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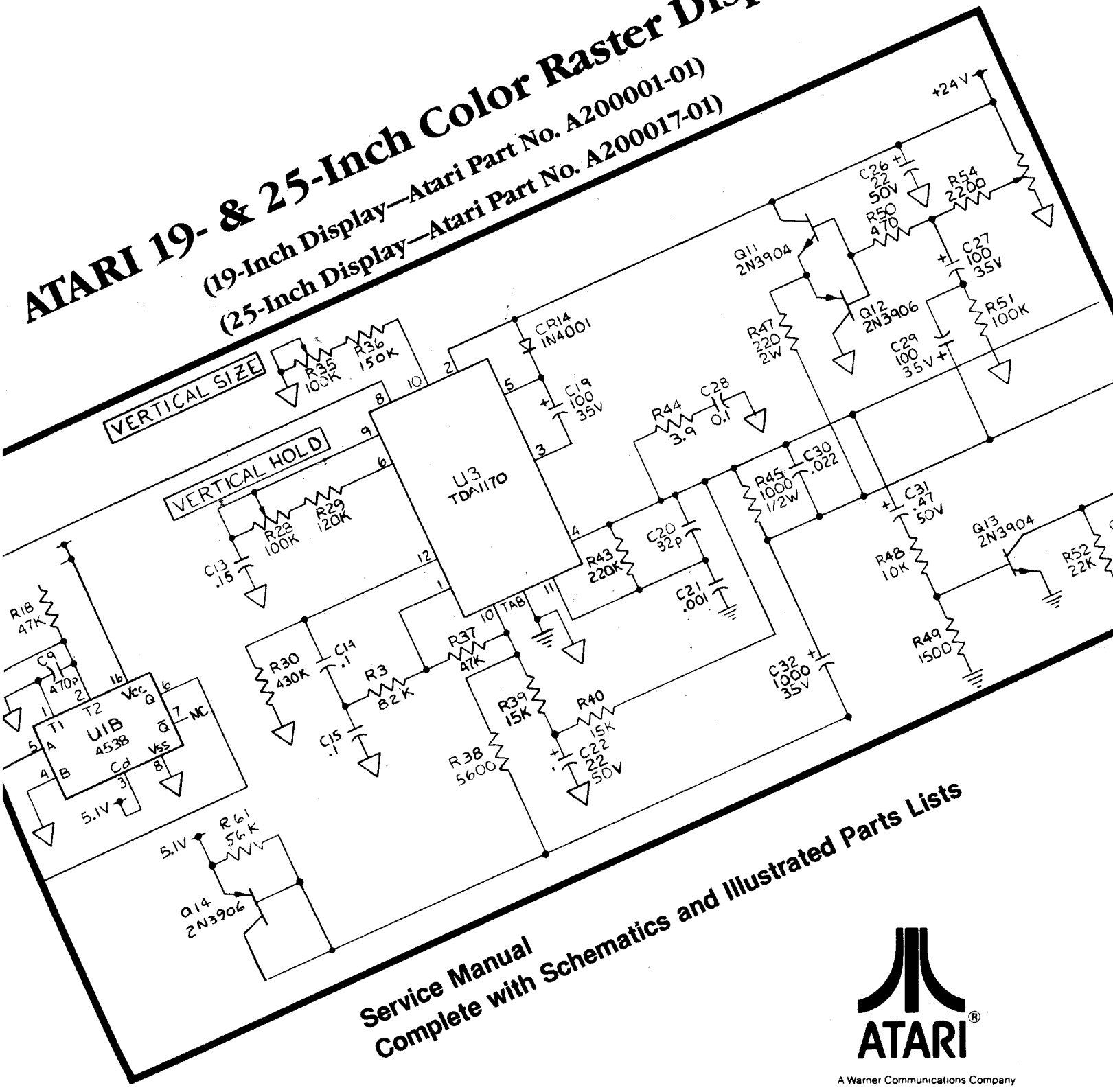
ATARI 19- & 25-Inch Color Raster Displays

(19-Inch Display—Atari Part No. A200001-01)
(25-Inch Display—Atari Part No. A200017-01)



Service Manual
Complete with Schematics and Illustrated Parts Lists

ATARI®

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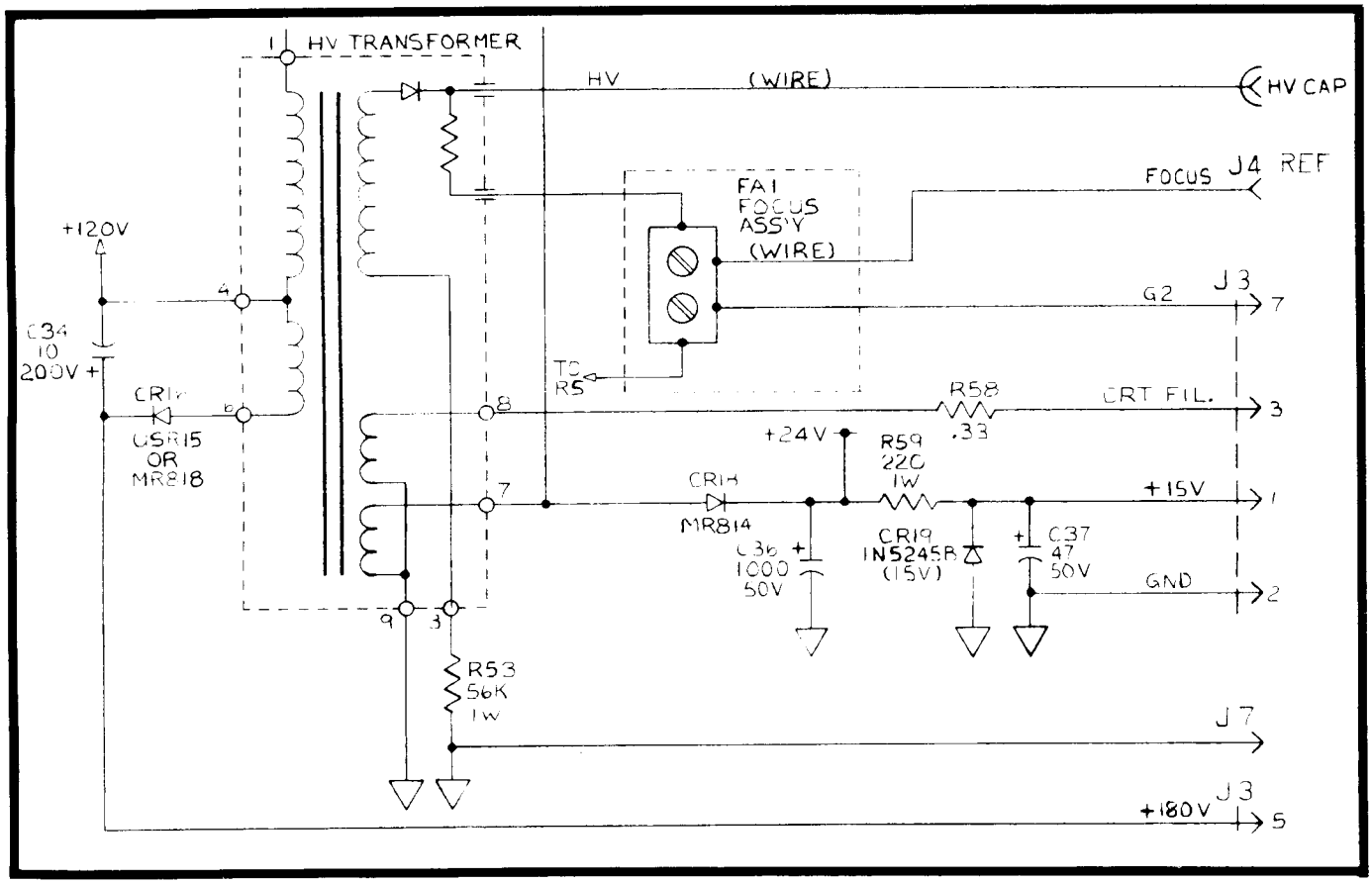

Manufactured by Amplifone, Inc., Brownsville, Texas-
a wholly owned subsidiary of

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

Published by: ATARI,INC.
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NOTICE REGARDING NON-ATARI PARTS

WARNING

Use of non-ATARI parts or modifications of any ATARI © game circuitry may adversely affect the safety of your game, and may cause injury to you and your players.

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.

Table of Contents

LIST OF ILLUSTRATIONS

CHAPTER 1 WARNINGS AND CAUTIONS

This color raster display has been built to Atari specifications by Amplifone, Inc. The display is not contained within a separate chassis; instead, each assembly is separately mounted inside the game cabinet. The Deflection printed-circuit board (PCB) assembly and the cathode-ray tube (CRT) assembly are mounted to the game cabinet. The Neck PCB is attached to the pins of the CRT. Input signals for the display are supplied through a 6-pin harness connector on the Neck PCB.

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 electrical shock, due to high voltage or AC line voltage
- X-ray radiation (if the display is out of adjustment)
- Implosion

Therefore, never modify any circuit in this display.

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

WARNING

High Voltage

This display contains lethal high voltages. To avoid danger, do not attempt to service this display until you observe 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 may implode! Shattered glass may fly 6 feet or more from the implosion site. Use care when replacing the cathode-ray tube.

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, use only one hand. This avoids the possibility of carelessly putting one hand on electrical ground and the other hand on an electrical connection. Doing so could cause a severe electrical shock.

If you service the Atari 19- or 25-Inch Color Raster Display on a test bench, use 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.)

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

Periodically check for frayed insulation on the wires within the display. 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.

CATHODE-RAY TUBE HANDLING

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

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

If you service the CRT, 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, jumper wire. Allow two minutes to pass and discharge the anode again.

REPLACE WITH PROPER COMPONENTS

Maintain the specified values of all components within the display. Failure to do so could cause a rise in the high voltages.

The CRT 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 for type numbers. For continued product safety, use only exact replacement parts, especially for those parts identified in the parts lists with the (!) symbol and on the schematics with shading.

FINAL TESTING BEFORE REINSTALLING DISPLAY ASSEMBLIES

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

CHAPTER 2 SPECIFICATIONS

POWER INPUT AND CONSUMPTION

Line Voltage	120 VAC, within +10% and -15%, or 145 VDC ±10%
Line Frequency	49-61 Hz
Power Consumption	80 W at 120 VAC with typical game display. 105 W maximum at 120 VAC and 0.2 mW/sq. cm. white field (i.e., a bright field)

ENVIRONMENTAL

Temperature	
Operating	0° to +55°C (+32° to +131°F)
Storage	-40° to +65°C (-40° to +149°F)
Humidity	
Operating	10-90%, noncondensing
Storage	10-90%, noncondensing

CURRENT AND VOLTAGES

CRT Anode Current (Average)	Less than 1 mA
High Voltage	25 kV
B1	+120 V, within ±1 V (adjustable)
B2	+24 V, within ±2.0 V

CRT SPECIFICATIONS

Convergence Tolerance:	
At Screen Center	0.75 mm maximum misconvergence
At Screen Edges	1.5 mm maximum misconvergence
Color Purity	Practically uniform throughout the screen area after degaussing with a hand-held degaussing coil.
Scan Rates	
Horizontal	15.750 kHz, within ±500 Hz
Vertical	60 Hz, within ±6 Hz
CRT Type	#19VLTP22 or #19VNJP22, 19-inch, 90° #25VGDP22 25-inch, 90°
Tilt of Deflection Yoke	Declination of a horizontal line is within 0.20 inch (2.54 mm) of CRT center markers.

CONNECTORS

6-Pin Connector for Video Signals	Signal
Pin 1	Horizontal sync
Pin 2	Vertical sync
Pin 3	Ground
Pin 4	Blue input
Pin 5	Green input
Pin 6	Red input

2-Pin Connector for Power	Voltage
Pin 1	120 VAC
Pin 2	120 VAC

MONITOR INPUT SIGNALS

RGB Video Input Signals

Blanking Level	+0.5 V
Threshold	+1.0 V
Display On	+1.0 V to +3.5 V with uniformly increasing brightness
Input Impedance	2.2 KΩ

Sync Signal

Horizontal Sync	3 to 6 µs wide, positive-going pulse. Low level, 0 to +1.5 V; high level, +3.0 to +5.0 V.
Frequency	15,750 ±500 Hz
Vertical Sync	100 to 500 µs wide, positive-going pulse. Low level, 0 to +0.4 V; high level, +1.0 to +5.0 V.
Frequency	60 ±6 Hz
Input Impedance	2.2 KΩ

CHAPTER 3 DETAILS OF OPERATION

A basic block diagram of the circuitry within this display is shown in Figure 3-1. Refer to this figure and the wiring and schematic diagrams shown in Chapter 7 throughout the following discussion.

VERTICAL AND HORIZONTAL AMPLIFIERS

The vertical sync signal from pin 5 of connector J1 is applied to pin 8 of integrated circuit U3. Integrated circuit U3 functions as a vertical sync, voltage ramp generator, and high power gain amplifier. The VERTICAL HOLD adjustment (R28) tunes the vertical sync oscillator to the vertical sync signal frequency. The VERTICAL SIZE adjustment (R35) varies the amplitude, and the VERTICAL POSITION adjustment (R55) varies the DC level of vertical yoke current. The vertical output signal from pin 4 of U3 is applied to the vertical deflection yoke through pin 1 of connector J2. Vertical yoke current flows through current sensing resistor R46, which develops the feedback voltage for the amplifier section of U3.

The horizontal sync signal from the PLL Adapter PCB is applied to pin 12 of one-shot multivibrator U2A. Multivibrator U2A provides a variable-width positive-going output pulse from pin 10 at the horizontal sync signal frequency. The HORIZONTAL POSITION control (R11) varies the width of the output pulse. The trailing edge triggers multivibrator U2B. The output at pin 7 of multivibrator U2B is a negative-going pulse with a width which, when added to the output pulse width from U2A, equals approximately the time of one displayed line. When the output pulse from U2B goes high (i.e., at the end of one displayed line), buffer and horizontal driver transistors Q8 and Q9 turn on. With transistor Q9 turned on, the voltage at the secondary of transformer T1 goes low, which turns horizontal output transistor Q10 off. Consequently, the collapsing fields of the inductive elements in the horizontal circuit generate a positive-going pulse at the collector of Q10, which is applied to the horizontal yoke through pins 3 and 5 of connector J2.

The phase-locked-loop (PLL) circuit prevents incorrect horizontal sync signals from reaching the horizontal amplifier. Phase-locked-loop integrated circuit U1 contains a phase comparator and a voltage-controlled oscillator (VCO). When the horizontal sync signal is applied to U1, the phase comparator compares the phase and frequency of the sync signal with the VCO frequency and generates an error voltage proportional to the phase and frequency difference of the sync signal and VCO. The error voltage is filtered by the filter network comprised of R6, R9, C2, and C5. The resultant voltage is applied to the control input of the VCO, which then causes the VCO to lock to the sync frequency. The output of the VCO is a square-wave horizontal sync signal, which is applied to the horizontal circuit at pin 6 of connector P2.

Transistor Q1 and its associated circuitry limits the cathode-ray tube beam current to 2 milliamperes.

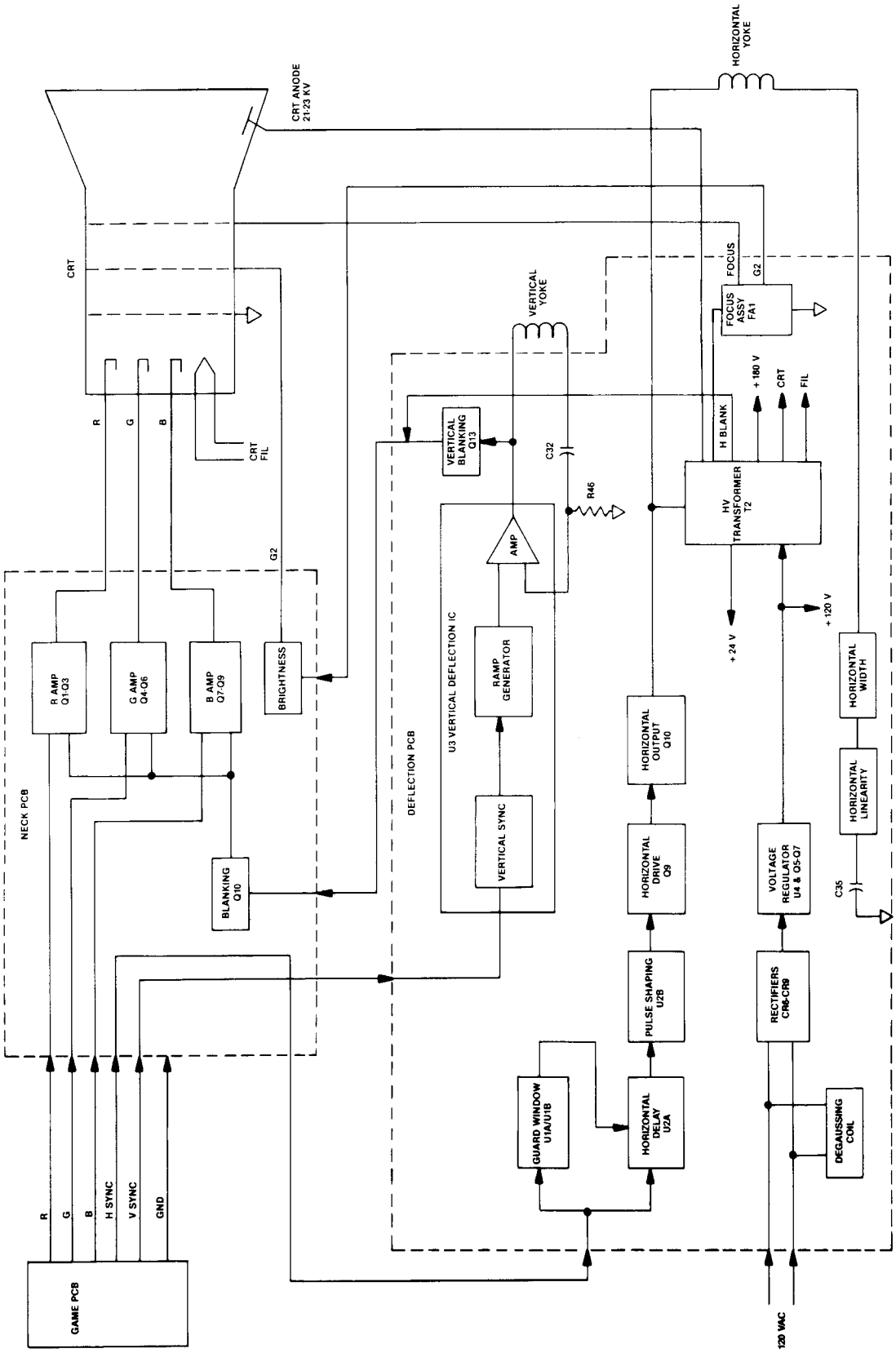


Figure 3-1 Display Block Diagram

Z AMPLIFIERS (RED, GREEN, AND BLUE)

> **NOTE**
>
> The Z amplifiers are located on the Neck PCB. Because the red, green, and blue amplifiers are similar in operation, only the red amplifier will be discussed here.

The red intensity signal from the game circuitry is applied from pin 6 of J205 to the base of red intensity buffer transistor Q1. Transistors Q2 and Q3 comprise a cascode amplifier that provides the final amplification for the red intensity signal from the game circuitry. The RED DRIVE adjustment (R8) sets the gain and the RED BIAS adjustment (R11) sets the cutoff characteristics of this stage. The amplified signal from the collector of Q3 is applied through resistor R10 to the red cathode gun in the CRT. Transistor Q10 is the blanking transistor for all three Z amplifiers.

BLANKING

Horizontal blanking occurs when the negative-going retrace pulse is present at pin 7 of high-voltage transformer T2. Resistor R52 develops the horizontal blanking pulse. Diode CR17 clamps the retrace pulse to one diode drop below ground. Consequently, blanking transistor Q10 located on the Neck PCB is turned off, which disables the Z amplifiers during the horizontal retrace interval.

Vertical blanking occurs whenever the positive-going retrace pulse appears at pin 4 of vertical-deflection integrated circuit U3. Capacitor C3 allows the retrace pulse to pass through R48 and turns on vertical-blanking transistor Q13, which turns off blanking transistor Q10 located on the Neck PCB. Thus, the Z amplifiers are disabled during the vertical retrace interval.

HIGH VOLTAGE

The high-voltage signals are developed across flyback transformer T2. The horizontal deflection signal is applied across the primary of T2 to induce a signal into the secondary. The voltage induced into the secondary is stepped up to approximately +25 kV before it is applied to the anode of the CRT. The FOCUS and BRIGHTNESS voltages are derived from the high voltage through a resistive divider in focus assembly FA1.

LINE INPUT AND DEGAUSSING

The 120 VAC line voltage is applied through AC fuse F1 to both the degaussing network and the rectifier.

The full-wave rectifier is composed of CR6 through CR9, which converts the AC input voltage into an unfiltered DC voltage. Capacitor C12 filters out AC ripple and coil L1 filters out the noise.

+120-VOLT REGULATED SUPPLY

The +120-volt regulated supply provides operating power to circuitry throughout the display. The regulator for the +120-volt regulated supply is comprised of a feedback system that operates between ground and the rectified DC voltage. Current to the load is delivered by power transistor Q5. The supply voltage is established by the voltage drop set by voltage regulator integrated circuit U4 across resistive-divider network R25, R26, and R27. Emitter follower Q7 buffers the voltage-divider network. Variable resistor R26 sets the current in the voltage-divider network, which establishes the voltage at the output.

CHAPTER 4 REPAIR

WARNING

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

Tools required to replace these assemblies: 1/4-inch hex socket wrench, 7/16-inch hex socket wrench (or an open wrench or pliers), Phillips-head screwdriver, and a flat-blade screwdriver.

CATHODE-RAY TUBE REPLACEMENT

WARNING

The display contains a circuit for discharging the cathode-ray tube high-voltage to ground when power is removed. However, to make certain that the bleeder circuit is operating properly, always discharge the cathode-ray tube as described in step 1 of the following procedure. If a spark occurs when grounding the CRT anode, check for a fault in the bleeder circuit.

NOTE

Whenever the cathode-ray tube is replaced, you must readjust the brightness and perform the purity and convergence adjustment procedures.

1. Discharge the high voltage from the cathode-ray tube (CRT) as follows:

   a. Attach one end of a large, well-insulated, 18-gauge, jumper wire to ground.

b. Momentarily touch the free end of the grounded 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 CRT.

2. Unplug the Neck PCB from the rear of the CRT and disconnect the 1-pin ground wire connector.

3. Unplug the 4-wire connector attaching the yoke wires to the Deflection PCB. Unplug the 2 wire degaussing coil connector from the Deflection PCB.

4. Use a 7/16-inch hex socket wrench to remove the four screws holding the CRT to the mounting bracket.

5. Carefully remove the CRT by easing it out the front of the cabinet. Refer to the game manual for more complete instructions.

6. Place the CRT on a soft mat in a protected location.

7. To install a CRT, reverse the order of this procedure.

YOKE REPLACEMENT

NOTE

Whenever the yoke is replaced, you must reconverge the picture and readjust the color purity.

1. Discharge the high voltage from the CRT using the procedure given in step 1 under Cathode-Ray Tube Replacement.

2. Remove the CRT assembly from the game as described under Cathode-Ray Tube Replacement.

3. Use screwdrivers to loosen the screws that secure the two neck clamps around the CRT.

4. Slide the magnet assembly and the yoke assembly off the end of the CRT.

5. To replace a yoke assembly, reverse the order of this procedure.

HIGH-VOLTAGE TRANSFORMER REPLACEMENT

1. Disconnect all the connectors from the Deflection PCB.

2. Discharge the high voltage from the CRT as described in step 1 under Cathode-Ray Tube Replacement. Unplug the anode wire from the CRT.

3. Remove the Deflection PCB assembly from the cabinet.

4. Slide back the rubber cap on the wire that connects the high-voltage transformer to the focus assembly on the Deflection PCB. Unsolder this wire from the focus assembly.

5. Using a 1/4-inch hex socket wrench, remove the two screws that secure the high-voltage transformer to the Deflection PCB.

6. Unsolder the high-voltage transformer connections on the bottom side of the Deflection PCB. Lift the transformer off the Deflection PCB.

7. Replace the high-voltage transformer by reversing this procedure. Be sure to check the picture for sharpness after the transformer is replaced. If appropriate, readjust the FOCUS control.

NECK PCB REPLACEMENT

1. Disconnect the 6-pin video-signal connector and the 14-pin power connector from the Neck PCB. Disconnect the 1-pin in-line connector on the focus-voltage lead.

2. Unplug the 1-pin connector (ground) on the Neck PCB. Gently pull the Neck PCB from the neck pins of the CRT.

3. To replace the Neck PCB, reverse the order of this procedure.

DEFLECTION PCB REPLACEMENT

1. Discharge the high voltage from the CRT as described in step 1 under Cathode-Ray Tube Replacement. Unplug the anode wire from the CRT.

2. Disconnect the 2-pin power connector in the harness near the display, and the 1-pin in-line connector on the focus-voltage lead. Disconnect the 6-pin signal connector, the 7-pin power connector, the 2-pin degaussing connector, the 5-pin yoke connector, and the 1-pin ground connector from the Deflection PCB.

3. Slide the Deflection PCB out of the game cabinet.

4. To replace the Deflection PCB, reverse the order of this procedure.

CHAPTER 5 CONTROL ADJUSTMENTS

WARNING

Remember to observe the precautions regarding high voltages when making adjustments to the display!

NOTE

Before making any of the following adjustments, turn on the display and allow it to warm up for at least 5 minutes.

BRIGHTNESS

The BRIGHTNESS control (R31) should be adjusted if the picture image is either too bright or too dark. Figure 5-1 shows the location of the BRIGHTNESS control on the Neck Printed-Circuit Board (PCB).

1. Start the game's attract or play mode.

2. Adjust the BRIGHTNESS control (R31) for a pleasing level of display brightness.

NOTE

Too high a brightness level will cause the retrace lines to show; too low a level will cause the entire screen to be dark and obscure.

VERTICAL HOLD

The VERTICAL HOLD control (R28) should be adjusted if the picture drifts straight up or down on the screen. Figure 5-2 shows the location of the VERTICAL HOLD control on the Deflection PCB. Adjust the VERTICAL HOLD control until the picture no longer drifts up or down on the screen.

HORIZONTAL POSITION

The HORIZONTAL POSITION control (R11) should be adjusted if the picture is not centered across the screen, as indicated by a black area at either the left or the right edge of the screen. Figure 5-2 shows the location of the HORIZONTAL POSITION control on the Deflection PCB. Adjust the HORIZONTAL POSITION control until you obtain a normal screen image.

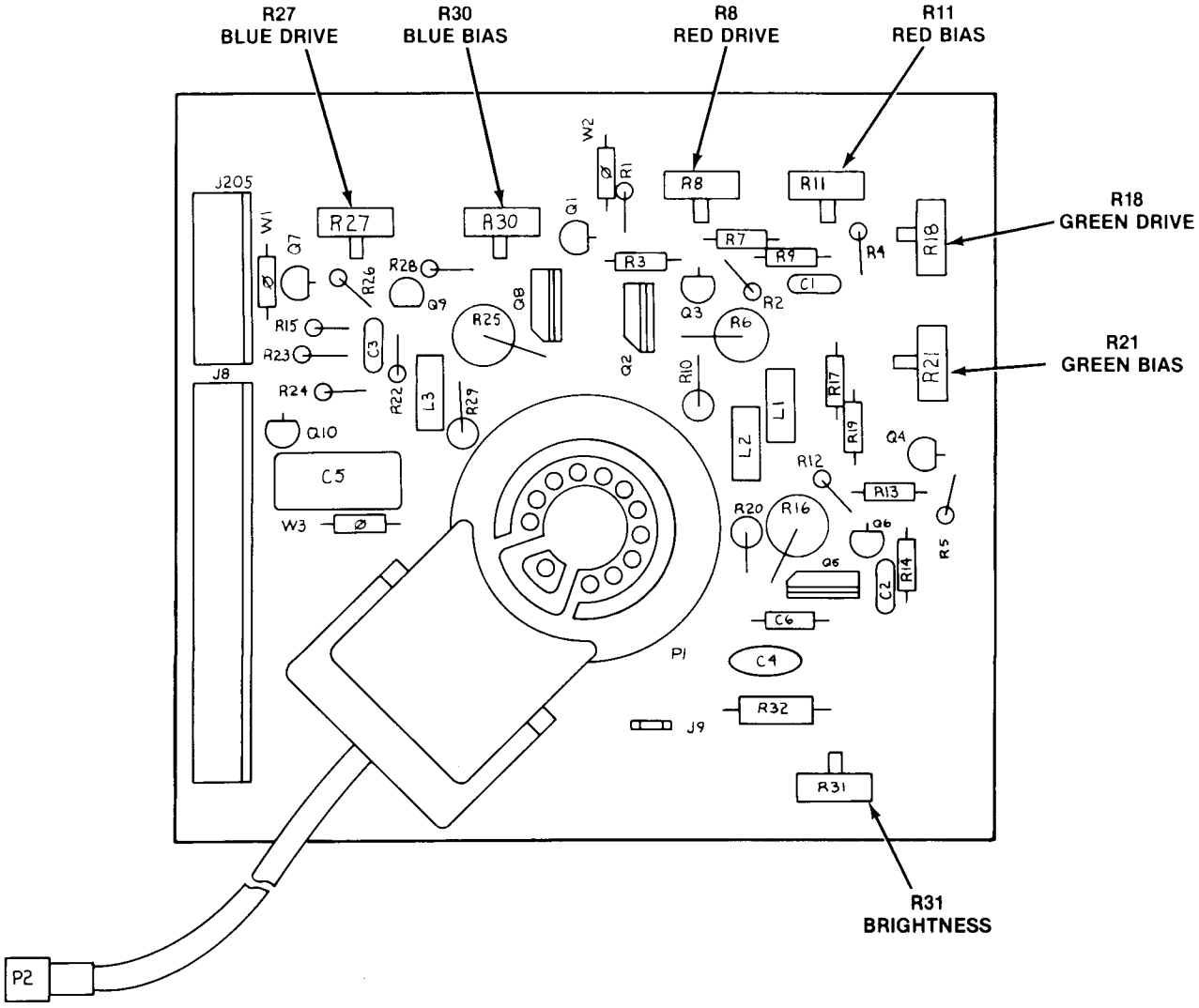


Figure 5-1 Adjustable Controls on the Neck PCB

VERTICAL POSITION

The VERTICAL POSITION control (R55) should be adjusted if the picture is not vertically centered on the screen. Figure 5-2 shows the location of the VERTICAL POSITION control on the Deflection PCB. Adjust the VERTICAL POSITION control until you obtain a normal screen image.

HORIZONTAL SIZE

The HORIZONTAL SIZE control (L4) should be adjusted if the screen raster is either too wide or narrow. Figure 5-2 shows the location of the HORIZONTAL SIZE control on the Deflection PCB. Adjust the HORIZONTAL SIZE control as follows:

1. Set the game for the self-test diagnostic pattern that displays the convergence grid and dots. (Refer to the game manual for detailed procedures on selecting the self-test patterns.)

2. Use only a non-metallic Allen wrench (commonly called a "tweaking tool") to adjust the HORIZONTAL SIZE control until the right and left grid lines run along the edges of the screen. These grid lines should not be positioned off the screen, which would indicate overscanning.

VERTICAL SIZE

The VERTICAL SIZE control (R35) should be adjusted if the screen image is either not filling the screen vertically, or if it is overscanning the screen vertically. Figure 5-2 shows the location of the VERTICAL SIZE control on the Deflection PCB. Adjust the VERTICAL SIZE control as follows:

1. Set the game for the self-test diagnostic pattern that displays the convergence grid and dots. (Refer to the game manual for detailed procedures on selecting the self-test patterns.)

2. Slowly adjust the VERTICAL SIZE control until the top and bottom grid lines are along the top and bottom edges of the screen. These grid lines should not disappear off the edges of the screen, which would indicate overscanning.

FOCUS

The FOCUS control (FA1) should be adjusted if the CRT screen image is not sharply defined. The location of the FOCUS control is shown in Figure 5-2. Adjust the FOCUS control until you get optimum screen sharpness.

VIDEO B+

1. Set BRIGHTNESS control (R31) for maximum brightness. Refer to Figure 5-1 for the location of the BRIGHTNESS control on the Neck PCB.

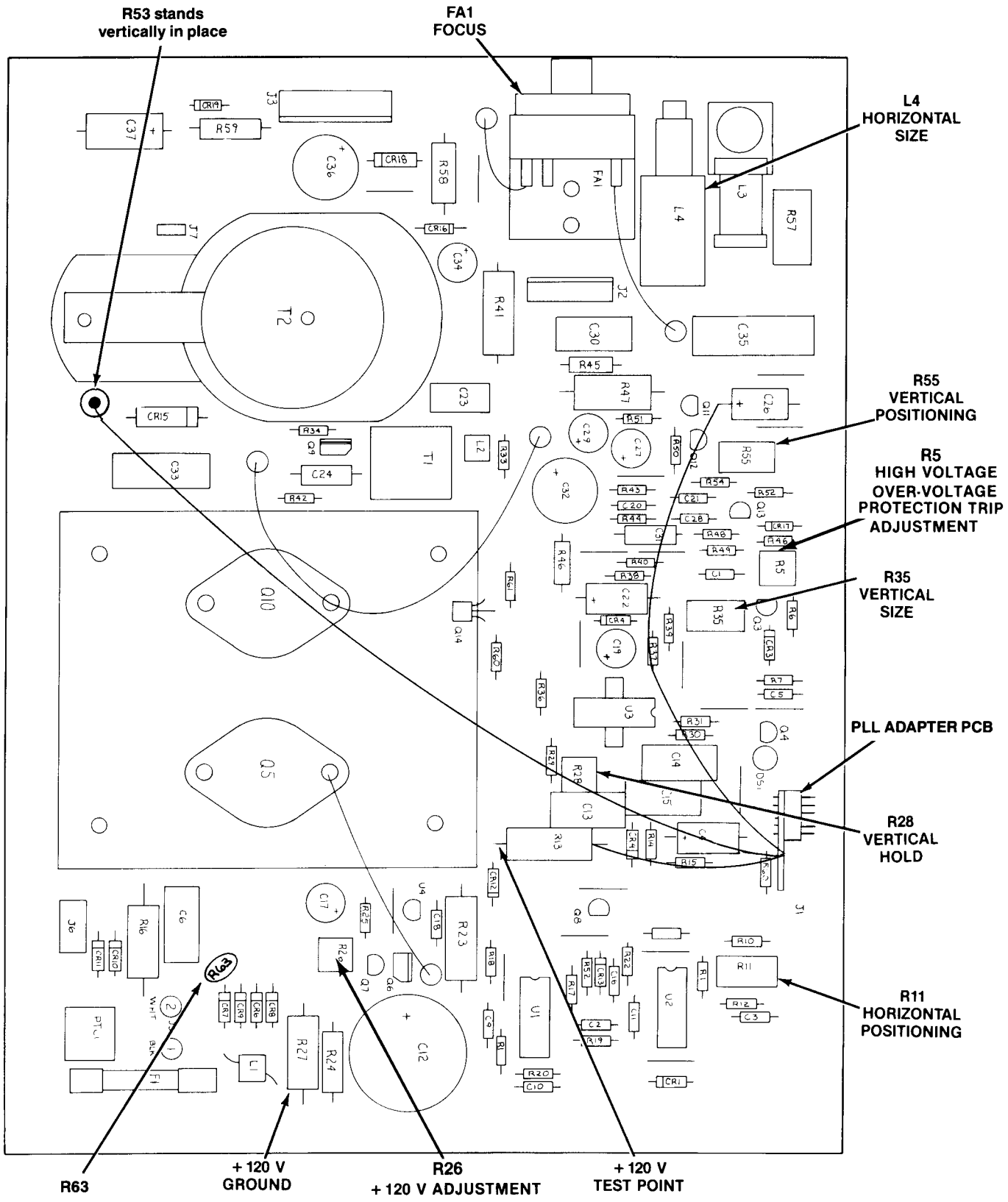


Figure 5-2 Adjustable Controls on the Deflection PCB

2. Remove power from the display.

3. Set a DC voltmeter to the 0-volt to +150-volt range.

4. Connect the plus lead of the voltmeter to the +120 V Test Point and the minus lead to the +120 V Ground located on the Deflection PCB as shown in Figure 5-2.

5. Apply power to the display.

6. Adjust the +120 V ADJ control (R26) for a voltmeter reading of +120 volts. Figure 5-2 shows the location of the +120 V ADJ on the Deflection PCB.

7. Return the BRIGHTNESS control (R31) to its normal setting.

PURITY

> NOTE
>
> The convergence adjustments must be performed after completion of the purity adjustments.

1. Set up the display for the purity adjustments as follows:

   a. Remove power from the display.

   b. Loosen the screws that are used to tighten the deflection yoke and convergence-magnet assembly clamps to the neck of the CRT.

   c. Remove any glue that may be holding the purity magnets in place.

   d. Remove the three rubber wedges beneath the deflection yoke of the CRT. Use a razor blade or thin knife to loosen any glue holding the rubber wedges to the CRT surface.

   e. Position the display so that the CRT faces either north or south. Degauss the CRT with a hand-held degaussing coil.

   f. Apply power to the display.

2. Position the convergence-magnet assembly so that the purity rings shown in Figure 5-3 are positioned directly over the gap in the CRT gun assembly. This is about two inches forward from the start of the neck glass.

3. Secure the convergence-magnet assembly in position by tightening the neck-clamp mounting screw.

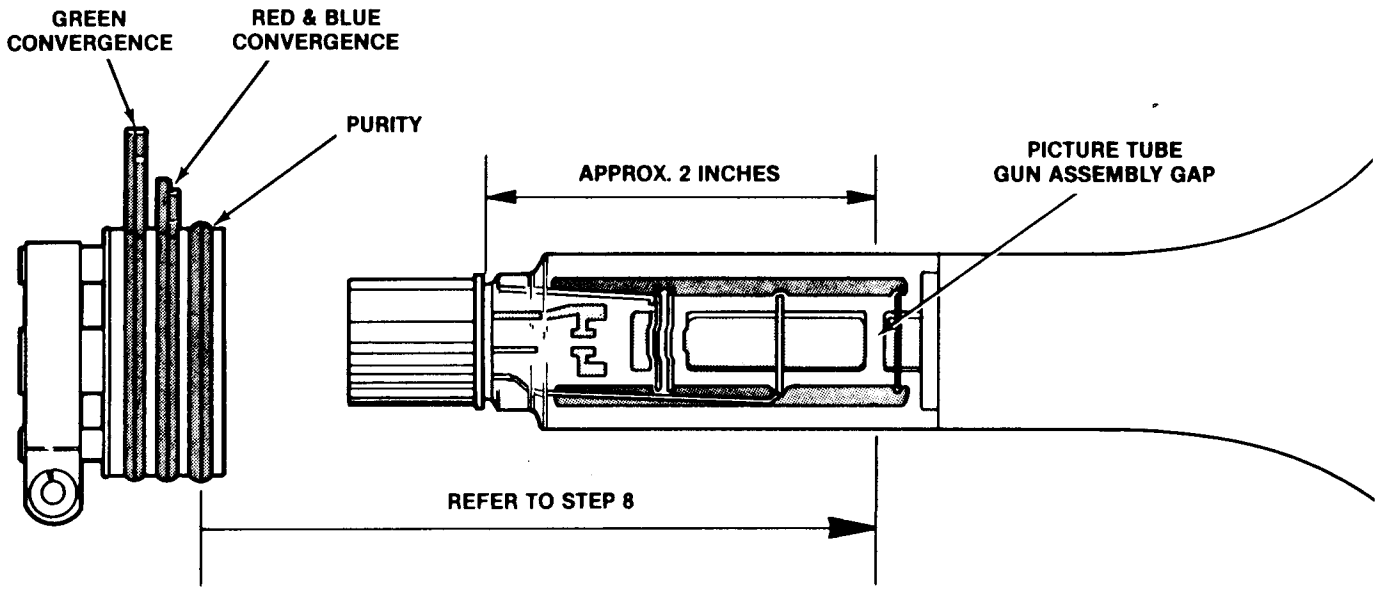


Figure 5-3 Purity and Convergence Adjustments

4. 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 procedure in the game manual for the details on selecting self-test diagnostic patterns.)

5. Preset the convergence magnets to superimpose the red, blue, and green lines at the center of the screen.

6. Set the game so it displays only the green crosshatch diagnostic pattern. If the game does not produce a green-only crosshatch pattern, turn off the RED DRIVE (R8) and BLUE DRIVE (R27) controls. Refer to Figure 5-1 for the locations of these controls.

7. Slide the deflection yoke toward the magnet assembly to produce a vertical green band within the center of the crosshatch pattern.

8. Adjust the purity rings of the magnet assembly shown in Figure 5-3 to center the green band horizontally on the face of the CRT.

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.

9. Slowly slide the deflection yoke forward until the crosshatch pattern is entirely green. Tighten the yoke-mounting screw.

10. Set the game to display the self-test diagnostic pattern that shows a crosshatch pattern of all three colors. If you turned off the RED DRIVE and BLUE DRIVE controls of the display, return them to their normal settings.

11. Check the display for good overall purity.

12. Perform the convergence adjustments.

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 crosshatch of all three colors. This may appear as a white crosshatch pattern. (Refer to the self-test procedure in 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 5-3.

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

   c. While keeping their angles the same, rotate both tabs of these magnets to superimpose the red horizontal lines on the blue horizontal lines in the center of the screen area. This produces magenta horizontal lines at screen center.

   d. Adjust the angle between the tabs of the green convergence magnets to superimpose the green vertical lines on the magenta vertical lines already converged in the center of the screen.

   e. 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 dynamic convergence, which aligns the registration of all three colors at the outer areas of the screen, as follows:

   a. If not already done as part of the purity adjustments, loosen the screw securing the deflection yoke assembly to the neck of the CRT. Remove the three rubber wedges beneath the yoke. Use a razor blade or thin knife to loosen any glue securing the three rubber wedges to the CRT.

   b. Tilt the deflection yoke in a vertical direction to superimpose the red horizontal lines on the blue and green horizontal lines at the 3 o'clock and 9 o'clock positions of the screen. This produces white horizontal lines.

   c. While maintaining the vertical position of the yoke, tilt it in a horizontal direction to superimpose the red crosshatch on the blue and green crosshatch patterns at the 6 o'clock and 12 o'clock positions of the screen. This produces a white crosshatch pattern.

d. Install the three rubber wedges firmly beneath the yoke collar to hold the yoke in position. Recheck the convergence of the display. If necessary, repeat parts b and c of this procedure and the static convergence adjustments of step 1.

3. Secure the rings of the convergence-magnet assembly and the rubber yoke wedges with glue.

4. Tighten the deflection-yoke mounting screw.

TRACKING

1. Remove power from both the game and the display.

2. Remove the game's 6-pin video-signal connector from J205 on the Neck PCB.

3. Assemble a test switch and a 1 KΩ resistor as shown in Figure 5-4.

4. Connect the test switch/resistor and jumper leads as shown in Figure 5-4.

5. On the Neck PCB, set the RED DRIVE (R8), BLUE DRIVE (R27), GREEN DRIVE (R18), RED BIAS (R11), BLUE BIAS (R30), and GREEN BIAS (R21) controls two-thirds clockwise. Set the brightness (R31) control to midrange. See Figure 5-1 for the tracking adjustment locations.

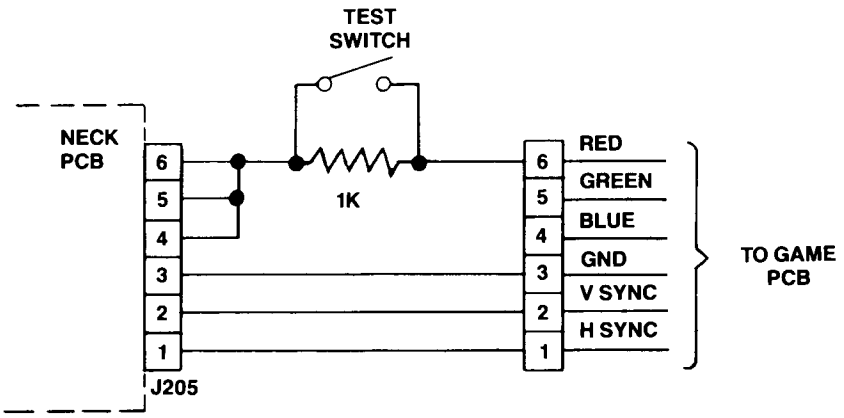


Figure 5-4 Tracking Adjustment Set-Up

6. Connect the positive lead of a high-impedance voltmeter (greater than 100 MΩ) to the BRIGHTNESS (R31) control wiper terminal and the negative lead to the CRT Dag Spring assembly (see Figure 6-1).

7. Apply power to both the game and the display.

8. Adjust the brightness (R31) control for a voltmeter reading between 530 and 590 volts .

9. Set the game to display the self-test diagnostic pattern that shows a white crosshatch. (Refer to the self-test procedure in the game manual).

10. Set the test switch to the closed position and adjust the RED DRIVE (R8) and BLUE DRIVE (R27) controls for a neutral white crosshatch pattern.

11. Set the test switch to the open position and adjust the RED BIAS (R11) and BLUE BIAS (R30) controls for a dim but perceptible gray display.

12. Repeat steps 10 and 11. If the display in step 10 is too bright, turn the GREEN DRIVE (R18) control slightly counterclockwise (decrease drive). If the display in step 11 is too dim, turn the GREEN BIAS control slightly clockwise (increase drive).

13. If the GREEN DRIVE or GREEN BIAS control was adjusted in step 12, repeat steps 10 through 12.

HIGH-VOLTAGE POWER SUPPLY

WARNING

To avoid injury due to electrical shock, use extreme care when making the following adjustments. Do not attempt these adjustments without a 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 CRT by slipping the probe tip under the anode cap.
4. Apply power to the display.
5. Turn the high-voltage over-voltage protection trip adjustment control (R5) on the Deflection PCB to the fully counterclockwise position. Refer to Figure 5-2 for the location of the high-voltage over-voltage protection trip adjustment and +120 V adjustment controls.
6. Turn the +120 V adjustment control (R26) for a reading of 30.5 kV on the voltmeter.
7. Slowly turn the high-voltage over-voltage protection trip adjustment control (R5) counterclockwise until the voltmeter reading drops to 0 and the high-voltage trip LED (DS1) illuminates.
8. Turn the display power off for about 10 seconds. Then turn on the display to reset the over-voltage protection circuit.
9. Reset the +120 V control (R26) for a voltmeter reading of +120 V as described in the Video B+ Adjustment procedure.

CENTER FREQUENCY

NOTE

Normally, the CENTER FREQUENCY control (R4) on the PLL Adapter PCB should not require adjustment. The following adjustment procedure should only be performed if the phase-locked-loop integrated circuit U1, located on the PLL Adapter PCB, is replaced.

1. Set CENTER FREQUENCY control (R4) to the center of its adjustment range. Refer to Figure 5-5 for the location of CENTER FREQUENCY control (R4).

2. Apply power to the game and obtain a display.

3. Slowly adjust CENTER FREQUENCY control (R4) for a stable display.

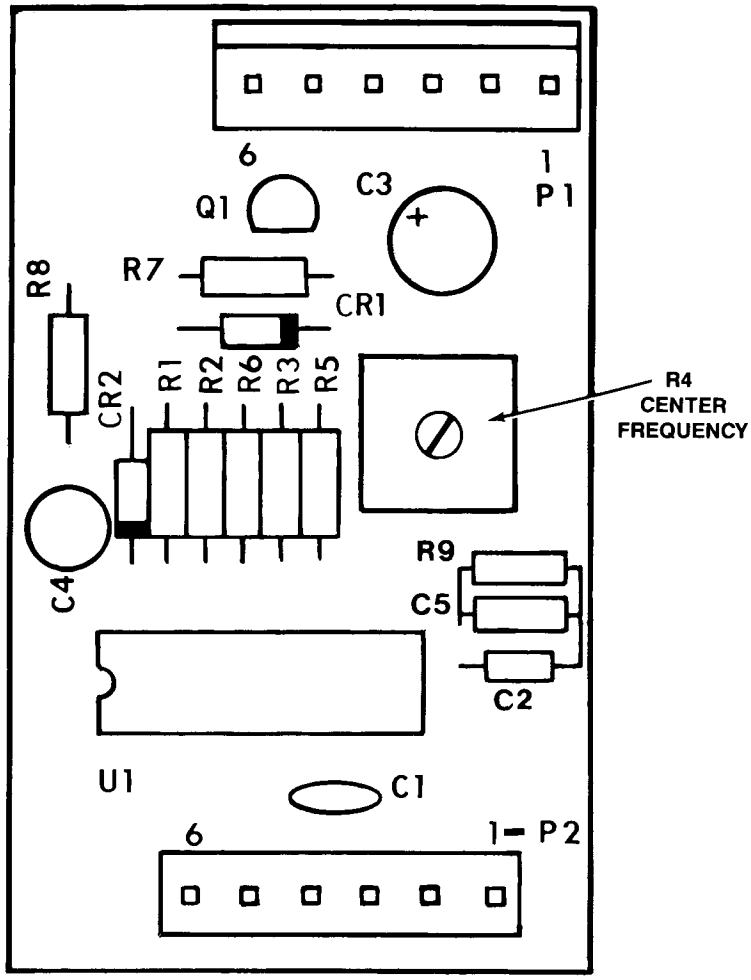


Figure 5-5 Adjustable Control on the PLL Adapter PCB

CHAPTER 6 ILLUSTRATED PARTS LISTS

This chapter provides the information necessary for you to order parts for your ATARI 19- or 25-Inch Color Raster 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 PCB parts lists are arranged in alphabetical order by component type. Each component subsection is arranged alphanumerically by reference designator.

Other parts lists are arranged alphanumerically by Atari part number. For example, all "A-" prefix numbers come first. Following these are numbers in sequence evaluated up to the hyphen, namely 00- thru 99-, then 000598- thru approximately 201000-.

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. Remember, use only exact replacement parts, especially for those parts identified in the parts lists with the (!) symbol in the parts list and on the schematic diagrams with shading. 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.

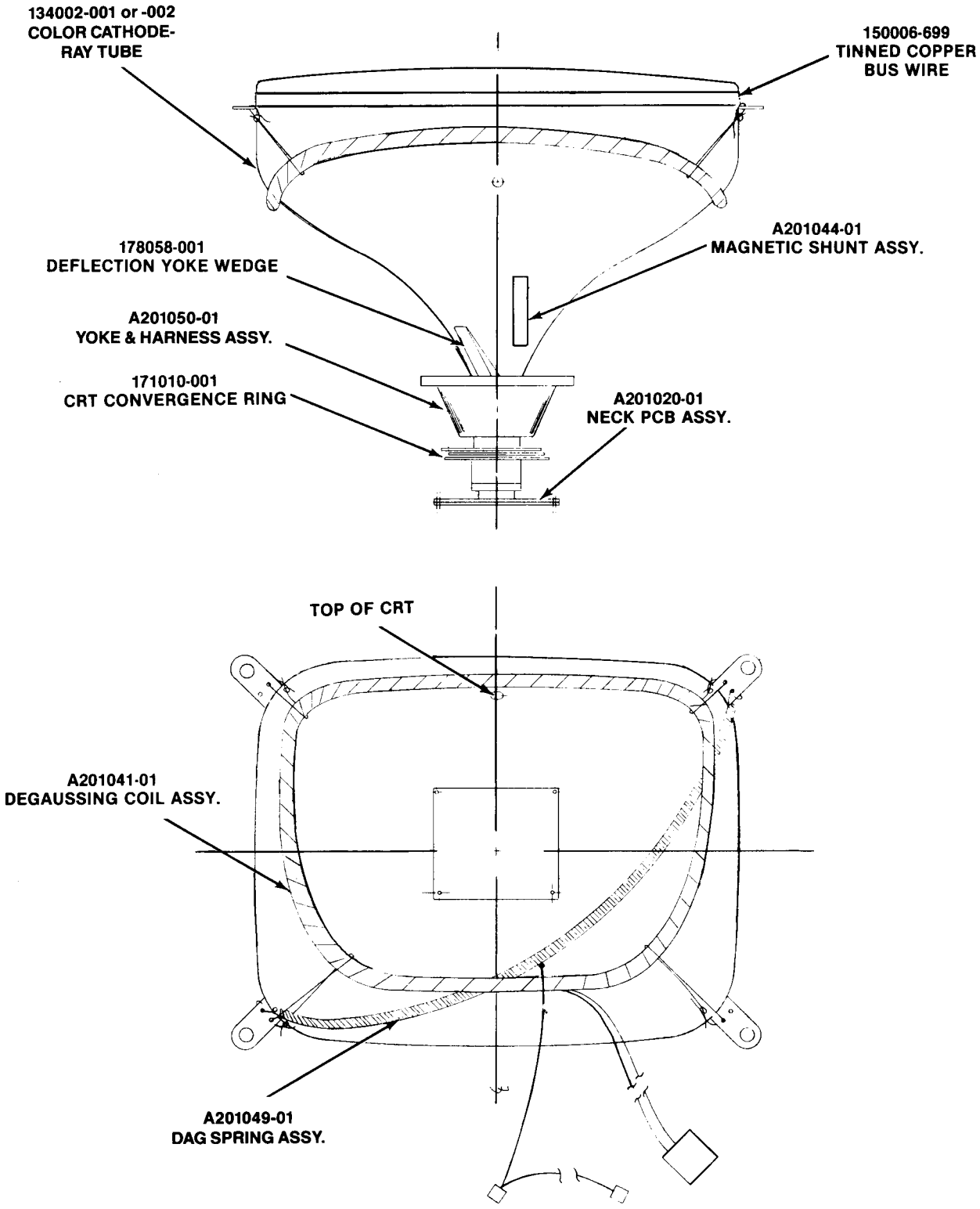


Figure 6-1 Cathode-Ray Tube Assembly
19-Inch Display A201092-01 A

Cathode-Ray Tube Assembly
19-Inch Display A201092-01 A
Parts List

	Part Number	Description
	A201049-01	Dag Spring Assembly--includes:
	150005-600	#20 AWG Tinned Copper Stranded Wire
	179085-000	#20-14 AWG Reel Socket Terminal
	179088-003	3-Circuit Plug Connector
	201048-01	Dag Spring
	A201020-01	Neck PCB Assembly
	A201024-01	Color Raster Harness Assembly
(!)	A201041-01	Degaussing Coil Assembly--includes:
	A201032-01	Harness Assembly
	A201046-01	Coil Assembly
	A201050-01	Yoke and Harness Assembly
(!)	134002-001	19-Inch 90-Degree Color Cathode-Ray Tube
	150006-699	#20 AWG Bare Tinned Copper Bus Wire
	171010-001	CRT Convergence Ring
	178058-001	Deflection Yoke Wedge

!Static-sensitive device

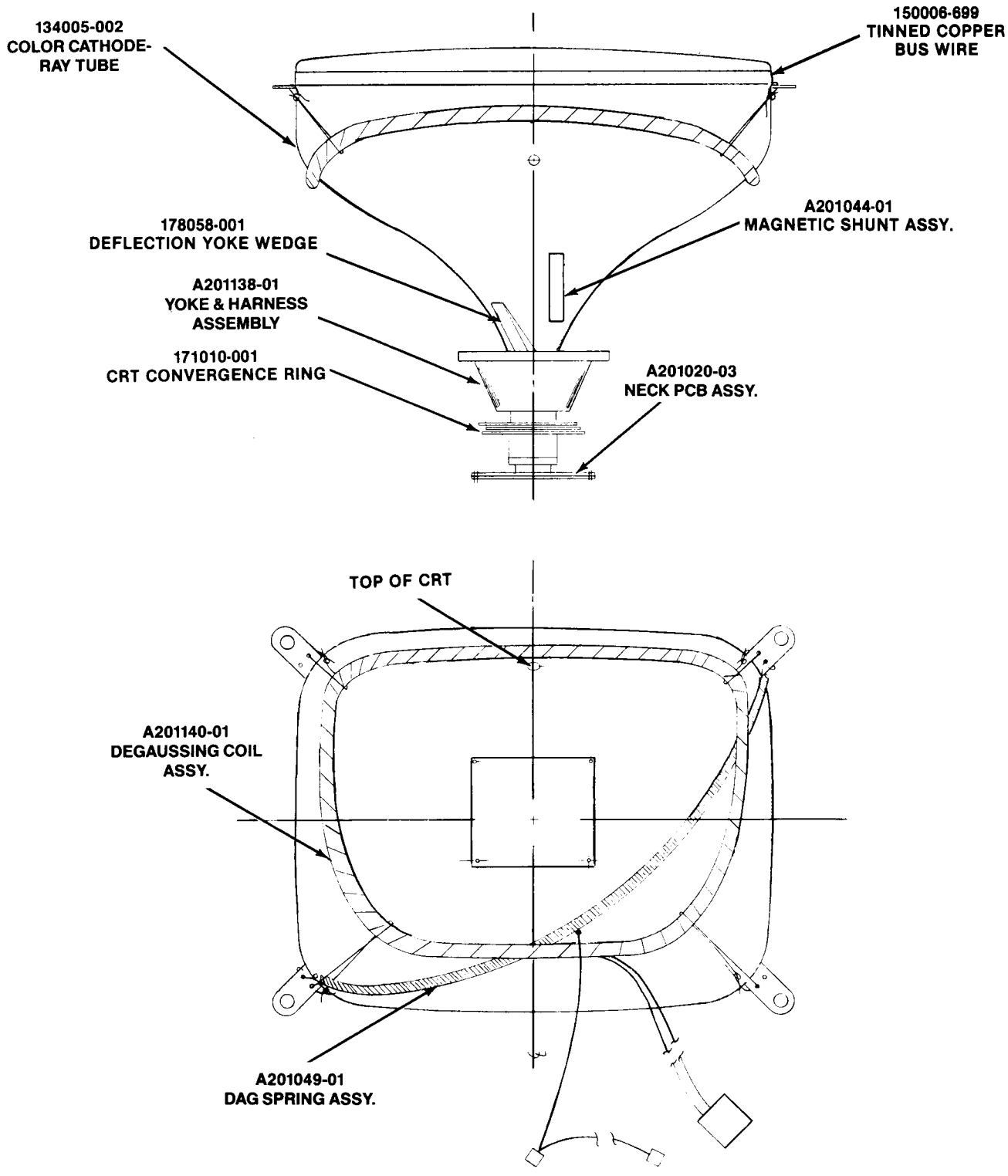


Figure 6-2 Cathode-Ray Tube Assembly
25-Inch Display A201139-01 A

Cathode-Ray Tube Assembly
25-Inch Display A201139-01 A
Parts List

	Part Number	Description
	A201024-01	Color Raster Harness Assembly
	A201044-01	Magnetic Shunt Assembly
	A201049-01	Dag Spring Assembly--includes
	A201033-01	Dag Lead Assembly
	201048-01	Dag Spring
	A201020-03	Neck PCB Assembly--includes
	A201146-01	CRT Socket Assembly
	201052-01	Hazard Shield
(!)	A201138-01	Color Raster Yoke and Harness Assembly--includes
	A201137-01	Yoke Assembly
	A201051-01	Yoke Harness Assembly
(!)	A201140-01	Degaussing Coil Assembly--includes
	A201032-01	Harness Assembly
	A201141-01	Coil Assembly
(!)	134005-002	25-Inch 90-Degree Color Cathode-Ray Tube
	150006-699	#20 AWG Bare Tinned Copper Bus Wire
	171010-001	CRT Convergence Ring
	178058-001	Deflection Yoke Wedge
	178158-001	Purity Shield (not shown)

!Static-sensitive device

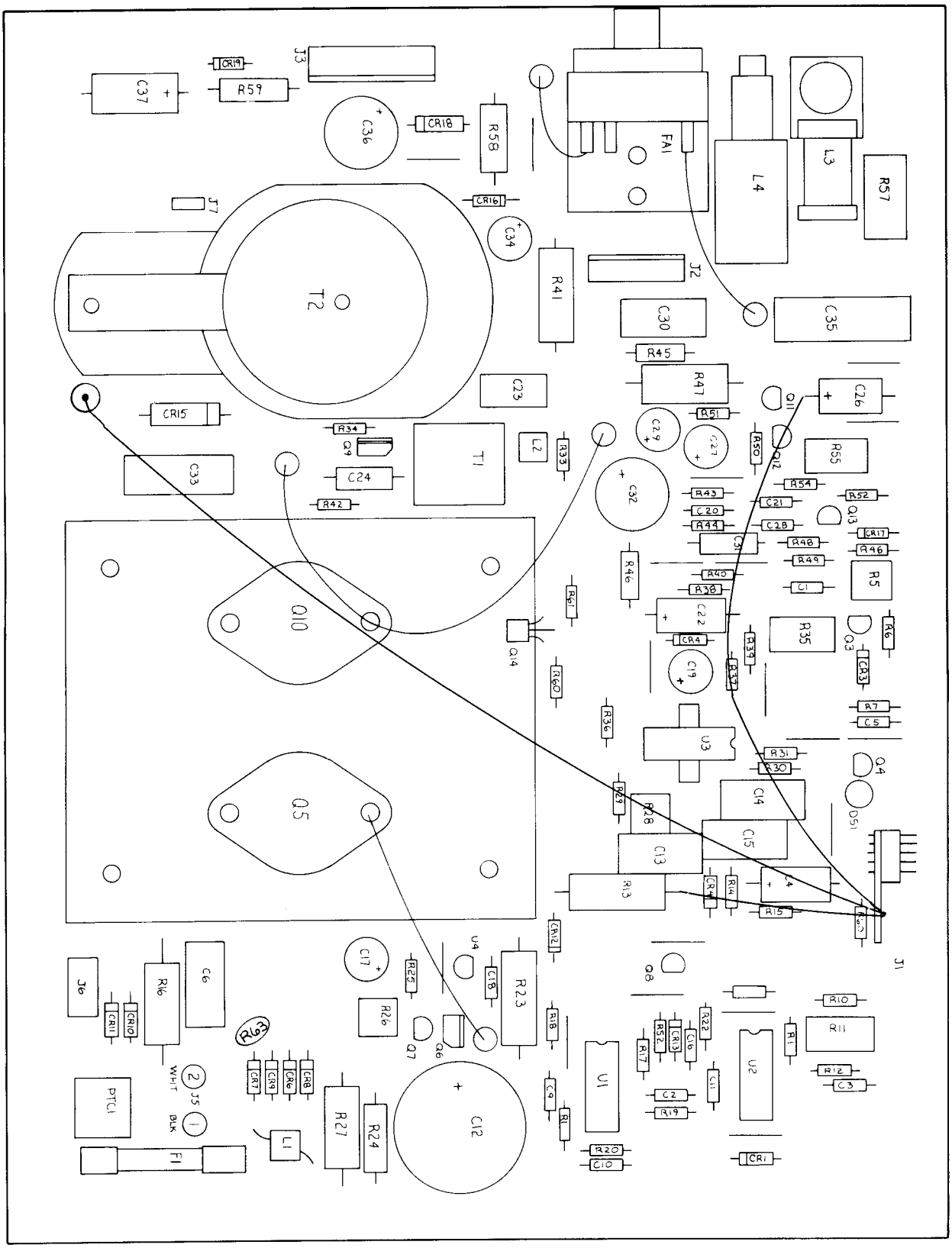


Figure 6-3 Deflection PCB Assemlby
19-Inch Display A201022-01 C
25-Inch Display A201022-02 A

Deflection PCB Assembly
19-Inch Display A201022-01 C
25-Inch Display A201022-02 A
Parts List

Designator		Description	Part Number
		Assemblies	
FA1	(!)	Focus Assembly includes:	A201025-01
		Lead Wire Assembly	A201059-01
		Flat Washer	75-024S
		Phillips-Head Screw	72-CL408S
		Focus Control	171008-001
		Insulating Boot	178064-001
		Focus Mounting Bracket	201011-01
		Jumper Wire	201060-01
		Jumper Wire	201060-02
T1		Driver Transformer Assembly	A201040-01
T2	(!)	Ultra-Tuned High-Voltage Transformer Assembly	A201144-01
		Power Input Harness Assembly	A201057-01
	(!)	Heatsink Assembly includes:	A201047-01
		Dual Heatsink Wire Assembly	A201061-01
		Heatsink Wire Assembly	A201062-01
		Phillips-Head Screw	72-1406S
		Nut/Washer Assembly	75-99514
		Type-2N5838 NPN Transistor	133012-001
		NPN High-Voltage Transistor	133014-001
		Nylon Shoulder Washer	175000-055
		Mica Insulator	178062-102
		Deflection PCB Heatsink	201043-01
		PLL Adapter PCB Assembly	A201133-01
		Capacitors	
C1		0.1 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C2, C3		470 pF, ±5%, 100 V Minimum, Axial-Lead Ceramic Capacitor	122016-471
C4		22 µF, 16 V, Axial-Lead Aluminium Electrolytic Capacitor	24-160226
C5		0.1 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C6	(!)	0.22 µF, ±10%, 250 VAC, Polyester Capacitor	129001-224

Deflection PCB Assembly
Parts List, continued

Designator		Description	Part Number
C7, C8	(!)	0.0033 µF, ±20%, 400 V, Radial-Lead Ceramic Capacitor	129000-332
C9		470 pF, ±5%, 100 V Minimum, Axial-Lead Ceramic Capacitor	122016-471
C10		0.01 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122014-103
C11		470 pF, ±5%, 100 V Minimum, Axial-Lead Ceramic Capacitor	122016-471
C12		470 µF, +30% -20%, 200 V, Radial-Lead Aluminium Electrolytic Capacitor	123008-477
C13		0.15 µF, ±10%, 100 V, Radial-Lead Mylar Capacitor	126000-154
C14, C15		0.1 µF, ±10%, 100 V, Radial-Lead Mylar Capacitor	126000-104
C16		0.1 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C17		22 µF, +50% -20%, 200 V, Radial-Lead Aluminium Electrolytic Capacitor	123007-226
C18		0.1 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C19		100 µF, 35 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123000-107
C20		82 pF, ±5%, 100 V Minimum, Axial-Lead Capacitor	122016-820
C21		1000 pF, ±5%, 100 V Minimum, Axial-Lead Ceramic Capacitor	122016-102
C22		22 µF, 50 V, Axial-Lead Aluminium Electrolytic Capacitor	124001-226
C23		0.1 µF, ±20%, 200 V, Radial-Lead Mylar Capacitor	126001-104
C24		0.001 µF, ±10%, 200 V, Axial-Lead Mylar Capacitor	125001-102
C26		22 µF, 50 V, Axial-Lead Aluminium Electrolytic Capacitor	124001-226
C27		100 µF, 35 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123000-107
C28		0.1 µF, +80% -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C29		100 µF, 35 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123000-107
C30		0.022 µF, ±10%, 100 V, Axial-Lead Mylar Capacitor	125000-223

Deflection PCB Assembly
Parts List, continued

Designator		Description	Part Number
C31		0.47 µF, 50 V, Axial-Lead Aluminium Electrolytic Capacitor	124001-474
C32		1000 µF, 35 V, Radial-Lead Aluminum Electrolytic Capacitor	123000-108
C33	(!)	0.01 µF, ±3%, 1600 V, Polypropylene Capacitor	126005-103
C34		10 µF, +50% -20%, 200 V, Radial-Lead Aluminium Electrolytic Capacitor	123007-106
C35		0.39 µF, ±5%, 400 V, Polypropylene Capacitor	126003-394
C36		1000 µF, 50 V, Aluminium Electrolytic Capacitor	123001-108
C37		47 µF, 50 V, Axial-Lead Aluminium Electrolytic Capacitor	24-500476
		Diodes	
CR3		Type-1N754A, 6.8 V, ±5%, 400 mW Zener Diode	131002-001
CR4	(!)	Type-1N751A, 5.1 V, ±5%, 500 mW Zener Diode	32-1N751A
CR6-CR9		Type-1N5397, 1.5 A, 600 V, Rectifier Diode	131030-001
CR10, CR11		Type-1N4001, 50 V, 1 A, Switching Diode	31-1N4001
CR12		Type-1N751A, 5.1 V, ±5%, 500 mW Zener Diode	32-1N751A
CR13		Type-1N914, 100 V, 250 mW, 4 nS Switching Diode	31-1N914
CR14		Type-1N4001, 50 V, 1 A, Switching Diode	31-1N4001
CR15		0.8 A, 1500 V, Rectifier	131017-001
CR16		1A, 1000 V, Fast-Recovery Rectifier (Acceptable substitute is part no. 131008-001)	131004-001
CR17		Type-1N914, 100 V, 250 mW, 4 nS Switching Diode	31-1N914
CR18		1 A, 400 V, Fast Recovery Rectifier	131004-004
CR19		Type-1N5245B, 15 V, 500 mW Zener Diode	131016-001
DS1		Light-Emitting Diode	38-MV5053

Deflection PCB Assembly
Parts List, continued

Designator	Description	Part Number
	Inductors	
L1	47 µH Inductor Assembly	A201058-01
L2	6.4 µH Inductor Assembly	A201053-01
L3	Linearity Coil Assembly	A201088-01
L4	Width Coil	A201148-01
	Integrated Circuits	
U1, U2	Dual Multiplier Integrated Circuit	137242-001
U3	Vertical Deflection Integrated Circuit	137292-001
U4	12 V, ±5%, Voltage Regulator	137291-001
	Resistors	
PTC1	100 Ω, 140 VAC, Positive-Temperature-Coefficient Resistor	110021-101
R1	10 kΩ, ±5%, 1/4 W Resistor	110000-103
R5	20 kΩ, 1/2 W, Horizontal Trimming Potentiometer	119002-203
R6	27 kΩ, ±5%, 1/4 W Resistor	110000-273
R7	1000 Ω, ±5%, 1/4 W Resistor	110000-102
R10	47 kΩ, ±5%, 1/4 W Resistor	110000-473
R11	50 kΩ, 1/4 W, Vertical Trimming Potentiometer	119001-503
R12	15 kΩ, ±5%, 1/4 W Resistor	110000-153
R13	10 kΩ, ±5%, 5 W, Wire-Wound Resistor	116001-103
R14	1000 Ω, ±5%, 1/4 W Resistor	110000-102
R15	47 kΩ, ±5%, 1/4 W Resistor	110000-473
R16	22 Ω, ±5%, 5 W, Wire-Wound Resistor	116001-220
R17	91 kΩ, ±5%, 1/4 W Resistor	110000-913
R18	47 kΩ, ±5%, 1/4 W Resistor	110000-473
R19	4.7 MΩ, ±5%, 1/4 W Resistor	110000-475
R20	10 kΩ, ±5%, 1/4 W Resistor	110000-103
R21	100 kΩ, ±5%, 1/4 W Resistor	110000-104
R22	39 kΩ, ±5%, 1/4 W Resistor	110000-393
R23	1000 Ω, ±5%, 5 W, Wire-Wound Resistor	116001-102
R24	15 kΩ, ±5%, 1 W Resistor	110009-153
R25	820 Ω, ±5%, 1/4 W Resistor	110000-821
R26	500 Ω, 1/2 W, Horizontal Trimming Potentiometer	119002-501
R27	10 kΩ, ±5%, 2 W Resistor	110010-103

Deflection PCB Assembly
Parts List, continued

Designator		Description	Part Number
R28		100 kΩ, 1/2 W, Horizontal Trimming	119002-104
R29		120 kΩ, ±5%, 1/4 W Resistor	110000-124
R30		430 kΩ, ±5%, 1/4 W Resistor	110000-434
R31		82 kΩ, ±5%, 1/4 W Resistor	110000-823
R32		47 kΩ, ±5%, 1/4 W Resistor	110000-473
R33		330 Ω, ±5%, 1/4 W Resistor	110000-331
R34		150 Ω, ±5%, 1/4 W Resistor	110000-151
R35		100 kΩ, 1/4 W, Vertical Trimming Potentiometer	119001-104
R36		150 kΩ, ±5%, 1/4 W Resistor	110000-154
R37		47 kΩ, ±5%, 1/4 W Resistor	110000-473
R38		5600 Ω, ±5%, 1/4 W Resistor	110000-562
R39, R40		15 kΩ, ±5%, 1/4 W Resistor	110000-153
R41	(!)	3000 Ω, ±5%, 2 W Resistor	110010-302
R42		4700 Ω, ±5%, 1/4 W Resistor	110000-472
R43		220 kΩ, ±5%, 1/4 W Resistor	110000-224
R44		3.9 Ω, ±5%, 1/4 W Resistor	110000-039
R45		1000 Ω, ±5%, 1/2 W Resistor	110001-102
R46		1.0 Ω, ±5%, 1/2 W Resistor	110001-010
R47		220 Ω, ±5%, 2 W Resistor	110010-221
R48		10 kΩ, ±5%, 1/4 W Resistor	110000-103
R49		1500 Ω, ±5%, 1/4 W Resistor	110000-152
R50		470 Ω, ±5%, 1/4 W Resistor	110000-471
R51		100 kΩ, ±5%, 1/4 W Resistor	110000-104
R52		22 kΩ, ±5%, 1/4 W Resistor	110000-223
R53		56 kΩ, ±5%, 1 W Resistor	110009-563
R54		2200 Ω, ±5%, 1/4 W Resistor	110000-222
R55		5000 Ω, 1/4 W, Vertical Trimming Potentiometer	119001-502
R57		220 Ω, ±5%, 3 W Resistor	110022-221
R58		0.33 Ω, ±5%, 1 W Resistor	110009-003
R59		220 Ω, ±5%, 1 W Resistor	110009-221
R61		56 kΩ, ±5%, 1/4 W Resistor	110000-563
R62		33 kΩ, ±5%, 1/4 W Resistor	110000-333
R68		47 Ω, ±5%, 1/4 W Resistor	110000-470
R69		40 Ω, 2A, Thermal Resistor	110018-400
W1-W14		0 Ω Resistor	110005-001

Deflection PCB Assembly
Parts List, continued

Designator		Description	Part Number
		Transistors	
Q3		Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q4	(!)	15 V, 0.8 A, Silicon Controlled Rectifier	131005-003
Q6		Type-D40P5, 225 V, 0.5 A, NPN Transistor	133009-001
Q7		High-Voltage PNP Transistor	133013-001
Q8		Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q9		Type-D40P5, 225 V, 0.5 A, NPN Transistor	133009-001
Q11		Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q12		Type-2N3906, 1 W ,40 V, PNP Transistor	33-2N3906
Q13		Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q14		Type-2N3906, 1 W ,40 V, PNP Transistor	33-2N3906
		Miscellaneous	
		Nut with Washer Assembly	75-99514
		Silicon Compound	107014-001
		Insulating Boot	178064-001
		Integrated Circuit Heatsink	178108-001
		Fuse Clip	179050-002
		Test Point Terminal	179051-001
F1	(!)	1.5 A, 250 V, 3AG Slow-Blow Fuse	46-2011502
J2		5-Position Header Connector	79-58096
J3		7-Position Header Connector	179014-007
J6		2-Position Header Connector	179069-002
		High Temperature Hot Melt (3M3792)	106006-001

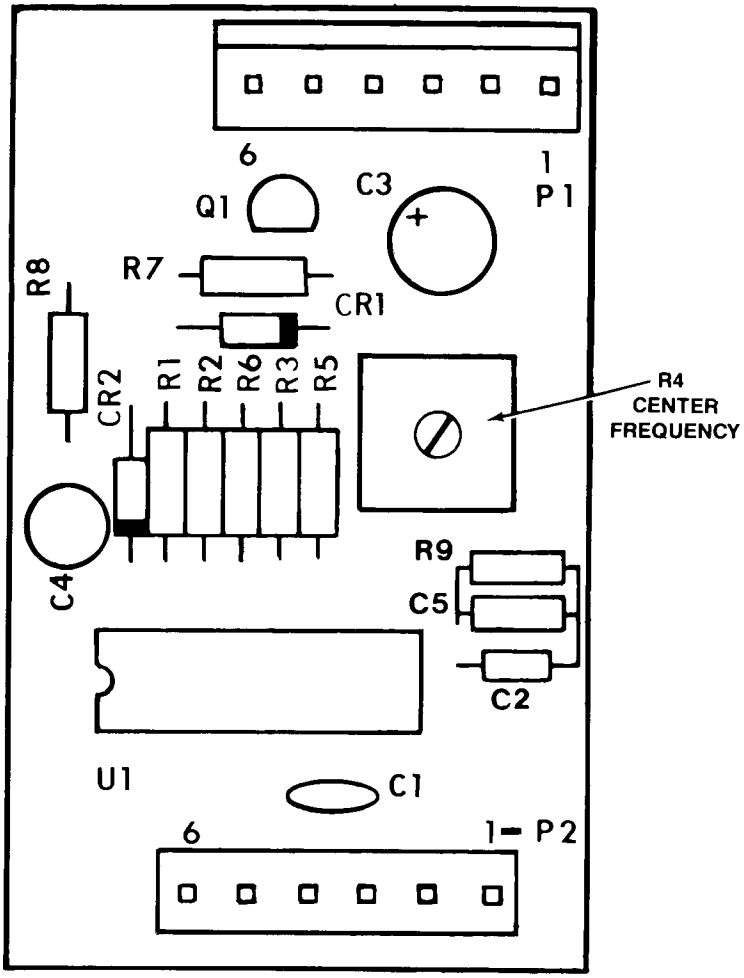


Figure 6-4 PLL Adapter PCB Assembly 19- & 25-Inch Displays A201133-01 A

PLL Adapter Printed-Circuit Board
19- & 25-Inch Displays A201133-01 A
Parts List

Designator	Description	Part Number
	Capacitors	
C1	0.0022 µF, 100 V, Plastic Film Radial-Lead Capacitor	121022-222
C2	0.1 µF, +80% -20%, 50 V Ceramic Capacitor	122002-104
C3	47 µF, ±20%, 16-V Minimum, Aluminum Electrolytic Radial-Lead Capacitor	123004-470
C4	2.2 µF, ±20%, 50-V Minimum, Aluminum Electrolytic Radial-Lead Capacitor	123005-225
C5	4700 pF, ±10%, 50 V, Axial-Lead Ceramic Capacitor	122015-472
	Resistors	
R1	2.2 kΩ, ±5%, 1/4 W Resistor	110000-222
R2	10 kΩ, ±5%, 1/4 W Resistor	110000-103
R3	27 kΩ, ±5%, 1/4 W Resistor	110000-273
R4	25 kΩ, 1/2 W, Horizontal Trimming Potentiometer	119002-253
R5	220 kΩ, ±5%, 1/4 W Resistor	110000-224
R6	10 kΩ, ±5%, 1/4 W Resistor	110000-103
R7	12 kΩ, ±5%, 1/4 W Resistor	110000-123
R8	5.6 kΩ, ±5%, 1/4 W Resistor	110000-562
R9	12 kΩ, ±5%, 1/4 W Resistor	110000-123
	Miscellaneous	
CR1	Type-1N914, 100 V, 10 mA Switching Diode	31-1N914
CR2	Type-1N751A, 5.1 V, 500 mW Zener Diode	31-1N7514
J1	6-Circuit, 0.056 Centers, Polarized Header Connector	179014-006
J2	6-Pin, 6-Circuit, 0.056 Centers, Polarized Right-Angle Header Connector	179014-006
Q1	Type-2N3906, 40 V, 1 W, PNP Transistor	33-2N3906
U1(!)	Type-4046, CMOS Phase-Locked Loop Integrated Circuit	137349-001

!Static-sensitive device

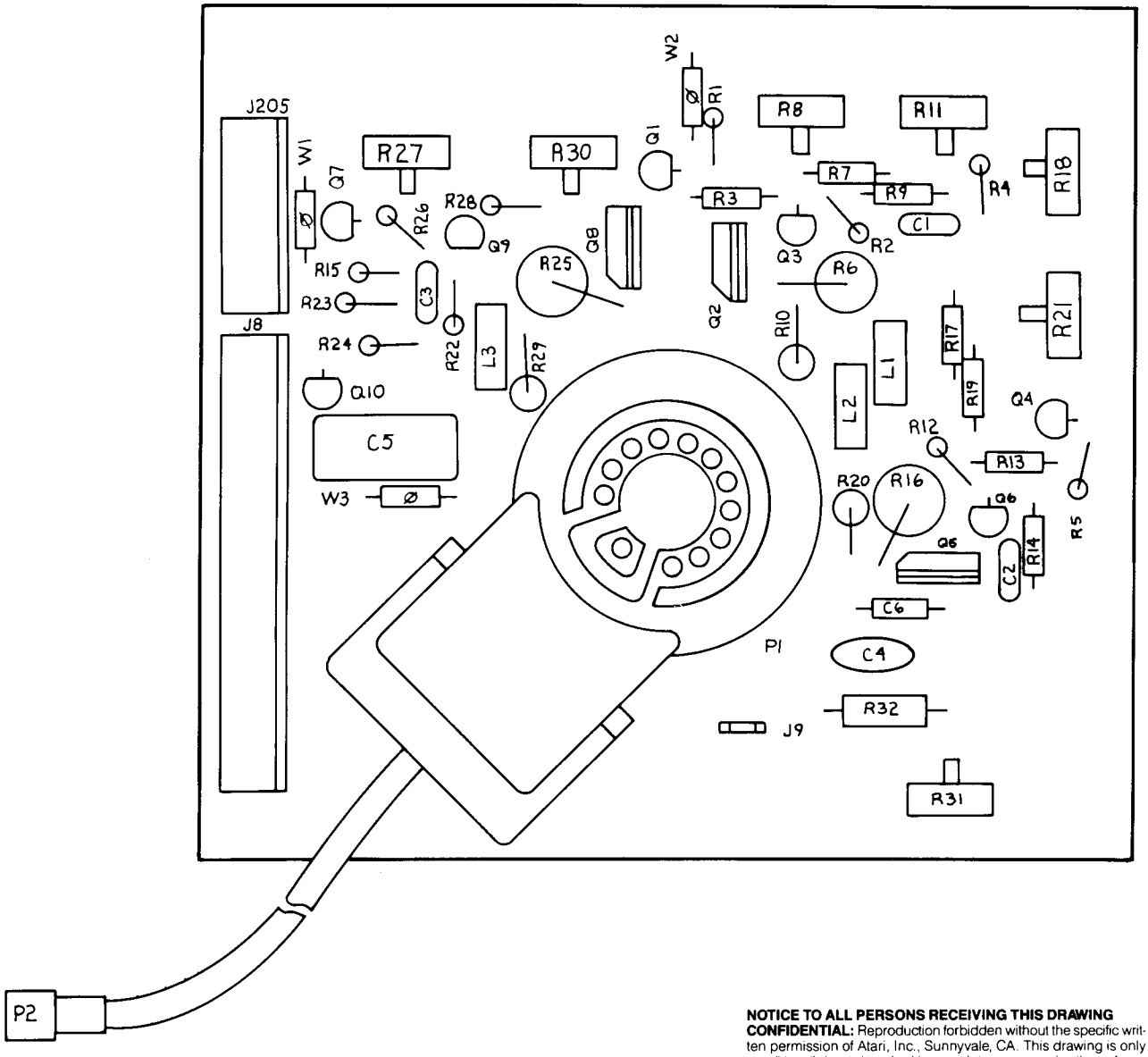


Figure 6-5 Neck PCB Assembly
19-Inch Display A201020-01 B
25-Inch Display A201020-03 A

Neck PCB Assembly
19-Inch Display A201020-01 B
25-Inch Display A201020-03 A
Parts List

Designator	Description	Part Number
	For -01 (19-Inch Display) Only	
P1, P4	CRT Socket Assembly includes:	A201065-01
	G3 Wire Assembly	A201064-01
	CRT Socket	171039-001
R2	3.3 kΩ, ±5%, 1/4 W Resistor	110000-332
R9	3.9 kΩ, ±5%, 1/4 W Resistor	110000-392
R12	3.3 kΩ, ±5%, 1/4 W Resistor	110000-332
R19	3.9 kΩ, ±5%, 1/4 W Resistor	110000-392
R22	3.3 kΩ, ±5%, 1/4 W Resistor	110000-332
R28	3.9 kΩ, ±5%, 1/4 W Resistor	110000-392
	For -03 (25-Inch Display) Only	
P1, P4	CRT Socket Assembly includes:	A201146-01
	G3 Wire Assembly	A201064-01
	CRT Socket	171044-002
R2	7.5 kΩ, ±5%, 1/4 W Resistor	110000-752
R9	1.8 kΩ, ±5%, 1/4 W Resistor	110000-182
R12	7.5 kΩ, ±5%, 1/4 W Resistor	110000-752
R19	1.8 kΩ, ±5%, 1/4 W Resistor	110000-182
R22	7.5 kΩ, ±5%, 1/4 W Resistor	110000-752
R28	1.8 kΩ, ±5%, 1/4 W Resistor	110000-182
	For -01 (19- Inch Display) and -03 (25- Inch Display)	
	Capacitors	
C1-C3	220 pF, 100 V Minimum, Mica Capacitor	128002-221
C4	0.0068 µF, +80%, -20%, 1 kV, Ceramic Capacitor	120000-682
C5	0.1 µF, ±20%, 400 V, Radial-Lead Mylar Capacitor	126002-104
C6	0.1 µF, +80%, -20%, 50 V, Ceramic Capacitor	122002-104
	Inductor	
L1-L3	330 µH, ±10%, Inductor	141009-001

Neck PCB Assembly
Parts List, continued

Designator	Description	Part Number
	Resistors	
R1	2.2 kΩ, ±5%, 1/4 W Resistor	110000-222
R3	1 kΩ, ±5%, 1/4 W Resistor	110000-102
R4	82 Ω, ±5%, 1/4 W Resistor	110000-820
R5	2.2 kΩ, ±5%, 1/4 W Resistor	110000-222
R6	10 kΩ, ±5%, 2 W Resistor	110010-103
R7	220 Ω, ±5%, 1/4 W Resistor	110000-221
R8	500 Ω, Vertical Trimming Potentiometer	119001-501
R10	2.7 kΩ, ±5%, 1/2 W Resistor	110001-272
R11	10 kΩ, Vertical Trimming Potentiometer	119001-103
R13	1 kΩ, ±5%, 1/4 W Resistor	110000-102
R14	82 Ω, ±5%, 1/4 W Resistor	110000-820
R15	2.2 kΩ, ±5%, 1/4 W Resistor	110000-222
R16	10 kΩ, ±5%, 2 W Resistor	110010-103
R17	220 Ω, ±5%, 1/4 W Resistor	110000-221
R18	500 Ω, Vertical Trimming Potentiometer	119001-501
R20	2.7 kΩ, ±5%, 1/2 W Resistor	110001-272
R21	10 kΩ, Vertical Trimming Potentiometer	119001-103
R23	1 kΩ, ±5%, 1/4 W Resistor	110000-102
R24	82 Ω, ±5%, 1/4 W Resistor	110000-820
R25	10 kΩ, ±5%, 2 W Resistor	110010-103
R26	220 Ω, ±5%, 1/4 W Resistor	110000-221
R27	500 Ω, Vertical Trimming Potentiometer	119001-501
R29	2.7 kΩ, ±5%, 1/2 W Resistor	110001-272
R30	10 kΩ, Vertical Trimming Potentiometer	119001-103
R31	5 MΩ, Vertical Trimming Potentiometer	119001-505
R32	10 MΩ, 1/2 W Resistor	110023-106
W1, W2	0 Ω Resistor	110005-001
	Transistors	
Q1	Type-2N3906, 40 V, 1 W, PNP Transistor	33-2N3906
Q2	Type-D40P5, 225 V, 0.5 A, NPN Transistor	133009-001
Q3	Type-2N3904, 60 V, 350 mW, NPN Switching Transistor	34-2N3904
Q4	Type-2N3906, 40 V, 1 W, PNP Transistor	33-2N3906
Q5	Type-D40P5, 225 V, 0.5 A, NPN Transistor	133009-001

Neck PCB Assembly
Parts List, continued

Designator	Description	Part Number
Q6	Type-2N3904, 60 V, 350 mW, NPN Switching Transistor	34-2N3904
Q7	Type-2N3906, 40 V, 1 W, PNP Transistor	33-2N3906
Q8	Type-D40P5, 225 V, 0.5 A, NPN Transistor	133009-001
Q9, Q10	Type-2N3904, 60 V, 350 mW, NPN Switching Transistor	34-2N3904
	Miscellaneous	
J205	6-Position Header Connector	179014-006
J9	Fast-On Tab Terminal	179051-001
J8	14-Position Header Connector	79-58324
	Hazard Shield	201052-01
	Nylon Snap-In Fastener	81-4302

CHAPTER 7 WIRING AND SCHEMATIC DIAGRAMS

A wiring diagram and complete schematic diagrams are provided in this chapter. Component designations and their electrical values are included on the schematic diagrams.

The shaded areas of the schematic indicate components whose values are of special significance to product safety. Should any component in the shaded areas need to be replaced, use only the value given in the parts lists. Do not deviate from the resistance, wattage, and voltage values shown.

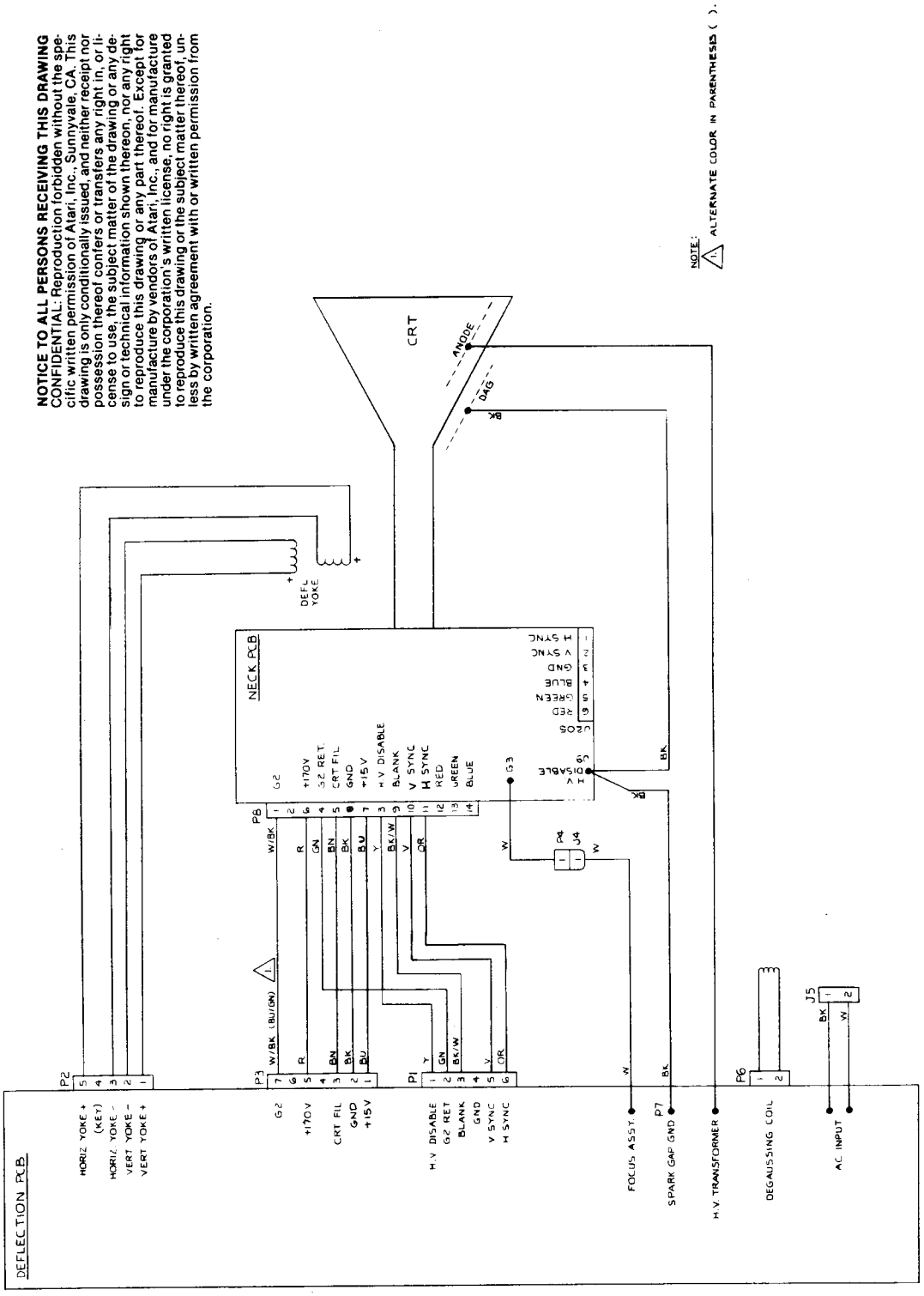


Figure 7-1 Wiring Diagram

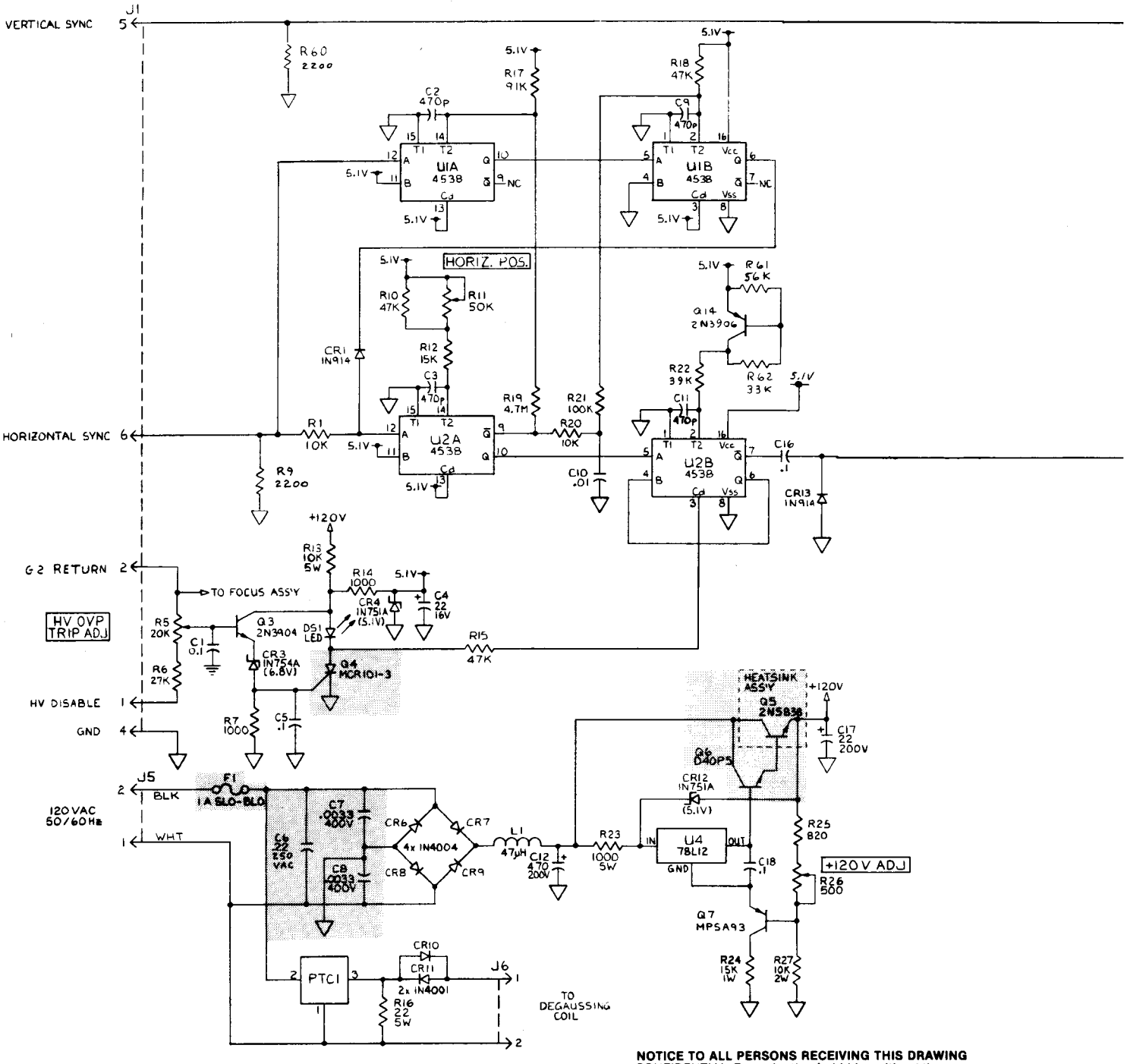
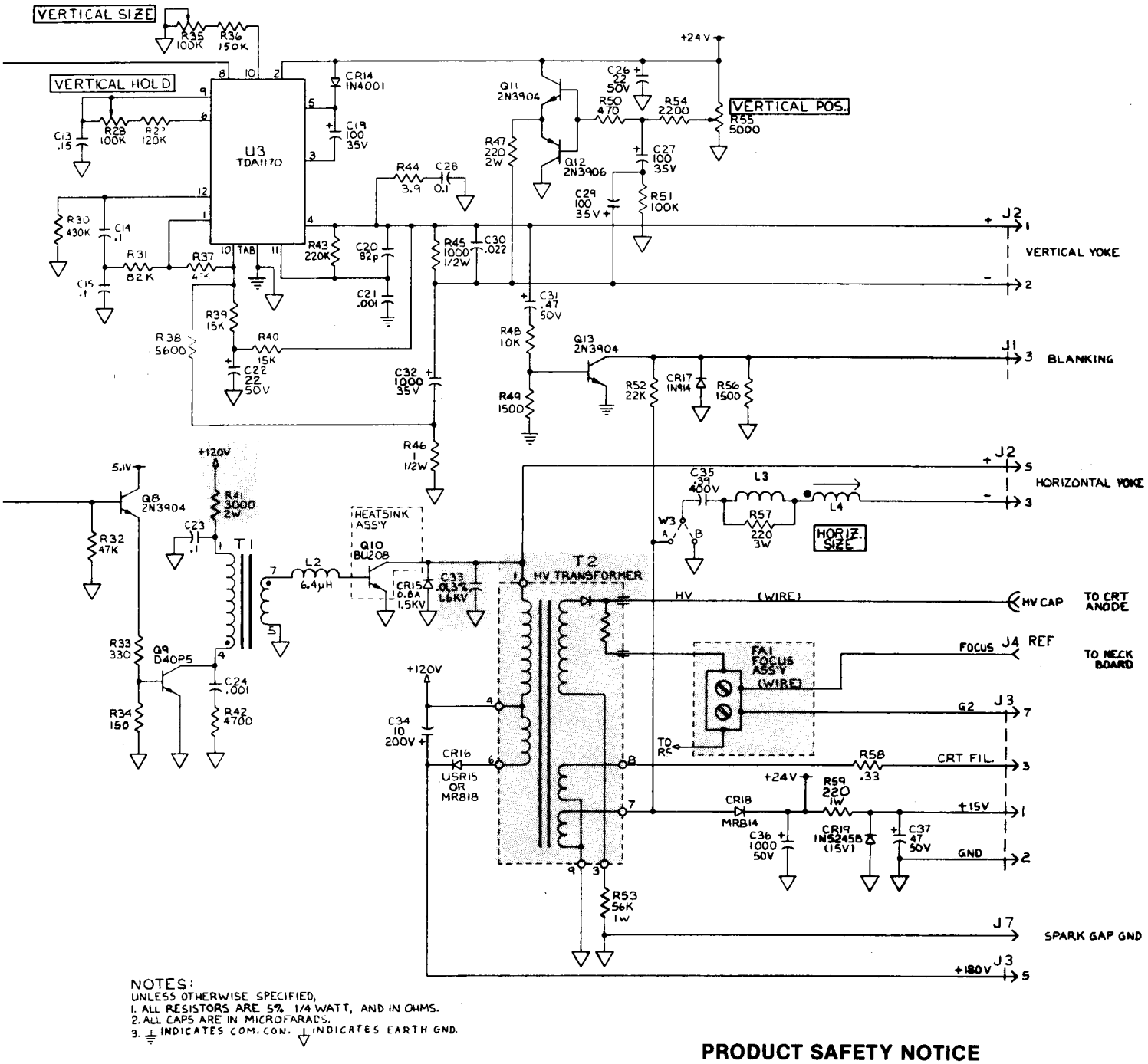


Figure 7-2 19- & 25-Inch Display Deflection PCB Schematic Diagram

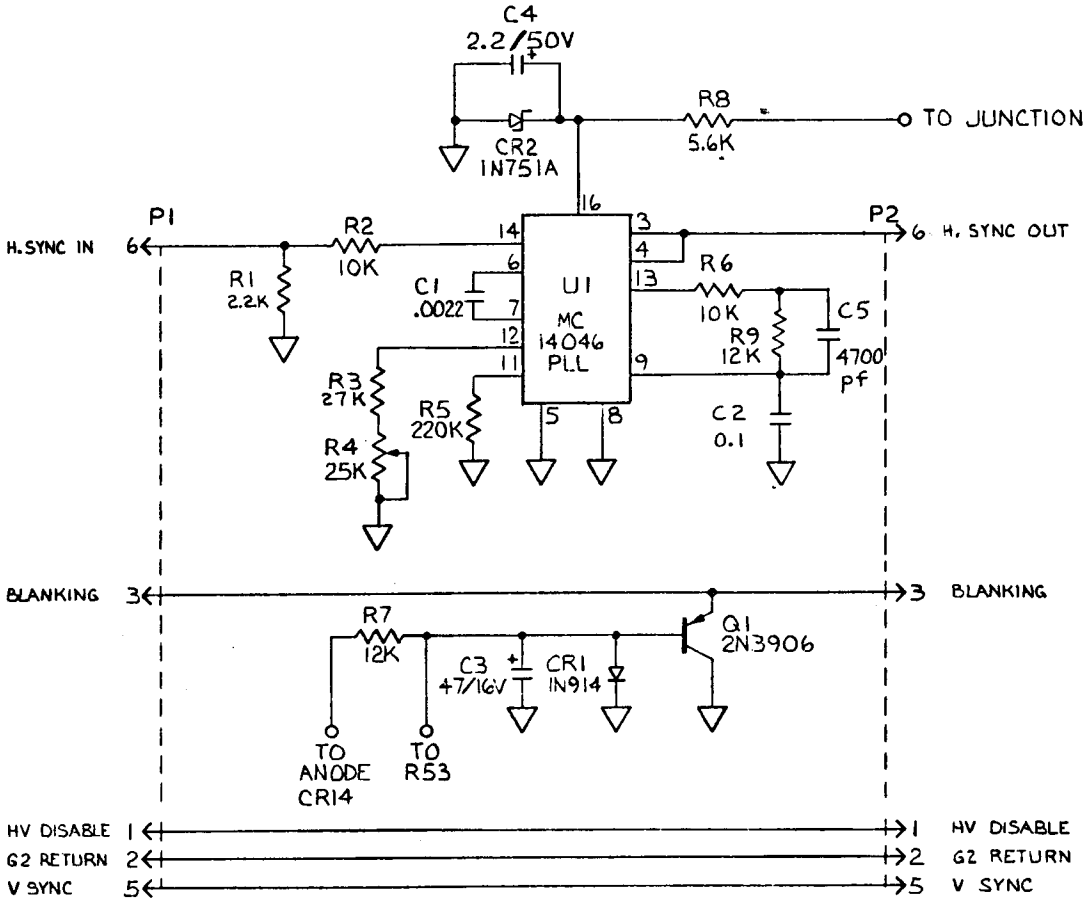


NOTES:
UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTORS ARE 5% 1/4 WATT, AND IN OHMS.
2. ALL CAPS ARE IN MICROFARADS.
3. ⏚ INDICATES COM. CON. ⏚ INDICATES EARTH GND.

PRODUCT SAFETY NOTICE

The shaded areas of this schematic indicate components whose values are of special significance to product safety. Should any component in the shaded areas need to be replaced, use only the value given in the parts lists. Do not deviate from the resistance, wattage, and voltage values shown.

Figure 7-2 19- & 25-Inch Display Deflection PCB Schematic Diagram, continued



NOTES:
UNLESS OTHERWISE SPEC'D,
1. RESISTORS ARE IN OHMS, 1/4W, 5%.
2. CAP'S ARE IN μF.
3. DESIGNATORS IN ( ) REF. TO 19" COLOR RASTER DEFLECTION BD., REV C.

Figure 7-3 19- & 25-Inch Display PLL Adapter PCB Schematic Diagram

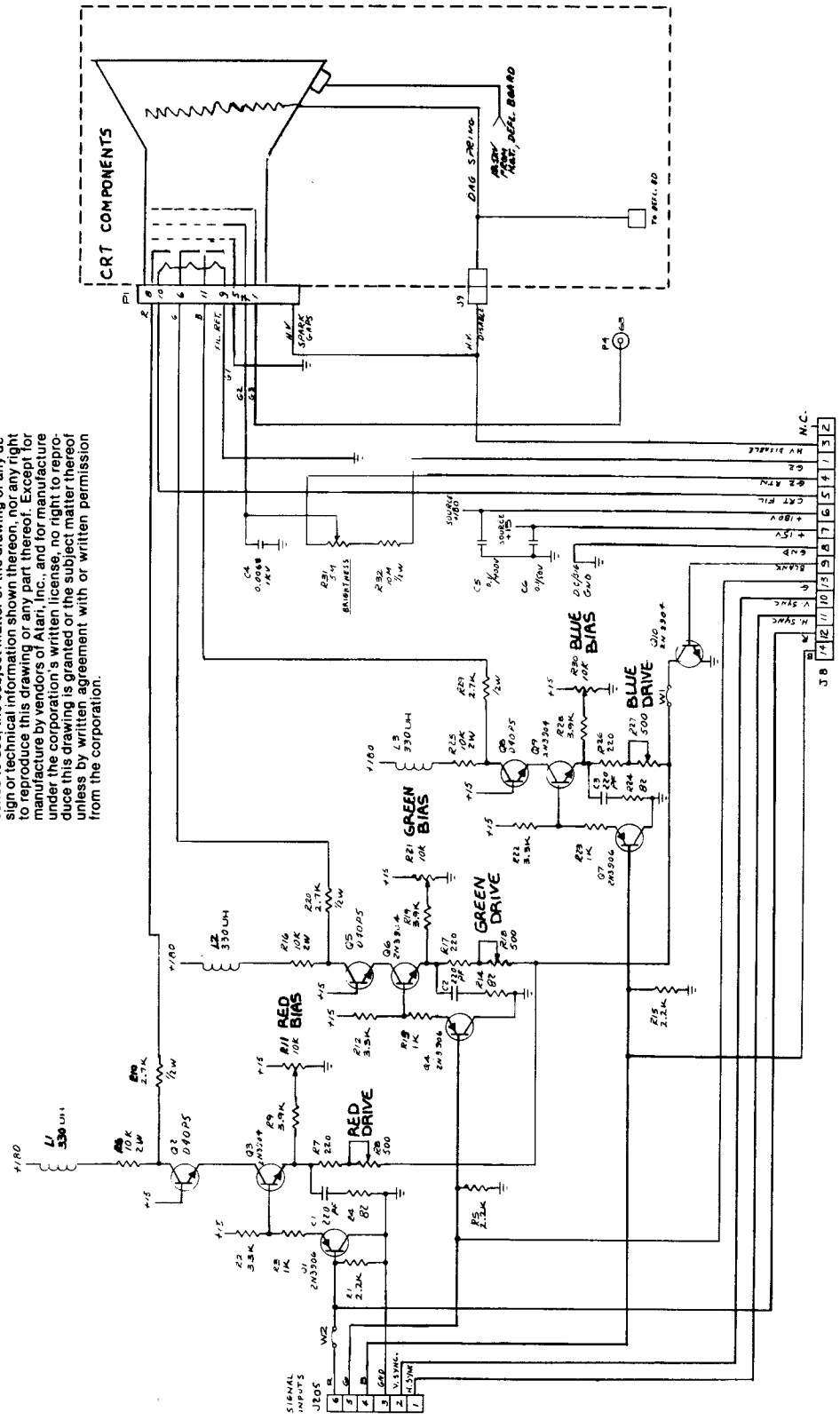


Figure 7-4 Neck PCB Schematic Diagram

Warranty

Seller warrants that its printed-circuit boards and parts thereon are free from defects in material and workmanship under normal use and service for a period of ninety (90) days from date of shipment. Seller warrants that its video displays (in games supplied with displays) are free from defects in material and workmanship under normal use and service for a period of thirty (30) days from date of shipment. None of the Seller's other products or parts thereof are warranted.

If the products described in this manual fail to conform to this warranty, Seller's sole liability shall be, at its option, to repair, replace, or credit Buyer's account for such products which are returned to Seller during said warranty period, provided:

(a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective;

(b) Such products are returned prepaid to Seller's 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.

In no event shall Seller be liable for loss of profits, loss of use, incidental or consequential damages.

Except for any express warranty set forth in a written contract between Seller and Buyer which contract supersedes the terms herein, this warranty is expressed in lieu of all other warranties expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the Seller's part, and it neither assumes nor authorizes any other person to assume for the Seller any other liabilities in connection with the sale of products by Seller.

The use of any non-Atari parts may void your warranty, according to the terms of the warranty. The use of any non-Atari parts may also adversely affect the safety of your game and cause injury to you and others. Be very cautious in using non-Atari-supplied components with our games, in order to ensure your safety.

Atari distributors are independent, being privately owned and operated. In their judgment they may sell parts or accessories other than Atari parts or accessories. Atari cannot be responsible for the quality, suitability or safety of any non-Atari part or any modification including labor which is performed by such distributor.