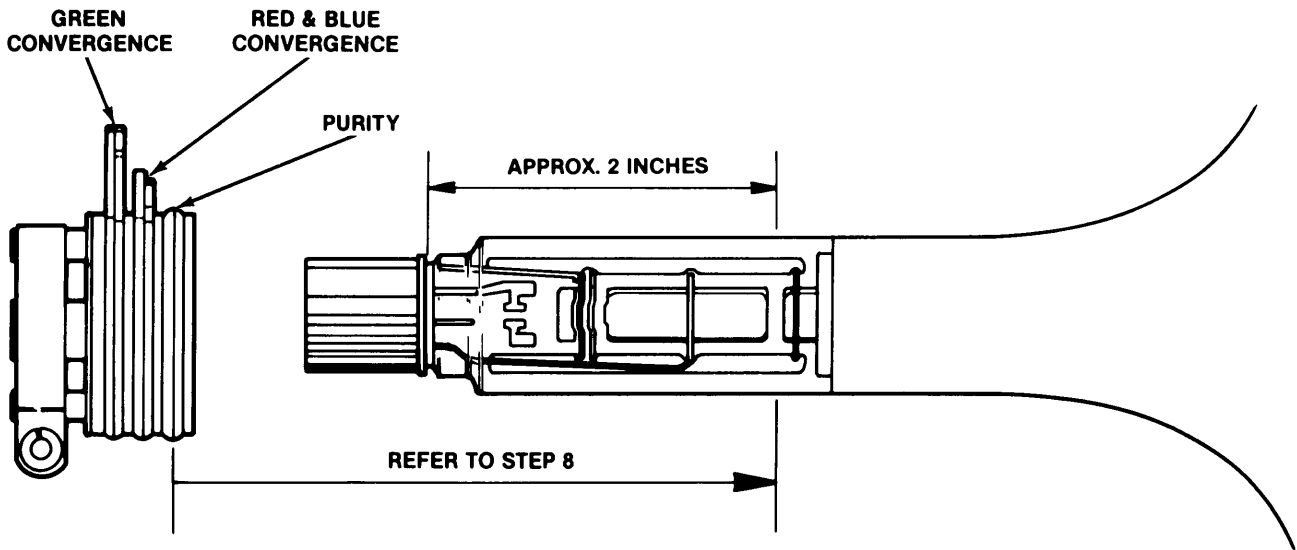


Figure 3 Purity and Convergence Adjustments



- c. Keeping their angles the same, rotate both tabs of these magnets to superimpose the red horizontal lines with the blue horizontal lines in the center of the screen area. This produces magenta horizontal lines at screen center.
  - d. Set the game to display the diagnostic crosshatch pattern composed of all three colors. (This may appear as a single white crosshatch pattern.)
  - e. Adjust the angle between the tabs of the green convergence magnets to superimpose the green vertical lines with the magenta vertical lines already converged in the center of the screen.
  - f. Keeping the tab angles the same, rotate these rings to superimpose the green horizontal lines on the magenta horizontal lines already converged in the center of the screen.
2. Adjust for peripheral convergence, which aligns the registration of all three colors at the outer areas of the screen, as follows:
  - a. If you have not already done so, loosen the screw securing the deflection yoke assembly to the neck of the cathode-ray tube. Then, use a razor blade or thin knife to loosen the glue holding the three rubber wedges beneath the collar of the yoke. Remove these wedges.
  - b. Set the game to display the magenta (both red and blue) crosshatch diagnostic pattern.
  - c. Tilt the deflection yoke in a vertical direction to superimpose the red horizontal lines with the blue horizontal lines at the 3 o'clock and 9 o'clock positions of the screen.
  - d. Install one rubber wedge at the 12 o'clock position to maintain the vertical position of the yoke.
  - e. Tilt the yoke in a horizontal direction to superimpose the red crosshatch with the blue crosshatch pattern at the 6 o'clock and 12 o'clock positions of the screen.
  - f. Install the other two rubber wedges firmly beneath the yoke collar to hold the yoke in position. Recheck the convergence of the display. If necessary, repeat parts c and d of this step.
  - g. Set the game to display the crosshatch pattern composed of all three colors. (This should appear as a white crosshatch pattern.)
  - h. Check the display for good convergence at all areas of the screen. If necessary, repeat the static convergence adjustments of step 1.
3. Secure the rings of the convergence-magnet assembly and the rubber yoke wedges with silicon rubber or a similar adhesive.
4. Tighten the deflection-yoke mounting screw.

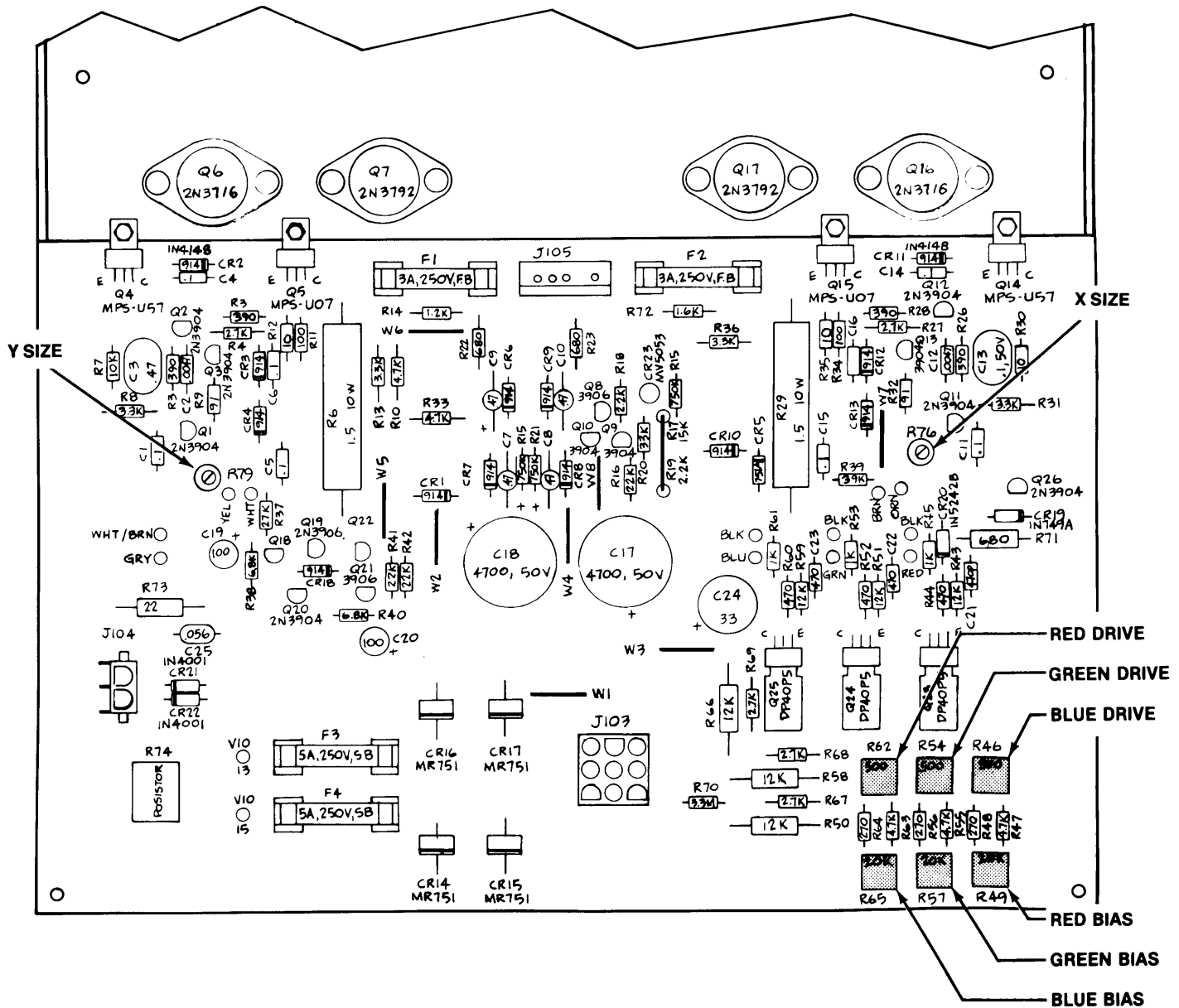


Figure 4 Adjustable Controls on the Deflection PCB

E. Adjusting the Tracking

1. Set the game to display the self-test diagnostic pattern that shows a series of colored bars of various intensities.
2. Turn all Bias and Drive controls to their fully clockwise position. Figure 4 shows the location of these controls.
3. Adjust RED BIAS R49, GREEN BIAS R57, and BLUE BIAS R65 until the fifth line from the top in the center group of lines is pure white.
4. Adjust RED DRIVE R46, GREEN DRIVE R54, and BLUE DRIVE R62 until the top line of the center group of lines is pure white.
5. If the fifth line from the right is no longer pure white, repeat step 3 of this procedure.

F. Adjusting the High-Voltage Power Supply

**WARNING**

To avoid possible electric shock, use extreme caution when making these high-voltage adjustments! Do not attempt to make these adjustments without the high-voltage probe!

1. Remove power from the display.
2. Attach the minus lead of the high-voltage probe to the DAG spring.
3. Connect the high-voltage probe to the anode connection of the cathode-ray tube by slipping it under the anode cap.
4. Apply power to the display.
5. Rotate HV OVER-VOLTAGE R17 to its fully counterclockwise position. Figure 2 shows the location of the HV OVER-VOLTAGE and FREQUENCY controls.
6. Rotate FREQUENCY R7 until you obtain a reading of +25 kV on the voltmeter.

7. VERY SLOWLY rotate HV OVER-VOLTAGE R17 until the voltmeter reading just drops to 0.
8. Turn the display power OFF and then ON. This resets the over-voltage protection circuit.
9. Readjust the FREQUENCY control for a voltmeter reading of +19.5 kV.
10. Remove power from the display and then remove the high-voltage probe from the anode connection.

## 6 ILLUSTRATED PARTS LISTS

In addition to maintenance and repair information, this chapter provides the necessary information for you to order parts for your Amplifone 19-Inch X-Y Display. Please note that, for simplicity, common hardware has been deleted from most of the parts lists. This includes screws, nuts, washers, bolts, etc.

The parts lists are arranged in alphanumeric order. For example, all "A-" prefix numbers come first. Following this are numbers in sequence evaluated up to the hyphen, namely 00- thru 99-, then 000598- thru approximately 190000-.

When ordering parts, please give the part number, part name, applicable figure number of this manual, and serial number of your display. This will help to avoid confusion and mistakes in your order. We hope the results will be less downtime and more profit from your game.

Atari Customer Service numbers are listed in the front of this manual for your convenience.

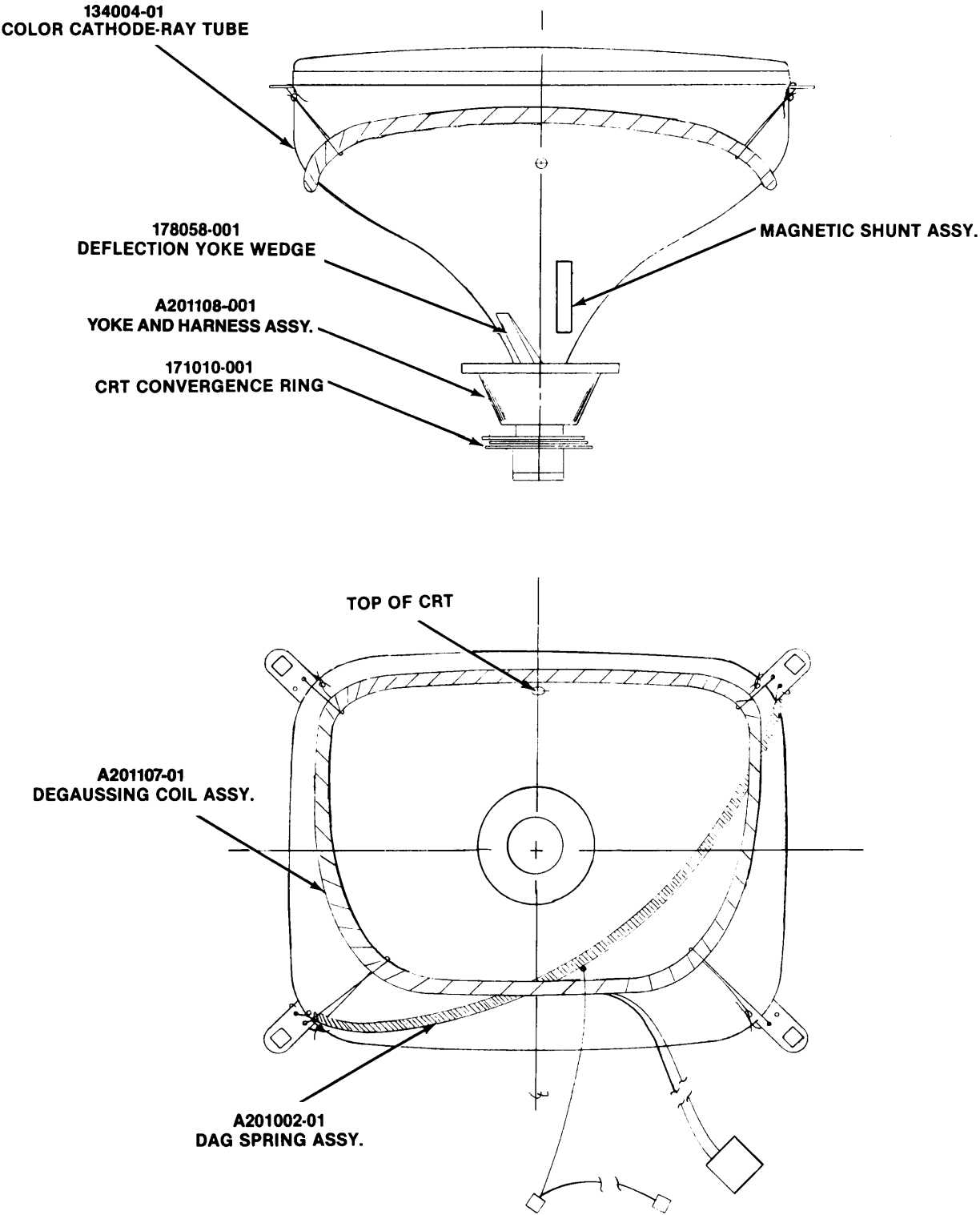


Figure 5 19-Inch Medium-Resolution Cathode-Ray Tube Assembly

19-Inch Medium-Resolution  
Cathode-Ray Tube Assembly Parts List  
A201106-01 A

CAUTION

Components identified by (!) have special characteristics important to safety and must be replaced only with identical types.

A201002-01	DAG Spring Assembly
178137-001	Vinyl Shunt Assembly
A201107-01(!)	Degaussing Coil Assembly
A201108-01(!)	Yoke and Harness Assembly
134004-001(!)	Medium-Speed, Medium-Resolution, 19-Inch 90-Degree Color Cathode-Ray Tube (CRT)
171010-001	CRT Convergence Ring
178058-001	Yoke Wedge
178130-016	Glass Fabric Tape

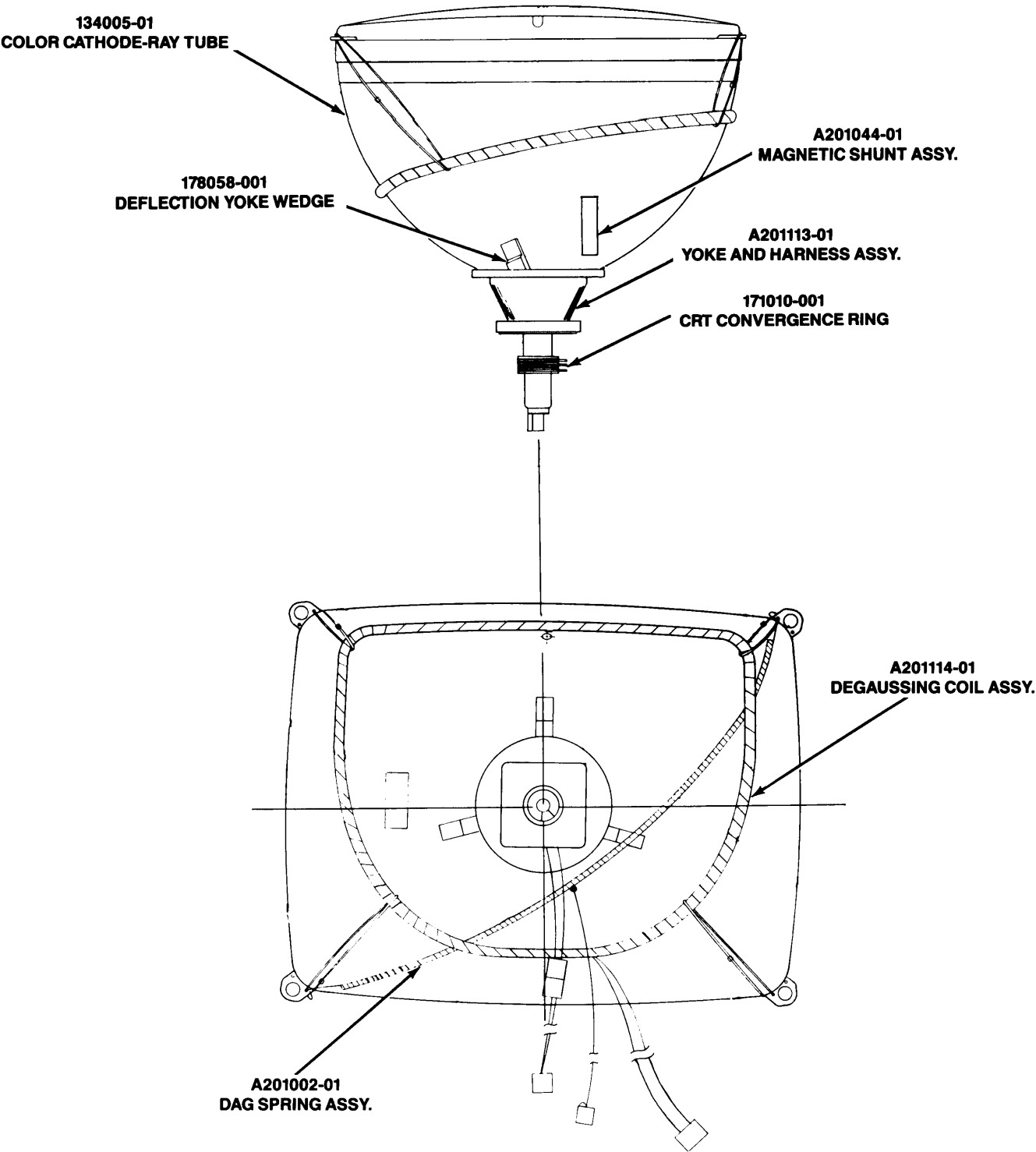


Figure 6 25-Inch Cathode Ray Tube Assembly



25-Inch Cathode-Ray Tube Assembly Parts List  
A201112-01 A

CAUTION

Components identified by (!) have special characteristics important to safety and must be replaced only with identical types.

A201002-01	DAG Spring Assembly
A201044-01	Magnetic Shunt Assembly
A201113-01(!)	Yoke and Harness Assembly
A201114-01(!)	Degaussing Coil Assembly
134005-001(!)	25-Inch 90-Degree Color Cathode-Ray Tube
171010-001	CRT Convergence Ring
178058-001	Yoke Wedge
178130-016	Glass Fabric Tape

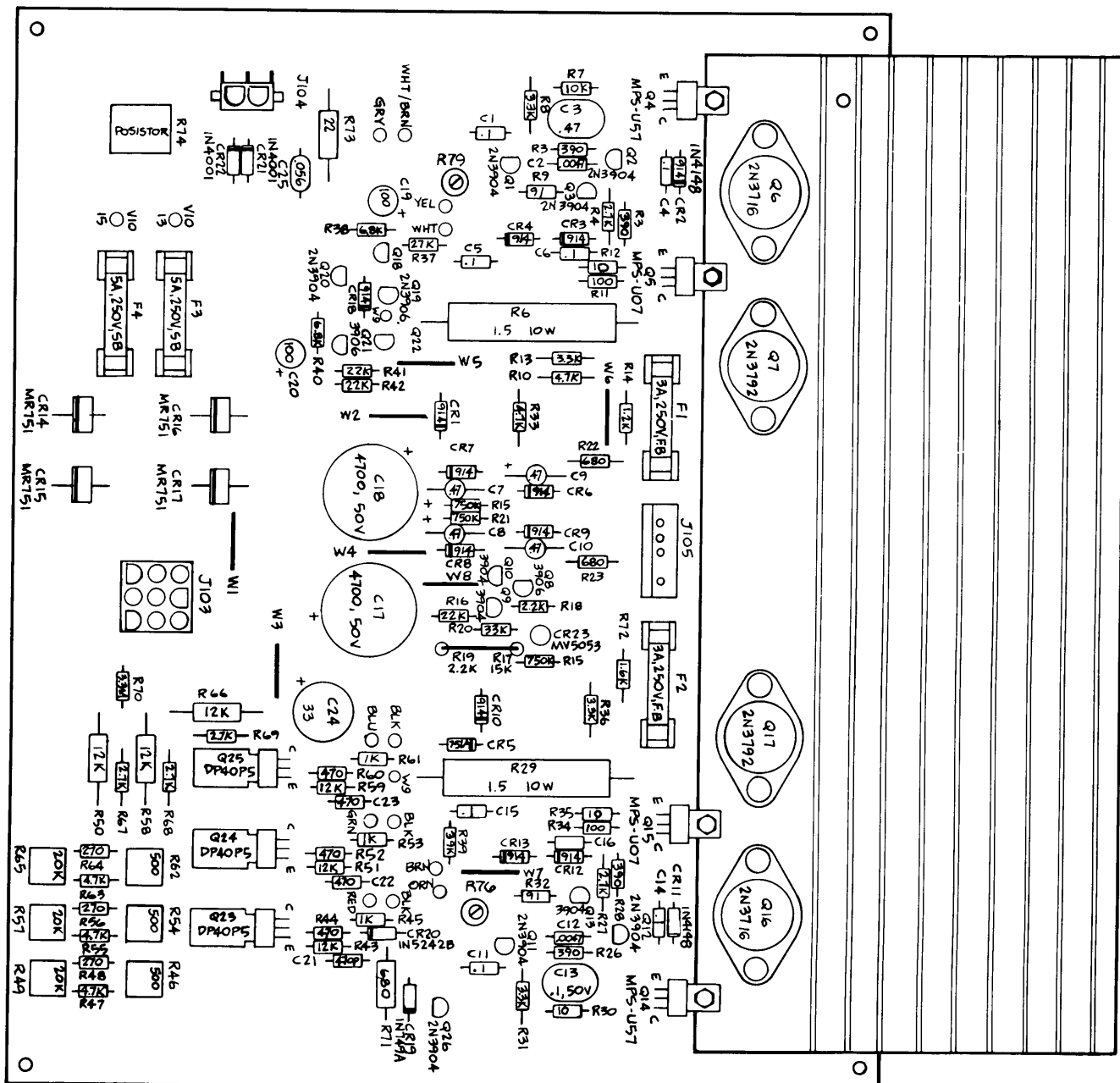


Figure 7 Deflection PCB Assembly

Deflection PCB Assembly Parts List  
A201014-01 F

! CAUTION !

Components identified by (!) have special characteristics important to safety and must be replaced only with identical types.

A201010-01	Harness Assembly
21-101474	0.47 $\mu$ F, $\pm 10\%$ , 100V Radial-Lead Epoxy-Dipped Mylar Capacitor (C3, 13)
31-1N914	100V Type-1N914 Switching Diode (CR1, 3, 4, 6-11, 13, 18)
31-1N4001	500 1-Amp. Silicon Rectifier Type-1N4001 Diode (CR21, 22)
32-1N749A	4.3V, $\pm 5\%$ , 500mW Type-1N749A Zener Diode (CR19)
32-1N751A(!)	5.1V, $\pm 10\%$ , 500mW Type-1N751A Zener Diode (CR5)
32-1N5242B	12V, $\pm 5\%$ , 500mW Type-1N5242B Zener Diode (CR20)
33-2N3906	PNP 40V 1W Type-2N3906 Transistor (Q8, 19, 21, 22)
34-2N3904	NPN 60V 350mW Type-2N3904 Switching Transistor (Q1-3, 9-13, 18, 20, 26)
38-MV5053	Type-MV5053 Light-Emitting Diode (CR23)
46-2015002(!)	5-Amp. 250V 3AG Slow-Blow Glass Cartridge-Type Fuse (F3, 4)
46-2033002(!)	3-Amp. 250V 3AG Normal-Blow Glass Cartridge-Type Fuse (F1, 2)
78-16001	Thermally Conductive Compound
78-16014	Thermally Conductive Silicon Insulator
79-58096	5-Position Header Connector (J105)
79-58169	9-Position Header Connector (J103)
81-4302	Nylon Snap-In Fastener
110000-100	10 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R7, 12, 30, 35)
110000-101	100 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R11, 34)
110000-102	1k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R45, 53, 61, 75)
110000-122	1.2k $\Omega$ , $\pm 5\%$ , 1/4W Metal-Film Resistor (R1, 24)
110000-123	12k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R43, 51, 59)

110000-152	1.62k $\Omega$ , $\pm 1\%$ , 1/4W Metal-Film Resistor (R2, 25)
110000-153	15k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R17)
110000-222	2.2k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R18)
110000-223	22k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R16, 41, 42)
110000-271	270 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R48, 56, 64)
110000-273	27k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R37)
110000-333	33k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R20)
110000-335	3.3M $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R70)
110000-391	390 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R3, 5, 26, 28)
110000-393	39k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R39)
110000-471	470 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R44, 52, 60)
110000-472	4.7k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R47, 55, 63)
110000-682	6.8k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R38, 40)
110000-754	750k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R15, 21)
110000-910	91 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R9, 32)
110001-122	1.2k $\Omega$ , $\pm 5\%$ , 1/2W Resistor (R14)
110001-162	1.6k $\Omega$ , $\pm 5\%$ , 1/2W Resistor (R72)
110001-272	2.7k $\Omega$ , $\pm 5\%$ , 1/2W Resistor (R4, 27, 67-69)
110001-472	4.7k $\Omega$ , $\pm 5\%$ , 1/2W Resistor (R10, 33)
110001-681	680 $\Omega$ , $\pm 5\%$ , 1/2W Resistor (R22, 23)
110005-001	0 $\Omega$ Jumper Resistor (W1-8)
110009-222	2.2k $\Omega$ , $\pm 5\%$ , 1W Resistor (R19)
110009-681	680 $\Omega$ , $\pm 5\%$ , 1W Resistor (R71)
110010-123(!)	12k $\Omega$ , $\pm 5\%$ , 2W Metal-Film Resistor (R50, 58, 66)
110010-220(!)	22 $\Omega$ , $\pm 5\%$ , 2W Metal-Film Resistor (R73)
110012-030	3 $\Omega$ , $\pm 10\%$ , 60V Positive-Temperature-Coefficient Resistor (R74)
110016-033	3.3 $\Omega$ , $\pm 5\%$ , 1/2W Metal-Film Resistor (R8, 13, 31, 36)
116003-001	1.5 $\Omega$ , $\pm 5\%$ , 10W Wire-Wound Resistor (R6, 29)
119002-203	20k $\Omega$ Horizontal Trimming Potentiometer (R49, 57, 65)
119002-501	500 $\Omega$ Horizontal Trimming Potentiometer (R46, 54, 62)
119007-103	10k $\Omega$ Horizontal Potentiometer (R76, 79)
121009-563	0.056uF 400V Metal/Polyester Capacitor (C25)
122002-104	0.1uF, $\pm 80\%$ , $\pm 20\%$ , 50V-Min. Ceramic Axial-Lead Capacitor (C1, 4-6, 11, 14-16)
122013-152	1500pF, $\pm 10\%$ , 50V Ceramic Axial-Lead Capacitor (C21-23)
122015-472	0.0047uF, $\pm 10\%$ , 50V Ceramic-Disc Axial-Lead Capacitor (C2, 12)
123001-478	4700uF 50V Vented Aluminum Electrolytic Radial-Lead Capacitor (C17, 18)
123002-336	33uF 250V Vented Aluminum Electrolytic Radial-Lead Capacitor (C24)

123003-107	100uF 25V Aluminum Electrolytic Radial-Lead Capacitor (C19, 20)
124001-474	0.47uF 50V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C7-10)
131007-001(!)	100V 6-Amp. Type-MR751 Plastic Diode (CR14-17)
131033-001	200 MA Switching Diode (CR2, 11)
133003-001	NPN 100V 2-Amp. Type-MPSU07 Medium-Power Transistor (Q5, 15)
133006-001	NPN 80V 10-Amp. Type-2N3716 Power Transistor (Q6, 16)
133007-001	PNP 80V 10-Amp. Type-2N3792 Power Transistor (Q7, 17)
133008-001	PNP 100V 2-Amp. Type-MPSU57 Medium-Power Transistor (Q4, 14)
133009-001	NPN 225V .5-Amp. Type-D40P5 Transistor (Q23-25)
141003-001	Ferrite Bead (FB1, 2)
175000-002	Nylon Shoulder Washer
178062-001	Mica Insulator
179050-002	PCB-Mounted Tin-Plated Brass Fuse Clip
179069-002	2-Position Header Connector (J104)
201019-01	Heat Sink (Finned Type)

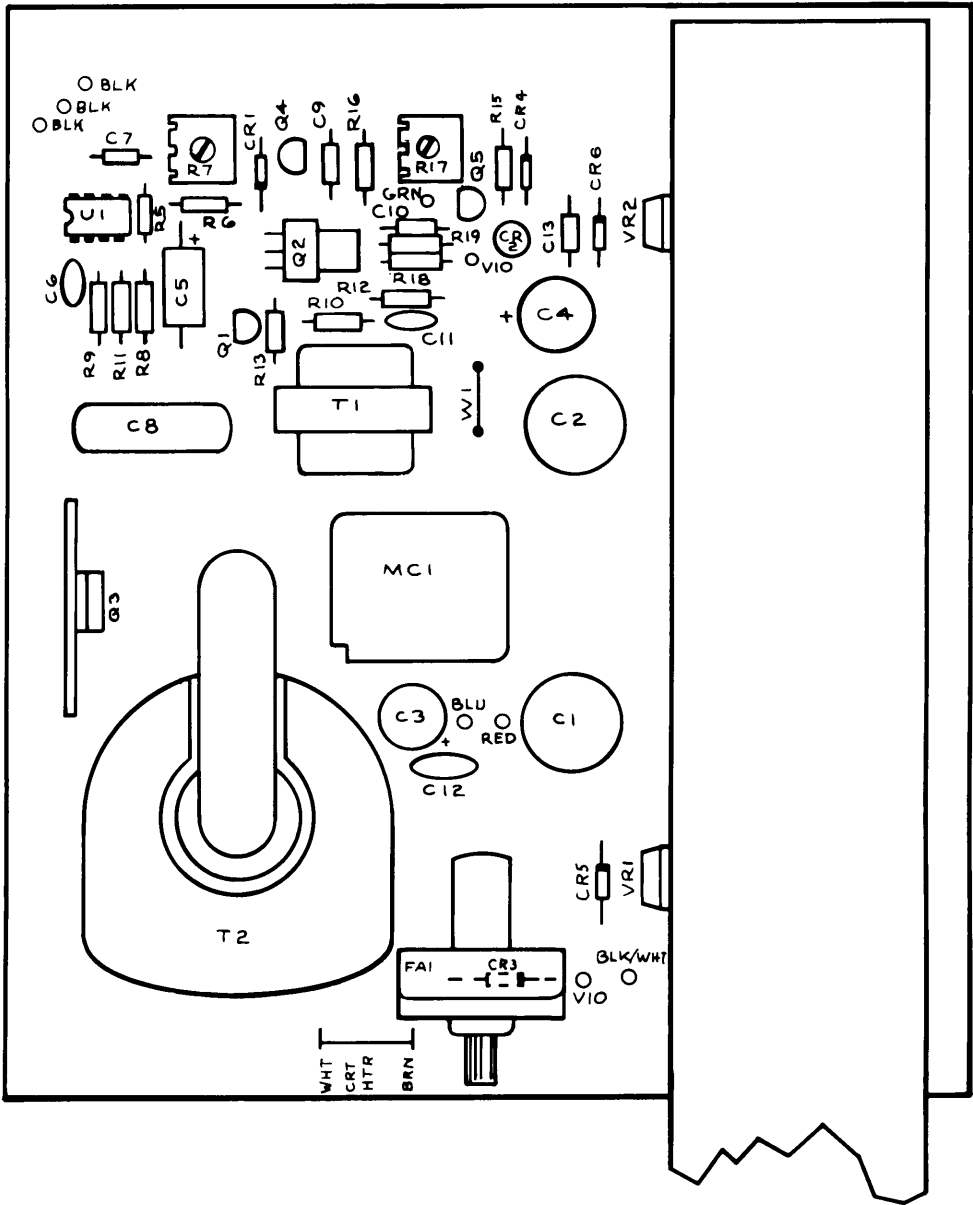


Figure 8 High-Voltage PCB Assembly

# High-Voltage Supply PCB Assembly Parts List A201012-01 D

## CAUTION

Components identified by (!) have special characteristics important to safety and must be replaced only with identical types.

A201005-01(!)	High-Voltage Transformer Assembly (T2)
A201006-01	Magnetic Correction Assembly (MC1)
A201007-01	High-Voltage Harness Assembly
A201008-01	Driver Transformer Assembly (T1)
A201009-01(!)	Focus Assembly (FA1)
21-101472	0.0047 $\mu$ F 100V Radial-Lead Mylar Capacitor (C6)
24-500475	4.7 $\mu$ F 50V Aluminum Electrolytic Fixed Axial-Lead Capacitor (C5)
31-1N4001	Type-1N4001 Diode (CR5, 6)
31-1N914	Type-1N914 100V Switching Diode (CR1)
34-2N3904	Type-2N3904 Transistor (Q1, 5)
37-555	Type-555 Integrated Circuit (U1)
38-MV5053	Type-MV5053 Light-Emitting Diode (CR2)
78-16014	Thermally Conductive Silicon Insulator
81-4302	Nylon Snap-In Fastener
110000-102	1k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R8, 19)
110000-122	1.2k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R5)
110000-222	2.2k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R11, 12, 15)
110000-223	22k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R9)
110000-333	33k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R18)
110000-390	39 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R13)
110000-392	3.9k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R6)
110000-471	470 $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R16)
110000-472	4.7k $\Omega$ , $\pm 5\%$ , 1/4W Resistor (R10)
110005-001	0 $\Omega$ Jumper Resistor (W1)

116001-500	50 $\Omega$ 5W Resistor (R20, 21)
119002-202	2k $\Omega$ Horizontal Trimming Potentiometer (R7)
119002-203	20k $\Omega$ Horizontal Trimming Potentiometer (R17)
121011-333(1)	0.033uF, $\pm 5\%$ , 600V Radial-Lead Polypropylene Capacitor (C8)
121012-102	0.001uF, $\pm 10\%$ , 1000V Radial-Lead Ceramic Capacitor (C11)
122002-104	0.1uF, $\pm 80 - 20\%$ , 50V Axial-Lead Ceramic Capacitor (C10, 12, 13)
122014-103	0.01uF Axial-Lead 50V Ceramic Capacitor (C7, 9)
123000-107	100uF 35V Radial-Lead Vented Aluminum Electrolytic Capacitor (C3, 4)
123009-227	220uF, 35V Low ESR Electric Capacitor (C3, 4)
123001-477	470uF 50V Radial-Lead Vented Aluminum Electrolytic Capacitor (C1, 2)
131002-001	Type-1N754A Diode (CR4)
131005-003(1)	0.8-Amp. 100V Silicon-Controlled Rectifier (Q4)
131008-001	0.4-Amp. 1500V Fast-Recovery Rectifier (CR3)
133003-001	NPN 2-Amp. 100V Medium-Power Transistor (Q2)
133005-001(1)	NPN 7-Amp. 400V Power Transistor (Q3)
137183-001	Type-7824 1-Amp. +24V Fixed Voltage-Regulator Integrated Circuit (VR1)
137220-001	Type-7924 1-Amp. -24V Fixed Voltage-Regulator Integrated Circuit (VR2)
178063-002	Black Aluminum Heat Sink (Acceptable substitute is part no. 178063-001, Heat Sink)
178064-001	Preformed Silicon Boot Insulator
178136-820	Teflon Sleeving
201017-01	Heat Sink



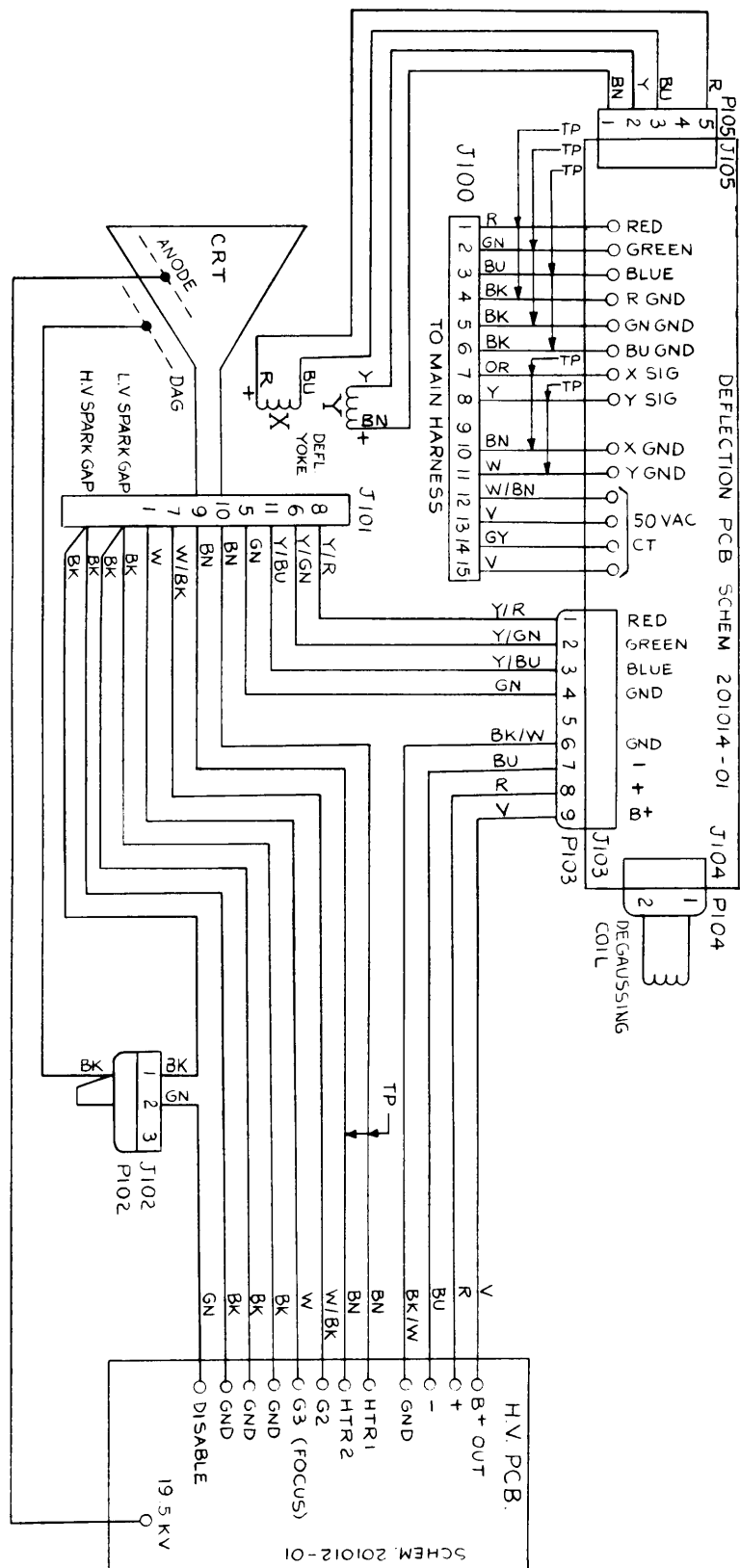


Figure 9 Amplifone Wiring Diagram

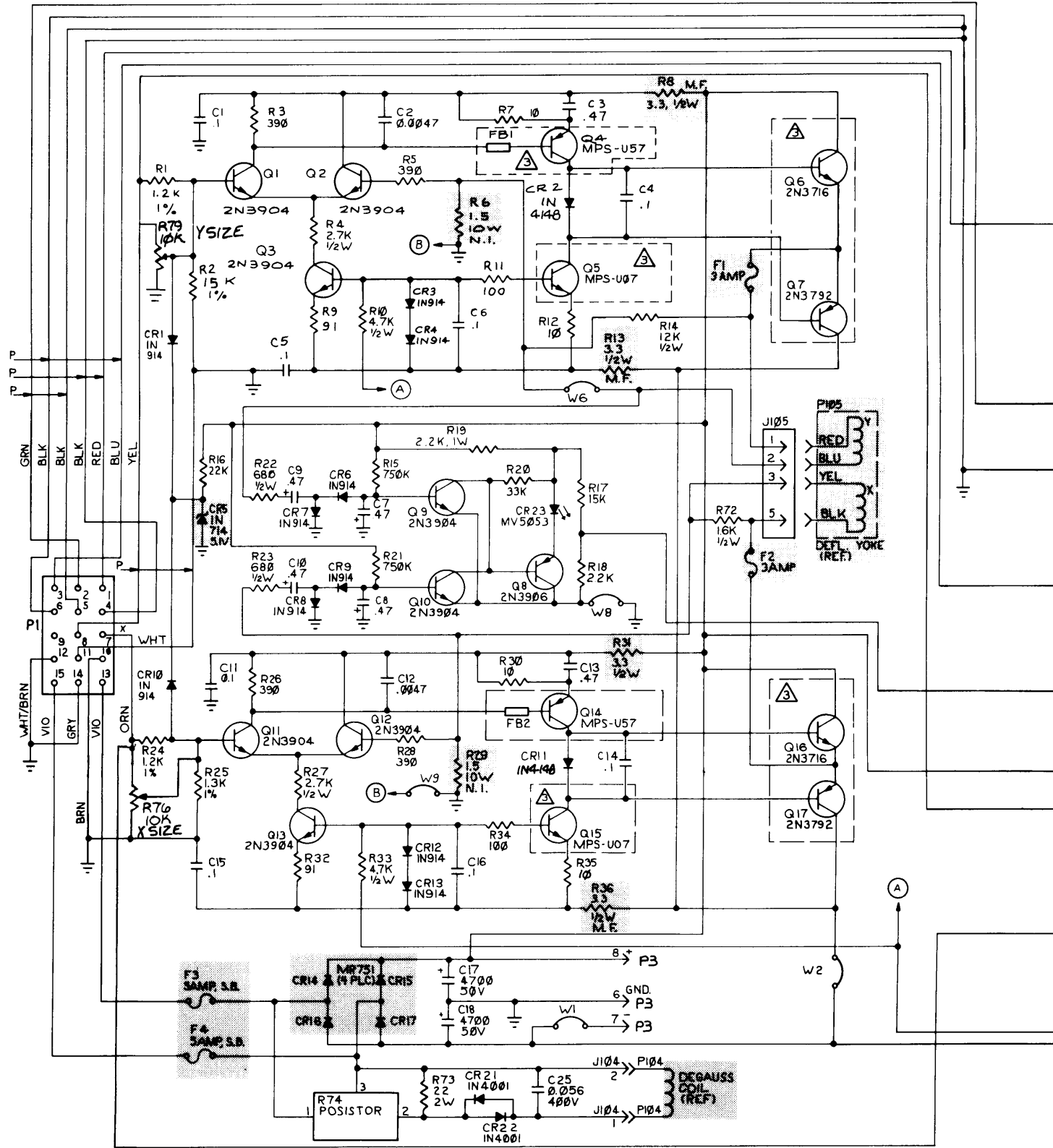


Figure 10 Deflection PCB Schematic Diagram

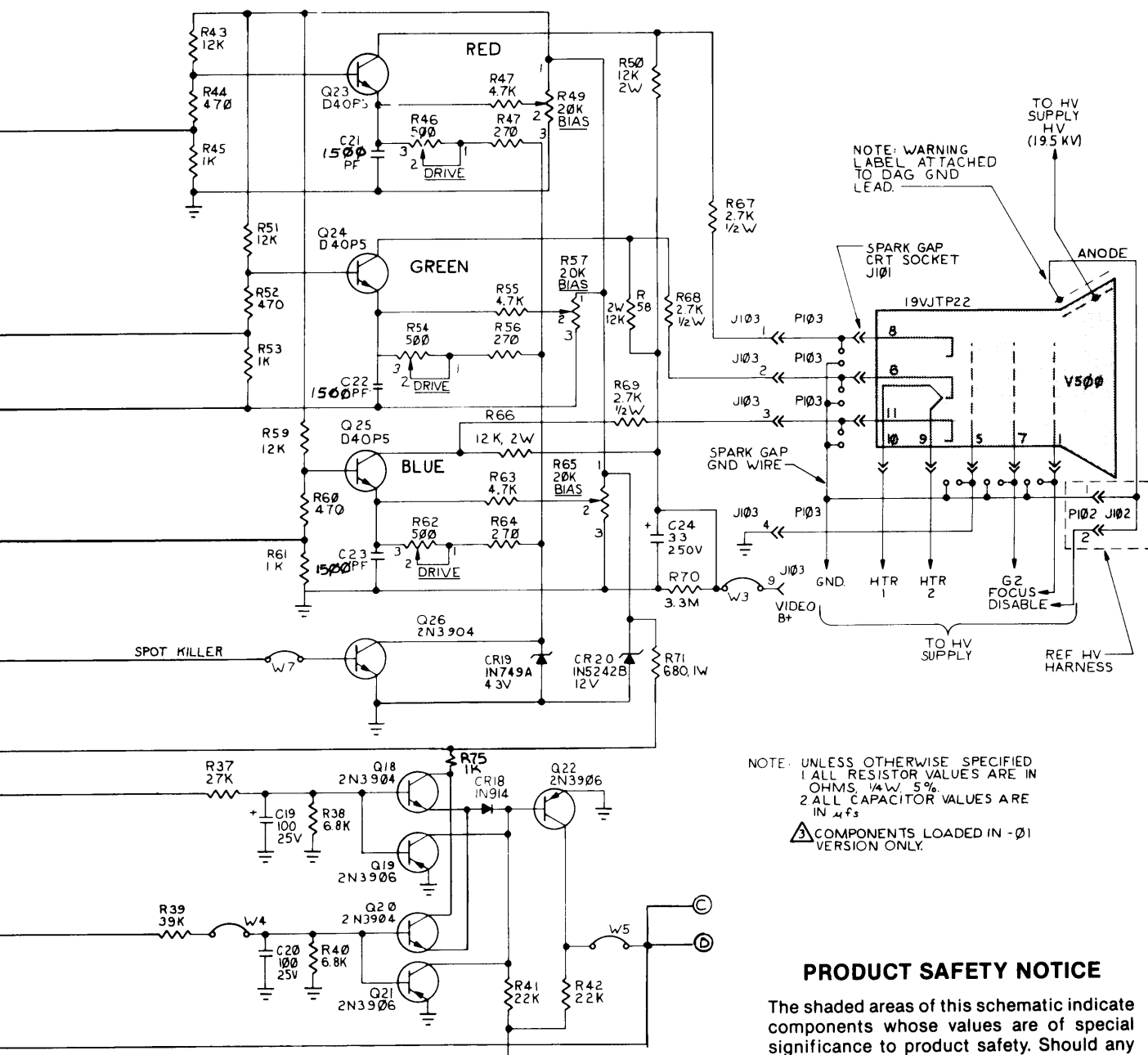


Figure 10 continued, Deflection PCB Schematic Diagram

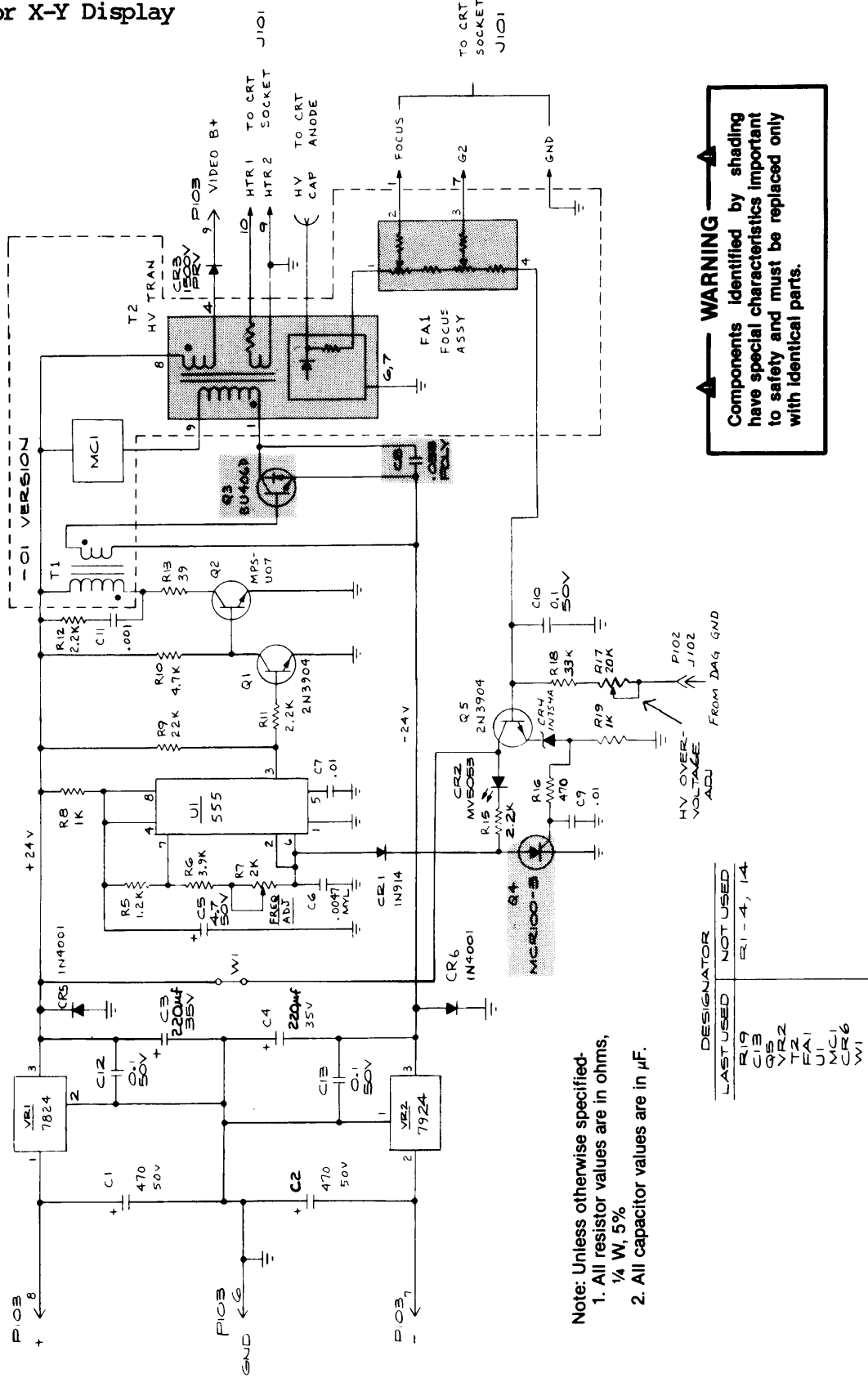


Figure 11 High-Voltage PCB Schematic Diagram

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- (b) Such products are returned prepaid to Sellers' plant; and
- (c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair, installation or improper testing.

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