HEWLETT PACKARD

HP 82912A

HP 82913A

Video Monitor

SERVICE MANUAL

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CONTENTS

TABLES

ILLUSTRATIONS

SECTION
I

GENERAL INFORMATION

1.1 INTRODUCTION

This service manual contains information to help you troubleshoot and repair the HP 82912A and HP 82913A Video Monitors.

The seven sections in this manual give:

- A description of the monitor.
- A brief description of its circuits.
- Information for disassembling and reassembling the monitor.
- Adjustment procedures.
- Steps for troubleshooting, repairing, and testing the monitor.
- Replaceable parts lists.
- Reference diagrams.

Before using this manual in an actual repair, read through sections I and II to learn about the monitor and its operation, and sections III through VII to become familiar with the service procedures.

The appendix contains optional troubleshooting procedures for component-level repair.

1.2 DESCRIPTION

The HP 82912A (9-inch) and the HP 82913A (12-inch) Video Monitors provide a CRT capability for the HP-86 Personal Computer. The 80-column display can be used for alpha or graphics information. The monitor also includes an audio amplifier, which is not used by the HP-86.

Table 1-1. Specifications

Physical Properties

9-inch monitor

- Width: 270 millimeters (10.6 inches).
- Height: 225 millimeters (8.6 inches).
- Depth: 261 millimeters (10.3 inches).
- Weight: 4.8 kilograms (10.56 pounds).

12-inch monitor

- Width: 382 millimeters (15 inches).
- Height: 299 millimeters (11.75 inches).
- Depth: 330 millimeters (13 inches).
- Weight: 6.7 kilograms (14.7 pounds).

Display

Active Display Area

- 9-inch monitor: 165 x 126 millimeters (6.50 x 4.96 inches).
- 12-inch monitor: 230 x 150 millimeters (9.05 x 5.90 inches).

Picture Tube

- 9-inch monitor: C9M60P31ARF.
- 12-inch monitor: C1270P31ARF.

Characters: 80 characters with 24 lines (5 x 7 dot matrix, 8 x 8 dot/cell).

Color: Green phosphor.

Connectors

Video Input and Output: RCA type phone pin jack.
Audio Input and Output: RCA type phone pin jack.

Table 1-1. Specifications (Continued)

Electrical

Power Consumption

- 9-inch monitor: 28W.
- 12-inch monitor: 30W.

Power Supply

- Standard: 120V 60 Hz.
- Option 001: 220V/240V 50/60 Hz.

Video Input Signal

- Polarity: Negative sync.
- Level: 1.0 Vp-p.
- Impedance: 75 ohms (switchable to higher impedance).

Scanning Frequency

- Horizontal: 15.75 kHz (63.5 us).
- Vertical: 60 Hz (16.67 ms) 50 Hz (20.0 ms).

Video Bandwidth: 30 Hz to 20 MHz (+- 3 dB).

Audio Output Power: 1.0W (10% distortion).

Audio Input Power: -36 dBm (input impedance 5 kOhms, 0.1 Vp-p).

Temperature Limits

Operating Temperature: 0 to 40 degrees C (32 to 104 degrees F).

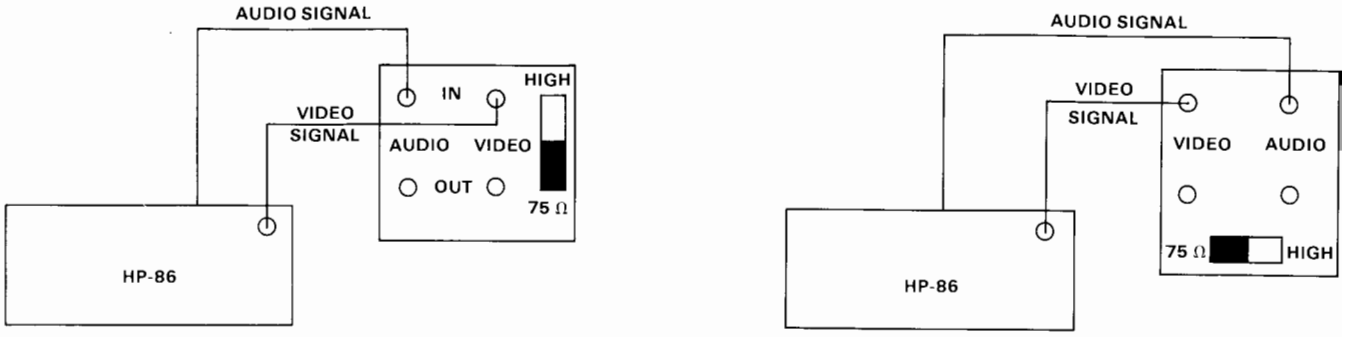
Storage Temperature

- 9-inch monitor: -40 to 75 degrees C.
- 12-inch monitor: -40 to 65 degrees C.

1.3 INSTALLATION

The monitor should be connected to a microcomputer that has a video output impedance of 75 ohms.

For one monitor:

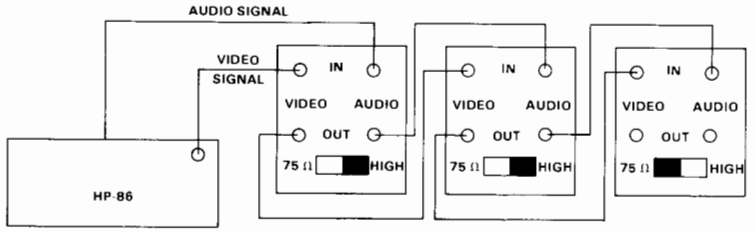


HP 82912A HP 82913A

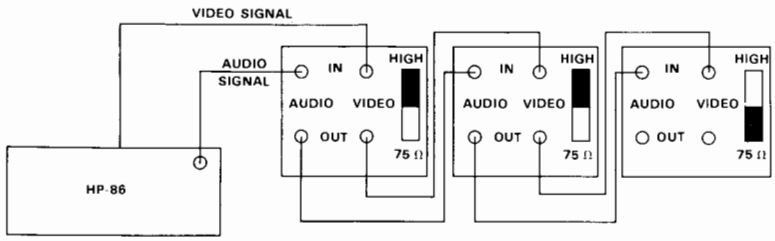
Figure 1-1. Single Monitor Video Connection

Feed the video signal from the microcomputer to the unit's VIDEO IN connector and slide the impedance switch to the 75 ohm position.

For two or more monitors:



HP 82913A



HP 82912A

Figure 1-2. Multiple Monitor Video Connection

Connect the first monitor as described above, but slide the impedance switch to the HIGH position. Connect the video signal from the VIDEO OUT connector of the first monitor to the VIDEO IN connector of the second, and so on. The impedance switch on all of the monitors except the last one should be set to the HIGH position. The switch on the last monitor should be set to 75 ohms.

1.4 RECOMMENDED TOOLS

Table 1-2 contains the recommended tools for monitor adjustment and repair.

Table 1-2. Recommended Tools

HP PART/MODEL NUMBER	DESCRIPTION
8730-0008	Screwdriver, Small Flat-blade
8710-0899	Screwdriver, #1 Pozidriv®
8710-1355	CRT Alignment Tool
HP 3465 or HP 3466	Digital Voltmeter
8710-1107	Pliers, Long-nose, Serrated Tip
HP 82163A	Test Pattern Generator*

* Optional, see paragraph 5.3. A known good microcomputer may be substituted.

SECTION
II

FUNCTIONAL DESCRIPTION

2.1 INTRODUCTION

The HP 82912A and HP 82913A Video Monitors contain two major circuit assemblies. The Main PWB (printed wiring board) is designated PW 279; the Video PWB is designated PW 280.

The support circuitry for the monitor consists of these main elements:

- Power regulator circuit.
- Video PWB.
- Audio output circuit.
- Vertical deflection circuit.
- Blanking circuit.
- Horizontal deflection circuit.

The monitor provides a CRT function for both alpha and graphics display information when it is connected to a microcomputer such as the HP-86.

The power supply in the HP 82912A and HP 82913A Video Monitor standard models operates over a voltage range of 108 Vac to 132 Vac. The option 001 models require a voltage range of 207 Vac to 265 Vac.

The following description may be better understood by referring to the block diagram (figure 2-1) and the schematic diagrams (figures 7-1 and 7-2).

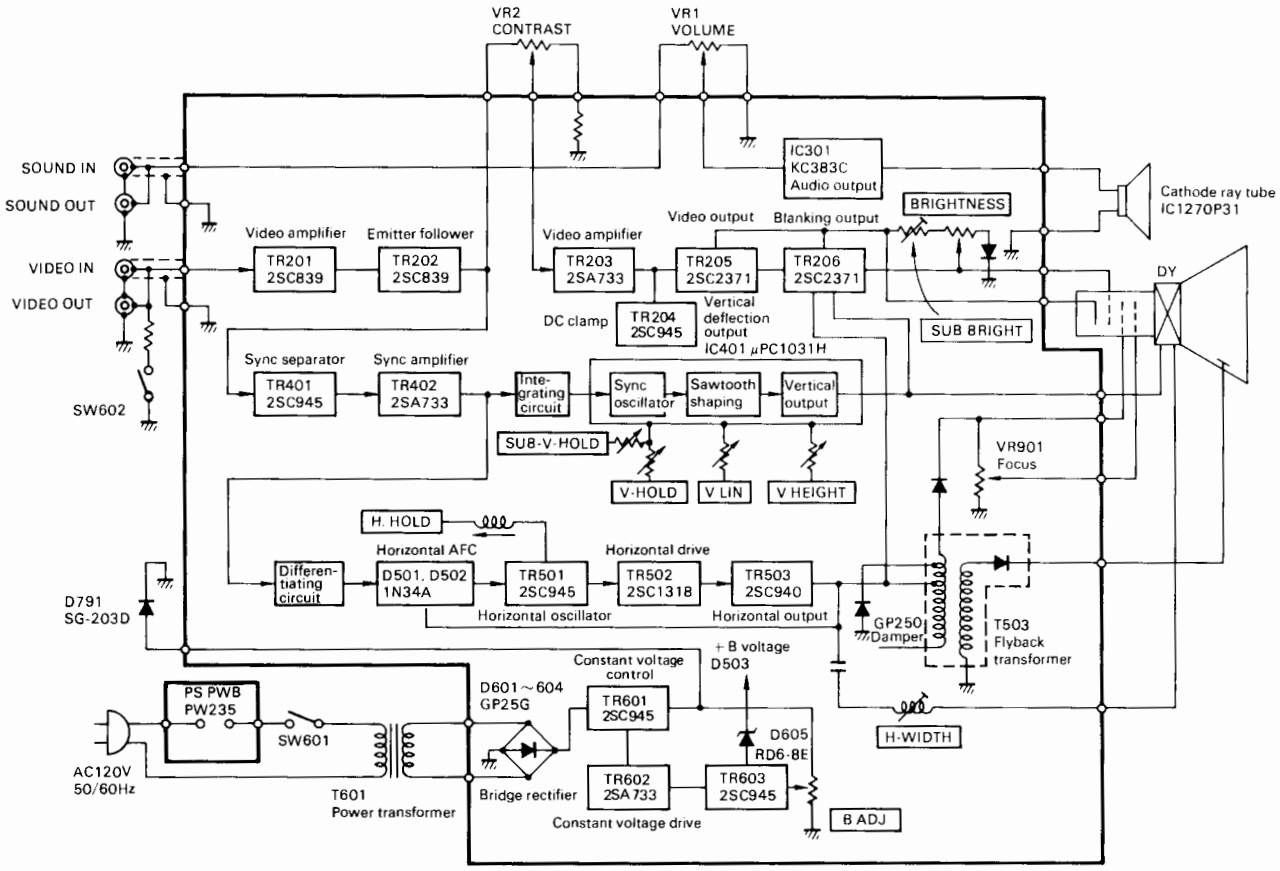


Figure 2-1. Block Diagram

2.2 VIDEO INPUT SIGNAL

The waveform and timing chart of recommended signals are given in figure 2-2.

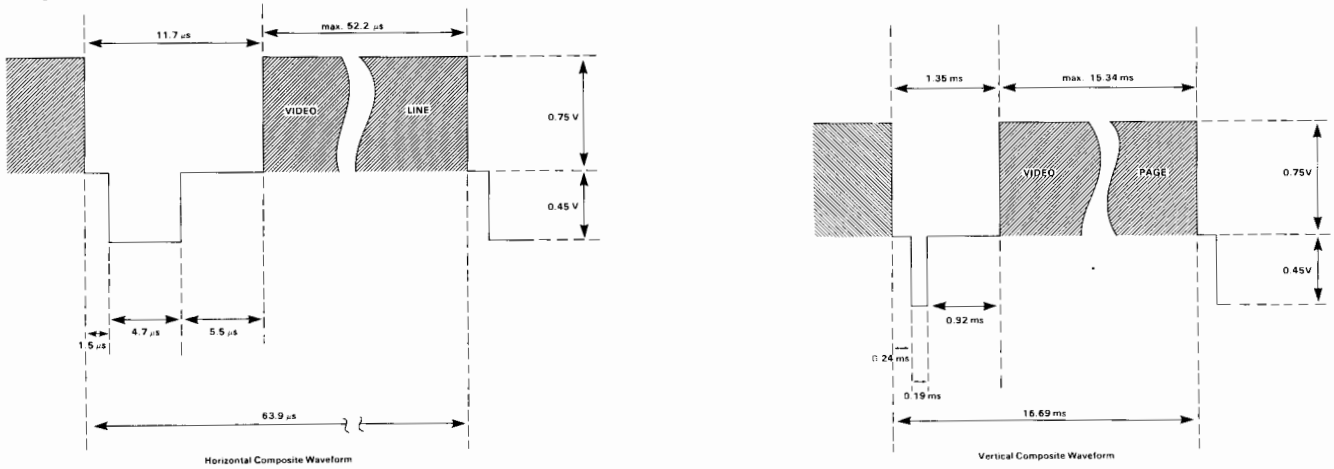


Figure 2-2. Video Input Signal Charts

2.3 POWER REGULATOR CIRCUIT

The power regulator circuit stabilizes the power source voltage. The block diagram (figure 2-3) and the basic circuit (figure 2-4) are used in the discussion that follows.

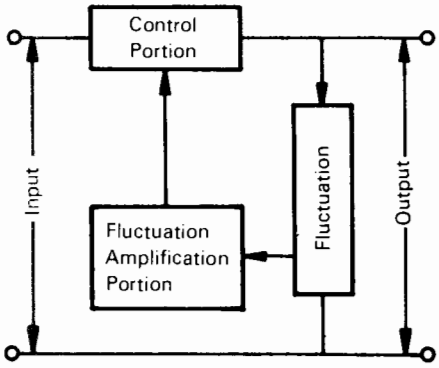


Figure 2-3. Power Regulator Block Diagram

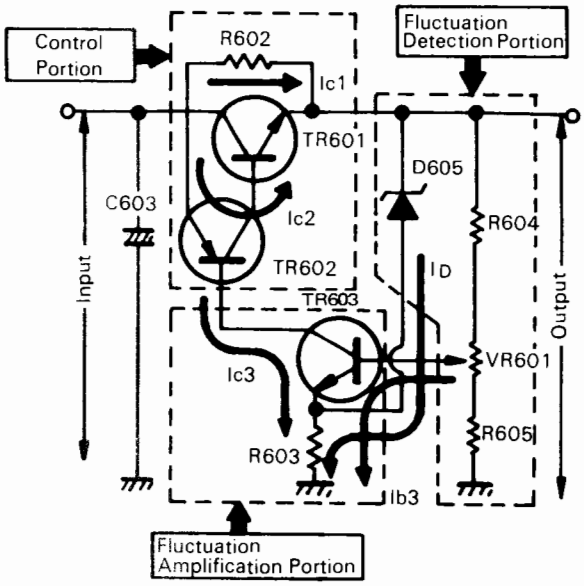


Figure 2-4. Power Regulator Circuit

As shown in the block diagram (figure 2-3), the power regulator circuit comprises three major sections when roughly divided into its functions. The fluctuation detection portion detects the fluctuation of the output voltage and feeds it to the fluctuation amplification portion. The fluctuation amplification portion will amplify the voltage fluctuation and input it to the control portion. Thus, the control portion modifies the +B voltage.

If, for some reason, the output voltage begins to go high, the fluctuation amount will be added to the emitter of transistor TR6Ø3 by the Zener diode D6Ø5, and the emitter voltage will be raised. On the other hand, at the base of transistor TR6Ø3 the voltage fluctuations will be divided at resistors R6Ø4 and R6Ø5, and a fluctuation voltage smaller than the emitter voltage will be added. Therefore, the voltage increase of the emitter will become greater than the base, and the voltage between the base of transistor TR6Ø3 and the emitter will become small. So the base current will decrease.

If the base current of transistor TR6Ø3 decreases, the base currents of transistors TR6Ø2 and TR6Ø1 will decrease. Consequently, the collector current of transistor TR6Ø1 will decrease, causing the output voltage to drop. When the output voltage begins to drop, the potentials of the base and emitter of transistor TR6Ø3 will be reduced; the reduction will be greater for the emitter. Therefore, the voltage difference between the base and emitter will increase, causing Ib3 to increase. So Ic3, Ic2, and Ic1 will increase and cause the output voltage to rise.

When the power switch is turned on, resistor R6Ø2 causes the output voltage to be generated immediately. Without resistor R6Ø2 no output voltage would be impressed, and transistor TR6Ø3 would not turn on. Thus, resistor R6Ø2 is required to actuate this constant voltage circuit at power-up time.

2.4 VIDEO PWB

The video input of 1 Vp-p is fed from the A5 terminal of PW 279 to the base of transistor TR2Ø1 in the first video amplifier via the U2 terminal of the Video PWB (PW 28Ø). Subsequently it is amplified to about 2.7 Vp-p by transistors TR2Ø1 and TR2Ø2.

Between the output side of transistor TR2Ø2 and the amplifier of the next stage, variable resistor VR2 is installed, and the input to transistor TR2Ø3 is increased or decreased by the changes in this division ratio and the adjustment of the picture contrast.

Each stage of the image section is connected with capacitors, so the direct current component will be eliminated, and the average brightness of the picture will be reduced. However, the synchronous pulses of transistor TR4Ø2, which have been delayed by coil L2Ø1 and capacitor C2Ø6, are input to the base of transistor TR2Ø4. During this pulse period transistor TR2Ø4 will maintain continuity. This period is equivalent to the back porch of the composite video signal.

When continuity is established for transistor TR204, the back porch of the video signal on the collector side will be clamped to the electric potential of the emitter.

In this way the video signal, with the direct current portion regenerated by transistor TR204, will be sufficiently amplified by transistor TR205 and impressed on the cathode of the CRT. The output of transistor TR202 will appear at test point TP31 and be synchronously separated at transistor TR401. The synchronous signal which has been amplified by transistor TR402 will pass through terminal W2 to the integration circuit composed of resistors R408 and R409, and capacitors C405 and C408. Only the vertical synchronous signals will be separated and fed to pin 5 of integrated circuit IC401.

Additionally, the synchronous signals which passed through the differentiating circuit composed of capacitor C501 and resistor R501 via terminal W3 will be added to the unbalanced-type AFC circuit.

2.5 AUDIO OUTPUT CIRCUIT

The audio signal entering the AUDIO IN connector will be input to pin 7 of integrated circuit IC301 via terminal S1 of the main PWB and the volume control, variable resistor VR1. At the IC it is amplified to about 40 dB and output to pin 8. Voltage to drive the IC is fed from capacitor C603 to pin 9. Capacitor C305 is for bootstrap; resistor R302 is for output bias.

2.6 VERTICAL DEFLECTION CIRCUIT

As shown in the block diagram in figure 2-5, the vertical deflection circuit is composed of the vertical oscillation circuit for generating the sawtooth wave voltage, amplification waveform shaping, and the output circuit.

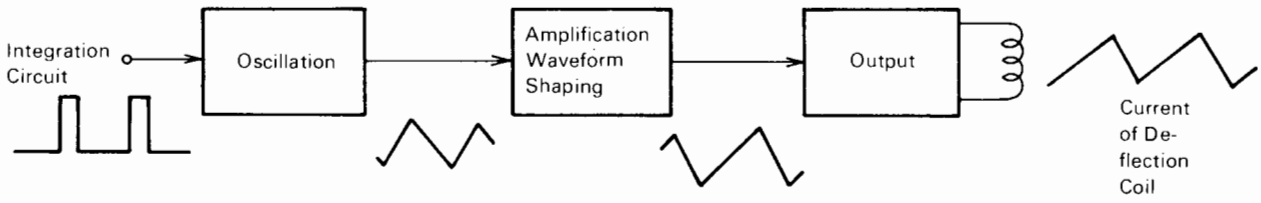


Figure 2-5. Vertical Deflection Circuit Composition

See figure 2-6 while reading the following discussion.

The vertical synchronous signal that has been synchronously separated and which has passed through the integration circuit is added to the

vertical synchronous circuit at pin 5 of integrated circuit IC401. The sawtooth wave of 50 Hz which has been generated by the vertical oscillation circuit is taken from pin 4. After passing through resistor R412, variable resistor VR401, and capacitor C410, it is fed to pin 7. Then, after the waveform shaping, it is amplified and added to the vertical output.

The oscillation is determined by resistor R413 and capacitor C409.

The vertical output waveform includes a superimposed sawtooth wave. High voltage is added to the retrace line period, and low voltage is added to the scanning period. In this way circuit power is reduced and efficiency is increased.

Variable resistor VR401 is for vertical height adjustment; variable resistor VR402 is for vertical linearity adjustment. These are connected to pin 4 and pin 7 respectively. Vertical synchronization (vertical hold) is adjusted with variable resistor VR4.

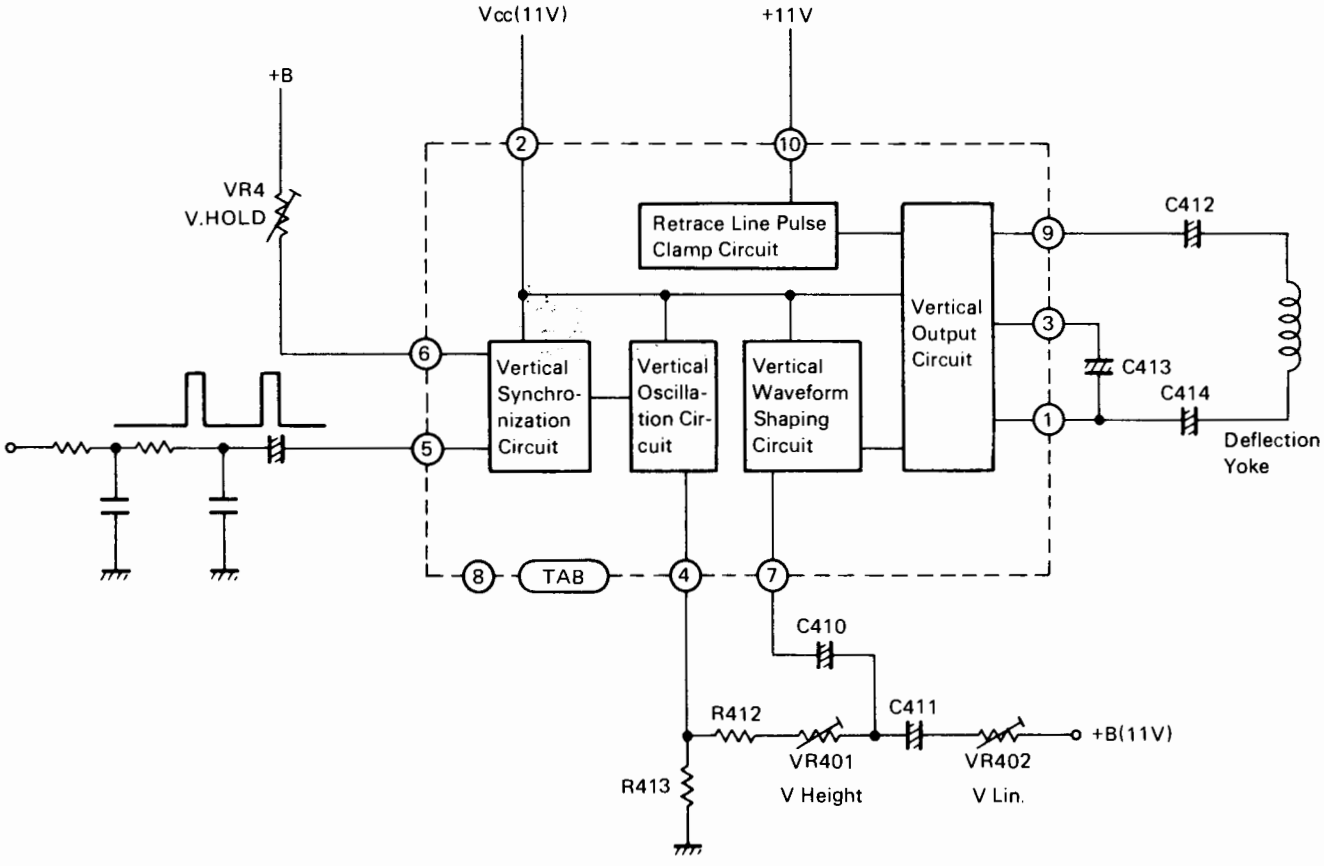


Figure 2-6. Vertical Deflection Circuit

2.7 BLANKING CIRCUIT

During the retrace line period, if the picture tube is operating, white slanted (or flyback) lines will appear on the tube and obstruct the picture. To prevent this problem, it is sufficient to make the picture tube inoperable during the retrace (flyback) line period.

In the circuit, the positive polarity pulse generated during the retrace line period is added to the base of the blanking transistor TR2Ø6 from integrated circuit IC4Ø1 and the collector of the horizontal output transistor TR5Ø3. A negative polarity pulse is taken from the collector of transistor TR2Ø6 and fed to the control grid (G1) of the CRT via capacitor C211 and resistor resistor R228. During the retrace (flyback) line period, the bias of the CRT is cut off.

2.8 HORIZONTAL DEFLECTION CIRCUIT

As shown in figure 2-7, the horizontal deflection circuit includes an AFC circuit, a horizontal oscillation circuit, a horizontal drive circuit, and an output circuit. It passes the sawtooth wave current, synchronized with the horizontal synchronization signal, to the deflection coil.

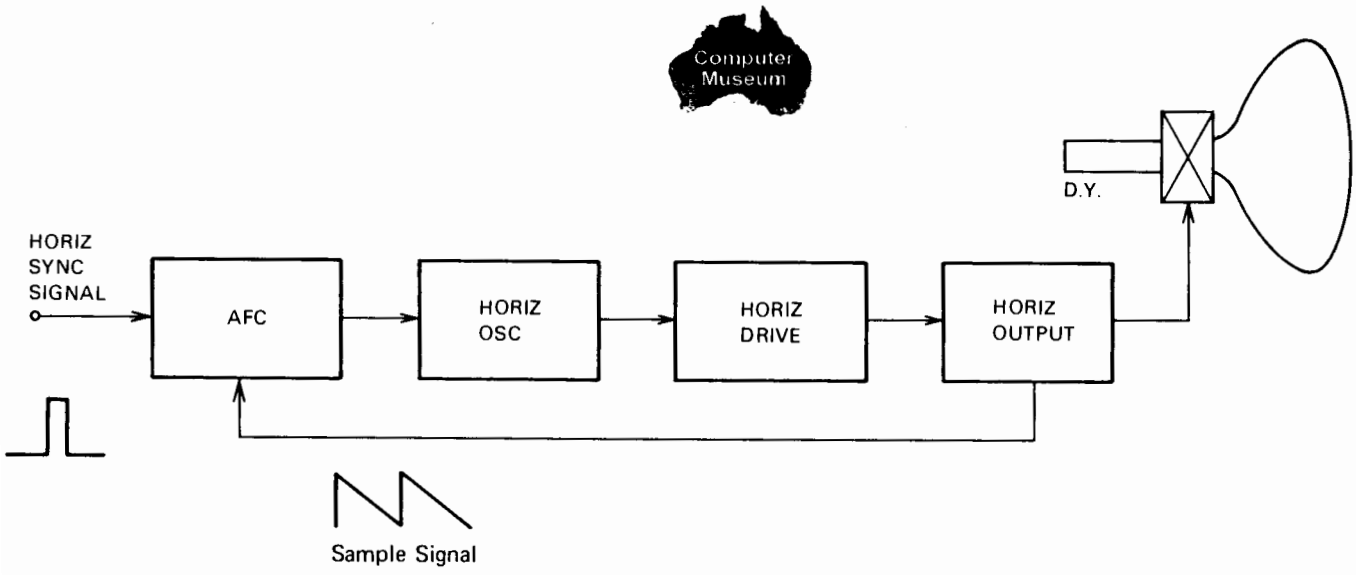


Figure 2-7. Horizontal Deflection Circuit

2.9 AFC Circuit Function

The vertical synchronous signals, which control the vertical oscillation current, pass through several stages of integration circuitry. Acting as a lowpass filter, these circuits eliminate the horizontal synchronous signals and pulsing noises from the output.

The AFC circuit controls the horizontal oscillation frequency by comparing the phases of the oscillation circuit and the synchronous signal. Then a direct current output voltage proportional to the phase difference is generated. This voltage is fed to the oscillation circuit, and the oscillation frequency and phase are made to coincide with the horizontal synchronous signal.

2.10 Horizontal Oscillator

The horizontal oscillator generates a frequency of 15.625 kHz. The oscillation time constant is smaller than that of the vertical oscillator discussed earlier. Oscillation transformer T501 (figure 2-8) permits positive feedback and oscillation to occur.

If the base voltage of transistor TR501 increases, the oscillation frequency increases also; if the base voltage decreases, the oscillation frequency decreases.

Frequency control is achieved in the following way. If the frequency begins to decrease (the phase is delayed), the output of the AFC circuit increases. Since this voltage is fed to the base of transistor TR501, it causes the frequency of oscillation to increase (phase is advanced).

Conversely, if the frequency begins to increase (phase advances), the output of the AFC circuit will decrease. Consequently, it will decrease the frequency of oscillation (phase is delayed). Thus, the horizontal oscillation frequency and its phase will always conicide with the horizontal synchronous signal.

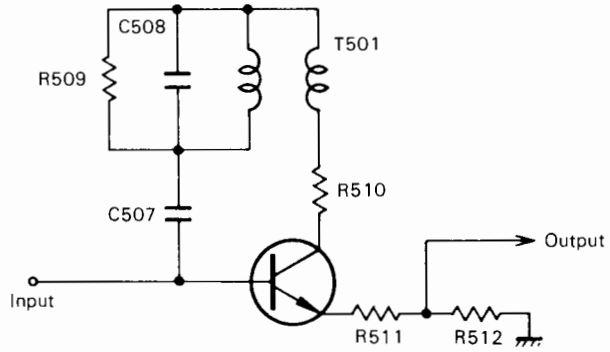


Figure 2-8. Horizontal Oscillator

2.11 Horizontal Drive Circuit

The horizontal drive circuit is located between the oscillation circuit and the output circuit. Its function is to amplify the oscillation output and drive the output circuit. The circuit is shown in figure 2-9.

The amplified waveform is rectangular. Since a transformer is used, sharp pulses are generated when the transistors turn on or off. Capacitor C510 and resistor R513 are used to absorb these pulses.

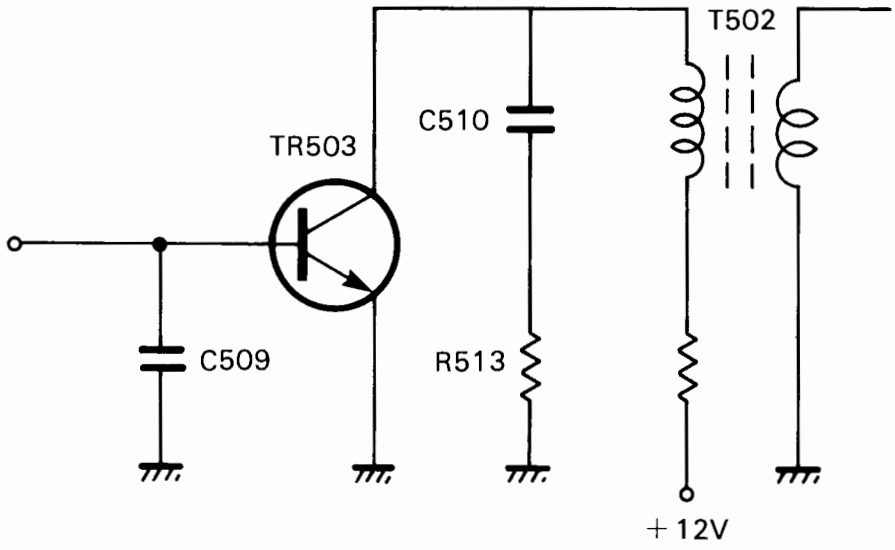


Figure 2-9. Horizontal Drive Circuit

2.12 Horizontal Output Circuit

The horizontal output circuit sends a 15.625 kHz sawtooth wave signal to the horizontal deflection coil. However, unlike the vertical output circuit, this is done by the switching operation of the transistors.

Figure 2-1Ø shows the horizontal output circuit.

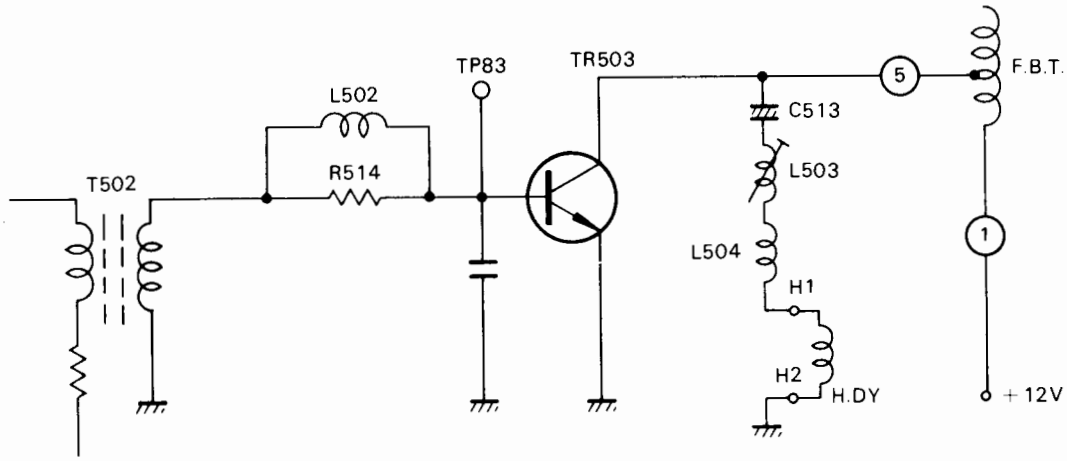


Figure 2-1Ø. Horizontal Output Circuit

DISASSEMBLY AND REASSEMBLY

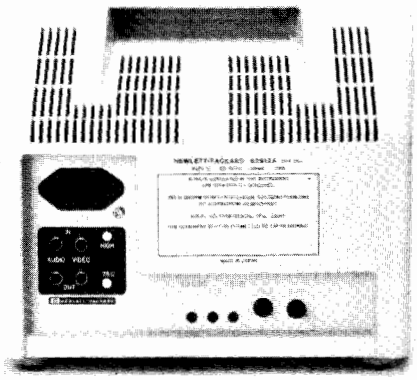
3.1 INTRODUCTION

The HP 82912A and HP 82913A Video Monitors must be disassembled to make some of the adjustments discussed in section IV or to troubleshoot. Although there are some differences between the 9-inch and 12-inch monitors, such as the locations of certain screws, the disassembly procedures are similar.

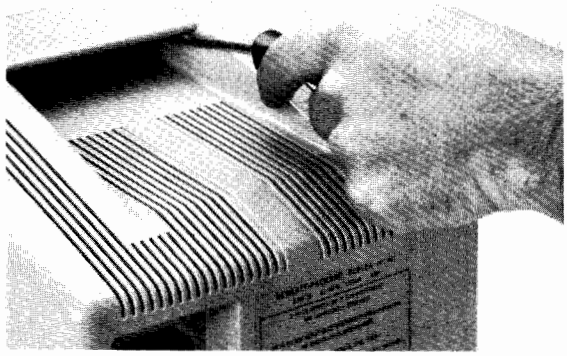
3.2 DISASSEMBLY

The following procedures describe the steps necessary to disassemble the monitors in order to make adjustments or replace faulty components. Use a #1 Posidriv® screwdriver to remove or replace the screws.

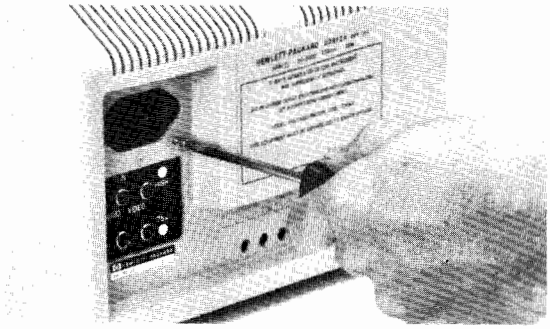
1. With the power cord removed, position the monitor as shown with the back case toward you.



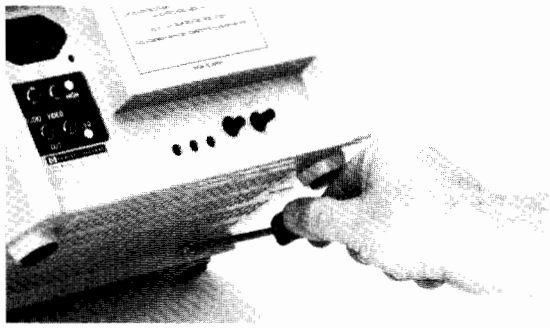
2. Remove the two screws from under the carrying handle (HP 82912A) or from the upper left and right sides (HP 82913A).



3. Remove the small screw near the power receptacle. Do not mix the various screw types; as you remove a screw, note its location for reassembly.



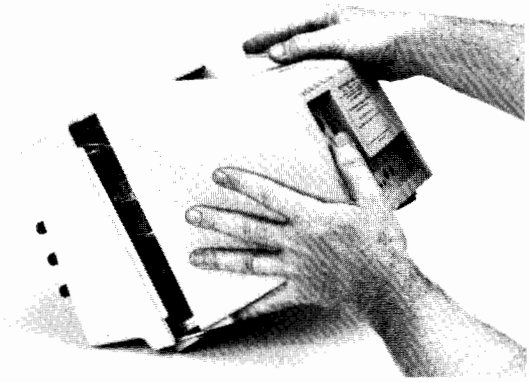
4. Tilt the monitor toward the CRT screen until it rests at an acute angle with the work surface. Then remove the two screws that are exposed on the bottom of the case.



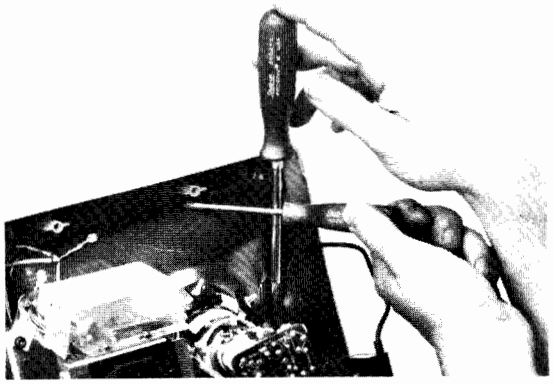
WARNING

Lethal voltages are exposed when the back case of the monitor is removed. At certain points these voltages are present not only while power is on, but also for up to several days after power has been turned off. Electrical and mechanical failures may cause dangerous voltages to be present at points that normally are safe. For your own safety, carefully follow the procedures given below.

5. Gently slide the back case to the rear of the monitor, exposing the printed circuit assemblies and the picture tube. Do not curl your fingers inside the case.



6. Using two screwdrivers with insulated handles, slide the tip of one under the rubber cap protecting the anode on the CRT. Form a connection with the second screwdriver to either the picture tube mounting wire or the Aquadag® coating on the rear surface of the tube. Any residual charge should arc. Be careful not to touch the metal portion of either screwdriver during this procedure.



3.3 REASSEMBLY

1. Align the back case with the chassis so that the rails on the bottom of each part mesh as the back case is gently slid over the monitor. The five screw holes should be aligned, and the adjustment knobs for V HOLD and H HOLD should protrude through the holes in the back case.

> **CAUTION**
> Due to the nature of the plastic used in the case, the threads in screw holes can easily be stripped if you overtighten screws. All screws should be tightened only until they feel snug; if you strip the threads by overtightening the screws, you will have to replace the monitor. Also, try to engage screws--especially small screws--in the original threads; if a screw cuts new threads, they can easily be stripped.

2. Insert and tighten the five screws in their proper holes, tilting the monitor forward as necessary.

ADJUSTMENTS

4.1 EXTERNAL ADJUSTMENTS AND CONNECTORS

The controls and connectors listed can be accessed without tools or monitor disassembly. A brief explanation is included with each item. See figures 4-1 and 4-2 for their locations.

- OFF-ON-VOL: To turn the monitor on, rotate this knob clockwise. The volume increases as the knob is rotated clockwise. Power is turned off with a fully counterclockwise rotation.

- BRIGHTNESS: To adjust the intensity of the image on the CRT, use this knob.

- CONTRAST: This control allows adjustment of the contrast between the green phosphor image and the background.

- H HOLD: If the picture tears toward the left or right, or appears as diagonal stripes across the screen, the horizontal hold should be rotated clockwise or counterclockwise until the picture stabilizes.

- V HOLD: If the picture rolls upward or downward, the vertical hold should be rotated clockwise or counterclockwise until the picture stabilizes.

- 75-ohm Impedance Switch: This switch should be set to 75 when the monitor is connected to equipment with a 75-ohm output impedance. The switch should be set to HIGH when the output impedance is higher.

- VIDEO IN and VIDEO OUT Connectors: The video output signal from a microcomputer should be fed to the VIDEO IN connector. Use the VIDEO OUT connector when bridging a video signal between the monitor and other equipment.

- AUDIO IN and AUDIO OUT Connectors: These are for use only with computers having audio capabilities. The audio signal from a computer should be fed to the AUDIO IN connector using a shielded cable (not supplied with the monitor).

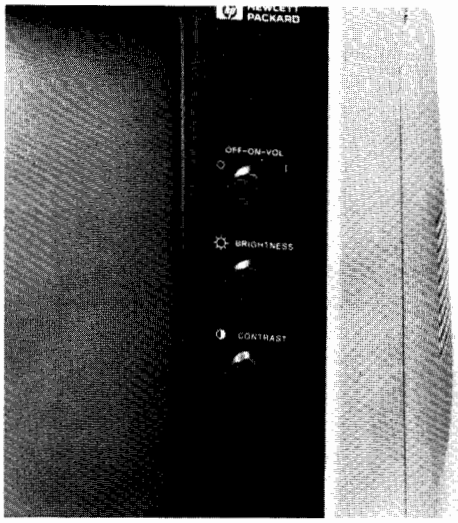
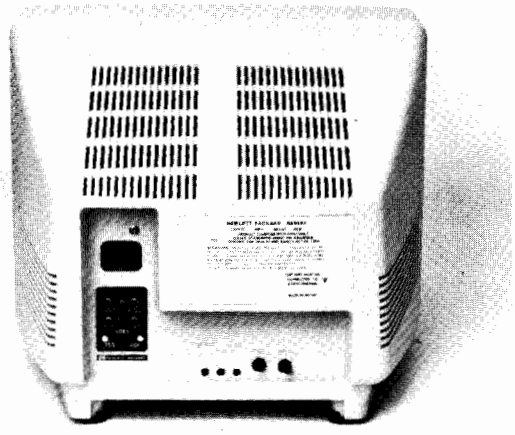


Figure 4-1. Controls (front view)

HP 82912A



HP 82913A

Figure 4-2. Controls and Connectors (rear view)

4.2 SEMI-FIXED CONTROLS

These controls are accessible through the three small holes in the back of the case (see figure 4-2) using a plastic tuning tool:

- SUB BRIGHT: Brightness Range.
- V LIN: Vertical Linearity.
- V HEIGHT: Vertical Height.

In addition, these adjustments can be made by disassembling the monitor as described in section III of this manual:

- +B Voltage Regulator.
- Focus.
- Centering.
- Skew.
- Horizontal Width.

See figures 4-3 and 7-3 for the location of these adjustments.

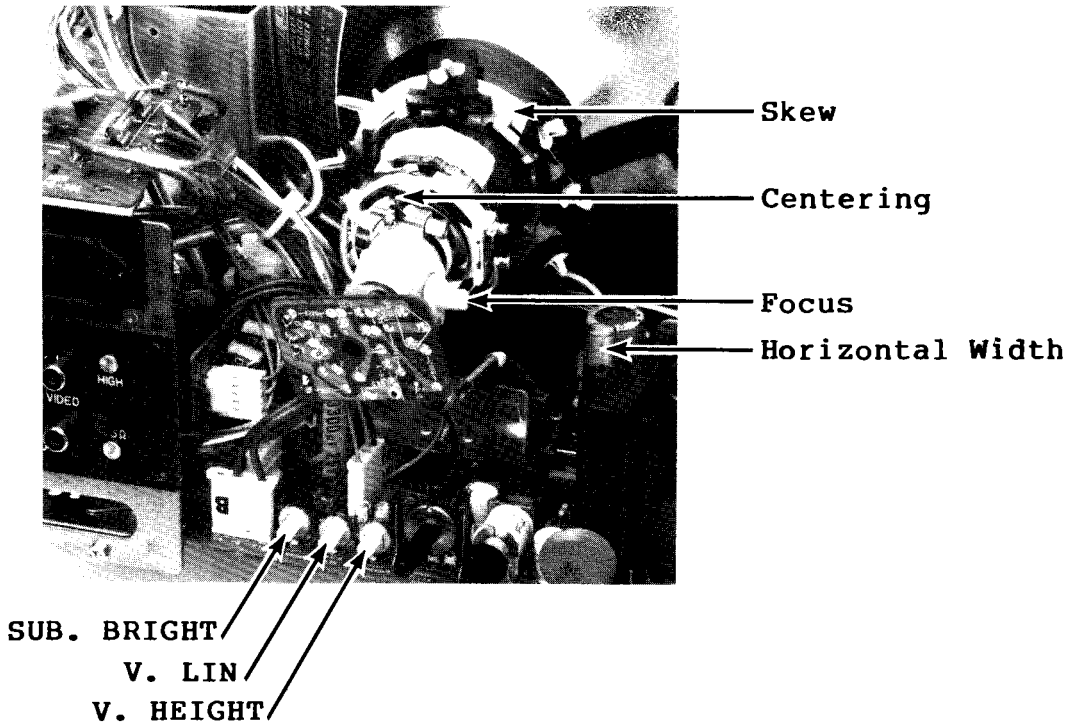


Figure 4-3. Internal Adjustment Locations

4.3 BRIGHTNESS AND CONTRAST ADJUSTMENT PROCEDURES

CAUTION

Damage to the screen could result if the same characters or graphics are shown for a long period of time with the BRIGHTNESS and CONTRAST controls set to maximum positions.

The following procedure permits proper adjustment for good images:

1. Completely fill the display with a character or a pattern on the screen of the cathode ray tube (CRT).

2. Turn the CONTRAST and BRIGHTNESS knobs fully clockwise. Then use a tuning tool to adjust the SUB BRIGHT control until the raster background is no longer luminous.

3. Turn the CONTRAST and BRIGHTNESS knobs counterclockwise until the character or pattern on the CRT screen is easiest to see without blooming.

4.4 OTHER ADJUSTMENTS

Make these adjustments as necessary after unsuccessfully attempting to correct a problem using the external adjustments:

WARNING

When making the following adjustments use a plastic tuning tool (8710-1355 or equivalent) as appropriate.

1. Adjust the +B voltage by connecting a DC voltmeter to ground and test point TP91 on the printed circuit board. Adjust variable resistor VR601 until the voltmeter reads +12V.

2. The horizontal width can be adjusted using the horizontal width coil, L503, by:

   a. Completely filling the display with a character (for example the letter H) and adjusting for optimum brightness and contrast.

   b. Turning the hexagonal core of coil L503 using the tuning tool until the optimum horizontal size is obtained.

3. Vertical linearity is adjusted by:

   a. Completely filling the display with a character (for example the letter H) and adjusting for optimum brightness and contrast.

b. Turning variable resistor VR402 until the characters at the top of the display are the same size as the characters at the bottom of the display.

4. Vertical height is adjusted by:

   a. Completely filling the display with a character (for example the letter H) and adjusting for optimum brightness and contrast.

   b. Turning variable resistor VR401 until the optimum vertical size is obtained.

5. Display centering is adjusted by:

   a. Completely filling the display with a character (for example the letter H) and adjusting for optimum brightness and contrast.

   b. Moving the two tabs on the centering magnets on the yoke (see figure 4-4) until the display is centered in the CRT.

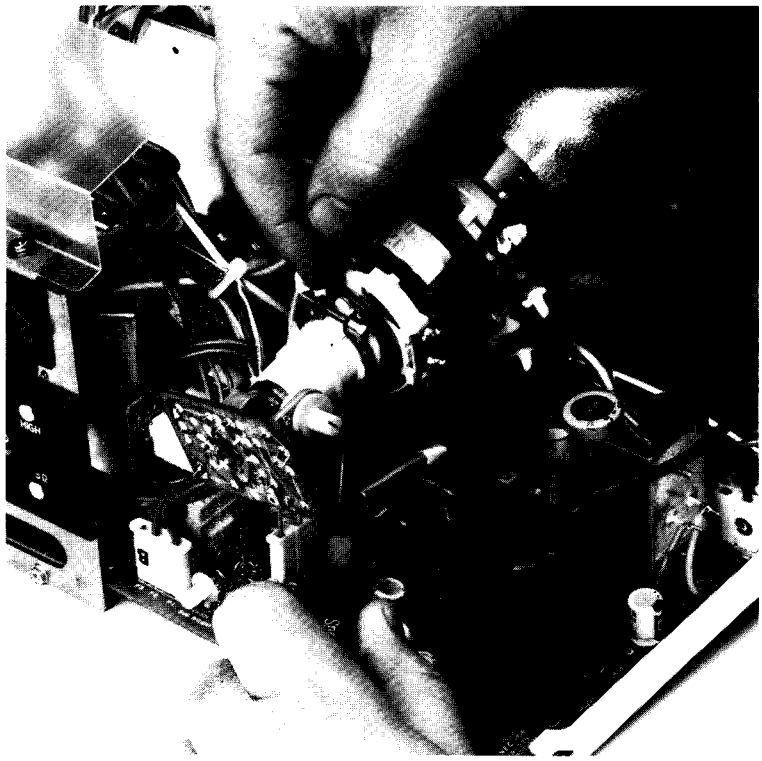


Figure 4-4. Centering the Display

6. Skew is adjusted by:

   a. Displaying at least one complete line and adjusting for brightness and contrast.

   b. Loosening the yoke clamp with a #1 Pozidriv® screwdriver.

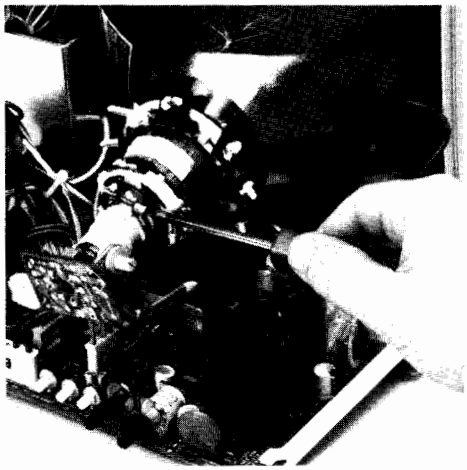


Figure 4-5. Yoke Clamp

   c. Rotating the yoke around the neck of the CRT until the line is parallel to the top and bottom of the CRT (see figure 4-6).

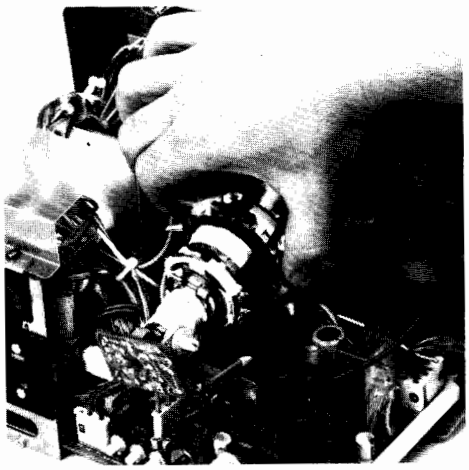


Figure 4-6. Skew Adjustment

7. Bring the picture to the best focus by adjusting variable resistor VR901.

SECTION
V

TROUBLESHOOTING

5.1 INTRODUCTION

This section contains procedures you should follow to isolate the cause of a problem in an HP 82912A or HP 82913A Video Monitor. The recommended repair procedure is adjustments, fuse replacement, or direct exchange of the monitor. However, before you exchange a monitor, you should follow the standard troubleshooting procedures given later in this section to avoid exchanging it unnecessarily.

5.2 SAFETY PRECAUTIONS

Make sure you read and understand the following precautions before you attempt to troubleshoot the monitor.

- Do all possible operations with the monitor turned off.
- NEVER WORK ALONE. Be familiar with the location of power switches in your service area and what they control.
- In case of an accident, know where to obtain respiratory resuscitation and/or cardiac pulmonary resuscitation (CPR).
- Have available and use approved warning signs in areas where high voltage testing is in progress.
- Keep your work area neat, free of any nonessential conducting material or sharp objects. Remember that reaction to an electrical shock can make you strike nearby objects, which could result in serious injury.
- Do not exceed the rated specifications of test instruments.
- Make sure the probe being used has insulation that is rated higher than the voltage being measured. Check all instrument wires and probes for cracked insulation and other defects. If you find any problems, do not risk your safety by using faulty equipment.
- While measuring high voltages, keep one hand behind your back or in a pocket. This helps prevent you from touching a point that could close a high-voltage loop.

- Always be certain that the monitor is turned off and all high voltages are discharged before touching or removing any electrical or mechanical part. Keep in mind while servicing that some circuits can be lethally charged if a component or connector is faulty or disconnected even after the monitor has been turned off.

- Never reach around energized high voltage circuits. Develop a habit of turning the monitor off and discharging the high voltage before reaching. (See section III for discharge procedures.)

- Do not make measurements in a circuit where corona is present. Corona can be identified by a pale-blue color, by a buzzing sound emanating from sharp metal points in the circuit, or by the odor of ozone.

- Never leave your work area with high voltage circuits energized and exposed.

- Never do any service work while your hands, shoes, workbench, or the floor is wet. Avoid making measurements under humid, damp, or other environmental conditions that could affect the dielectric voltage tolerance of the test leads or instruments.

5.3 TEST PATTERN GENERATOR

The materials, tools, and procedure required to make a test pattern generator are given here.

Table 5-1. Test Pattern Generator Requirements

Materials

- HP 82163A Video Interface.
- Capacitor, 100uF, 15V, part number 0180-2056 (or equivalent).

Tools

- Screwdriver, #2 Pozidriv®, part number 8710-0900.
- Soldering Iron.
- Wire Cutters.

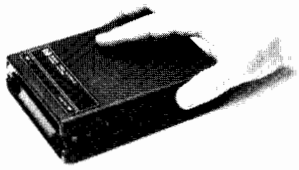
To make a test pattern generator by modifying the video interface, follow these procedures:

> **CAUTION**
> Ensure that adequate precautions are taken regarding electrostatic protection. Work at a bench setup that is electrostatically protected. Otherwise, ICs may be damaged.

1. DISASSEMBLING THE MODULE

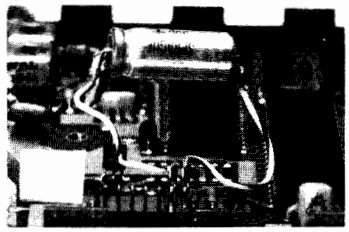
   a. Remove the three screws holding the bottom case to the top case.

   b. Carefully lift off the top case.

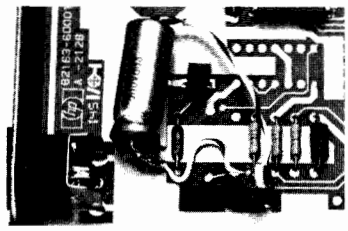


2. MODIFYING THE PCA

   a. Position the capacitor so that the + lead is connected to pin 2, and the other lead is connected to pin 1. See photo for pin locations.



   b. Make sure that the capacitor causes no short circuits; clip the leads.

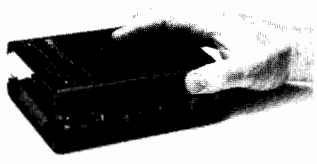


   c. Solder the leads to pins 1 and 2.

3. REASSEMBLING THE MODULE

   a. Carefully position the top case on the module so that the screw holes are aligned.

   b. Tighten the three screws.



5.4 STANDARD TROUBLESHOOTING PROCEDURES

These steps should be taken before exchanging the monitor:

1. Disassemble the monitor (see section III).

2. Using the MONITOR jack, connect a test pattern generator (described in paragraph 5.3) to the VIDEO IN connector on the monitor using a coaxial cable. Plug the ac adapter into a power receptacle and connect it to the generator.

3. Set the impedance switch on the back of the monitor to 75 OHMS.

4. Connect the monitor to a power source and turn it on. If a picture can be obtained, attempt to correct any problems using the adjustment procedures in section IV. The correct test pattern is shown in figure 5-1.

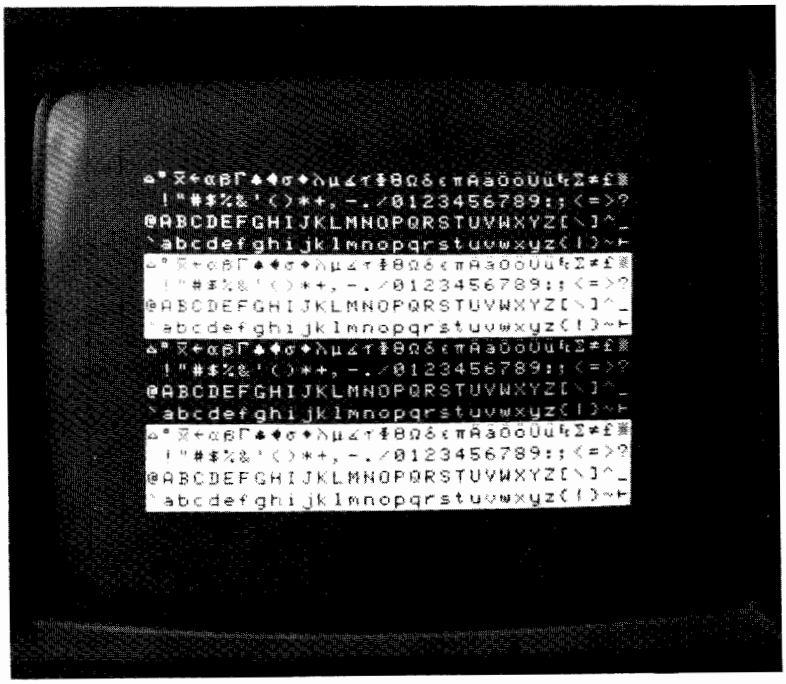


Figure 5-1. Test Pattern

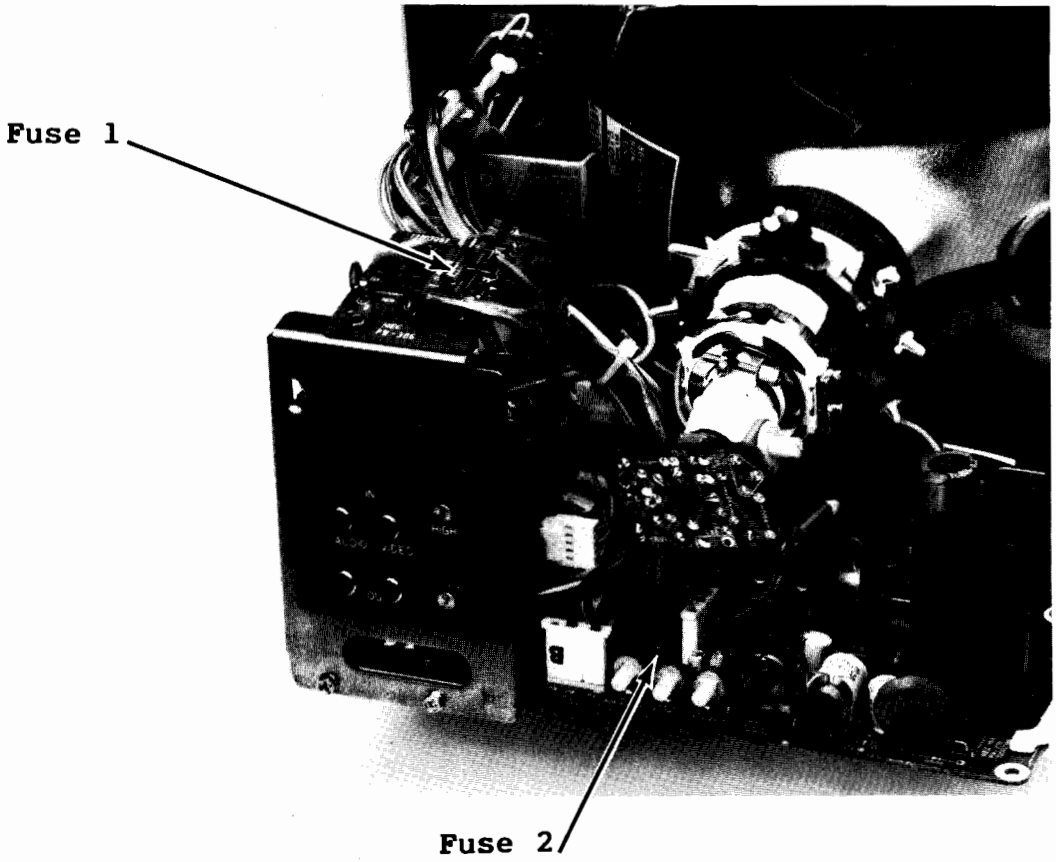
d. Enter the table below at the appropriate symptom and follow the steps indicated:

Table 5-2. Standard Troubleshooting

SYMPTOM	STEP/ACTION	GOOD	BAD
Blank screen & LED does not light.	1. Check F1.	Do step 2.	Replace fuse; do step 4.
	2. Check F2.	Do step 3.	Replace fuse; do step 4.
	3. Check ac power at outlet.	Return for repair.	
	4. After replacing fuse, check LED and screen.	Fixed.	Return for repair.
LED lights, but screen is blank.	1. Turn brightness fully clockwise. Turn sub-brightness 1/4 turn clockwise. Check for screen raster.	Turn sub-brightness 1/4 turn counterclockwise. Do step 2.	Return for repair.
	2. Use test pattern generator. Check for correct pattern.*	Troubleshoot microcomputer.	If adjustment cannot be made, return for repair.†
Vertical or horizontal synchronization cannot be made.	1. Try adjustments to solve problem.		Do step 2.
	2. Use test pattern generator.* Check for synchronization.	Troubleshoot computer to determine if video signal is providing proper sync signals.	Return for repair.†

* Instead of using the test pattern generator, a known good monitor may be substituted for the monitor being serviced. This may be the quickest way to determine whether the problem is with the monitor or the microcomputer.

† If a microcomputer such as the HP-86 is used to generate a test pattern, a fault in the VIDEO output on the computer can cause these same symptoms. Substitute a known good monitor to ensure that the problem is not in the computer.


Fuse 1
Fuse 2

SECTION
VI

REPLACEABLE PARTS

6.1 INTRODUCTION

This section lists the replaceable parts for the HP 82912A and HP 82913A Video Monitors.

Parts descriptions, HP replacement part numbers, and quantities for the monitor are listed in table 6-1. Printed circuit component location diagrams are shown in figures 7-4, 7-5, 7-6, 7-7, and 7-8.

Since the repair strategy for the monitor is unit exchange, the only replacement parts available from the Corporate Parts Center or Parts Center Europe are the exchange monitor, the back case, the power cord, the fuses, and the video cable.

6.2 ORDERING INFORMATION

To order replacement parts or assemblies, address your order or inquiry to your authorized HP dealer, to the nearest HP sales and service facility, or to Corporate Parts Center or Parts Center Europe. Specify the following information for each part ordered:

a. Monitor model.

b. HP part number.

c. Part description.

Table 6-1. HP 82912A and HP 82913A Video Monitor Replaceable Parts

HP PART NUMBER	DESCRIPTION	QUANTITY
25300891-NEC	Cabinet, Back, 9-inch	1
25301121-NEC	Cabinet, Back, 12-inch	1
66652056-NEC	Fuse 2, 2A, Standard	1
66671005-NEC	Fuse 2, 2A, Option 001	1
66652056-NEC	Fuse 1, 0.6A, Standard	1
66671010-NEC	Fuse 1, 0.315A, Option 001	1
82912-69001	Monitor Assy, 9-inch, Standard	1
82912-69003	Monitor Assy, 9-inch, Option 001	1
82913-69001	Monitor Assy, 12-inch, Standard	1
82913-69003	Monitor Assy, 12-inch, Option 001	1
8120-1351	Power Cord, U.K.	1
8120-1369	Power Cord, Australia	1
8120-1378	Power Cord, U.S. Grounded	1
8120-1689	Power Cord, Europe Grounded	1
8120-2104	Power Cord, Swiss	1
8120-2956	Power Cord, Denmark	1
8120-3760	Video Cable	1

SECTION
VII

REFERENCE DIAGRAMS

This section includes reference diagrams for the HP 82912A and HP 82913A Video Monitors.

The schematic diagrams for the standard and option 001 video monitors are shown in figures 7-1 and 7-2 respectively. Adjustment locations are given in figure 7-3, and the component location diagrams for the printed circuit assemblies are shown in figures 7-4 through 7-8.

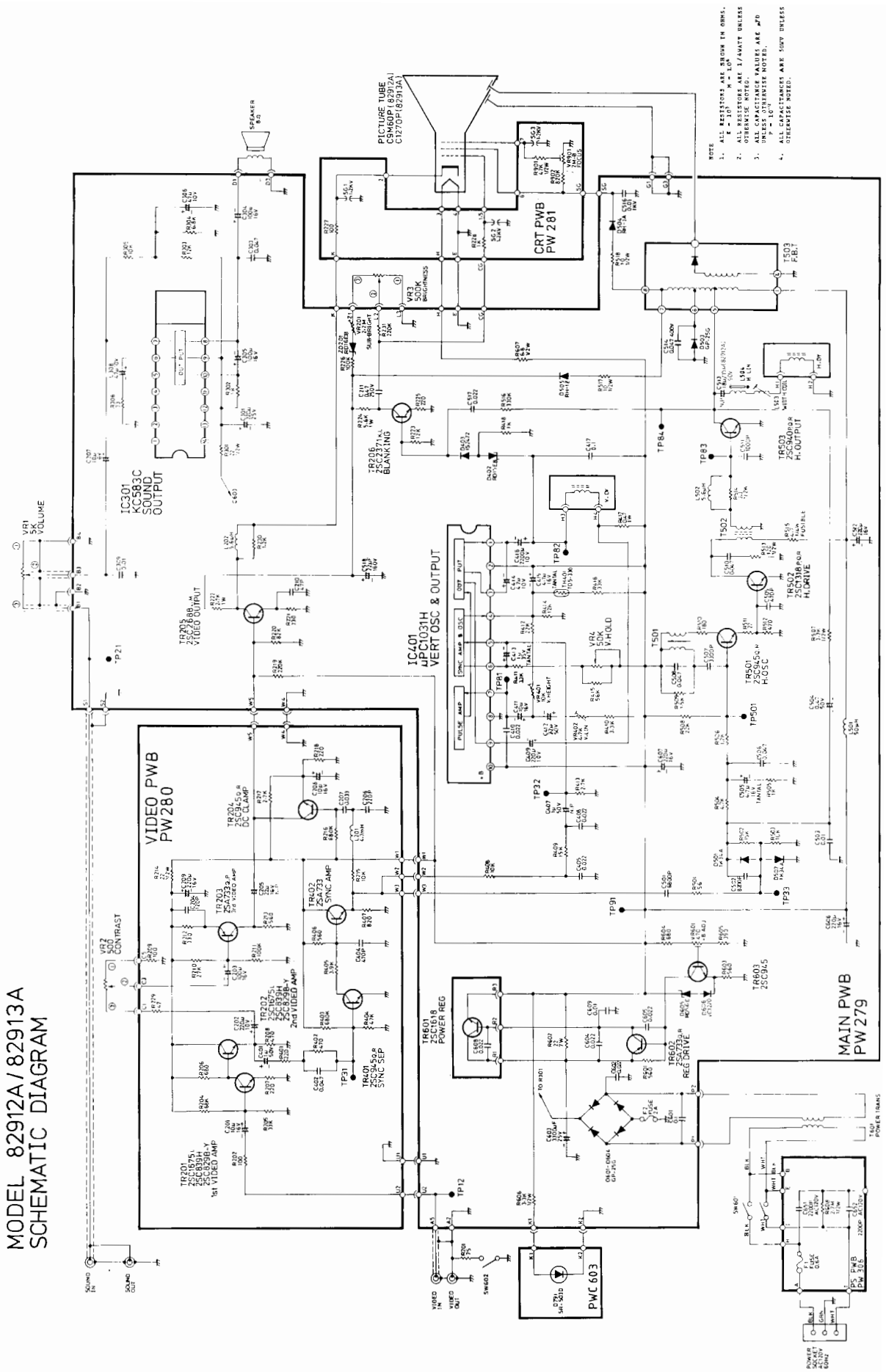


Figure 7-1. HP 82912A/HP 82913A Video Monitor Schematic Diagram

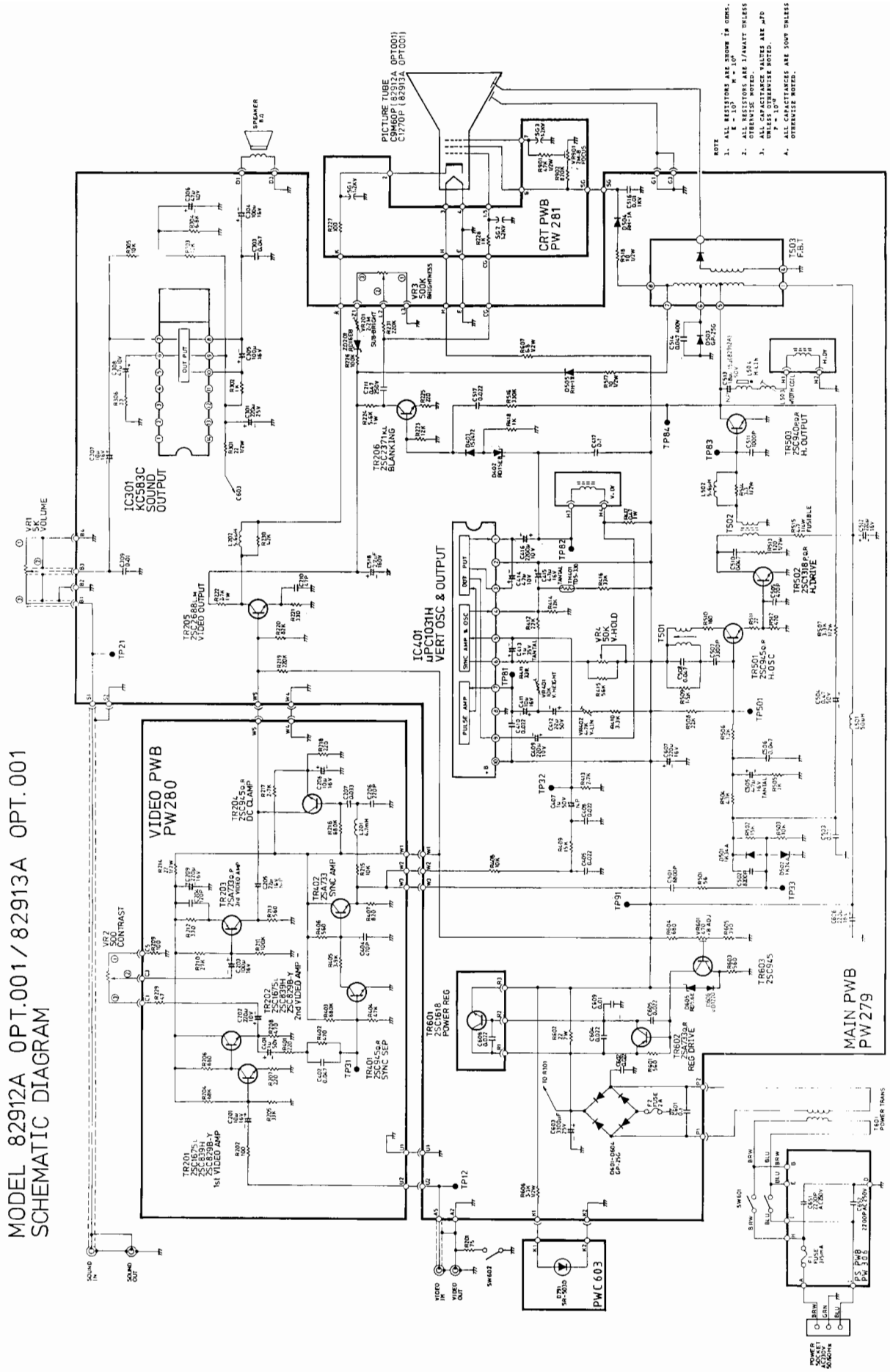


Figure 7-2. HP 82912A/HP 82913A Video Monitor Opt.001 Schematic Diagram

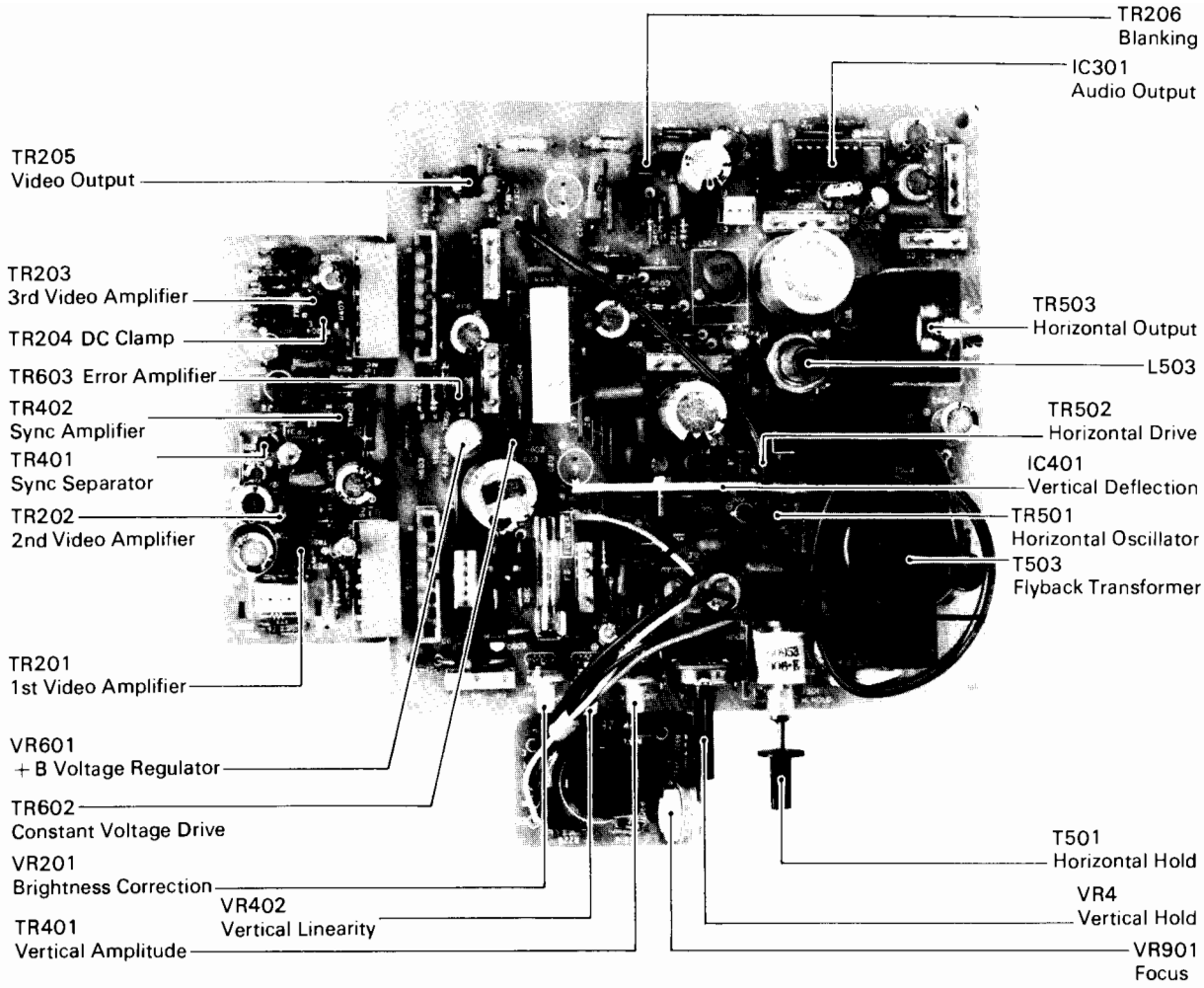


Figure 7-3. Location of Main Parts

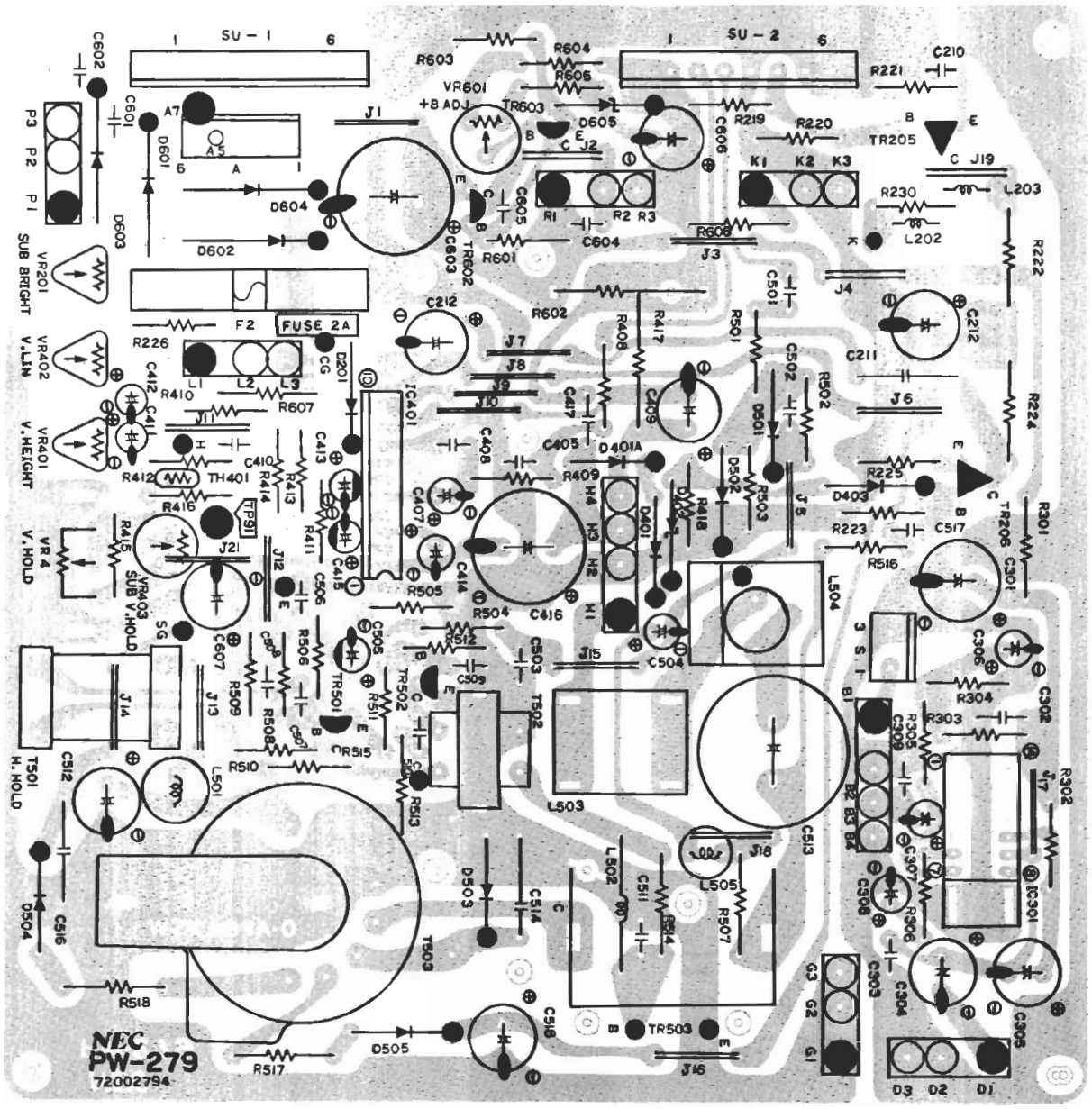


Figure 7-4. Component Location Diagram PWB 279 (Mounting Side)

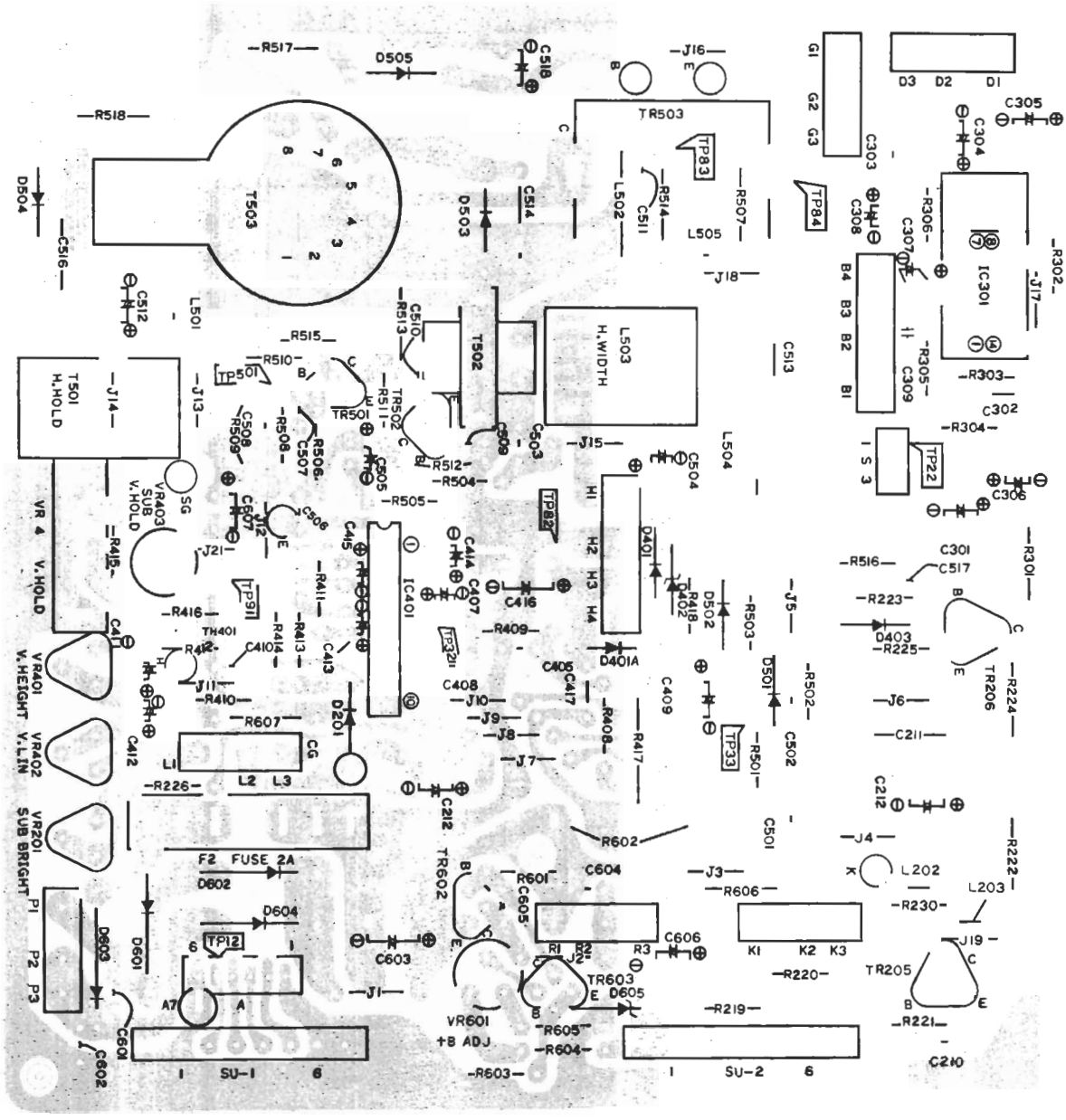


Figure 7-5. Component Location Diagram PWB 279 (Copper Side)

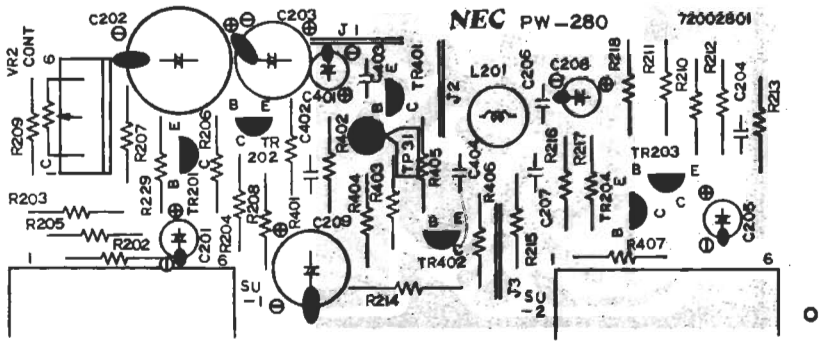


Figure 7-6. Component Location Diagram PWB 280 (Mounting Side)

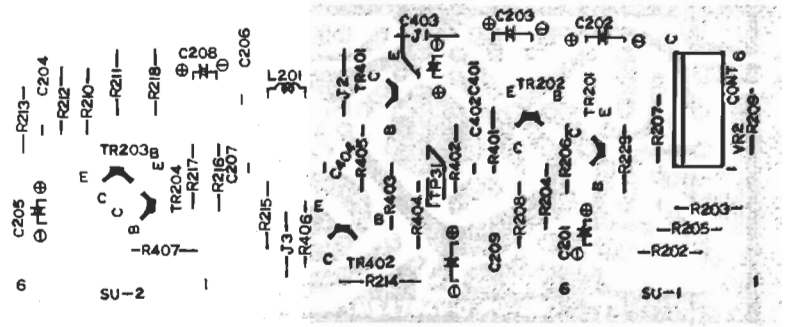


Figure 7-7. Component Location Diagram PWB 280 (Copper Side)

Mounting Side Copper Side

Figure 7-8. Component Location Diagram PWB 281

OPTIONAL TROUBLESHOOTING PROCEDURES

Standard repair procedure does not require that you use these procedures; they are given for information only.

Use the following tables to isolate the cause of a problem. Each table is preceded by the condition or problem it is designed to help you solve. Enter the correct table at the left and proceed to the right side.

The five conditions are:

1. Power LED Does Not Light, or No Raster and No Audio Are Observed.

2. Audio Is Normal, but No Raster Is Observed.

3. Audio and Raster Are Normal, but No Picture Is Observed.

4. Vertical Synchronization Cannot Be Made.

5. Horizontal Synchronization Cannot Be Made.

To troubleshoot cases 3, 4, and 5, you should connect a test pattern generator (described in paragraph 5.3).*

* An HP-86 may be substituted for the test pattern generator. It should be set to cause the monitor to display a full screen of characters (for example H's). If you are unsure of the quality of the video output from the HP-86, you should first verify it by substituting a known good monitor (the exchange monitor).

1. POWER LED DOES NOT LIGHT, OR NO RASTER AND NO AUDIO ARE OBSERVED

Table A-1. Troubleshooting Procedures #1

<table>
<tr><th>ACTION</th><th>SITUATION</th><th colspan="2">CONDITION OR PROBLEM AREA</th></tr>
<tr><td rowspan="6">Check fuse F1</td><td rowspan="3">Fuse is blown/ replace fuse</td><td>Fixed</td><td></td></tr>
<tr><td rowspan="2">Blows easily</td><td>Short circuit in power supply diode (D601 - D604)</td></tr>
<tr><td>T601 failed</td></tr>
<tr><td rowspan="3">Fuse F1 is not blown</td><td colspan="2">Bad ac power receptacle</td></tr>
<tr><td colspan="2">Power cord broke</td></tr>
<tr><td colspan="2">Bad main switch</td></tr>
<tr><td rowspan="4">Check fuse F2 (2A)</td><td>Fuse F2 is not blown</td><td colspan="2">Check TR601, TR603, and surrounding circuits</td></tr>
<tr><td rowspan="3">Fuse is blown/ replace fuse</td><td colspan="2">Fixed</td></tr>
<tr><td colspan="2">Short circuit in C606</td></tr>
<tr><td colspan="2">See note 1</td></tr>
</table>

Note 1: Check these dc voltages:

- TP91 (12V).
- TR205 base (1.6V).
- IC401 pins 2 and 10 (12V).
- TR501 base (0.76V).
- TR502 collector (11.7V).
- T503 pin 1 (12V)
- CRT heater pin 3 (11.7V).
- TR501 collector (10.7V).

2. AUDIO IS NORMAL, BUT NO RASTER IS OBSERVED

Table A-2. Troubleshooting Procedures #2

CONDITION	RESULT/ACTION	RESULT/PROBLEM AREA	
CRT heater off		Heater is open-circuited	
CRT heater on; (6-12 ohms between E and H when cool)/ check screen voltage of CRT (550V at pin 6)	OK/ check cathode voltage (about 100 Vdc)	High	Check TR205
		OK/check for voltage at CRT anode	OK--failure of CRT
			No voltage--failure of T503
	Too low or 0V/ check TR503 base voltage; see note 2	Bad	Failure of TR501, T501, or nearby circuitry
		OK	Failure of TR503, T503, or nearby circuitry

Note 2: A voltmeter attached to the base of TR503 will deflect when the horizontal oscillator circuit is operating; thus, you can determine whether the problem is occurring before or after the oscillator circuit.

3. AUDIO AND RASTER ARE NORMAL, BUT NO PICTURE IS OBSERVED

Table A-3. Troubleshooting Procedures #3

ACTION	RESULT/ACTION	RESULT/PROBLEM AREA	
Connect the test pattern generator and check waveform at the base of TR205	No output	Failure of video amplifier on PW 280	
	Waveform is normal/ check waveform at terminal K of Main PWB	No output	Failure of R230 or L202
		Normal	PW 281 faulty
			CRT failure

4. VERTICAL SYNCHRONIZATION CANNOT BE MADE

Table A-4. Troubleshooting Procedures #4

ACTION	RESULT	PROBLEM AREA
Turn VR4 to adjust vertical synchronization	Sync cannot be made	Failure in VR4, C408, R415, or R411
	Unstable synch can be obtained	Failure in C413
		Failure in R408, R409, C405, or C406
		Failure in TR401, TR402, or IC401

5. HORIZONTAL SYNCHRONIZATION CANNOT BE MADE

Table A-5. Troubleshooting Procedures #5

ACTION	RESULT/ACTION	RESULT/PROBLEM AREA	
Turn coil T501 and attempt to adjust for horizontal synchronization	No apparent help	Failure in TR501, T501, C507, or C508	
	Portions of the picture almost synchronize/ observe waveform at TP33	Normal	AFC circuit failure
			Failure in R502, C504, or C503
		No waveform	Observe TP31 waveform and see note 3

Note 3: If the waveform at TP 31 is normal, there may be a failure in TR401, TR402, C401, R402, or C402. If no waveform is present, check around TR201 and TR202.