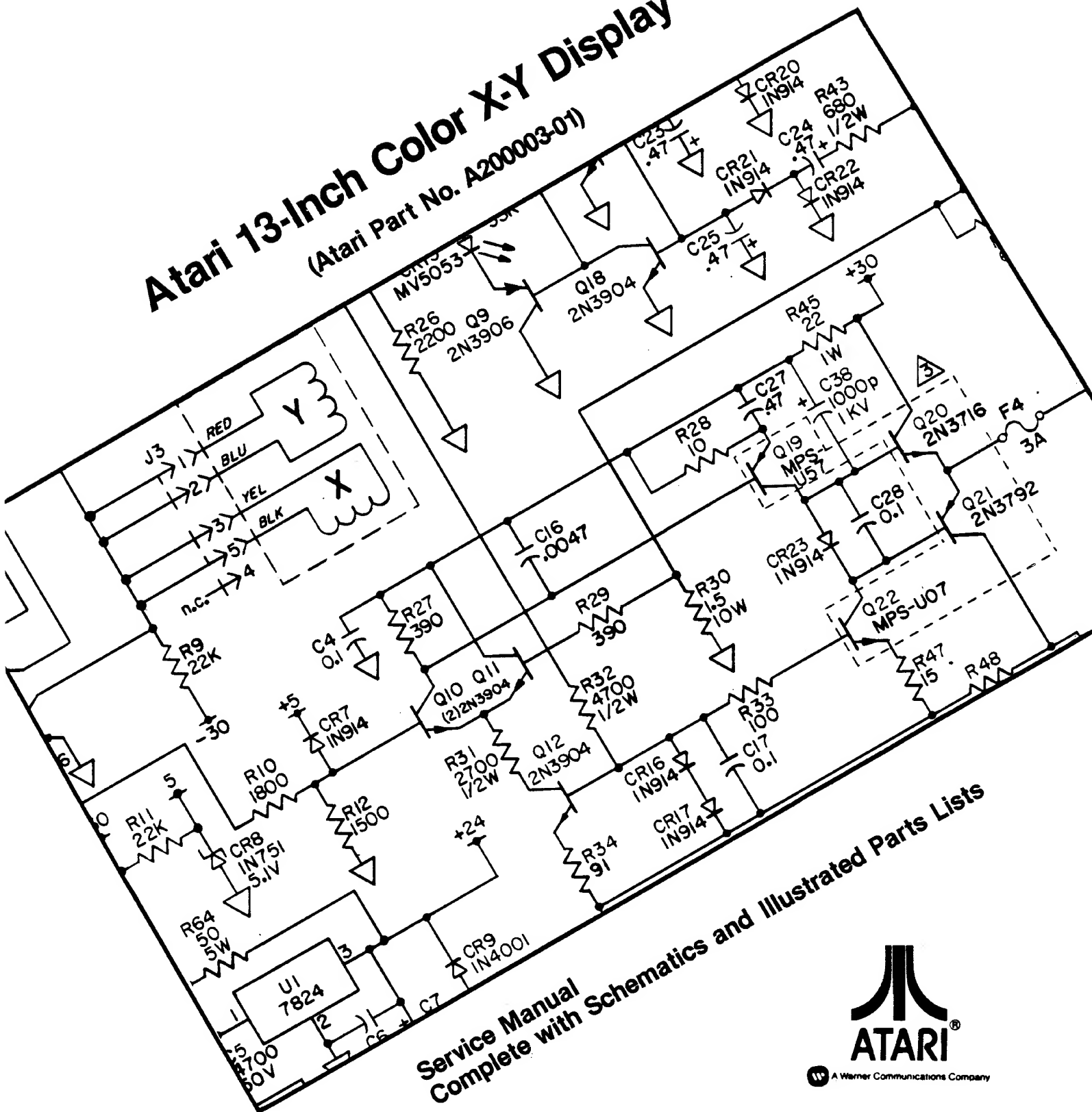


Atari 13-Inch Color X-Y Display

(Atari Part No. A200003-01)



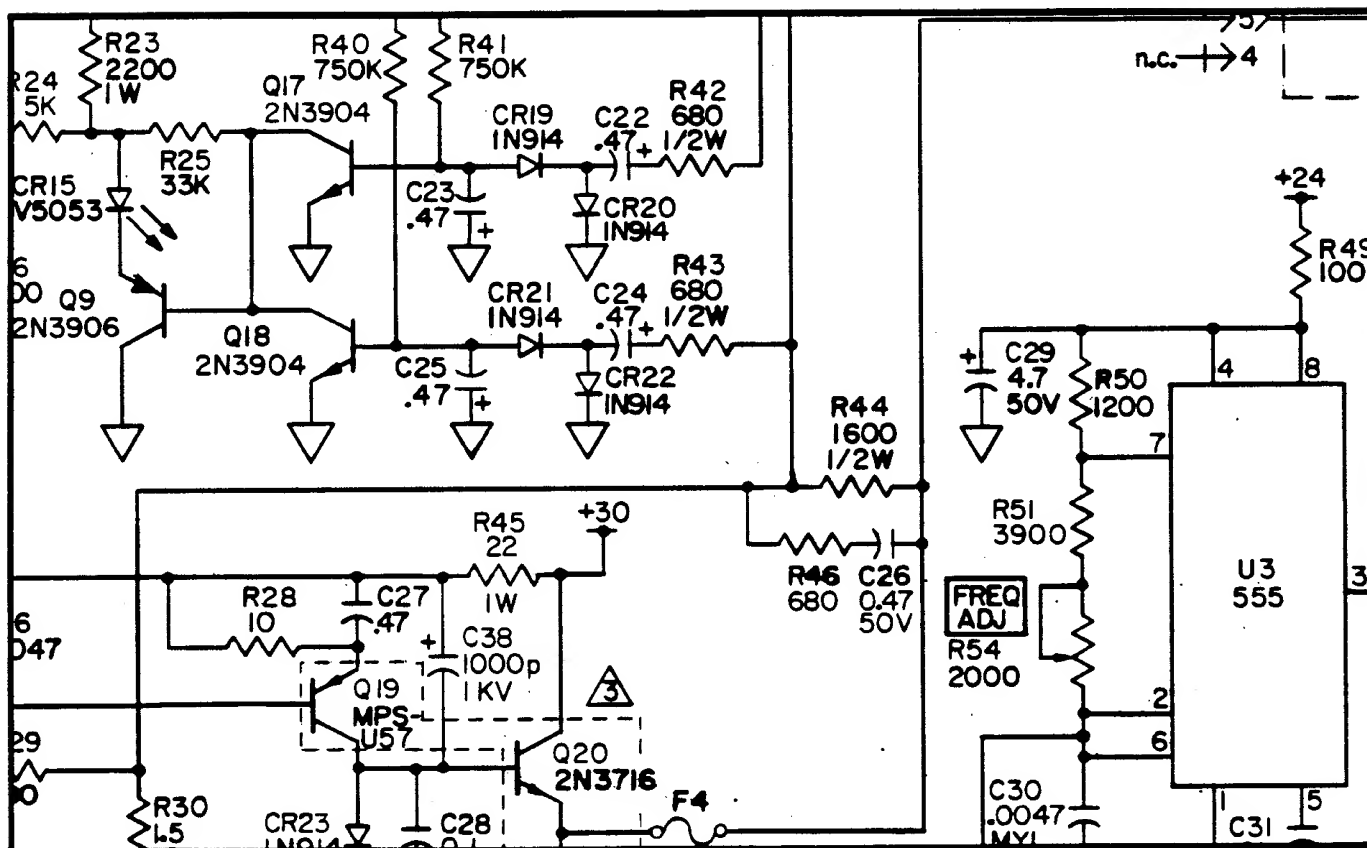
Service Manual
Complete with Schematics and Illustrated Parts Lists



Atari 13-Inch Color X-Y Display

(Atari Part No. A200003-01)

Service Manual Complete with Schematics and 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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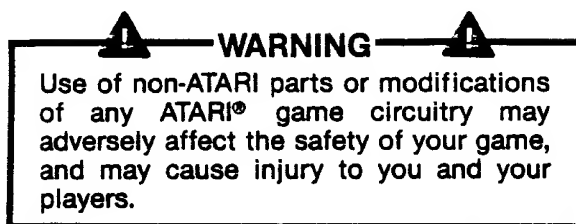
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Notice Regarding Non-ATARI Parts



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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ATARI 13-Inch Color X-Y Display

1 WARNINGS AND CAUTIONS

This color X-Y display has been built to Atari specifications by Amplifone, Inc. This display is not contained within a separate chassis; instead, the printed-circuit board (PCB) and the cathode-ray tube assembly (CRT) are separately mounted inside the game cabinet. Input signals for the display are supplied through a 15-pin harness connector that is wired to the Deflection PCB.

This display operates similarly to those used in ATARI black-and-white X-Y video games, such as Asteroids®, Battlezone®, or Red Baron™. However, this display has three Z amplifiers for controlling the three color guns of the cathode-ray tube. This tube is a 90-degree, in-line gun, stripe-phosphor, color cathode-ray tube.

WARNINGS

High Voltage

This display contains high voltages capable of delivering lethal quantities of energy. To avoid danger, do not attempt to service the display until you have observed all precautions necessary for working on high-voltage equipment.

X-Radiation

This display has been designed for minimum X-radiation hazard. To reduce risk of possible exposure to X-radiation, take X-radiation protective measures for personnel during servicing. It is imperative that you never modify the high-voltage circuitry.

Implosion Hazard

The high vacuum cathode-ray tube is dangerous to handle. If you drop the cathode-ray tube and it breaks, it will implode! Shattered glass can fly 6 feet or more from the implosion site. Use care when replacing the cathode-ray tube.

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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:

1. Strong electric shock, due to high voltage or AC line voltage
2. X-ray radiation (when the display is out of adjustment)
3. 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.

B. Safety Measures

Good safety habits will allow you to automatically take the proper precautions, 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 on an electrical connection, which could cause a severe electrical shock.

If you service the ATARI 13-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 frayed wires are found, replace them with the same gauge, insulation type, thickness, and length of wire. Always observe the original lead dress (routing and length of harness wires).

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

C. Cathode-Ray Tube Handling

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 by the neck; the neck should only be used to guide the lifting process.

ATARI 13-Inch Color X-Y Display

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

If 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 jumper wire. 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. Failure to do this could cause a rise in the high voltage.

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, 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, 25-0-25), within +10, -15%.
X-Amplifier Input	16 V peak-to-peak (± 8 V) for 10.5 inches of Voltage deflection.
Y-Amplifier Input Voltage	12 V peak-to-peak (± 6 V) for 8 inches of deflection.
Z-Amplifier Drive	+3.5 V for maximum intensity; 1.0 V for black level.

Input Impedance:

X Amplifier	3.3 kilohms
Y Amplifier	2.2 kilohms
Z Amplifiers	2.2 kilohms

B. Z Bandwidth

8 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 Adjustable	Focus

3 DETAILS OF OPERATION

A basic 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 section.

A. Low-Voltage Power Supply

Input voltage of 50 VAC is applied to the bridge rectifier (CR1, CR2, CR3, CR4) through fuses F1 and F2. The bridge circuit converts the AC input voltage into an unfiltered DC voltage. Capacitors C5 and C8 form the first stage of filtering for the ± 30 VDC provided by the bridge.

The input voltage is also applied to the degaussing circuit if posistor PTC1 is cool. This occurs when power is initially applied to the display. At this time the current flowing through the degaussing coil will degauss the cathode-ray tube (CRT). However, after PTC1 becomes heated, current is removed from the degaussing coil, making it inoperative.

The +30 V and -30 V are applied to regulators U1 and U2. These electronic regulators provide stable DC voltages of +24 V and -24 V.

B. High-Voltage Power Supply

Oscillator U3 provides a squarewave output at pin 3 that runs at about 20 kHz. Variable resistor R54 (off pin 6 of U3) sets the operating frequency of this oscillator. The output from U3 drives current amplifiers Q25 and Q26. These, in turn, drive the primary of transformer T1. Transformer T1 is a step-down type that is used to increase the current.

Transistor Q24 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 also off the secondary 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 Q23 will fire, turning off oscillator U3. This shuts off the high-voltage power supply.

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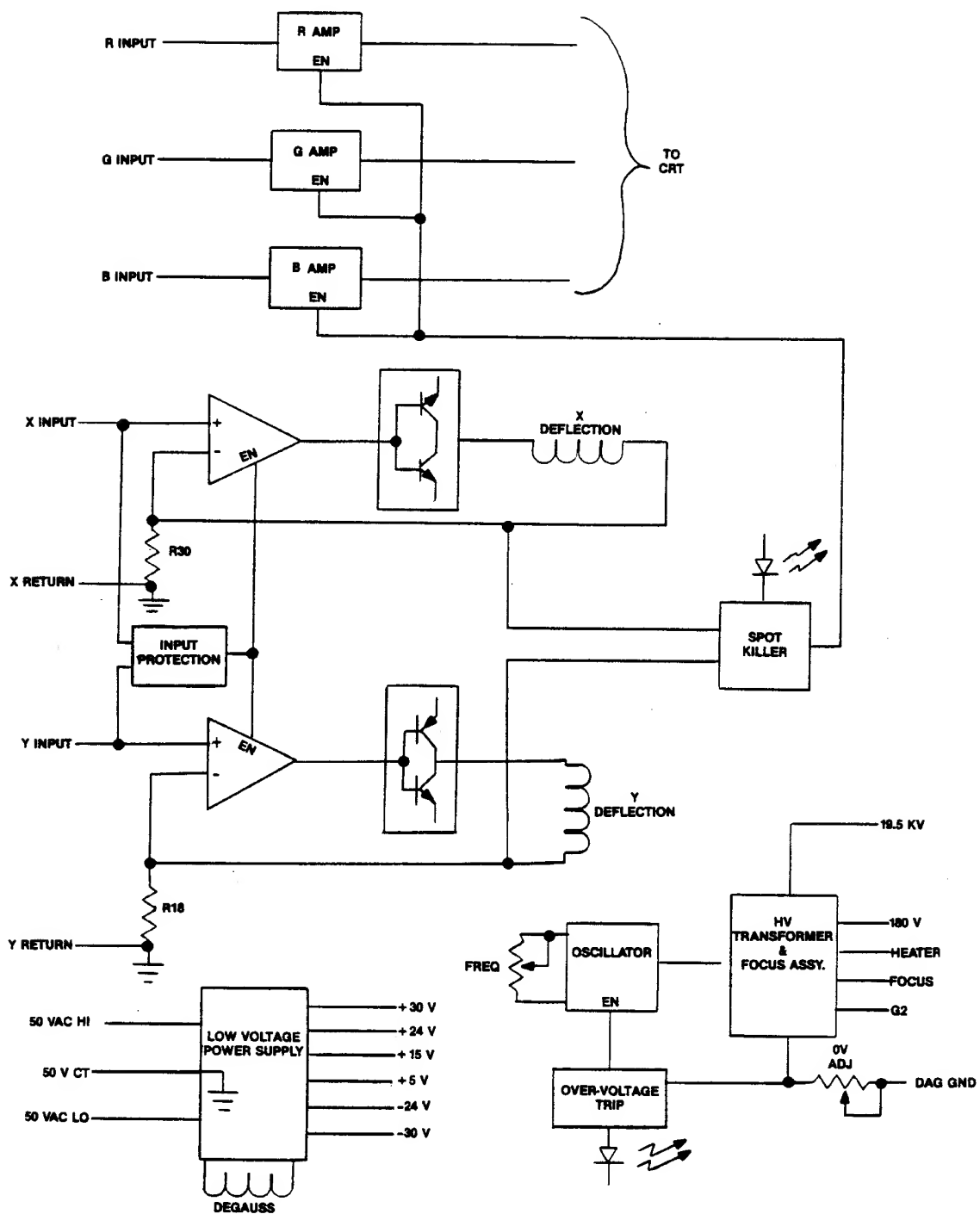


Figure 1 Display Block Diagram

D. X and Y Deflection Amplifiers

NOTE

Because the X and Y deflection amplifiers are similar in operation, only the Y deflection amplifier is described here.

The Y deflection amplifier processes the Y signals developed by the game circuitry and provides final amplification to drive the Y deflection coil of the CRT. The Y input signal is applied to the base of Q6, which is connected as a differential amplifier with transistor Q7. Constant current for this differential amplifier is supplied by Q8.

After amplification by Q6 and Q7, the Y signal is applied through driver Q13 to the emitter-follower pair of Q14 and Q15. The Y signal from the emitters of Q14 and Q15 is then applied through fuse F3 to the Y deflection coil of the CRT. Transistor Q16 is the constant-current source for driver Q13.

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 will turn 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 R1 to the bases of Q1 and Q2, and the X input signal is applied through R3 to the bases of Q3 and Q4. If either vertical or horizontal deflection is excessive in average DC level, at least one of transistors Q1 through Q4 will turn on. This turns off Q5, which then shuts down the X and Y deflection amplifiers.

F. 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 is described here.

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Transistors Q1 through Q3 comprise a cascode amplifier that provides the final amplification for the red intensity signal from the game circuitry. Variable resistor R8 is the RED DRIVE adjustment and sets the amount of gain in this stage. Variable resistor R11 is the RED BIAS adjustment and is used to set the cutoff characteristics of this stage. The amplified signal from the collector of Q3 is applied across R10 to the red cathode gun of the CRT.

When the spot killer is turned on, transistor Q10 will turn 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 R18 and R30. These sample deflection voltages are rectified and filtered by CR19 and CR20 (for the Y signal) and by CR21 and CR22 (for the X signal). Then they are applied to the bases of Q17 and Q18.

Anytime either deflection amplifier is not driving current through the CRT deflection coils, then that side of the spot killer will not be receiving a sample signal. This lack of signal on the base of either Q17 or Q18 will turn on that transistor. When either Q17 or Q18 conducts, Q9 will also conduct. The signal at the emitter of Q9 causes CR15 to illuminate, indicating that the spot killer is on. From the cathode of CR15, the spot killing signal is applied to the base of Q10 (located on the Neck PCB). When Q10 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! Observe the precautions regarding high voltages and cathode-ray tube handling when servicing this display.

Tools Required to Replace the Display Assemblies: Phillips-head screwdriver.

A. Cathode-Ray Tube Replacement

NOTE

You must readjust the BRIGHTNESS control whenever the cathode-ray tube is replaced.

1. Disconnect the 15-pin video-signal connector, which is wired to the Deflection PCB.
2. Unplug the Neck PCB from the rear of the cathode-ray tube.
3. Discharge the high voltage from the cathode-ray tube as follows:
 - a. Attach one end of a well-insulated 18-gauge jumper wire 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.
4. Unplug the degaussing coil 2-pin connector from the Deflection PCB.
5. Unplug the yoke 5-wire connector from the Deflection PCB.
6. Unhook the spring that runs across the back of the cathode-ray tube.

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7. Remove the four screws holding the cathode-ray tube.
8. CAREFULLY remove the cathode-ray tube by easing it out the front of the cabinet. Refer to the operators manual for your product for complete instructions on how to perform this step.
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. Yoke Replacement

NOTE

You must reconverge the picture and readjust the purity whenever the yoke is replaced.

1. Disconnect the 15-pin video-signal connector which is wired to the Deflection PCB.
2. Unplug the Neck PCB from the rear of the cathode-ray tube.
3. Discharge the high voltage from the cathode-ray tube using the procedure given in step 3 under Cathode-Ray Tube Replacement.
4. Use a thin knife or a single-edged razor blade to carefully loosen the rubber wedges (located under the yoke) from the cathode-ray tube surface. Remove the magnetic strips, if any.
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 yoke assembly off the end of the cathode-ray tube.
7. To replace a yoke assembly, reverse the order of this procedure. Replace the magnetic strips only if complete convergence cannot be obtained with the convergence magnets.

C. Neck PCB Replacement

1. Disconnect the 1-pin focus-wire connector from the Neck PCB.
2. Unplug the Neck PCB from the rear of the cathode-ray tube.
3. Unplug the connector from the Dag spring.
4. Disconnect the 14-pin video-signal connector at the Neck PCB.

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5. To install a Neck PCB, reverse the order of this procedure.

D. Deflection PCB Replacement

1. Disconnect the 15-pin video-signal connector, which is wired to the Deflection PCB.
2. Unplug the 9-pin and 4-pin connectors from the Neck PCB; the 2-pin connector from the deguassing coil; the 5-pin connector from the yoke; and the individual wires to the Dag spring, cathode-ray tube socket, and anode. See step 3 under Cathode-Ray Tube Replacement.
3. Remove the two Phillips-head screws securing the Deflection PCB to the cabinet.
4. Slide the Deflection PCB from the cabinet.
5. To install the Deflection PCB, reverse the order of this procedure.

E. High-Voltage Transformer Replacement

1. Remove the Deflection PCB from the cabinet as previously described under Deflection PCB Replacement.
2. Unsolder the white wire at the top of the focus assembly.
3. Remove the four sheet-metal screws that attach the high-voltage cage cover to the display.
4. Remove the two small hex nuts that secure the transformer to the Deflection PCB.
5. Unsolder the seven transformer connections on the bottom of the Deflection PCB.
6. Lift the transformer off the Deflection PCB.
7. 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 observe the precautions regarding high voltages when making adjustments on this display!

A. Focus Adjustment

The FOCUS control (FA1) should be adjusted if the screen image is not sharply defined. Figure 4 shows the location of the FOCUS control. Turn this control until you get optimum screen sharpness; then readjust for a slightly defocused image to enlarge the line size. This is the only control not preset by the factory.

B. Brightness

The BRIGHTNESS control (R31) is set at the factory and then sealed. Do not adjust the BRIGHTNESS control unless the cathode-ray tube is replaced. Figure 2 shows the location of the BRIGHTNESS control. To adjust, follow the steps below.

1. Turn on the display. Allow it to warm up for 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 appropriate game manual.

C. Purity Adjustments

NOTE

The Convergence Adjustments must be performed after completion of the Purity Adjustments.

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.

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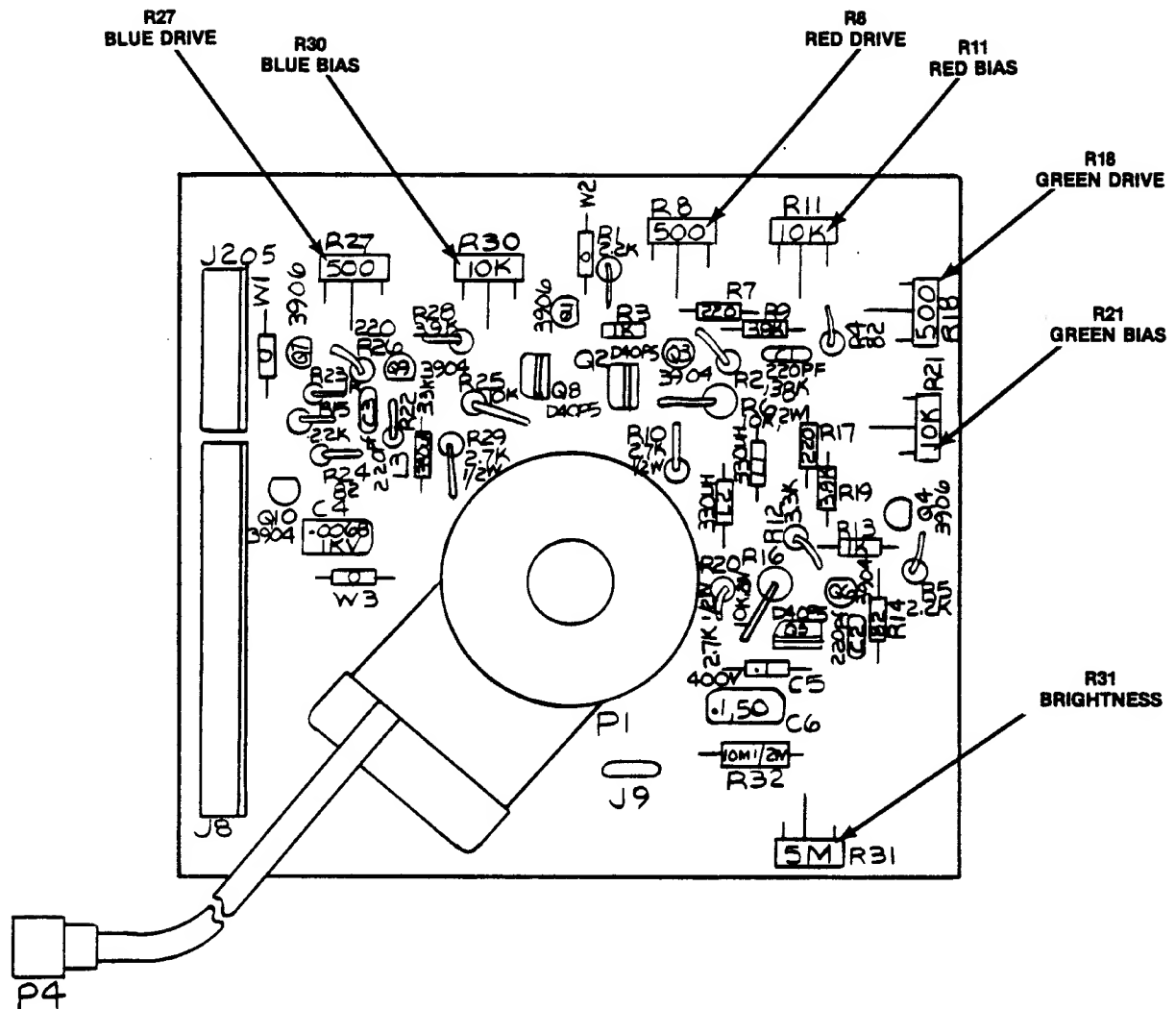


Figure 2 Adjustable Controls on the Neck PCB

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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 cabinet 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 in the game manual for 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.

15. Slide the deflection yoke forward until the crosshatch pattern is entirely green. Continue the forward movement of the yoke until other colors begin to show on the display. This is the forward purity-adjustment limit of the yoke.

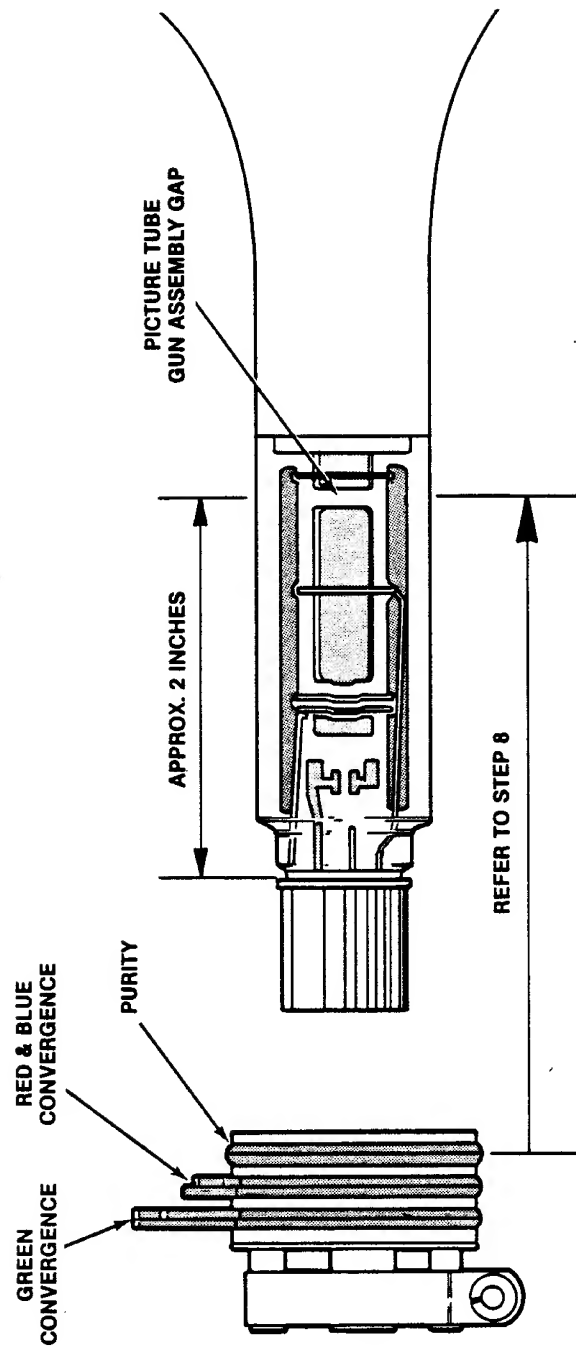


Figure 3 Purity and Convergence Adjustments

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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 to the middle of the forward and rear purity-adjustment limits. Tighten the yoke-mounting screw.
18. Set the game to display the red and green crosshatch diagnostic patterns.
19. Check the display for good overall purity.
20. Perform the Convergence Adjustments.

D. Convergence Adjustments

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 in the game manual for 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.

- 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.

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- 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 not already done as part of the Purity Adjustments, 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. While maintaining the vertical position of the yoke, tilt it 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.
 - e. 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 c and d of this procedure.
 - f. Set the game to display the crosshatch diagnostic pattern composed of all three colors (this should appear as a white crosshatch pattern).
 - g. 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 white glue.
4. Tighten the deflection-yoke mounting screw.

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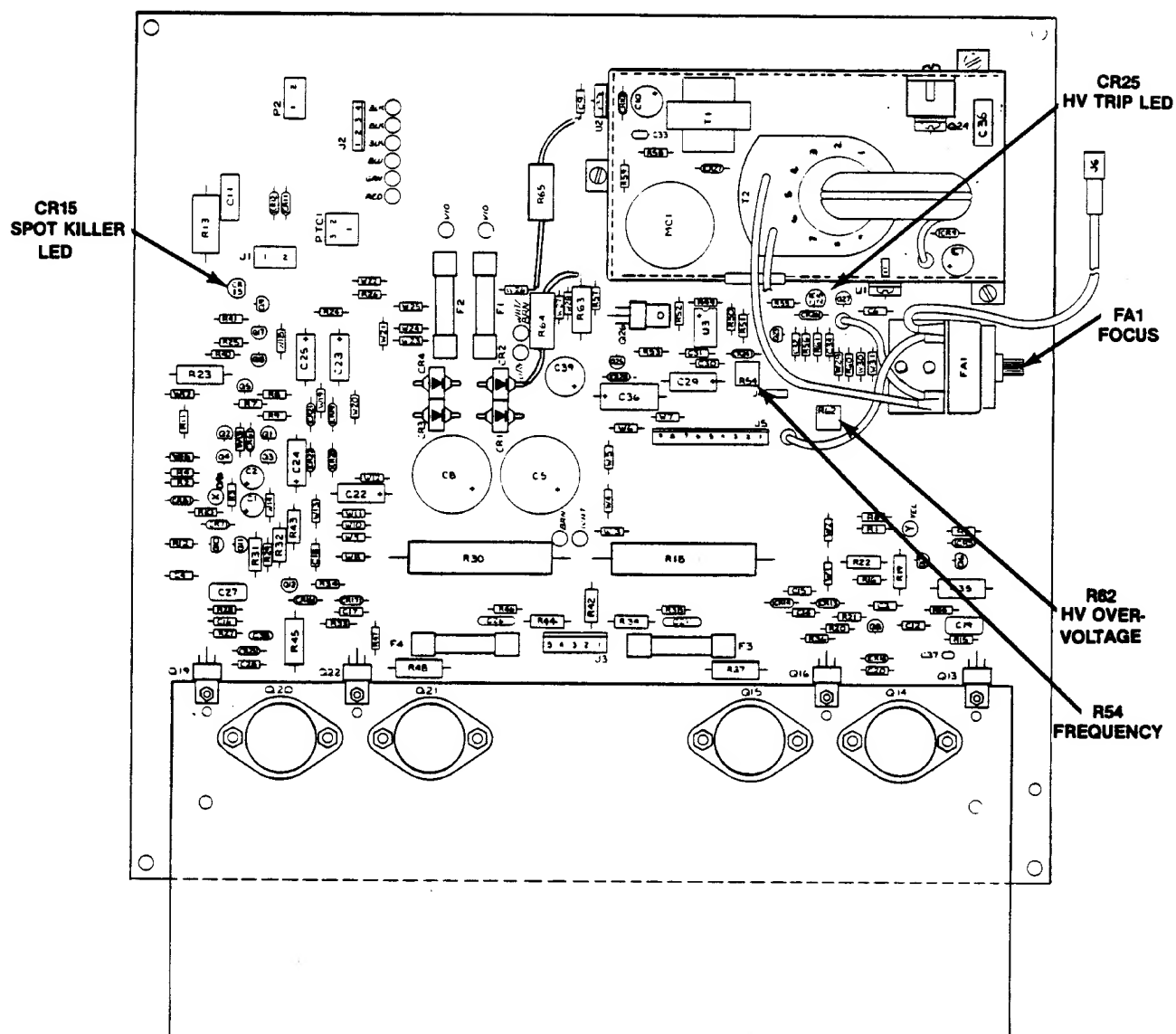
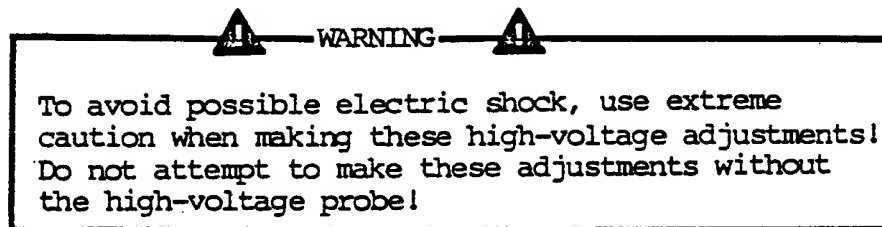


Figure 4 Adjustable Controls on the Deflection PCB

E. Tracking Adjustments

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. Refer to Figure 2 for the location of these controls.
3. Adjust RED BIAS R11, GREEN BIAS R21, and BLUE BIAS R30 until the fifth line from the right in the center group of lines is pure white.
4. Adjust RED DRIVE R8, GREEN DRIVE R18, and BLUE DRIVE R27 until the far right 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. High-Voltage Power Supply Adjustments



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 R62 to its fully counterclockwise position. Figure 2 shows the location of the HV OVER-VOLTAGE and FREQUENCY controls.
6. Rotate FREQUENCY R54 for a reading of +25 kV on the voltmeter.
7. Very slowly rotate HV OVER-VOLTAGE R62 until the voltmeter reading just drops to 0 and HV Trip LED CR25 illuminates.
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.

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10. Remove power from the display and then remove the high-voltage probe from the anode connection.

6 ILLUSTRATED PARTS LISTS

This chapter provides the necessary information for you to order parts for your ATARI 13-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, and bolts.

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.

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

ATARI 13-Inch Color X-Y Display

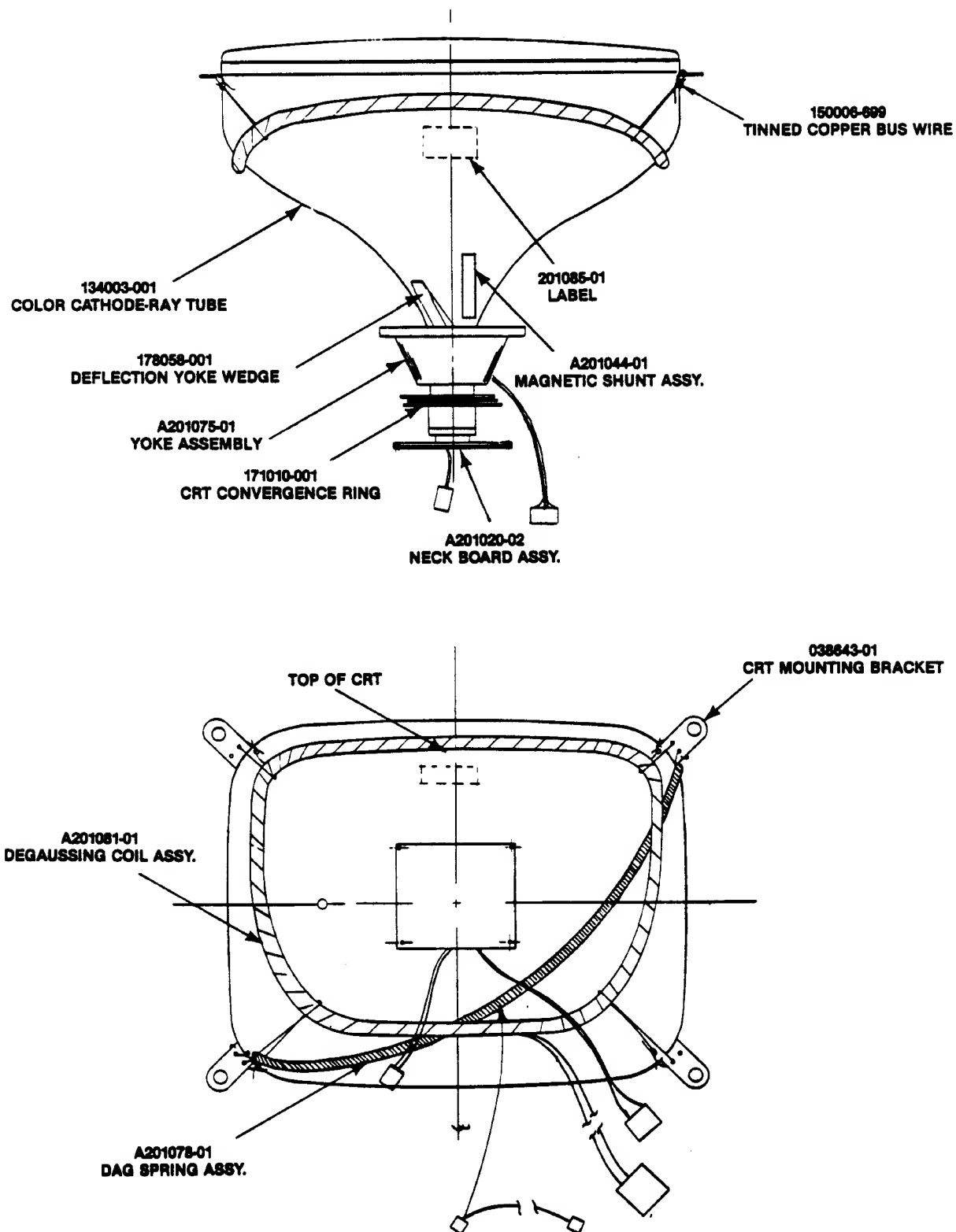


Figure 5 Cathode-Ray Tube Assembly

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Cathode-Ray Tube Assembly A201074-01 1

A201020-02	Neck Board Assembly
A201044-01	Magnetic Shunt Assembly
▲ A201075-01	Yoke Assembly
A201078-01	Dag Spring Assembly
▲ A201081-01	Degaussing Coil Assembly
038643-01	Color X-Y CRT Mounting Bracket
▲ 134003-001	Type-13VBSP22 13-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
201085-01	Label

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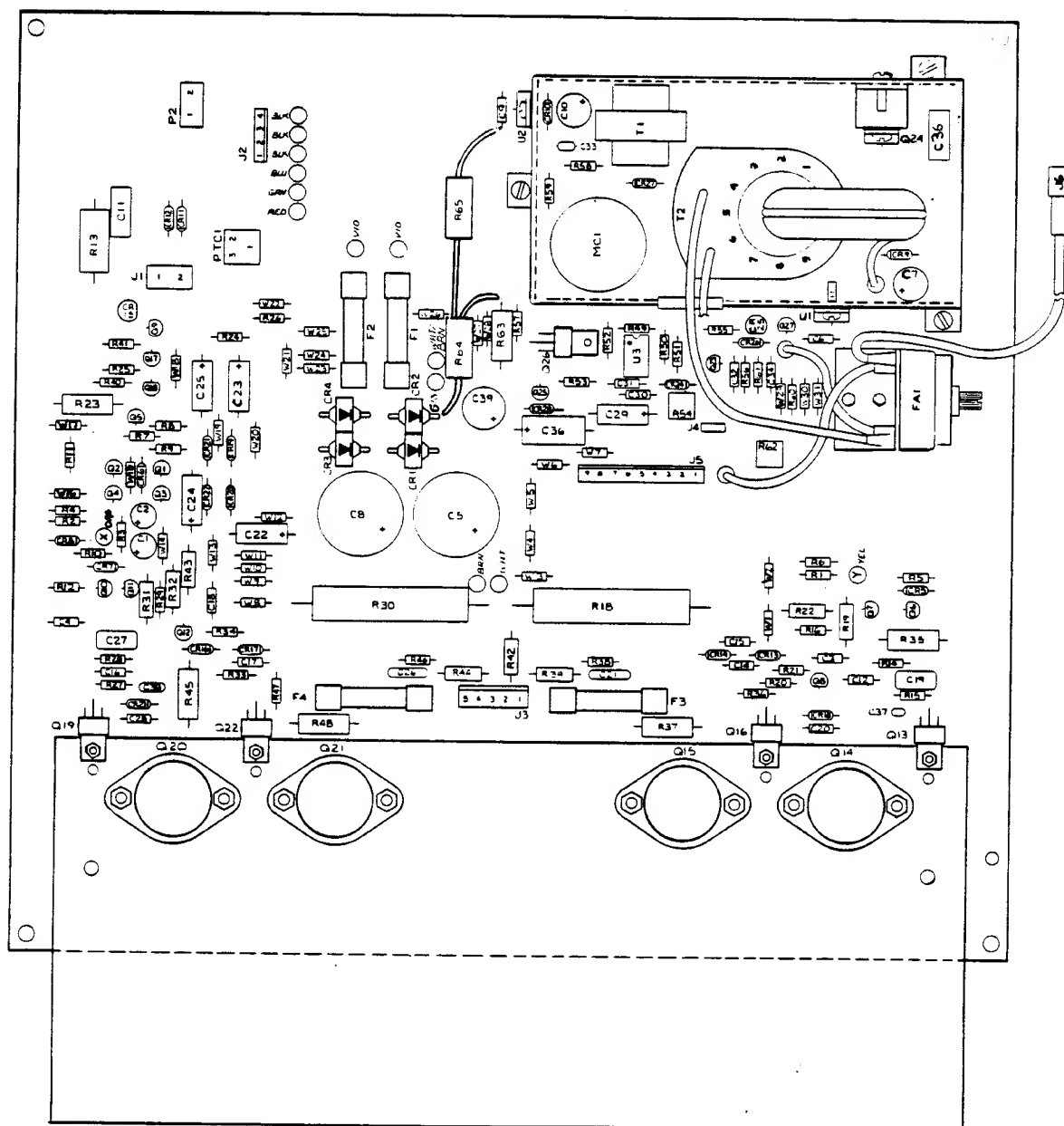


Figure 6 Deflection PCB Assembly

Deflection PCB Assembly
A201066-01 3

Assemblies

FA1	Focus Assembly (Assembly consists of: 201011-01—Focus Mounting Bracket, 171008-001—Focus Control, A201059-02—Lead Wire Assembly, 201060-01—Jumper Wire, 201060-02—Jumper Wire, and 178064-001—Insulating Boot)	A201068-01
MC1	Ind./Reactive Voltage Regulator Assembly	A201006-01
T1	Driver Transformer Assembly	A201008-01
T2	Ultra Tuned I.F.T.M. Assembly	A201005-01
	Harness Assembly	A201070-01
	High-Voltage Cage Assembly	A201071-01
	Fan Power Harness Assembly	A201089-01
	High-Voltage Transistor/Bracket Assembly (Assembly consists of: 133005-001—400 V, 7 A, NPN Power Transistor; 201091-01—High-Voltage Transistor Bracket; 178109-001—Mica Insulator; and 175000-055—Shoulder Washer)	A201090-01
Q24		

Capacitors

C1, C2	100 uF, 25 V, Radial-Lead Aluminum Electrolytic Capacitor	123003-107
C3, C4	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C5	4700 uF, 50 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123001-478
C6	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C7	100 uF, 35 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123000-107
C8	4700 uF, 50 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123001-478
C9	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C10	100 uF, 35 V, Vented, Radial-Lead Aluminum Electrolytic Capacitor	123000-107
C11	0.056 uF, 400 V Metallic/Polyester Capacitor	121009-563
C12	0.0047 uF, ±10%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122015-472

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C14, C15	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C16	0.0047 uF, ±10%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122015-472
C17, C18	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C19	0.47 uF, 100 V Radial-Lead Mylar Capacitor	21-101474
C20	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C21	0.47 uF, 50 V, Radial-Lead Aluminum Electrolytic Cap- Capacitor	123001-474
C22-C25	0.47 uF, 50 V, Aluminum Electrolytic Axial-Lead Cap- Capacitor	124001-474
C26	0.47 uF, 50 V, Radial-Lead Aluminum Electrolytic Capacitor	123001-474
C27	0.47 uF, 100 V Radial-Lead Mylar Capacitor	21-101474
C28	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C29	4.7 uF, 50 V Axial-Lead Aluminum Electrolytic Capacitor	24-500475
C30	0.0047 uF, 100 V Radial-Lead Mylar Capacitor	21-101472
C31, C32	0.01 uF, +80%, -20%, 50 V Minimum, Axial-Lead Cera- mic Capacitor	122014-103
C33	0.001 uF, ±10%, 1 kV, Radial-Lead Ceramic Capacitor	121012-102
C34	0.1 uF, +80%, -20%, 50 V Minimum, Axial-Lead Ceramic Capacitor	122002-104
C35	0.033 uF, ±5%, 600 V, Radial-Lead Polypropylene Capacitor	121011-333
C36	47 uF, 50 V Axial-Lead Aluminum Electrolytic Capacitor	24-500476
C37, C38	0.001 uF, ±10%, 1 kV, Radial-Lead Ceramic Capacitor	121012-102
C39	10 uF, +50%, -20%, 200 V, Radial-Lead Aluminum Elec- trolytic Capacitor	123007-106

Diodes

▲ CR1-CR4	100 V, 6 A, Plastic Diode MR751	131007-001
CR5-CR7	Type-1N914, 100V, 250 mW Switching Diode	31-1N914
▲ CR8	Type-1N751A, 5.1 V, +5%, 500 mW Zener Diode	32-1N751A
CR9-CR12	Type-1N4001, 50 V Switching Diode	31-1N4001
CR13, CR14	Type-1N914, 100V, 250 mW Switching Diode	31-1N914
CR15	Type-MV5053 Light-Emitting Diode	38-MV5053
CR16-CR24	Type-1N914, 100V, 250 mW Switching Diode	31-1N914
CR25	Type-MV5053 Light-Emitting Diode	38-MV5053
CR26	Type-1N754A, 6.8 V, +5%, 400 mW Zener Diode	131002-001
CR27	1000 V, 1A, Fast Recovery Rectifier Diode MR818	131004-001
CR28	Type-1N5245B, 15 V, 500 mW Zener Diode	131016-001
Q23	100 V, 0.8 A, Silicon Controlled Rectifier	131005-003

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Diode MCR100-3

Integrated Circuits

U1	24 V, 1 A, Fixed Voltage Regulator 7824	137183-001
U2	-24 V, 1 A, Fixed Voltage Regulator 7924	137220-001
U3	Integrated Circuit Timer LM555	37-555

Resistors

PTC1	3 Ω , 60 V, $\pm 10\%$, Positive-Temperature-Coefficient Resistor	110012-030
R1	82 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-823
R2	10 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-103
R3	100 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-104
R4	10 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-103
R5	680 Ω , $\pm 5\%$, 1/4 W Resistor	110000-681
R6	1.5 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-152
R7	1 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-102
R8, R9	22 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-223
R10	1.8 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-182
R11	22 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-223
R12	1.5 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-152
R13	22 Ω , $\pm 5\%$, 2 W, Metal-Film Resistor	110010-220
R14	390 Ω , $\pm 5\%$, 1/4 W Resistor	110000-391
R15	10 Ω , $\pm 5\%$, 1/4 W Resistor	110000-100
R16	390 Ω , $\pm 5\%$, 1/4 W Resistor	110000-391
R18	1.5 Ω , $\pm 5\%$, 10 W, Wire-Wound Resistor	116003-001
R19	2.7 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-272
R20	100 Ω , $\pm 5\%$, 1/4 W Resistor	110000-101
R21	91 Ω , $\pm 5\%$, 1/4 W Resistor	110000-910
R22	4.7 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-472
R23	2.2 k Ω , $\pm 5\%$, 1 W Resistor	110009-222
R24	15 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-153
R25	33 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-333
R26	2.2 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-222
R27	390 Ω , $\pm 5\%$, 1/4 W Resistor	110000-391
R28	10 Ω , $\pm 5\%$, 1/4 W Resistor	110000-100
R29	390 Ω , $\pm 5\%$, 1/4 W Resistor	110000-391
R30	1.5 Ω , $\pm 5\%$, 10 W, Wire-Wound Resistor	116003-001
R31	2.7 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-272
R32	4.7 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-472
R33	100 Ω , $\pm 5\%$, 1/4 W Resistor	110000-101
R34	91 Ω , $\pm 5\%$, 1/4 W Resistor	110000-910
R35	22 Ω , $\pm 5\%$, 1 W Resistor	110009-220

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R36	15 Ω , $\pm 5\%$, 1/4 W Resistor	110000-150
R37	22 Ω , $\pm 5\%$, 1 W Resistor	110009-220
R38	820 Ω , $\pm 5\%$, 1/4 W Resistor	110000-821
R39	1.2 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-122
R40, R41	750 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-754
R42, R43	680 Ω , $\pm 5\%$, 1/2 W Resistor	110001-681
R44	1.6 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-162
R45	22 Ω , $\pm 5\%$, 1 W Resistor	110009-220
R46	680 Ω , $\pm 5\%$, 1/4 W Resistor	110000-681
R47	15 Ω , $\pm 5\%$, 1/4 W Resistor	110000-150
R48	22 Ω , $\pm 5\%$, 1 W Resistor	110009-220
R49	1 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-102
R50	1.2 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-122
R51	3.9 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-392
R52	22 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-223
R53	2.2 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-222
R54	2 k Ω , Horizontal Trimming Potentiometer (FREQ ADJ)	119002-202
R55	2.2 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-222
R56	470 Ω , $\pm 5\%$, 1/4 W Resistor	110000-471
R57	4.7 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-472
R58	2.2 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-222
R59	39 Ω , $\pm 5\%$, 1/4 W Resistor	110000-390
R60	33 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-333
R61	1 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-102
R62	20 k Ω , Horizontal Trimming Potentiometer (HV OVER-VOLTAGE ADJ)	119002-203
R63	560 Ω , $\pm 5\%$, 1 W Resistor	110009-561
R64, R65	50 Ω , $\pm 5\%$, 5 W Resistor	116001-500
W1-W32	0 Ω Resistor	110005-001

Transistors

Q1	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q2	Type-2N3906, 1 W, 40 V, PNP Transistor	33-2N3906
Q3	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q4, Q5	Type-2N3906, 1 W, 40 V, PNP Transistor	33-2N3906
Q6-Q8	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q9	Type-2N3906, 1 W, 40 V, PNP Transistor	33-2N3906
Q10-Q12	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q13	2 A, 100 V, PNP Medium Power Transistor MPSU57	133008-001
Q14	Type-2N3716, 10 A, 80 V, NPN Power Transistor	133006-001
Q15	Type-2N3792, 10 A, 80 V, NPN Power Transistor	133007-001
Q16	2 A, 100 V, Medium Power NPN Transistor MPSU07	133003-001
Q17, Q18	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904

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Q19	2 A, 100 V, PNP Medium Power Transistor MPSU57	133008-001
Q20	Type-2N3716, 10 A, 80 V, NPN Power Transistor	133006-001
Q21	Type-2N3792, 10 A, 80 V, NPN Power Transistor	133007-001
Q22	2 A, 100 V, Medium Power NPN Transistor MP5U07	133003-001
Q25	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904
Q26	2 A, 100 V, Medium Power NPN Transistor MP5U07	133003-001
Q27	Type-2N3904, 350 mW, 60 V, NPN Switching Transistor	34-2N3904

Miscellaneous

Thermally Conductive Compound	78-16001
Thermally Conductive Silicon Insulator	78-16014
Nylon Snap-In Fastener	81-4302
Nylon Shoulder Washer	175000-002

Mica Insulator, TO-3	178062-001
Preformed Silicon Boot Insulator	178064-001
Mica Insulator, TO-220	178109-001
Grommet Strip	178113-001

Fuse Clip	179050-002
Heat Sink	201019-01
High-Voltage Cage Cover	201073-01

▲ F1, F2	5 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-2015002
▲ F3, F4	3 A, 250 V, 3AG Slow-Blow Glass Cartridge-Type Fuse	46-2033002
J1	2-Position Header Connector	179069-002
J2	4-Position Header Connector	79-58317
J3	5-Position Header Connector	79-58318
J4	Terminal, Fast-On Tab	17-9051-001
J5	9-Position Header Connector	79-58319

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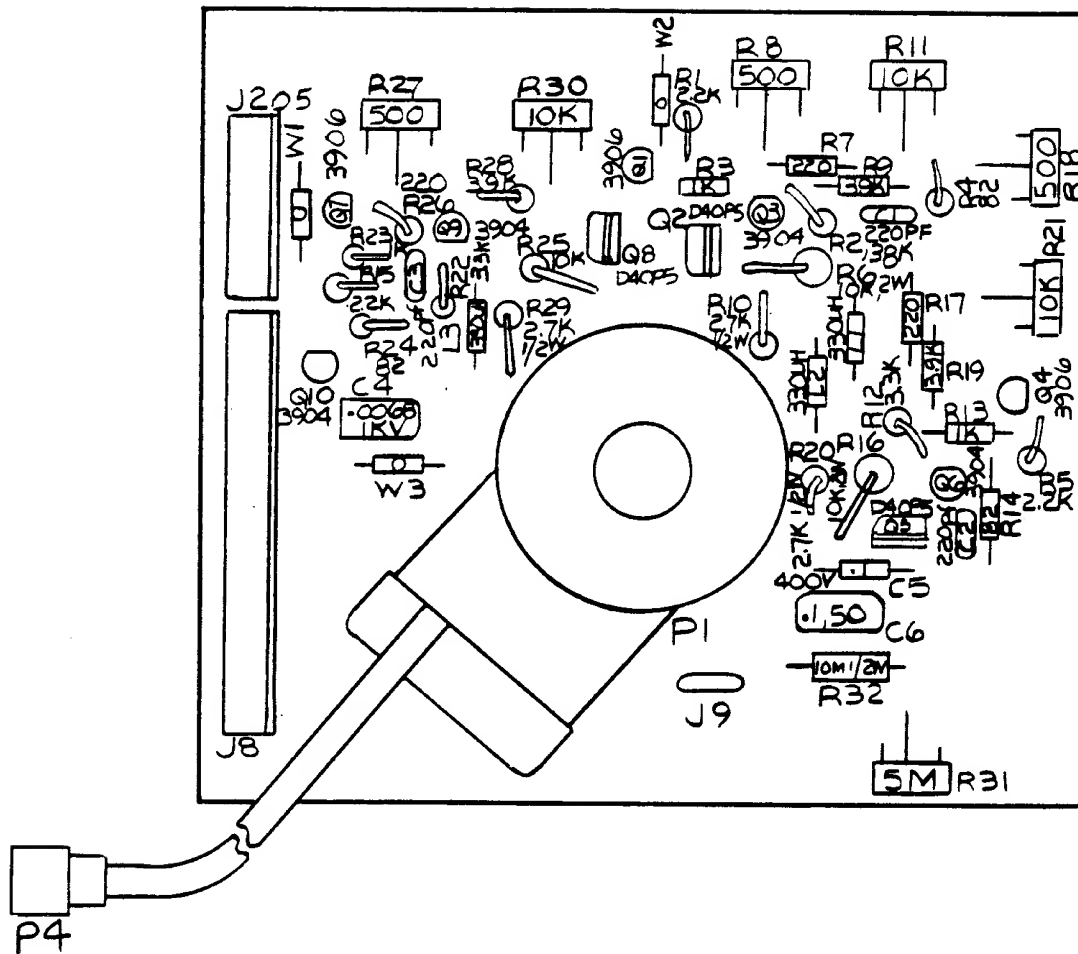


Figure 7 Neck PCB Assembly

Neck PCB Assembly
A201020-02 1

Capacitors

C1-C3	220 pF, 100 V Minimum, Mica Capacitor	128002-221
C4	0.0068 μ F, +80%, -20%, 1 kV, Ceramic Capacitor	120000-682
C5	0.1 μ F, $\pm$ 20%, 400 V, Radial-Lead Mylar Capacitor	126002-104
C6	0.1 μ F, +80%, -20%, 50 V, Ceramic Capacitor	122002-104

Inductors

L1-L3	330 μ H, $\pm$ 10%, Inductor	141009-001
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Resistors

R1	2.2 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-222
R2	3.3 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-332
R3	1 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-102
R4	82 Ω , $\pm$ 5%, 1/4 W Resistor	110000-820
R5	2.2 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-222
R6	10 k Ω , $\pm$ 5%, 2 W Resistor	110010-103
R7	220 Ω , $\pm$ 5%, 1/4 W Resistor	110000-221
R8	500 Ω Vertical Trimming Potentiometer (Red Drive)	119001-501
R9	3.9 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-392
R10	2.7 k Ω , $\pm$ 5%, 1/2 W Resistor	110001-272
R11	10 k Ω , Vertical Trimming Potentiometer (Red Bias)	119001-103
R12	3.3 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-332
R13	1 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-102
R14	82 Ω , $\pm$ 5%, 1/4 W Resistor	110000-820
R15	2.2 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-222
R16	10 k Ω , $\pm$ 5%, 2 W Resistor	110010-103
R17	220 Ω , $\pm$ 5%, 1/4 W Resistor	110000-221
R18	500 Ω Vertical Trimming Potentiometer (Green Drive)	119001-501
R19	3.9 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-392
R20	2.7 k Ω , $\pm$ 5%, 1/2 W Resistor	110001-272
R21	10 k Ω Vertical Trimming Potentiometer (Green Bias)	119001-103
R22	3.3 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-332
R23	1 k Ω , $\pm$ 5%, 1/4 W Resistor	110000-102
R24	82 Ω , $\pm$ 5%, 1/4 W Resistor	110000-820
R25	10 k Ω , $\pm$ 5%, 2 W Resistor	110010-103
R26	220 Ω , $\pm$ 5%, 1/4 W Resistor	110000-221

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R27	500 Ω Vertical Trimming Potentiometer (Blue Drive)	119001-501
R28	3.9 k Ω , $\pm 5\%$, 1/4 W Resistor	110000-392
R29	2.7 k Ω , $\pm 5\%$, 1/2 W Resistor	110001-272
R30	10 k Ω Vertical Trimming Potentiometer (Blue Bias)	119001-103
R31	5 M Ω Vertical Trimming Potentiometer (Brightness)	119001-505
R32	10 M Ω , 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
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
P1, P4	CRT Socket Assembly	A201084-01
	Hazard Shield	201052-01
	Nylon Snap-In Fastener	81-4302

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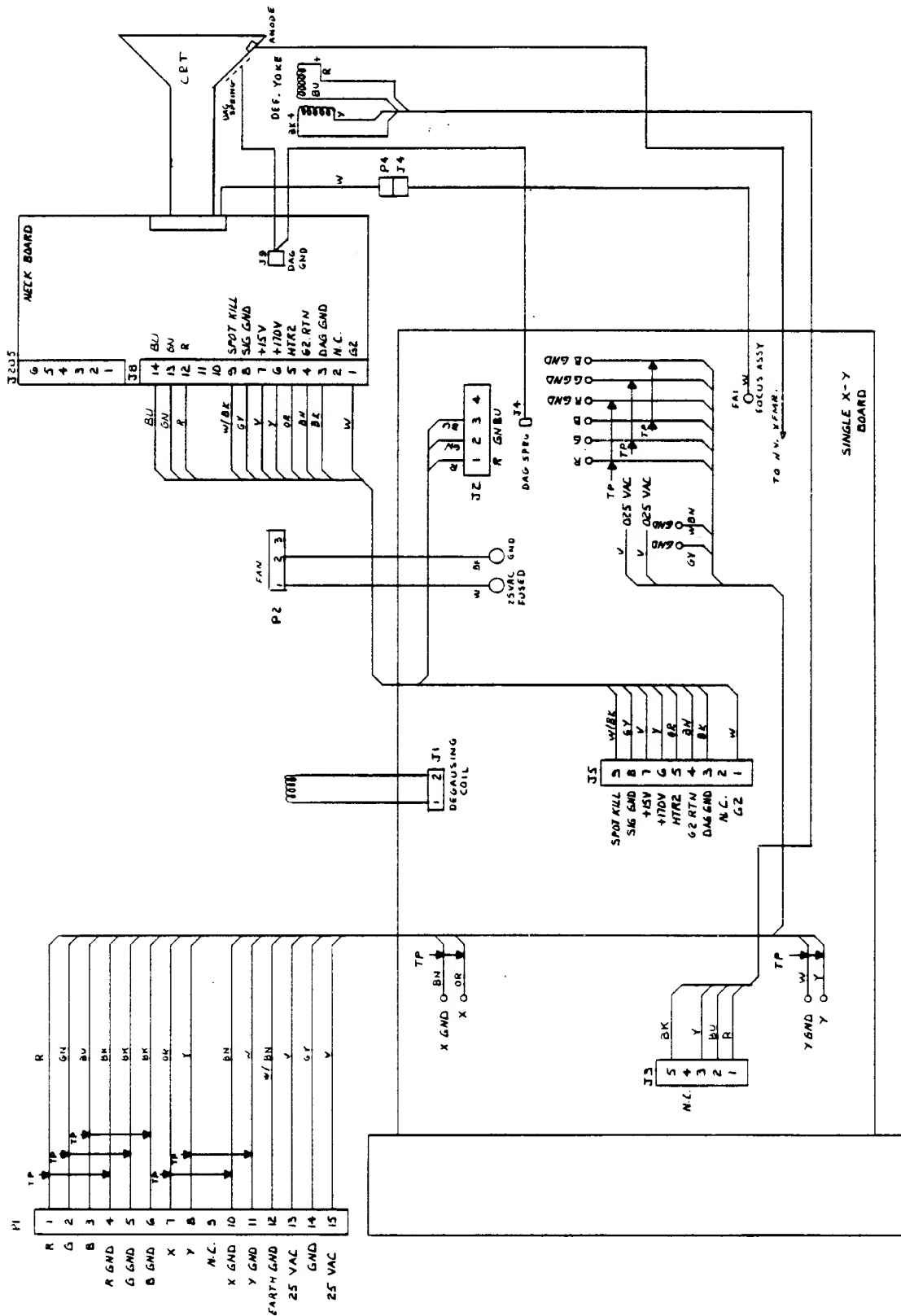


Figure 8 Wiring Diagram

ATARI 13-Inch Color X-Y Display

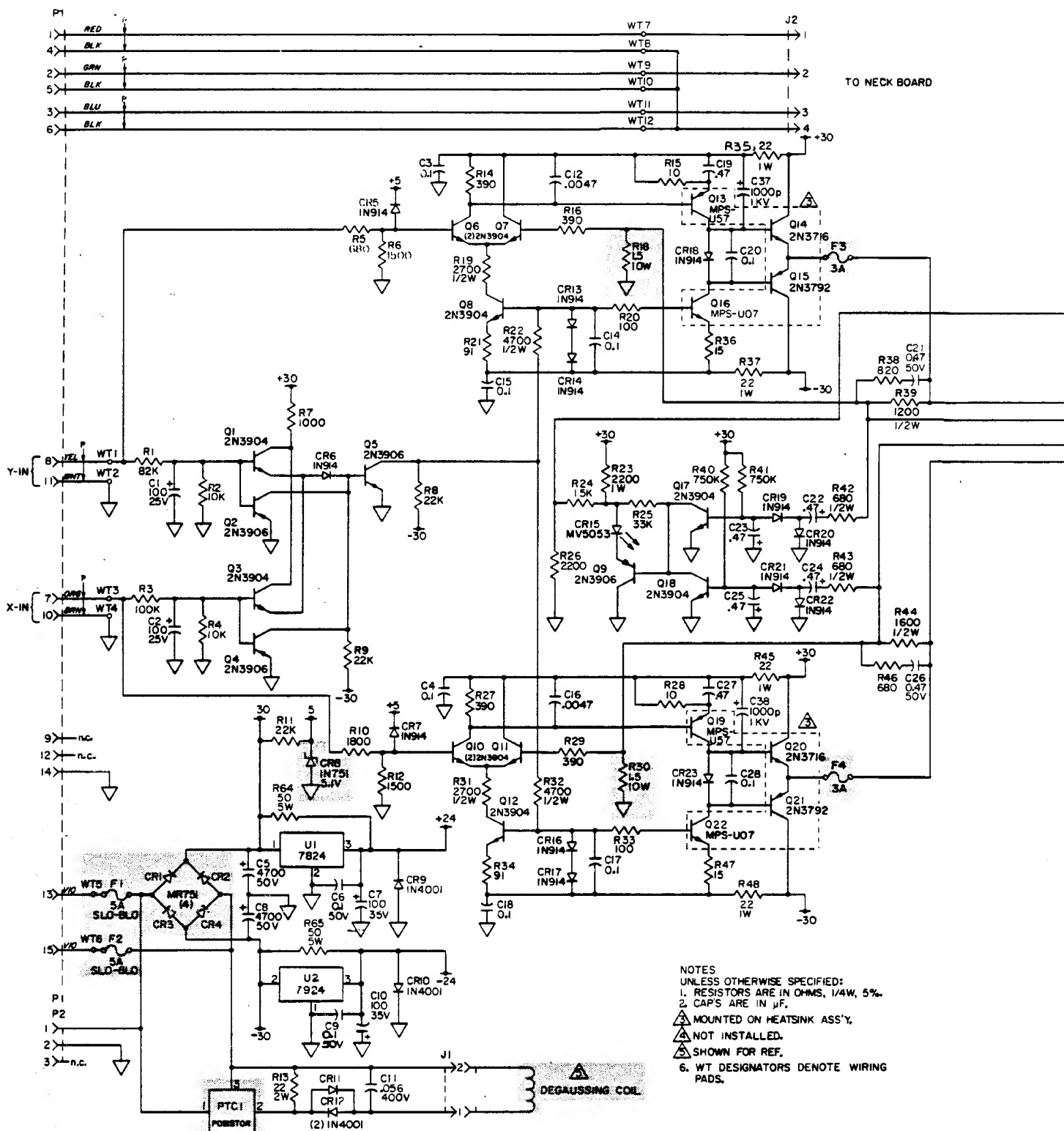


Figure 9 Deflection PCB Schematic Diagram

ATARI 13-Inch Color X-Y Display

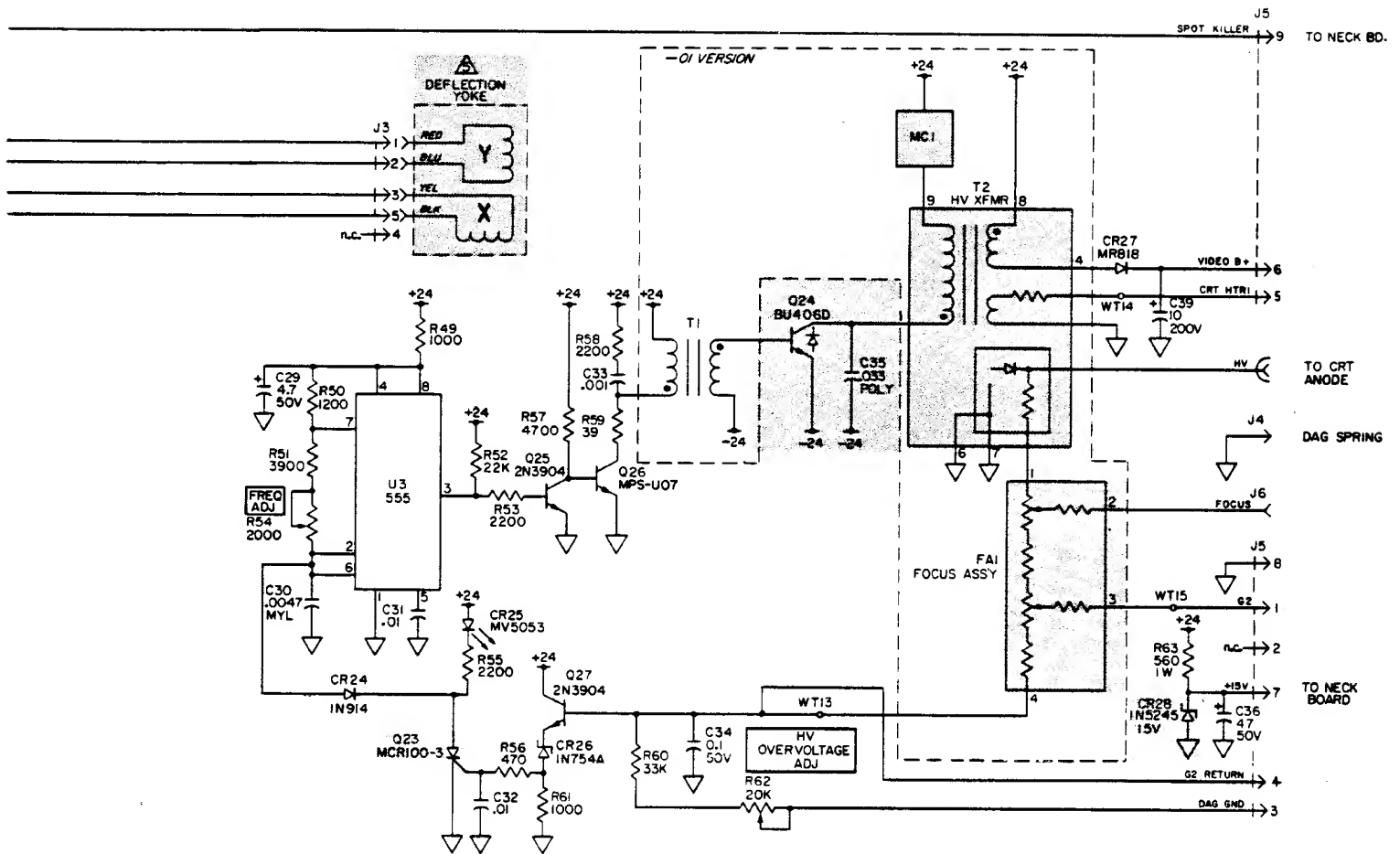


Figure 9 Deflection PCB Schematic Diagram, continued

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Figure 10 Neck PCB Schematic Diagram

