RECORD OF FIELD SERVICE BULLETINS

The purpose of this page is to make sure that all service bulletins are entered in this manual. When a field service bulletin is received, annotate the manual and list the information in the record below.

SERVICE BULLETIN NUMBER	DATE OF ISSUE	CHANGED PAGE(S)	PURPOSE OF SERVICE BULLETIN	INITIALS

CONTENTS

Tables

Listing

The Zenith Data Systems ZVM-124 Video Monitor is fitted with signal and power cables to interface directly with the IBM PC computer and includes the following features. Refer to Figure 1.1.

- Major operating controls behind an access door on the front panel.
- A 12-inch display, featuring a non-glare, amber phosphor CRT, capable of displaying 25 rows of 80 characters per row.
- A width adjustment accessible from the rear panel.
- Focus control and video circuits mounted on the CRT socket board to aid in servicing.
- A power switch with a power indicator on the front panel.

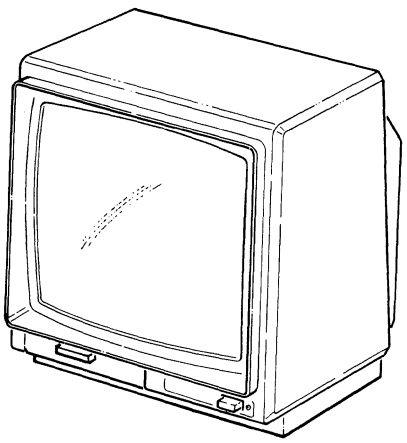

Figure 1.1
The ZVM-124 Monitor

List of Tools, Test Equipment, and Supplies

The following tools, test equipment, and supplies are recommended for servicing this product.

TOOLS

- 1/4" nut driver
- Standard screwdriver, 1/4" blade
- Phillips screwdriver, No. 1 tip
- Phillips screwdriver, No. 2 tip
- Diagonal cutters
- Wire strippers
- Long-nose pliers
- Desoldering tool
- Soldering iron, 25 to 40 watt
- Power cord, HE-89-60

TEST EQUIPMENT

- Oscilloscope — DC to 35 MHz, triggered sweep, with low capacitance (3 pF) probe
- Digital voltmeter — High impedance input, zero to 1000 volts, zero to 1 megohm, Heath model SM-2215, or equivalent
- High voltage probe — Zero to 40 KV, Heath model IM-5210, or equivalent
- Signal source — Quantum 801 A or equivalent in place of an IBM PC computer

SUPPLIES

- Solder, 60/40, HE-331-13
- Desoldering braid, HE-490-185
- Cable ties, HE-354-59
- Lint-free cloths

Specifications

Operating Voltage:	120 VAC 60 Hz (ZVM-124); 220 VAC 50 Hz (ZVM-124-E)
Operating Current:	0.3 ampere
Nominal Power:	28 watts
Nom. High Voltage:	13.0 KV
Fuse (primary):	4.0 amp, type FX3201
Fuse (secondary):	2.25 amp, type FX701
Video Bandwidth:	18 MHz
Rise Time:	20 nanoseconds
Horiz. Frequency:	18.432 KHz
Vert. Frequency:	50.09 Hz
Input Signal:	Four TTL-level inputs
CRT:	12″ diagonal, amber
Character Type:	8 x 10-pixel matrix
Characters/Line:	80 characters per line
Character Block:	7 x 9 pixels

The Zenith Data Systems ZVM-124 Video Monitor is a self-contained unit and is designed to be connected to an associated computer using an attached shielded signal cable and power cord. The monitor receives four TTL-level video signals (video input, highlight input, vertical input, and horizontal sync input) via the signal cable and D-type connector and 120 VAC (or 220 VAC on the ZVM-124-E) power via the power cable and connector.

The monitor must be located in an area that will provide proper ventilation. There are vents on the back and bottom of the cabinet which permit air flow through the monitor. Verify that these vents are not blocked.

Video Monitor

The following is a description of the controls and cables for the video monitor. Refer to Figure 2.1, position the video monitor so the front of it is facing you, and open the front door as shown.

- Contrast — The CONT. control adjusts the intensity of the displayed data on the screen.
- Black Level — The BLACK LEVEL control adjusts the intensity of the raster (background).
- Vertical Size — The VERT. SIZE control adjusts the vertical size at the top and the bottom of video display.
- Vertical Hold — The VERT. HOLD control adjusts the vertical sweep for a stable display.
- Horizontal Hold — The HORIZ HOLD control adjusts the horizontal sweep for a stable display.
- Power Switch — This push-to-latch, push-to-release switch turns the monitor on or off.
- Power Indicator — This LED lights when power is applied to the monitor and the power switch is turned on.

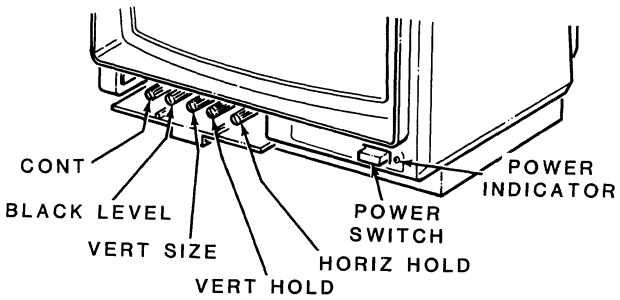

Figure 2.1
Video Monitor Front View

Refer to Figure 2.2 and position the video monitor so the back is facing you.

- Power Cord — This grounded, AC power cable connects to the 120-volt (for the ZVM-124) AC output of the computer, or with the HE-89-60 power cord, to any standard (120 VAC) AC power source. (The ZVM-124-E monitor accepts 220 VAC through this cord.)
- Signal Cable — his shielded cable connects to the output of the monochrome video card of a computer.
- Width Control — This control adjusts the horizontal size of the video display.

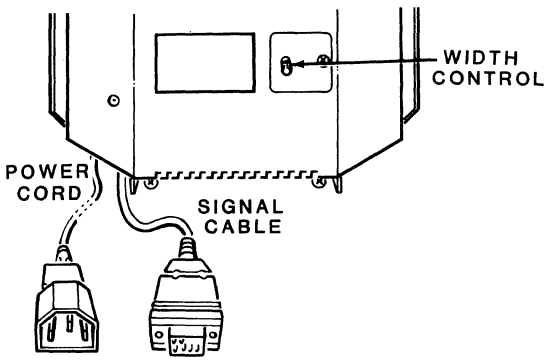

Figure 2.2
Video Monitor Rear View

Voltage Selection

Before connecting the monitor to a power source, make sure it is rated for the voltage available in your area. The ZVM-124 monitor is normally wired for 120 volts AC. To change the voltage rating to 220 volts AC, proceed as follows:

WARNING: Be sure the signal cable and power cord are unplugged from the computer or any other signal and power source before you attempt to change the voltage rating of this unit.

1. Refer to Section 6, "Detailed Disassembly," and remove the back cover, power transformer assembly, fuse board, main board, and power switch assembly.
2. Refer to Figure 2.3 and unsolder the two pairs of the 120-volt transformer leads at **A**, **B**, **C**, and **D** on the fuse board. (These leads are normally a pair of light tan (or white) and a pair of gray leads. One lead of each pair will normally have a brown stripe.)
3. Unsolder the two 120-volt power line leads at **G** and **H** on the fuse board.
4. Unsolder the 120-volt power switch (S201 — part number 85-1559) leads at **I** and **J** on the fuse board.

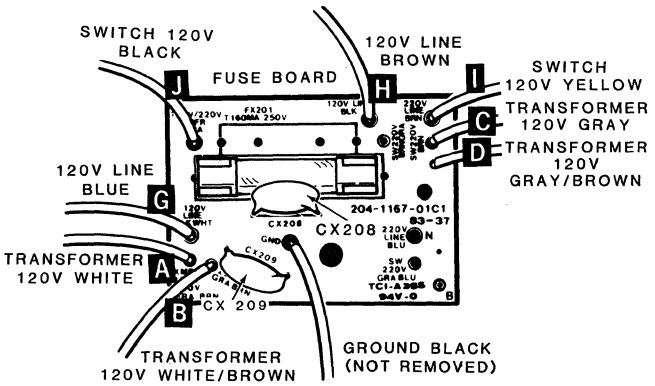

Figure 2.3
120-Volt Wiring

5. Refer to Figure 2.4 and unsolder the two 120-volt transformer leads at **E** and **F** on the main circuit board. Note how these leads are routed in relation to the other wiring.

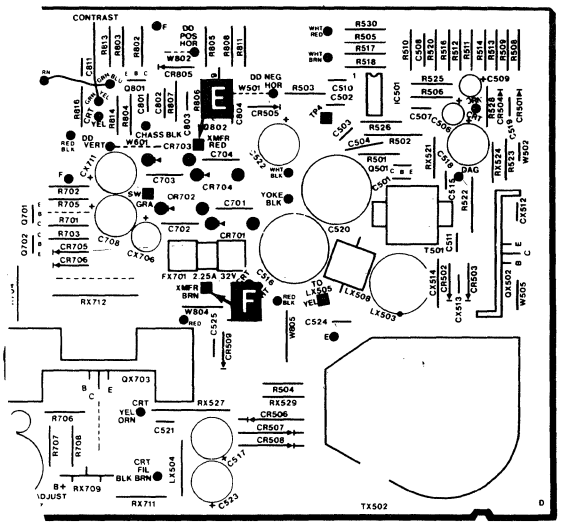

Figure 2.4
Main Board Transformer Leads

6. Refer to Figure 2.5 and remove the two **6-20 x .312"** screws that hold the transformer cover in place. Remove the cover.
7. Remove the two **8-18 x 1.25"** screws that hold the 120-volt transformer to the power transformer frame. Note how the leads are routed out of this assembly
8. Replace the 120-volt power transformer (TX201 — part number 95-3388-04) with a 220-volt transformer (part number 95-3578-03).
9. Replace the two **8-18 x 1.25"** screws that hold the transformer to the power transformer frame and tighten them.
10. Route the leads of the transformer as they were for the 120-volt transformer and use the two **6-20 x .312"** screws to replace the transformer cover. Tighten the screws.
11. Refer to Figure 2.6 and remove the two 8-18 x .437" screws at **F**. Remove and replace the 120-volt power switch with a 220-volt power switch (part number 85-1646). Replace the two screws at **F**.

12. Refer back to Figure 2.4 and solder the red and brown transformer leads to **E** and **F** on the main board.

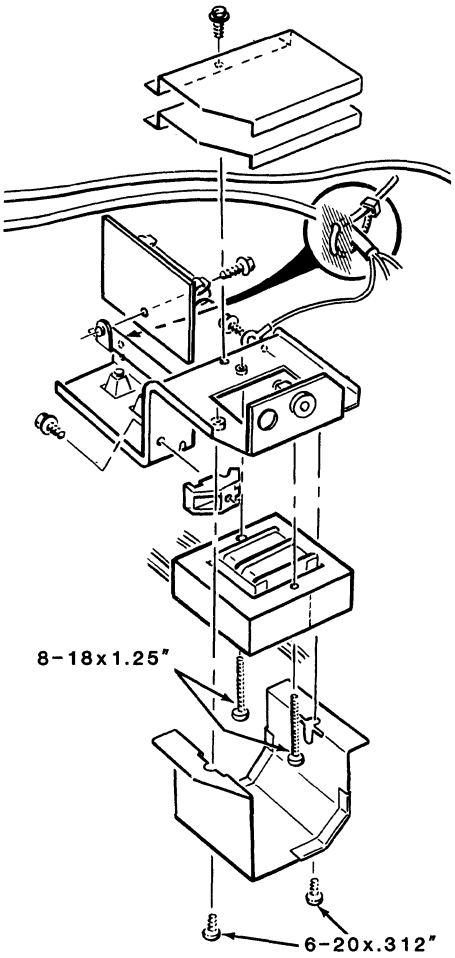

Figure 2.5
Power Transformer Replacement

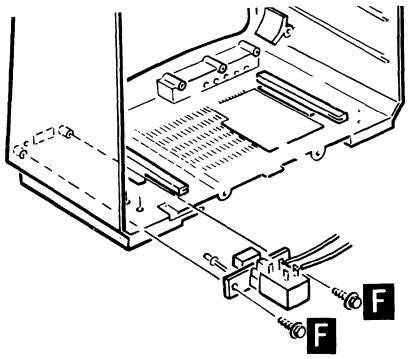

Figure 2.6
Power Switch Replacement

13. Refer to Figure 2.7 and solder the two 220-volt transformer leads at **A** (the gray-brown lead) and **J** (the gray lead) on the fuse board.
14. Solder the power line leads at **I** (the brown lead) and **L** (the blue lead) on the fuse board.
15. Solder the SX201A power switch leads at **B** (the gray/brown lead) and **M** (the gray/blue lead) on the fuse board.
16. Solder the SX201B power switch leads at **N** (the brown/gray lead) and **C** (the brown lead) on the fuse board.
17. Refer to Figure 2.7 and remove and replace the 4 amp fuse at **K** on the fuse board (FX201 — part number 136-114-23) with a .160 amp fuse (part number 136-133-07).

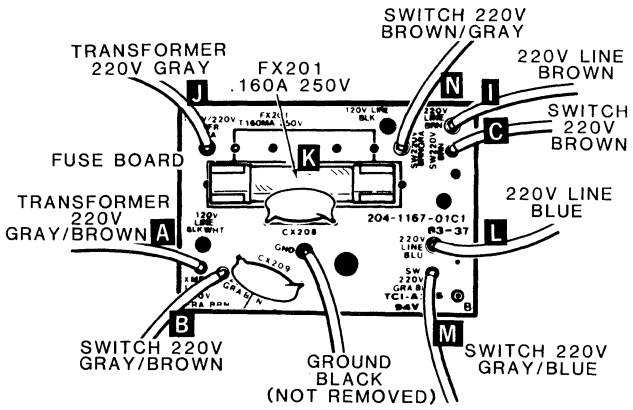

Figure 2.7
220-Volt Wiring

18. Refer to Section 8, "Reassembly," and replace the power switch assembly, main board, fuse board and power transformer assembly, and back cover. Verify that all the power and signal leads are routed as shown in the figures in that section.

NOTE: The ZVM-124-E monitor is wired for 220 volts AC at the factory. To change the voltage rating to 120 volts AC, follow the same procedure, but substitute the 120-volt parts (95-3388-04, 85-1559, and 136-114-23) for the equivalent 220-volt parts in the instructions.

Connections

To install and connect the monitor, refer to Figure 2.8 and complete the following procedure.

1. Place the monitor on a solid work surface near the computer.
2. Rotate the video monitor until the front is facing you.
3. Make sure the power switch on the front of the cabinet is off; also check that the power switch on the computer is off.
4. Plug the shielded signal cable into the appropriate video connector on the rear panel of the computer.
5. Plug the power cord into the power connector on the rear panel of the computer.
6. Turn the power on.

Signal Cable Interface

The monitor is designed to be used as a display device for a computer system. The shielded cable is used to connect the monitor to the computer.

CAUTION: A shielded cable is required by FCC regulations to prevent interference with other equipment.

Table 2.1 provides information on the signal cable at the D-type connector.

Table 2.1
Signal Cable Connector J201

PIN NUMBER	SIGNAL FUNCTION
1	Shield ground
2	Signal ground
3	Not used — not connected
4	Not used — not connected
5	Not used — not connected
6	Highlight input
7	Video input
8	Horizontal sync input
9	Vertical input

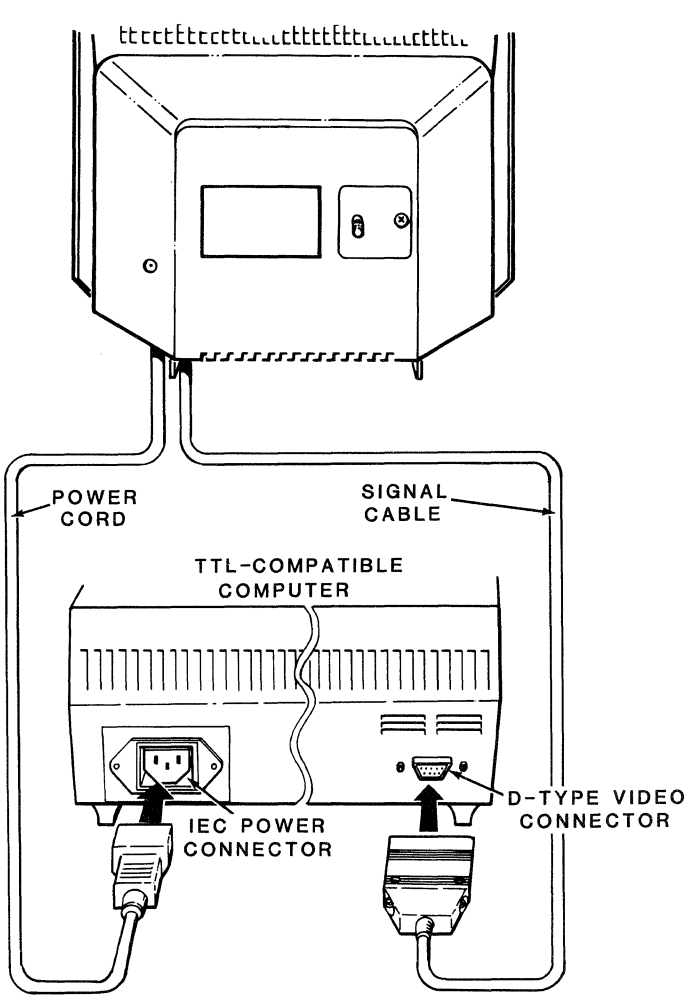

Figure 2.8
Monitor Cable Connections

This monitor uses the latest in solid-state technology for displaying video signals. The four TTL-level video signals (video input, highlight input, vertical input, and horizontal sync input) are received from the computer via the signal cable. This section covers the initial setup of the operating controls.

Initial Setup of the Operating Controls and Monitor

The following discussion assumes that you will be connecting the monitor to a computer, such as the IBM PC. Since the monitor requires TTL-level signals to drive it, the normal composite signals of the Zenith Data Systems Z-100 and Z-100 PC computers cannot be used as a signal source. However, in lieu of a computer, you may use a Quantum 801 A or a similar signal source to make your adjustments.

The location and function of each control is discussed in Section 2, "Installation."

1. Connect the ZVM-124 to a suitable signal source, such as an IBM PC.

The power switch is located on the front of the cabinet and turns the monitor on or off. The operating controls are located behind a door below the CRT screen in the front of the cabinet and on the back cover.

2. Turn on the computer (or test equipment) to which the ZVM-124 is connected.
3. Locate the power switch on the monitor and press it to turn it on. Verify that the power indicator, an LED, lights.
4. Assuming you are using a computer, use the BASIC program shown in Listing 3.1 to fill the screen with any character as follows:
   a. Enter the program shown in Listing 3.1 into the computer. You may want to save this program on a disk for later use.
   b. Run the program by typing RUN and pressing the **RETURN** key. The screen will be filled with the letter Z or any other character inserted in line 20.
   c. To end the program, press the **CTRL** and **BREAK** keys at the same time.

Listing 3.1
BASIC Program Used to Fill Screen with a Character

```
10 FOR I=1 TO 2000
20 PRINT "Z";                  'replace the "Z" with the
30 NEXT I                      'character of your choice
40 GOTO 40
```

With the monitor connected to a computer (or other signal source) and with a normal video display on the CRT screen, adjust the front panel controls. Refer to Figure 3.1 for the location of the controls during the following discussion.

1. Adjust the black level control, labeled BLACK LEVEL, counter-clockwise until the sweep raster is visible on the screen; then back off the control until the raster just disappears. Note that this control interacts with the contrast control.
2. Adjust the contrast control, labeled CONT., until the video display is comfortable to the eye. Note that this control interacts with the black level control.
3. Adjust the horizontal hold control, labeled HORIZ HOLD, as required for a stable horizontal display on the screen.
4. Adjust the vertical hold control, labeled VERT. HOLD, as required for a stable vertical display on the screen. Note that this control interacts with the vertical size control.

5. Adjust the vertical size control, labeled VERT. SIZE, until the video display is equal at the top and bottom of the screen. Note that this control interacts with the vertical hold control.

6. Locate the width control on the back of the monitor and use it to adjust the horizontal size of the video display. Refer to Figure 3.2 for the location of this control.

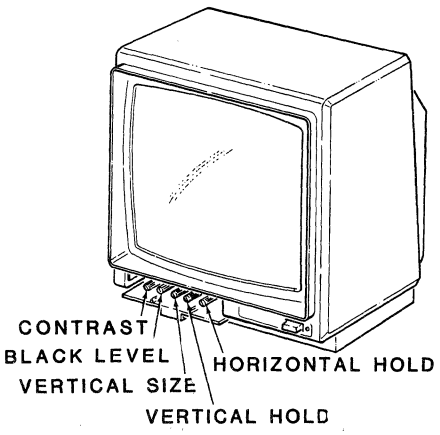

Figure 3.1
Front Panel Controls

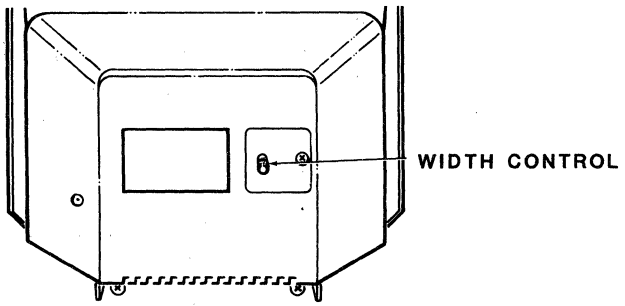

Figure 3.2
Video Monitor Rear View

This section provides you with the general theory of operation for the ZVM-124 video monitor. Refer to the block diagram in Figure 4.1 (on the next page) while you read the following material.

Theory of Operation

Four TTL-level input signals — video input, highlight input, vert sync input, and horz sync input--are received from the computer via the signal cable. These signals are applied to the video, vertical sync, and horizontal sync circuits as shown in the block diagram. The power supply provides +12.7 VDC for the various circuits.

VIDEO AND HIGHLIGHT INPUTS

The positive video and highlight input signals are direct-coupled to their respective driver stages. These signals are amplified, inverted, and applied to the DC contrast amplifiers 1 and 2. DC contrast amplifier 1 supplies the contrast signal current (controlled by the front panel contrast control) to the video output stage (amplifier).

The video output amplifier drives the signal to a level necessary to feed the cathode of the CRT. The CRT raster intensity is determined by the front panel black level control. Adjusting this control supplies a bias voltage to the control grid of the CRT.

VERTICAL SYNC INPUT

The positive-going vertical sync signal is coupled to the vertical oscillator so that the internally generated vertical frequency of the monitor may be synchronized with the incoming sync pulse signal. The lock-on point of the signal is determined by the front panel vertical hold control, which is adjusted to stabilize the vertical sweep.

The synchronized output of the oscillator is applied to vertical amplifier 1, which functions as a differential amplifier. The difference signal is fed to vertical amplifier 2, which drives the vertical output stages 1 and 2. These stages make up a complimentary push-pull class B power amplifier that drives the vertical deflection yoke of the CRT. The vertical blanking stage provides retrace "kick-up" during the retrace period of the sweep output.

HORIZONTAL SYNC INPUT

The positive-going horizontal sync signal is coupled to the horizontal sync amplifier, which amplifies and inverts the signal to produce a negative-going pulse. This pulse is applied to the horizontal processor, where it synchronizes the horizontal oscillator to the incoming frequency. The lock-on point of the pulse with the internal oscillator is determined by the front panel horizontal hold control. It is adjusted to stabilize the horizontal sweep.

The output from the horizontal processor is coupled through a transformer to the horizontal output driver. The flyback transformer is used to develop the ramp voltage for the horizontal deflection yoke of the CRT. This circuit also is used to develop the high voltage for the anode of the CRT.

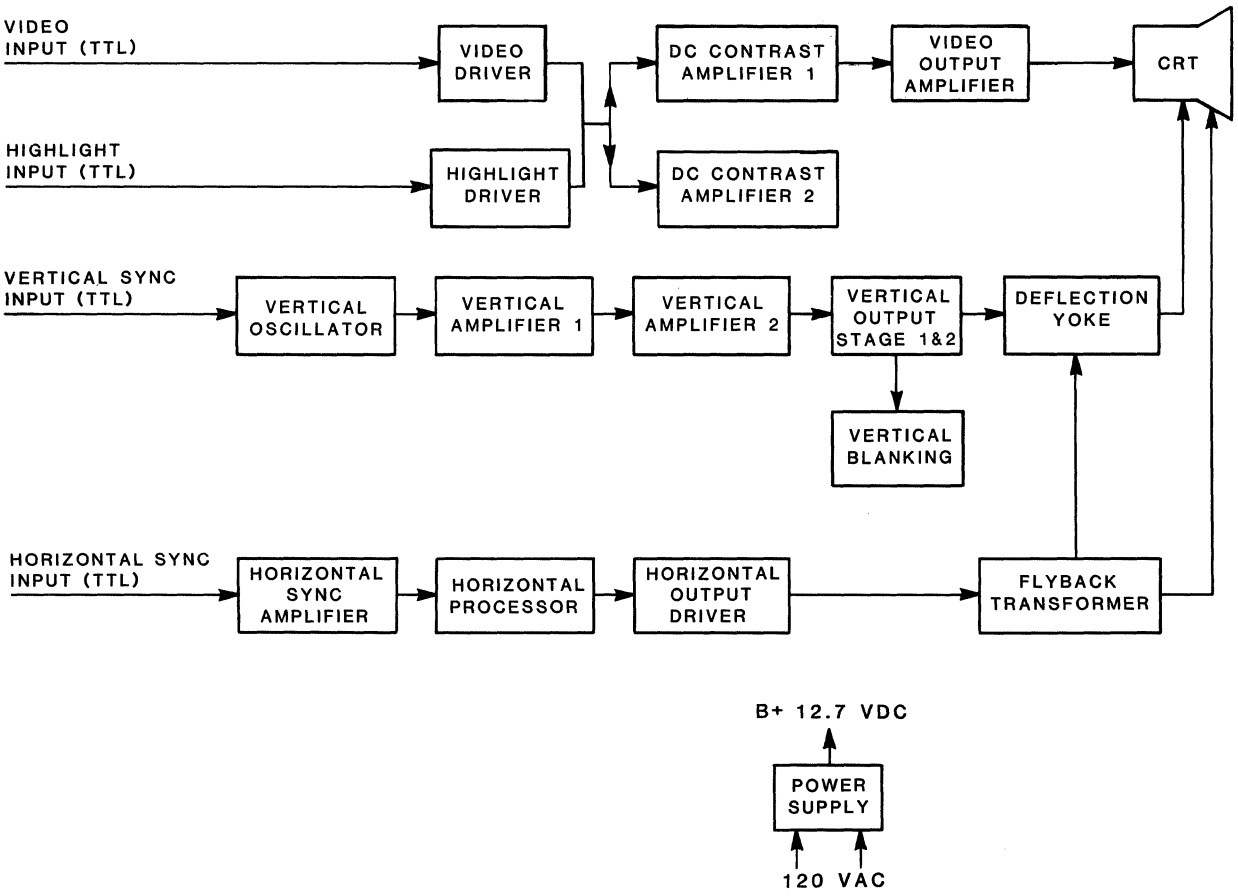

Figure 4.1
ZVM-124 Block Diagram

This section provides you with a detailed circuit description of the ZVM-124 video monitor. Refer to the schematic (a foldout at the end of this section) while you read the following circuit descriptions.

Power Supply

The AC line voltage enters the equipment via a special power cable that is permanently attached to the monitor and is designed to be attached directly to the rear panel of an IBM PC.

The AC line voltage is fed to the power transformer, TX201, and the bridge diodes CRX701, CRX702, CRX703, and CRX704. Approximately +17.1 volts DC output is developed across the bridge rectifier and capacitor CX707. Ripple at this point is limited to 1.7 volts rms on the DC voltage. The +17.1 VDC is fed to the regulator stages of the power supply to produce the B+ voltage of +12.7 VDC and provide power to light the power-on indicator, LED CR202.

Regulator QX703 serves as a variable series element, thereby dropping more or less voltage from base to collector in order to maintain the output voltage at a constant +12.7 volts DC.

As the output voltage attempts to increase or decrease due to input line voltage fluctuations or load requirements, the voltage change will start to appear at the base of error amplifier Q701 via the voltage divider network composed of resistors R704, R706, R707, R708, and RX709, and capacitor C709. Control RX709 is used to adjust the output voltage so that it remains at +12.7 VDC even if there are variations introduced into the circuit values because of component tolerances or drift in component values due to age or operating temperature.

Capacitor C709 is used to couple the AC ripple to the base of Q701. This voltage is compared against a reference voltage generated by the zener diode CR706 (+4.7 volts) and capacitor C708. Any voltage difference will cause the collector current to increase or decrease proportionally. This current is amplified by the error amplifier Q702 and fed to the regulator QX703. If the output voltage starts to increase, Q701 will attempt to turn off, causing Q702 and QX703 to start to turn off. If the output voltage starts to decrease, Q701 will turn on "harder" (the current will increase), causing Q702 and QX703 to conduct more, which will raise the output voltage back to normal (+12.7 volts).

The regulator circuit also is designed to switch from a regulator to an active filter at low line voltages. The voltage at the collector of Q702 is proportional to the available input voltage to the regulator. When the input voltage is too low to maintain +12.7 volts output, the voltage at the collector of Q702 drops below the zener diode (CR706) reference voltage, causing diode CR705 to conduct.

This additional current, sinking through resistor R701, disables the zener diode reference voltage, causing the DC output voltage to drop and no longer be regulated for DC variations. However, the AC reference remains in control; thus the AC ripple regulation continues, in effect providing an active filter which suppresses the ripple from the bridge rectifier.

Video and Highlight Driver Circuitry

The video input signal is fed directly to the base of Q205, the video driver amplifier. The highlight input signal is fed directly to the base of Q204, the highlight driver amplifier. These are positive polarity input signals and may be driven by TTL-level circuits.

The two input signals are amplified and inverted by Q205 and Q204, respectively, combined, and applied to the junction of R209

and R210 which are the emitter resistors for DC contrast amplifiers Q202 (1) and Q203 (2). R815 is connected to the base of Q202 to provide an adjustment of the bias voltage, which controls the signal current through the transistor.

Q203 is used as a current sink, supplying a constant voltage reference to Q202 through R209 and R210. When R815 is rotated clockwise, the bias of Q202 will increase, allowing more signal current to flow through the transistor. Because Q203 is supplying a constant voltage reference to the network, less current will flow through Q203. Any video signal at the collector of Q203 is passed to signal ground through capacitor C211. The adjustment range of R815 will take care of any normal variations in the values of the circuit components.

Q201, the video output amplifier, drives the cathode of the CRT display. The combined video/highlight signals are connected from the collector of Q202 directly to the emitter of Q201. The signal is amplified, but not inverted, by Q201 and is applied directly to the CRT cathode. R838, the black level control, is used to adjust the raster intensity to just below the point of visibility. The control supplies the control voltage to grid 1 of the CRT. The +24 and -40 VDC are obtained from the flyback transformer in the horizontal output circuit.

Horizontal Circuitry

The horizontal processor is an integrated circuit (IC501) that contains a phase detector, an oscillator, a regulator, and a predriver.

The horizontal synchronization pulse from the computer is amplified and inverted by Q802. It is coupled through C502 to pin 3 of the horizontal processor, the phase detector. The phase detector consists of a differential amplifier and a gated current source, the inverted horizontal sync pulse. The current division between the two transistors of the differential amplifier is determined by the phase relationship of the sync pulse and sawtooth waveform at pin 4 of IC501. The sawtooth waveform is derived from the negative horizontal flyback pulse coupled from one of the outputs of transformer TX502.

When the sync and sawtooth signals are in phase, the current division between the two transistors in the differential amplifier will be equal. When there is a phase difference, the current will either flow into or out of pin 5 of IC501. This pin is connected by a low-pass filter to pin 7 of IC501, the control point for the oscillator. This current controls the oscillator.

The oscillator, an RC type, is controlled by the current applied to pin 7 of IC501. The timing capacitor is charged up by an external resistor to a trip voltage set in the integrated circuit. When the trip voltage is reached, the capacitor is discharged to a new trip value. This process is repeated, producing a sawtooth waveform.

The output (pin 5 of IC501) of the phase detector controls the oscillator through R510 to pin 7 of IC501. The horizontal hold control R519 is connected to pin 7 of IC501. The two resistors, R505 and R518 in the horizontal hold circuit, center the control's range. An internal diode in series with the hold control is used for oscillator temperature compensation.

The voltage set by the regulator in IC501 is between 8 and 9 volts. The regulator is temperature compensated internally by two high current diodes in series with a zener diode via pin 6 of IC501. The zener current is determined by an external resistor R528, which is connected to +12.7 VDC.

The predriver in IC501 is composed of a four-transistor circuit which receives the sawtooth waveform formed at pin 7 of IC501. It produces a variable duty cycle waveform at pin 1. This output is used to drive the horizontal driver Q501. The period of the output waveform is determined by the bias voltage on pin 8 of IC501. This voltage is derived from a series of clipping resistors which match the integrated circuit to the video monitor.

The output of horizontal processor (IC501) is fed to the horizontal driver Q501. Transformer T501 couples the signal from the horizontal driver to the horizontal output transistor QX502. Resistor R522 and capacitor C511 are used to prevent transformer ringing.

Transistor QX502 functions as an electronic switch, which is turned on for approximately 60 to 70 percent of the horizontal scan period. Capacitors C516 and C520 provide a pseudo B+ voltage for the horizontal deflection yoke TX202B. When QX502 is on, current flows out of C516/C520, through TX202B, LX505A, LX508, LX503, and QX502 to ground. This action produces the right side of the scan. Coil LX503 provides left to right linearity.

Transformer LX505 sets the horizontal scan width. The value of C520 determines the shape of the parabolic waveform on the pseudo B+ voltage which controls the center to edge of scan linearity. A network, composed of CR510 and R531, provides suppression of spurious ringing (a cause of black vertical lines that sometimes appear at the left side of the raster).

When QX502 turns off, the resonant circuit, consisting of CX514 and LX503, LX505, and TX202B, continues to ring for one-half cycle equal to the LC time constant of the resonant circuit CX514 and LX505. This is the retrace pulse that moves the scanning beam from the right to the left side of the CRT and also produces a high amplitude pulse for use in developing the auxiliary power supplies. The flyback transformer, TX502, steps up the pulse to develop the 13 KV high voltage used by the CRT anode. TX502 also inverts and steps down the high voltage pulse. The pulse is rectified by CR504 to provide the video B+ voltage and is clamped by CR509 and C525 to provide a negative supply voltage for the CRT. The pulse is also rectified by CR506 to provide the B+ focus voltage for the CRT. Diode CR505 and capacitor C522 also rectify the pulse to provide the B+ voltage for the black level control.

At the end of the retrace, the sine wave goes negative, biasing the damper diode CR503 on. Current flowing through the yoke circuit into the damper diode provides reference point for the left side of the raster screen. The above horizontal output cycle is then repeated. The +12 volts DC for the horizontal scan is fed to diodes CR507 and CR508 via a parasitic suppressor choke, LX504. The diodes are tied to a tap on TX502 where transformer action increases the voltage to +24 volts and provide the pseudo B+ voltage necessary for the vertical deflection circuits.

The positive pulse from QX502 saturates the flyback transformer TX502 and charges C516 and C520 through the width transformer LX505 and horizontal deflection yoke TX202B. When QX502 turns off, the magnetic field of TX502 collapses, generating the acceleration voltage need by the CRT through an internal rectifier diode. Diode CR506 rectifies the focus voltage, charging C205 to a static level. Diode CR502 and CX514 form a damper network to eliminate the ringing effect of flyback transformer TX502. The width transformer LX505 and linearity coil LX503 modify the sawtooth waveform generated by TX502 to provide a linear horizontal scan.

Vertical Sweep Circuit

The vertical sweep circuit is a DC-coupled, ramp-generating oscillator circuit.

In general, the vertical sync signal is coupled through C601, R602, R603, and C606 to the base of the vertical oscillator, Q601. The oscillator output is fed to the base of differential amplifier Q602. The difference signal is applied to vertical amplifier driver Q603, which drives the complimentary push-pull class B amplifier, composed of transistors Q604 and Q606. Transistor Q607 provides vertical blanking for the sweep circuit output.

The output from the emitters of vertical output stages, Q604 and Q606, are fed back to oscillator Q601 through resistor R618 and capacitor C613. This differentiated, positive-going flyback pulse from the Q604 and Q606 charges capacitors C606 and C608 through Q601. The capacitors discharge through their respective resistor networks.

Capacitor C606 discharges during the trace interval to 0.6 volts below the emitter voltage of Q601. At this point, Q601 conducts and turns off the amplifier stages. This causes the yoke voltage to fly up and repeat the cycle.

The presence of a vertical sync signal on the base of Q601 causes it to start conducting just before the voltage on C606 discharges to 0.6 volts below the emitter voltage of Q601. This synchronizes the oscillator with the vertical sync signal.

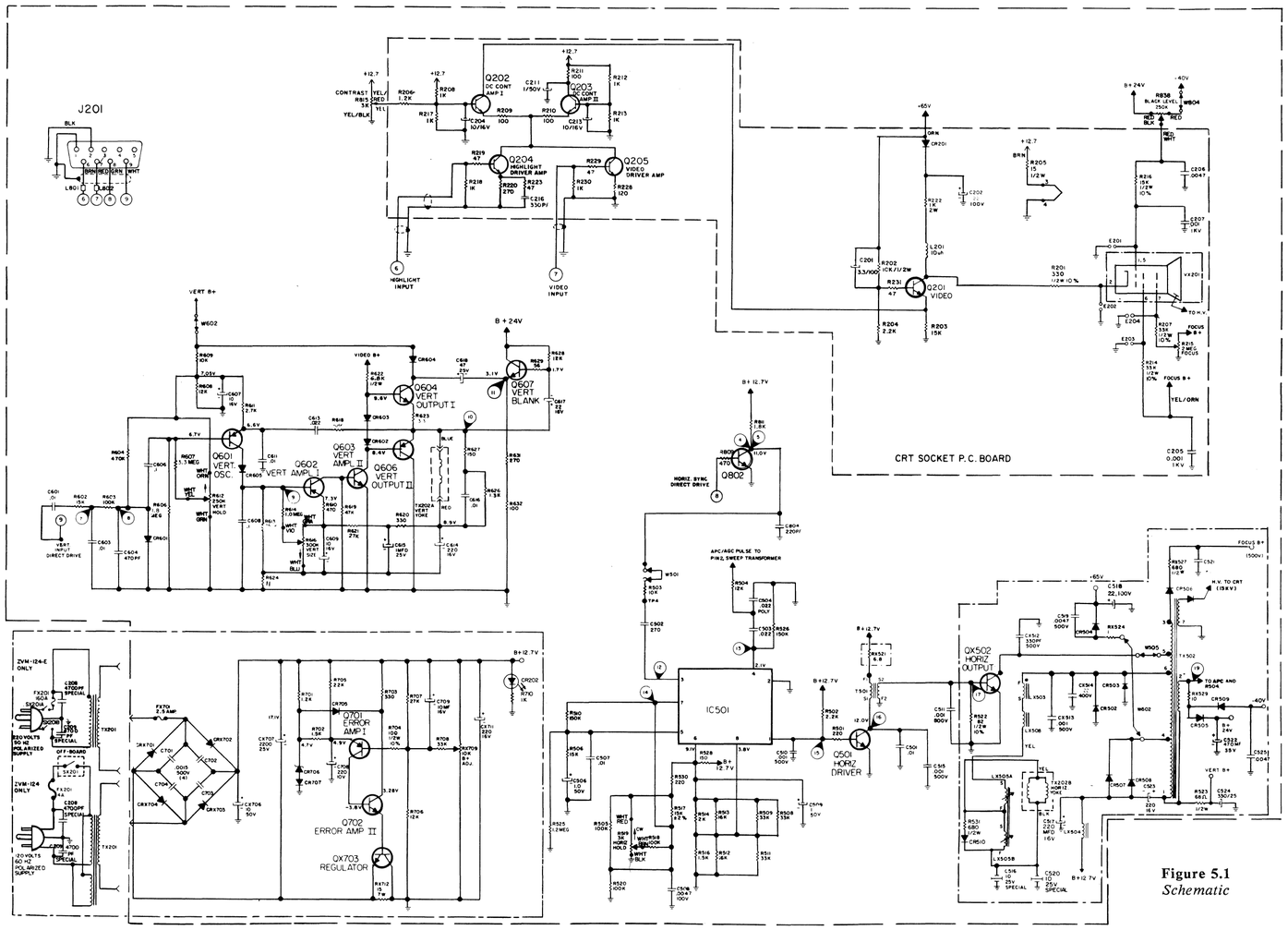

Figure 5.1
Schematic

Capacitor C608 discharges in a linear manner through its resistor network to the yoke current-sensing resistor R624. Here, the ramp voltage appears at the same amplitude as the ramp voltage across C608. Because a constant voltage appears across the discharge resistor R613, it maintains a constant discharge current from C608. Capacitor C608 provides, to the base of Q602, a linear, negative-going ramp voltage of an average DC value, which is established by R608 and R609. The signal to the emitter of the differential amplifier Q602 comes from the yoke return circuit.

The ramp voltage across R624 receives an inverse S-correction signal to produce a linear display on the CRT. The correction signal is injected through capacitor C609 and is derived through the shaping network composed of resistors R620 and R621. This adds to the ramp-plus-S-correction signal appearing across R624 to produce a linear ramp at the emitter of Q602. This linear ramp is compared by Q602 to the linear ramp across C608. The difference between the two ramps is coupled to the succeeding amplifier stages which restores the yoke current to the desired levels for producing a linear display on the CRT.

Schematic

In some instances, redundant circuitry is incorporated for additional circuit protection and X-radiation safety. Special circuits are also used to prevent shock and fire hazard. The letter **X** in the schematic (a foldout from this section), parts list (see Section 9), and component location illustration (Figure 9.2 in Section 9), designates special critical safety components. These should be replaced only with types that are identical to those in the parts list and on the schematic.

All areas of the schematic that contain critical circuit components are outlined using a "dot and dash" line.

The schematic may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the equipment is not delayed until new service literature is printed.

NOTE: When servicing this equipment, under no circumstances should the original design be modified or altered without permission of Zenith Electronics Corporation.

SERVICE MANUAL

Monochrome Video Monitors

ZVM-124 and ZVM-124-E

ZENITH | data systems

This section provides instructions to disassemble the ZVM-124 video monitor.

WARNING: Be sure the signal cable and power cord are unplugged from the computer or other signal and power sources before disassembling this monitor.

Normally, the disassembly sequence will be:

1. Remove the back cover.
2. Remove the power transformer assembly.
   a. Remove the fuse board.
3. Remove the CRT socket board.
   a. Remove the cathode-ray tube.
4. Remove the main circuit board.
5. Remove the power switch assembly.
6. Remove the control panel assembly.

Note, however, that some of the assemblies can be removed independently of the others; see each procedure.

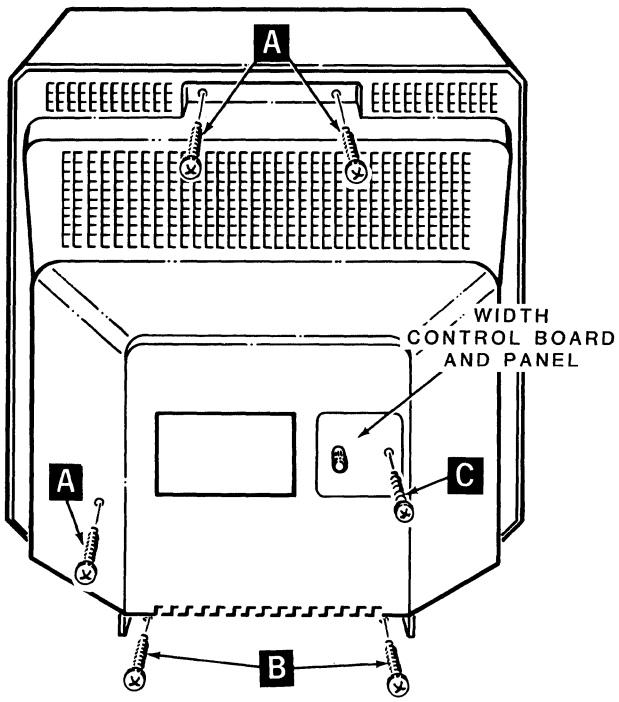

Figure 6.1
Back Cover Removal

Back Cover Removal

1. Refer to Figure 6.1 and position the monitor as shown. Remove the three 8-18 x .625″ screws at **A** from the back top and rear of the cabinet.
2. Remove the two 8-18 x .625″ screws at **B** from the rear bottom of the cabinet.
3. Remove the 6-20 x .500″ screw at **C** that secures the width control panel to the back cover.
4. Turn and slide the width control board and panel through the cutout in the back cover into the monitor.
5. Carefully remove the back cover from the cabinet.

Power Transformer Assembly Removal

1. Remove the back cover.
2. Refer to Figure 6.2 and remove the two 8-18 x .625″ hex head screws at **Q** that secure the power transformer assembly to the bottom of the cabinet; then remove the assembly from the cabinet.

NOTE: If the power transformer is to be replaced, then proceed to step 3.

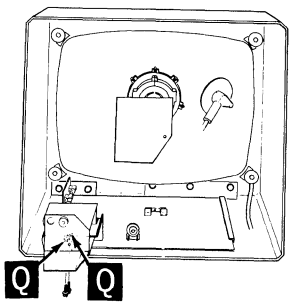

Figure 6.2
Transformer Removal

3. Refer to Figure 6.3 and remove the two 6-20 x .312″ screws at **R** that secure the cover to the transformer; then remove the cover.

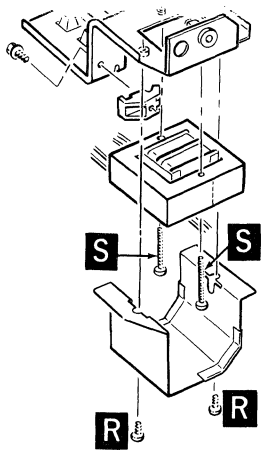

Figure 6.3
Transformer Disassembly

4. Refer to Figure 6.4 and unsolder transformer leads **A**, **B**, **C**, and **D** from fuse board.

NOTE: If you are servicing a 220-volt monitor, unsolder leads **A** and **J**, instead of those indicated previously in this step.

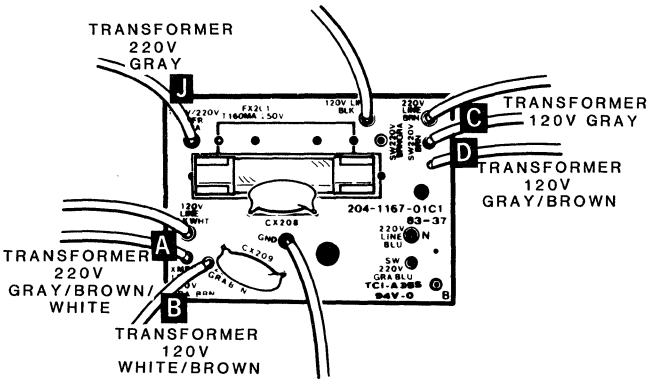

Figure 6.4
Fuse Board

5. Refer to Figure 6.5 and unsolder transformer leads **E** and **F** from the main board.

6. Refer to Figure 6.3 and remove the two 8-18 x 1.25″ transformer screws at **S**; remove the transformer.

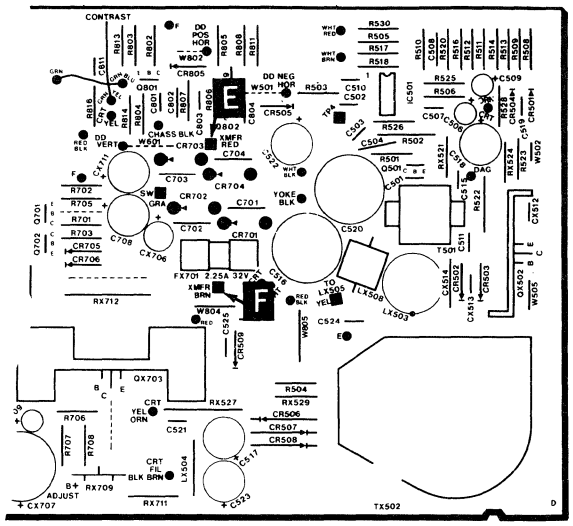

Figure 6.5
Main Board

Fuse Board Removal

1. Remove the back cover and power transformer assembly.

2. Refer to Figure 6.6 and remove the 8-18 x .312″ hex head screw at **H** that secures the board to the bracket; then remove the fuse board.

3. If the board is being replaced, prepare a chart, showing all connections, similar to Figure 2.3 and Figure 2.7 in Section 2.

4. Once the chart is prepared, unsolder the various connections and remove the board.

CRT Socket Board Removal

CAUTION: The CRT socket board plugs onto the pins on the neck of the cathode-ray tube. Use extreme care when you remove or replace this board to avoid damaging the pins on the cathode-ray tube.

1. Remove the back cover.

2. Refer to Figure 6.7 and carefully unplug the CRT socket board from the pins on the neck of the cathode-ray tube.

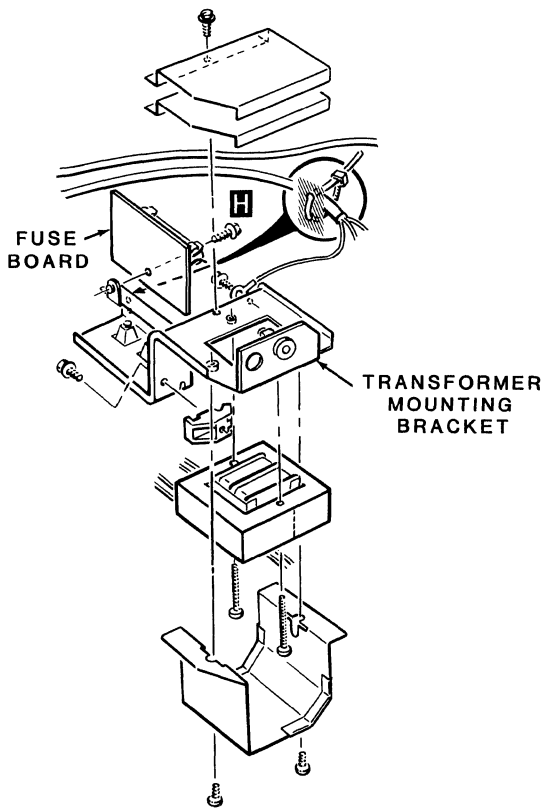

Figure 6.6
Fuse Board Removal

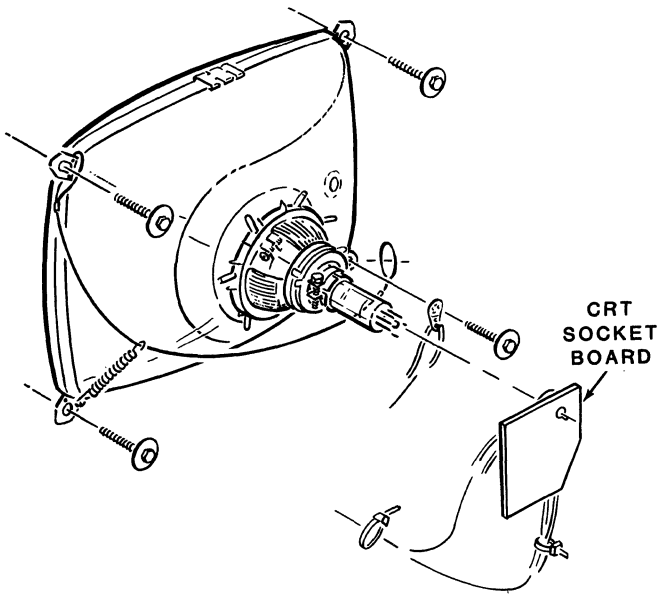

Figure 6.7
CRT Socket Board Removal

Main Circuit Board Removal

1. Remove the back cover and power transformer assembly and carefully unplug the CRT socket board from the cathode-ray tube.

WARNING: Discharge the high voltage anode lead of the cathode-ray tube by using a jumper lead connected between the chassis and a screwdriver or shock and/or injury may result.

2. Refer to Figure 6.8 and use a screwdriver with a jumper lead attached between it and the ground lug at **G** to discharge the high voltage anode lead at the cathode-ray tube as shown in inset #1.
3. Refer to inset #2 of Figure 6.8 and disconnect the anode lead from the cathode-ray tube.
4. Remove the 8-18 x .750" hex head screw and flat washer at **G** that secure the ground lug at the lower right-hand corner of the CRT. Free the ground lug and the two attached black wires.

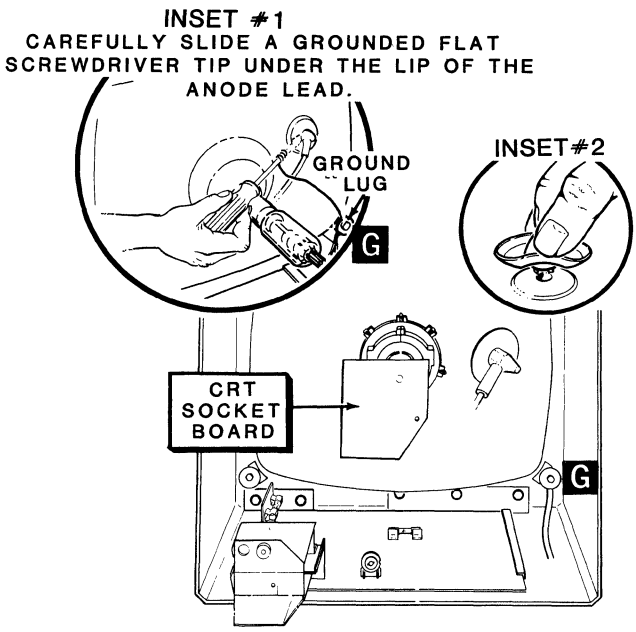

Figure 6.8
Main Board Removal
Discharging the CRT

5. The main circuit board is held in place by two plastic guides. Slide the main circuit board straight to the back. Do not solder any wires at this time.
6. To completely free the main board, you will have to also remove the power switch and control panel as described later in this section.

Power Switch Assembly Removal

1. Remove the back cover, power transformer assembly, CRT socket board, and main circuit board as previously described.
2. Refer to Figure 6.9 and remove the two 8-18 x .437″ hex head screws at **F** that secure the switch assembly to the mounting bracket.
3. Unsolder the two wires from the terminals on the switch; then remove the power switch and LED.

Control Panel Assembly Removal

1. Remove the back cover, the power transformer assembly, the CRT socket board, and the main circuit board as previously described.
2. Refer to Figure 6.10 and remove the three 8-18 x .500″ hex head screws at **E** that secure the control panel assembly to the back of the front of the cabinet.
3. Carefully remove the control panel assembly until the controls clear the holes in the cabinet; then remove the assembly from the cabinet.
4. If you are replacing any components of the control panel assembly, unsolder the leads at the component, not at the main circuit board.

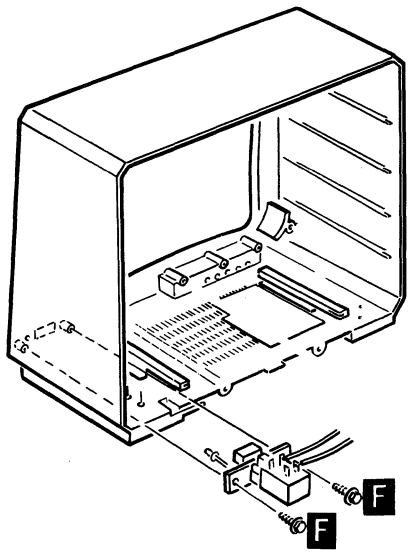

Figure 6.9
Power Switch Removal

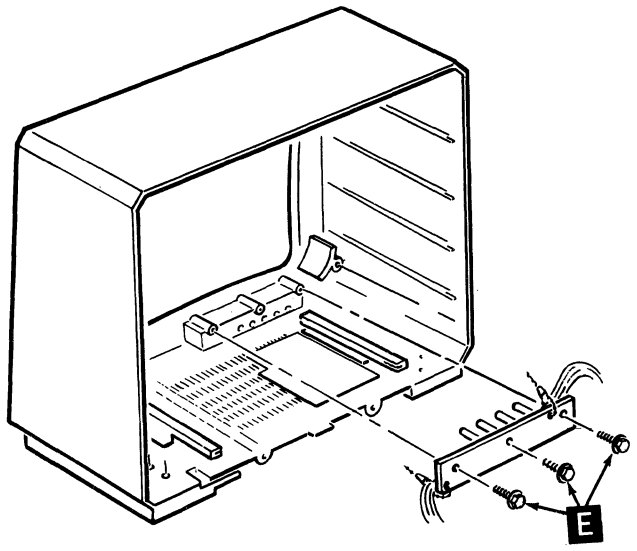

Figure 6.10
Control Panel Removal

Cathode-Ray Tube Removal

Refer to Figure 6.11, Figure 6.12, and Figure 6.13.

WARNING: Discharge the high voltage anode lead of the CRT using a jumper lead

connected between the chassis and a screwdriver or shock and/or injury may result.

1. Remove the back cover and CRT socket board as previously described.
2. Use a screwdriver with a jumper lead attached between it and the ground lug at the lower-right corner of the CRT and discharge the high voltage anode lead at the CRT as shown in inset #1 of Figure 6.11.
3. Refer to inset #2 of Figure 6.11 and disconnect the anode lead from the CRT.
4. Unsolder the five wires from the terminals on the CRT deflection yoke as shown in Figure 6.12.
5. Refer to Figure 6.13 and remove the four 6-32 x 3/4" hex head screws and flat washers at **G** that secure the CRT to the cabinet.
6. Carefully remove the CRT from the cabinet. Set it down on a padded work surface so the front surface of the glass is not scratched.

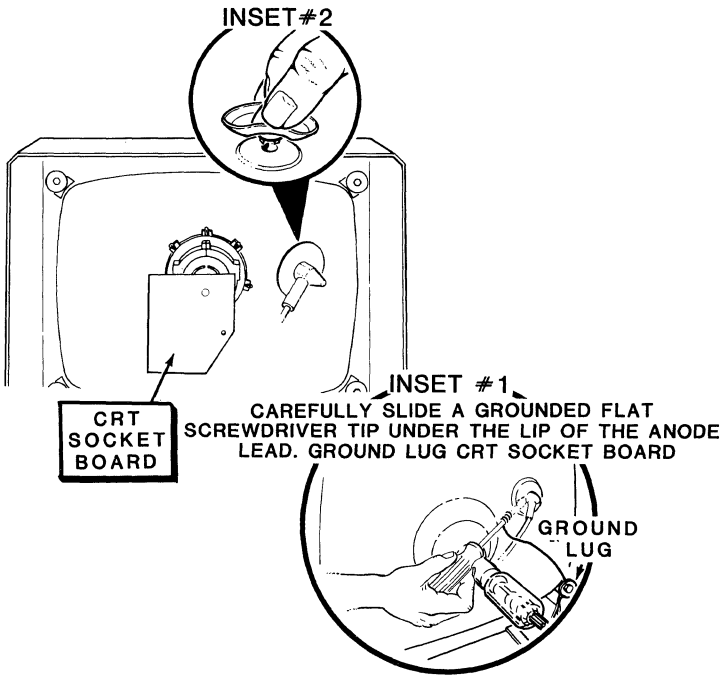

Figure 6.11
Preparing the Cathode-Ray Tube for Removal

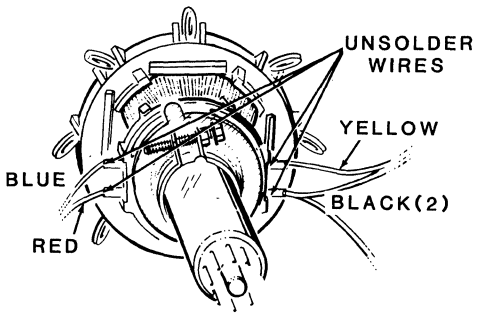

Figure 6.12
CRT Yoke Preparation

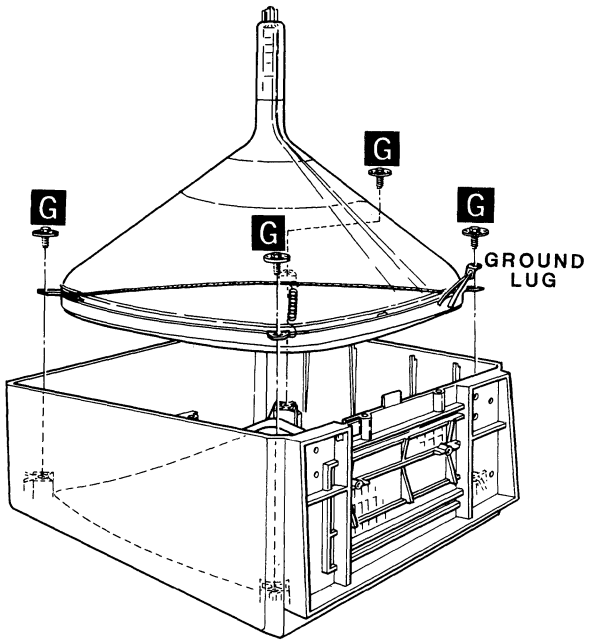

Figure 6.13
CRT Removal

This section provides servicing information to assist you in the servicing and troubleshooting of the monitor. Included are safety servicing guidelines, cleaning instructions, adjustments, inspection, testing, and troubleshooting.

Safety and Service Guidelines

WARNING: No work should be attempted on any part of the chassis by anyone not familiar with Zenith service procedures and precautions or severe injury may result.

WARNING: Discharge the high voltage anode lead of the CRT using a jumper lead connected between the chassis and a screwdriver. Failure to comply could result in severe shock and/or personal injury.

WARNING: Do not operate a monitor with excessive high voltage any longer than necessary or the monitor may produce X-rays from the CRT.

Excessive high voltage will produce X-rays from the cathode-ray tube; always check that the voltage is at normal levels when servicing the unit.

WARNING: Carefully handle the cathode-ray tube when you hold, remove, or install it or implosion and injury may result.

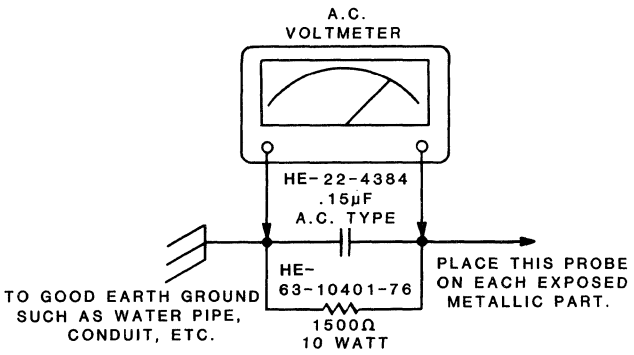

Figure 7.1
AC Leakage Test Arrangement

AC LEAKAGE TEST

To prevent electrical shock after reassembly, perform an AC leakage test on all exposed metal parts of the unit. Do not use a line isolation transformer to perform this test.

Refer to Figure 7.1 while conducting the following AC leakage test for the monitor.

NOTE: Use an AC voltmeter having 5000 ohms per volt sensitivity or better.

1. Connect a 1500 ohm, 10 watt resistor in parallel with a 0.15 uF capacitor rated at 150 volts AC.
2. Connect this parallel network to a known good earth ground and the exposed metal parts, one at a time.
3. Measure the AC voltage across the parallel combination; then reverse the AC plug and repeat the measurements.
4. Any voltage that exceeds 0.75 volts rms (0.5 milliamperes AC) constitutes a potential shock hazard and must be corrected immediately.

CAUTION: Some of the integrated circuits (ICs) used in this unit are electrostatic-sensitive devices (ESD). These devices can be damaged by static electricity. When handling any IC, use a wrist grounding strap or be sure to equalize the static charge before picking it up.

OTHER PRECAUTIONS

- Be sure that all components are positioned in such a manner as to avoid the possibility of shorting components or parts together.
- Inspect all soldered connections for cold solder joints, frayed leads, damaged insulation, splashed solder, or sharp points.
- Never release a repaired product to a customer unless all protective devices, such

as insulators, barriers, cover shields, strain reliefs, etc., have been reinstalled.

- Remove from inside the unit all loose material left after soldering or making other repairs.
- Follow the original lead layout, dress, lengths, and tension.
- Replace all components with exact Zenith replacement types.

Cleaning Procedures

Use the following suggestions to keep the monitor clean.

WARNING: Be sure the monitor's signal cable and power cord are uplugged before cleaning it.

- Clean the cabinet with a lint-free cloth, mildly dampened with a nondetergent cleaning solution; do not spray liquids directly on the monitor or use a wet, saturated cloth.
- Clean the monitor's screen with a good quality glass cleaner.
- Be sure the monitor is completely dry before applying electrical power.

Adjustments

You may use an IBM PC or equivalent for the following adjustments or, as an alternative signal source, a Quantum 801 A or equivalent.

NOTE: Before proceeding with trouble-shooting, check the adjustments that could affect the monitor's performance.

Refer to the operating controls part of section 3 and the service adjustments in this section.

FOCUS ADJUSTMENT

Refer to Figure 7.2 when making the focus adjustment.

1. Remove the back cover from the cabinet.
2. Use the BASIC program in Listing 3.1 to fill the CRT screen with any character. Refer to section 3 for more information.

NOTE: Locate the focus control, R215, on the CRT socket board. You may access this control through a hole in board.

3. With the screen filled with characters, adjust R215 for the clearest, sharpest display.
4. Reinstall the back cover on the unit.

B+ VOLTAGE ADJUSTMENT

Refer to Figure 7.2.

1. Remove the back cover from the monitor.
2. Locate the B+ voltage adjustment control, RX709, on the main circuit board.
3. Connect a digital voltmeter's (DVM) negative test lead to ground and its positive test lead to B+ ADJUST as indicated in Figure 7.2.
4. Adjust the control, RX709 on the main circuit board, until the digital voltmeter indicates +12.7 (±0.1) volts DC.
5. Disconnect the meter's test leads and reinstall the back cover on the cabinet.

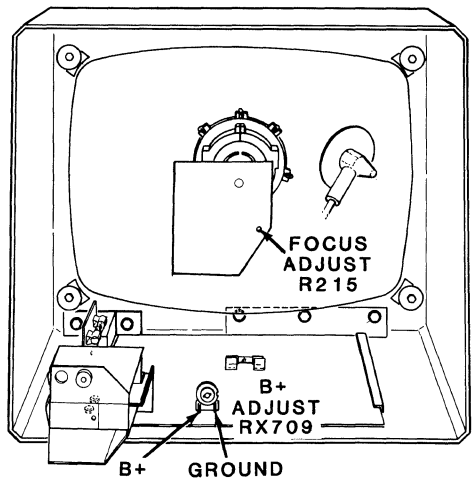

Figure 7.2
Internal Adjustments

CRT YOKE ADJUSTMENT

Refer to Figure 7.3 when making the CRT yoke adjustments.

1. Remove any ferrite magnets that may be installed on the yoke.
2. Loosen the clamp screw and rotate the deflection yoke until the edges of the display are parallel with the edges of the screen; then tighten the clamp screw.
3. Adjust the centering rings so that the display is centered on the screen.
4. Select the least straight of the four displayed edges and install a ferrite magnet on the yoke post that is closest to the greatest bow. Rotate the magnet slowly until the display is as straight as possible.
5. Repeat step 4 as necessary around the yoke until a uniform rectangular shape is displayed.

NOTE: If only a small effect is desired, reduce the size of the ferrite magnets by cutting off a small portion with diagonal cutters.

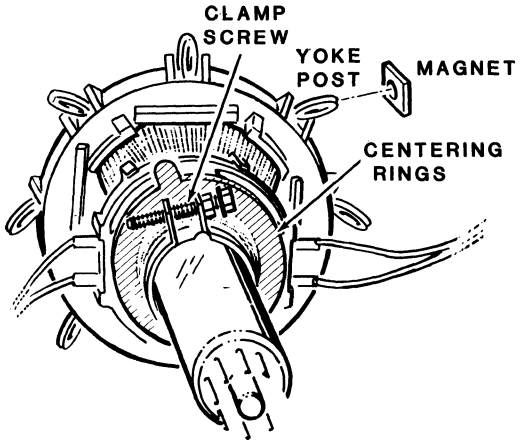

Figure 7.3
Yoke Adjustment

Troubleshooting

Use the following inspection to determine possible general causes of monitor failures.

- Unplug the signal cable and power cord from the rear of the computer and check for burnt insulation, broken wires, or loose prongs on plugs.
- Check the AC receptacle (wall outlet) for the proper supply voltage to the monitor equipment.
- Check all cabling and internal circuit board plugs in the monitor for proper electrical connections.
- Check all circuit boards in the monitor for broken or burnt components or for darkened areas or other signs of component overheating.

Refer to Table 7.1 for general troubleshooting.

Table 7.1
General Troubleshooting

PROBLEM	POSSIBLE CAUSES
Monitor completely dead (Power on LED is not lit)	1. Power cord not connected to computer 2. Power switch is not on 3. Fuses are missing or blown 4. Power supply 5. Shorted horizontal output
No video (Power on LED is lit — High and low voltage is okay)	1. Signal cable not connected to computer 2. Black level control 3. CRT socket board 4. Main circuit board 5. Wiring between boards
Insufficient brightness	1. Black level control 2. CRT socket board 3. Main circuit board
No raster	1. Black level control 2. Horizontal (and high voltage) not working 3. CRT socket board 4. Video tube (CRT)
Characters on screen appear out of focus	1. Focus control 2. CRT socket board 3. Main circuit board
No horizontal sync	1. Signal cable wiring 2. Horizontal hold control 3. Horizontal oscillator, JC501
No vertical sync	1. Signal cable wiring 2. Vertical hold control
Vertical sweep scans bottom to top instead of top to bottom	1. Red and blue wires reversed on deflection yoke
Horizontal sweep scans right to left instead of left to right	1. Yellow and black wires reversed on deflection yoke

MAIN CIRCUIT BOARD TROUBLESHOOTING

Refer to Table 7.2 for troubleshooting the main circuit board.

Table 7.2
Main Circuit Board Troubleshooting

PROBLEM	POSSIBLE CAUSES
No raster	1. Q501, QX502 2. Q201, VX201, TX502, TX202B (Check the high voltage at the CRT anode) 3. IC501, Q501, CR502, R522
No video (Raster okay)	1. Q201, Q202, CR201 2. VX201, R815, contrast control 3. CR504 4. CRT socket 5. R838, black level control
No vertical deflection	1. C524 2. Q601, Q602, Q603, Q604, Q606 3. TX202A 4. CR604
Vertical sweep off frequency	1. Q601, Q602, Q603 2. C606, C608
No vertical sync	1. C601, R602, C603 2. R612, vertical hold control
Horizontal sweep off frequency	1. IC501, R510 2. R504, C504, C508 3. C506, C507, R525
No horizontal sync	1. Q802, C804 2. C502, R502, R503 3. R518, horizontal hold control
Horizontal phasing out	1. IC501, R505 2. R518, horizontal hold control
Poor horizontal linearity of foldover	1. TX502, LX505, LX503, CR510 2. TX202B 3. Q501, QX502
Narrow horizontal raster	1. Q501, T501 2. LX505, CR510
Characters on screen out of focus	1. CR506, RX527, C521 2. R215 focus control
Only top or bottom of vertical deflection appears on screen	1. Q601, Q602, Q603, Q604, Q606 2. Vertical yoke TX202A open
Hum bars are present in display	1. CX707 2. R707 and R706 interchanged 3. CR701-CR704, one diode open 4. CR706
No high voltage at CRT anode	1. Q501 or QX502 2. Yoke winding TX202B 3. Flyback transformer TX502 4. CR507, CR508, CR502, CR503
No video display on screen	1. L201 open 2. Q205, Q201 3. Signal cable to computer

MAIN CIRCUIT BOARD WAVEFORMS

The voltages and waveforms shown on the schematic and in Figure 7.4 through 7.10 are provided to aid you in troubleshooting the ZVM-124.

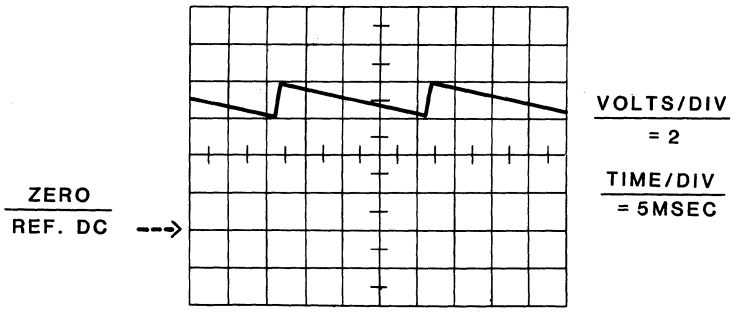

Figure 7.4
Waveform at Base of Q601, Vertical Oscillator

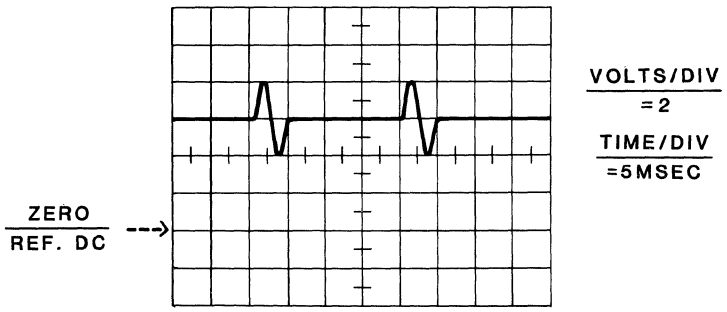

Figure 7.5
Waveform at Emitter of Q601, Vertical Oscillator

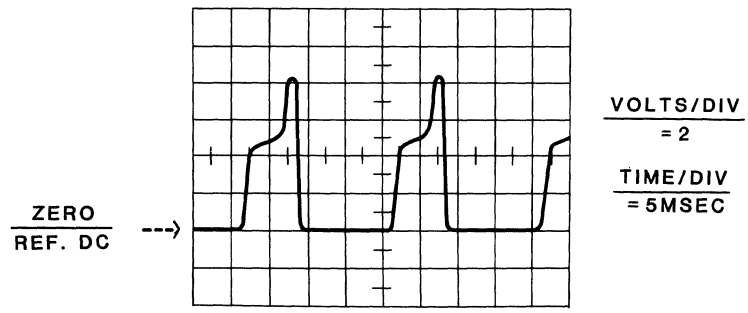

Figure 7.6
Waveform at Collector of Q601, Vertical Oscillator

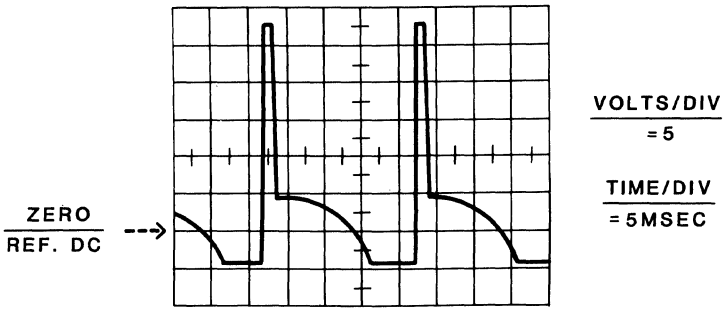

Figure 7.7
Waveform at Emitter of Q606, Vertical Output

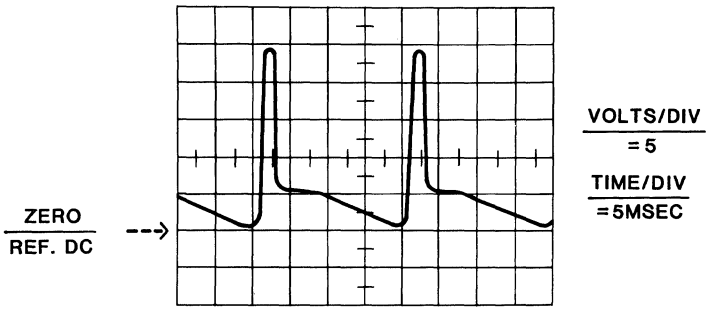

Figure 7.8
Waveform at Emitter of Q607, Vertical Blanking

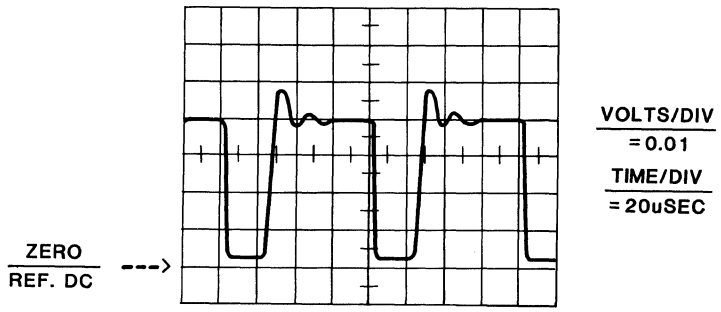

Figure 7.9
Waveform at Collector of Q501, Horizontal Driver

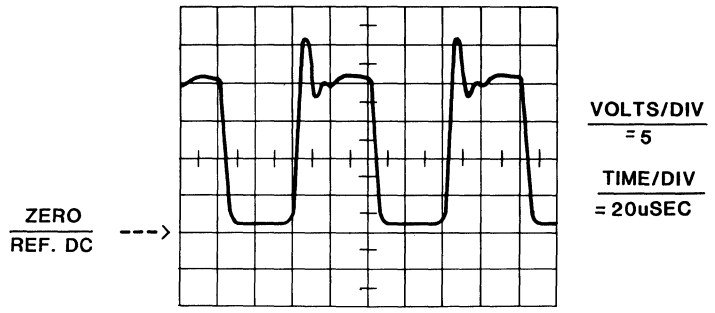

Figure 7.10
Waveform at Base of Q501, Horizontal Driver

CRT SOCKET BOARD TROUBLESHOOTING

The voltages on the schematic and the waveforms shown in Figure 7.11 and Figure 7.12 are provided to aid you in troubleshooting the ZVM-124.

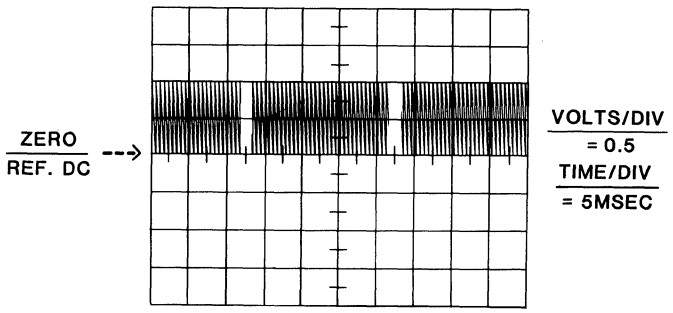

Figure 7.11
Waveform at Base of Q205, Video Input

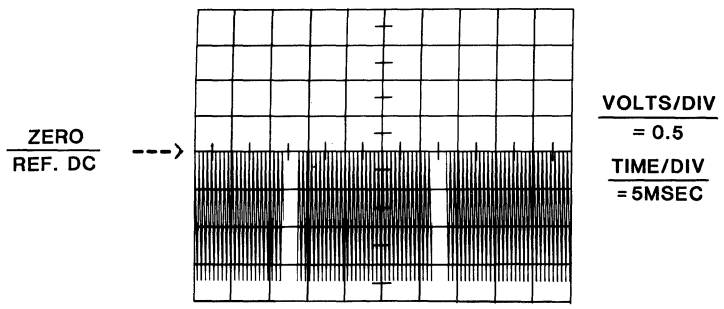

Figure 7.12
Waveform at Pin 2 of VX201, Cathode of the CRT

POWER SUPPLY TROUBLESHOOTING

Refer to Table 7.3 for troubleshooting the power supply. The voltages shown on the schematic are provided to aid you in troubleshooting the ZVM-124.

Table 7.3
Power Supply Troubleshooting

PROBLEM	POSSIBLE CAUSES
No +12.7 V output from power supply	1. FX701, TX201, FX201 2. Fuse board jumpers
+12.7V adjust RX709 does not vary voltage	1. RX709 2. Q701, Q702, QX703 3. Short (or heavy load) on supply
+12.7V output is not regulating	1. QX703 2. Zener CR706
Voltage across CX706 is not +17.1V	1. CRX701 to CRX704 2. C701 to C704

The following information is provided to assist you in reassembling the ZVM-124. Normally the reassembly sequence will be:

1. Resolder all wires that were unsoldered during disassembly or to replace parts.
2. Install the control panel.
3. Install the power switch and LED.
4. Install the main board.
5. Install the fuse board on the power transformer assembly.
6. Install the power transformer assembly.
7. Install the cathode-ray tube.
8. Install the CRT socket board.
9. Install the back cover.

Note, however, that some of the assemblies may be removed and reinstalled independent of this sequence.

WARNING: Verify that the monitor's signal cable is unplugged from any signal source (such as an IBM PC or Quantum 801 A) and the power cord is disconnected from a power source before reassembling the monitor.

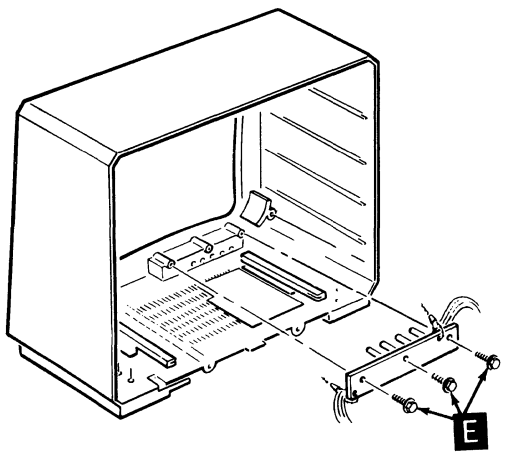

Figure 8.1
Control Panel Assembly Installation

Control Panel Assembly Installation

Refer to Figure 8.1.

1. Carefully place the control panel assembly in the front of the cabinet and feed the control shafts through the holes in the cabinet.
2. Install and tighten the three 8-18 x .500″ hex head screws at **E** that secure the assembly to the cabinet.
3. Install the remaining parts and assemblies as described in this section.

Power Switch Assembly Installation

Refer to Figure 8.2.

1. Solder the two wires coming from the main circuit board to the switch assembly. Dress the leads as shown.
2. Carefully place the switch assembly in the cabinet and align the switch and LED with the openings in the cabinet.
3. Install and tighten the two 8-18 x .437″ screws at **F** that secure the switch assembly to the cabinet.
4. Install the remaining parts and assemblies as described in this section.

Main Circuit Board Installation

Refer to Figure 8.3.

1. If the power transformer leads at **E** and **F** are not soldered into place, do so now.
2. Start (place) the main circuit board in the plastic guides and slide the board all the way into the cabinet.

3. Use an 8-18 x .750" hex head screw and washer and install the ground lug (two wires from the main circuit board are connected to it) at **G** (the lower right-hand corner of the CRT as viewed from the back of the monitor).
4. Install the remaining parts and assemblies as described in this section.

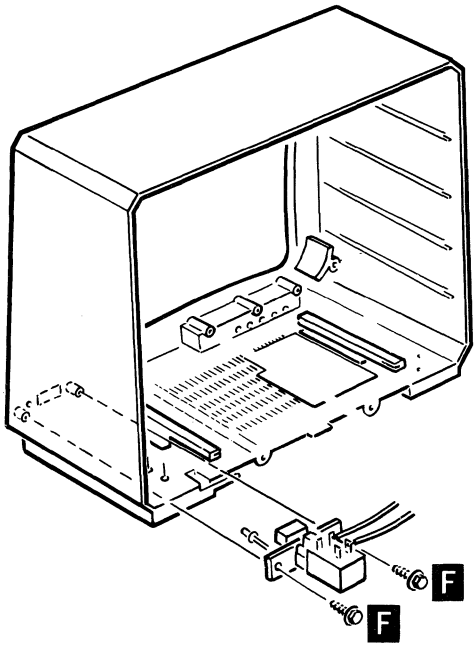

Figure 8.2
Power Switch Assembly Installation

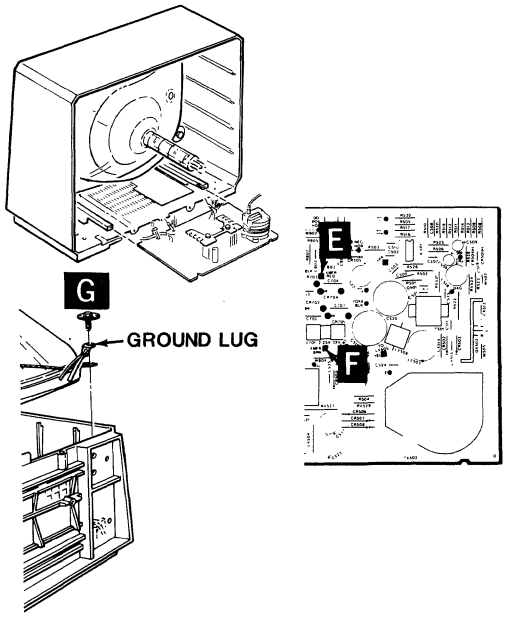

Figure 8.3
Main Circuit Board Installation

Fuse Board Installation

Refer to Figure 8.4.

1. If there are any disconnected power transformer or other leads, solder them in place now. Use the chart you prepared in Section 6, "Detailed Disassembly."
2. Use an 8-18 x 1/4" hex head screw at **H** to secure the fuse board to the mounting bracket of the power transformer assembly.
3. Install the remaining parts and assemblies as described in this section.

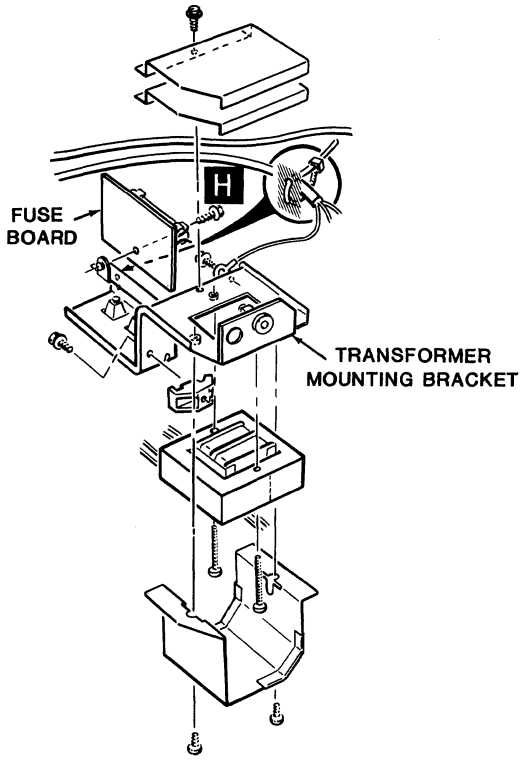

Figure 8.4
Fuse Board Installation

Power Transformer Assembly Installation

Refer to Figure 8.5.

1. If you have not done so, install the fuse board on the mounting bracket of the power transformer assembly as described previously.
2. The power transformer assembly mounts to the bottom of the cabinet. Mount the assembly using two 8-18 x .625" hex head screws at **Q**. Tighten the screws.
3. Install the remaining parts and assemblies as described in this section.

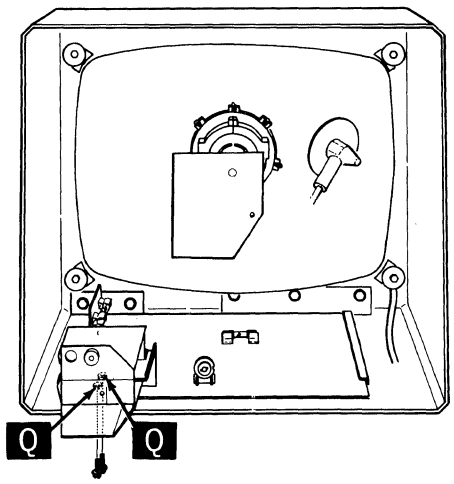

Figure 8.5
Power Transformer Assembly Installation

Cathode-Ray Tube Installation

Refer to Figure 8.6.

1. Carefully place the monitor's cabinet face down on a smooth, flat work surface.
2. Carefully place the CRT in the cabinet and align it with the front mounting brackets.
3. Install three 8-18 x .750" hex head screws and flat washers at **G** (the two upper positions and the lower-left position) to secure CRT to the cabinet.
4. Install the ground lead from the main circuit board and CRT socket board with the CRT mounting screw at **G** at the lower right-hand corner of the cathode-ray tube.
5. Refer to Figure 8.7 and resolder the wires to the terminals on the CRT deflection yoke.

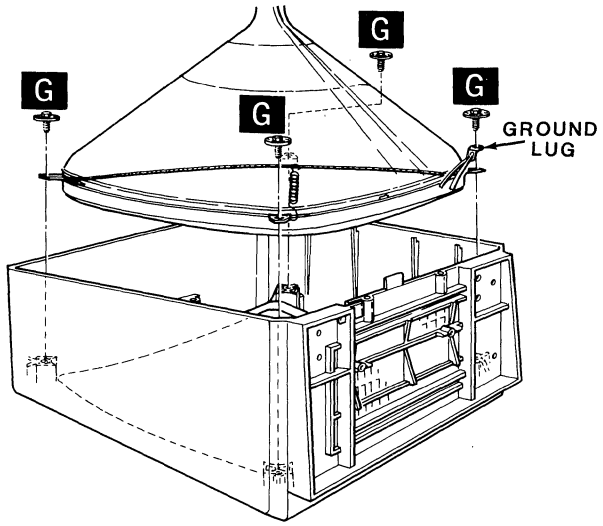

Figure 8.6
Installing the CRT in the Cabinet

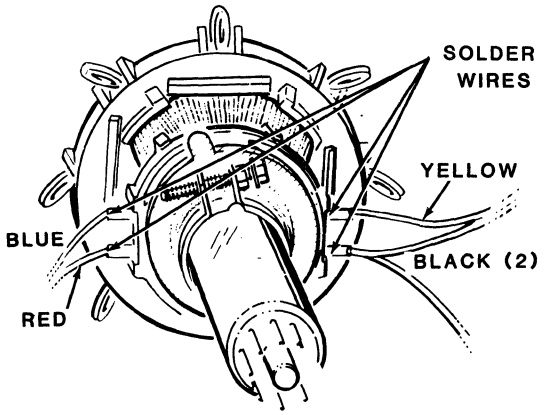

Figure 8.7
Yoke Leads

6. Refer to Figure 8.8 and reconnect the high voltage anode lead to the CRT.
7. Install the remaining parts and assemblies as described in this section.

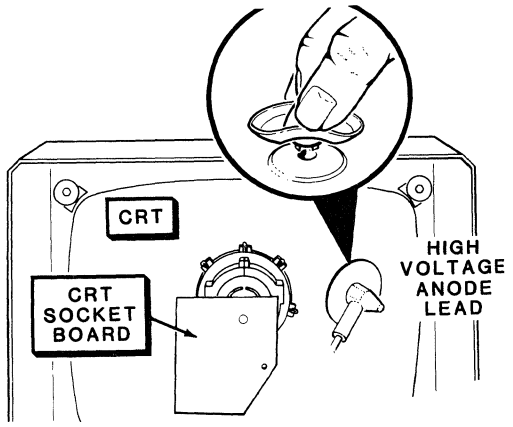

Figure 8.8
CRT Socket and High Voltage Anode Lead

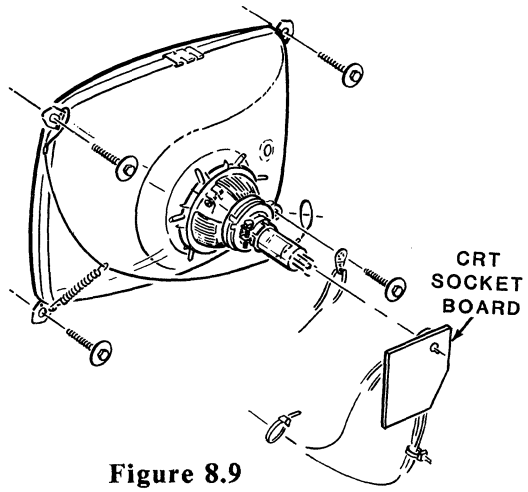

Figure 8.9
CRT Socket Installation

CRT Socket Board Installation

Refer to Figure 8.9.

CAUTION: The CRT socket board plugs onto the pins on the neck of the CRT. Use extreme care when you install this board that you do not damage the pins of the CRT.

1. Inspect the CRT socket board for any wires that may have broken loose and resolder them.
2. Carefully plug the CRT socket board onto the pins of the cathode-ray tube.
3. Install the remaining parts and assemblies as described in this section.

Back Cover Installation

Refer to Figure 8.10.

1. Before you install the back cover, verify that there are no loose connections or parts inside the cabinet. The width control board and panel will be installed during the following procedure.
2. Push the width control board and panel through the cutout in back cover so that it is on the outside of the cover.
3. Position the back cover and cabinet so the screw holes line up.
4. Use a 6-20 x .500" screw at **C** to secure the width control board and panel to the back cover.
5. Use two 8-18 x .625" screws at **B** to secure the bottom of the back cover to the cabinet.
6. Install the remaining three 8-18 x .625" screws at **A** to finish securing the back cover to the cabinet.

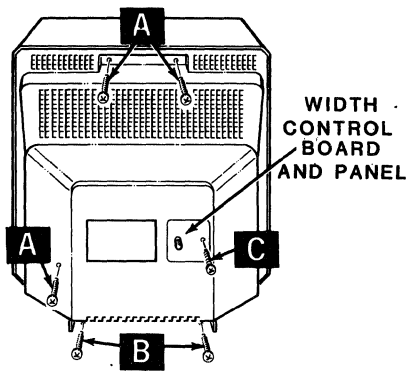

Figure 8.10
Back Cover Installation

CAUTION: Some of the integrated circuits (ICs) used in this unit are electrostatic-sensitive devices (ESD). These devices can be damaged by static electricity. When handling any IC, use a wrist grounding strap or be sure to equalize the static charge before picking it up.

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

In some instances, redundant circuitry is incorporated for additional circuit protection and X-radiation safety. Special circuits are also used to prevent shock and fire hazard. The letter "X" in the schematic, parts list, and component location charts designates special critical safety components. These should be replaced only with types identical to those in the parts list and schematic. Example: CRX701.

NOTE: The circuit diagram (schematic) may occasionally differ from the actual circuit used. This way, implementation of the latest safety and performance improvement changes into the equipment is not delayed until new service literature is printed.

NOTE: Unless otherwise specified all resistors are 1/4 watt, 5% tolerance.

In the following parts lists, N/A refers to parts for which there is no replacement part number assigned.

Table 9.1
Major Assemblies (Refer to Figure 9.1.)

REF. DES.	ZDS PART NUMBER	DESCRIPTION
5	A-11522-03	Cabinet front assembly
10	N/A	CRT, 12" amber
15	114-1014-02	Hex head screw w/washer 8-18 x .750"
20	80-2432	Extension spring, CRT ground
25	A-10413-02	Wire and terminal assembly
30	95-3397-02	Transformer, deflection yoke
35	A-10888	Shield assembly, sweep transformer
40	HE 234-370	Plastic rail, left PC board
45	HE 234-371	Plastic rail, right PC board
50	12ZM3ZX	Chassis assembly, main circuit board
55	N/A	Control panel board assembly
60	114-686	Hex head screw 8-18 x .500"
65	76-2166	Plastic shaft, controls
70	85-1559	Switch SPST, on/off
	85-1646	Switch DPST, on/off (ZVM-124-E)
72	103-319	Diode, LED, power on (CR202)
75	114-1011-03	Hex head screw 8-18 x .437"
80	52-2550	Signal connector/cable J201
85	11-358	Power cord
90	83-8066-02	Cable retainer, wire tie
91	149-535	Ferrite bead
92	19-733-01	Cable retainer, wire tie
95	194-420	Insulator insert
100	12-8091	Strain relief, signal cable
105	114-686	Hex head screw 8-18 x .500"
110	N/A	Power transformer and fuse board assembly
115	114-1190	Hex head screw 8-18 x .625"
117	12-8091	Strain relief, power cord
118	114-686	Hex head screw 8-18 x .500"
120	N/A	Fuse board assembly
125	114-802	Hex head screw 8-18 x .312"
130	126-2183	Outer shield, transformer
132	126-2183-01	Inner shield, transformer
135	114-686	Hex head screw 8-18 x .500"
140	126-1284	Bottom cover, transformer
145	112-2099-01	Screw 6-20 x .312"
150	95-3388-04	Power transformer
	95-3578-03	Power transformer (ZVM-124-E)
155	N/A	Screw 8-18 x 1.25"
160	N/A	CRT socket board assembly
165	N/A	Coil assembly
170	A-11523-01	Knob and insert assembly
175	24-2931	Plastic cover, width board
180	112-1139	Screw 6-20 x .500"
185	14-11540-02	Plastic rear cover
190	112-1628	Screw 8-18 x .625"

The parts list in Table 9.2 covers all parts that make up the electronics of the ZVM-124. The circuit boards are shipped as a single board. Therefore, the circuit reference designators are organized by circuit function, rather than

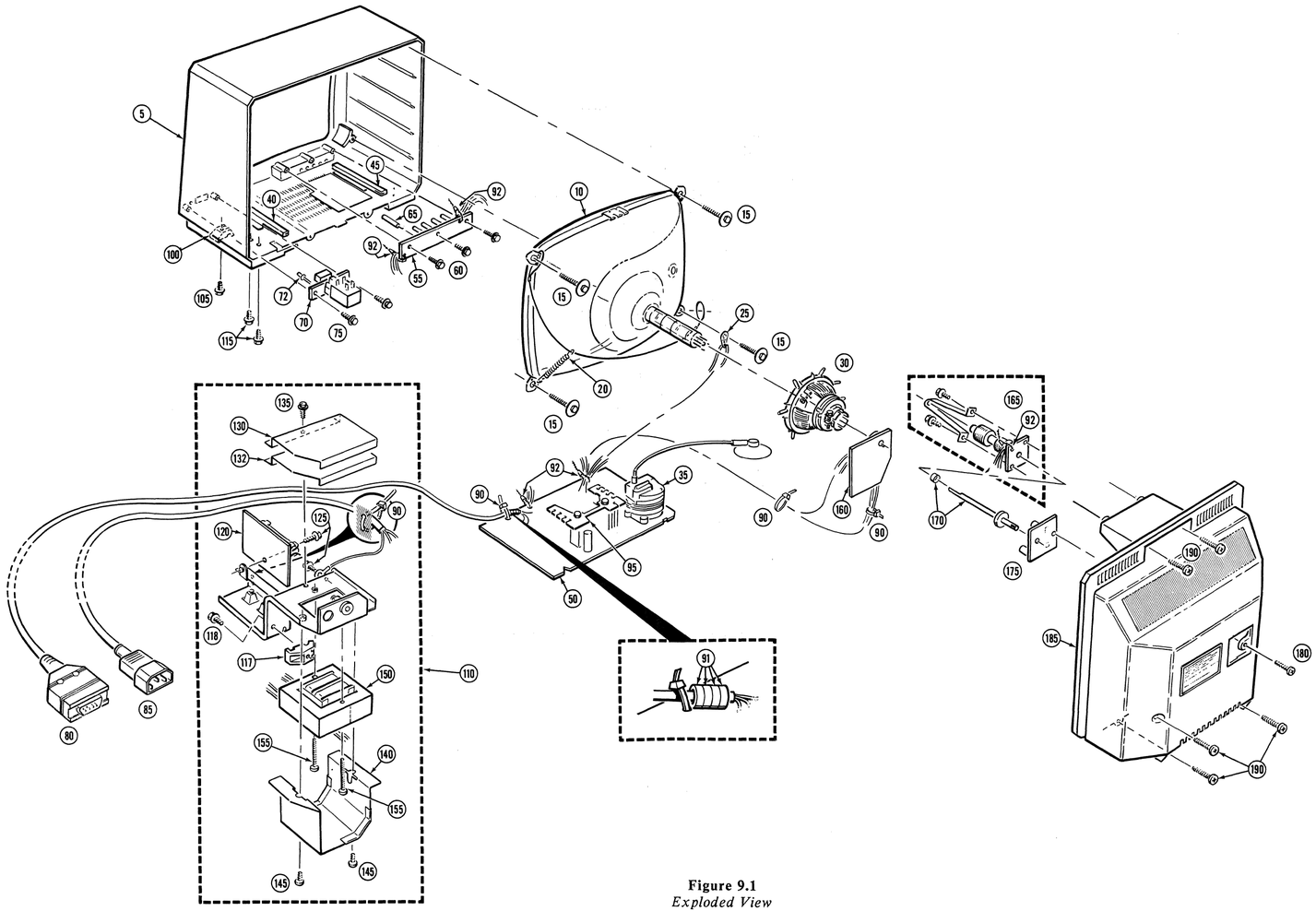

Figure 9.1
Exploded View

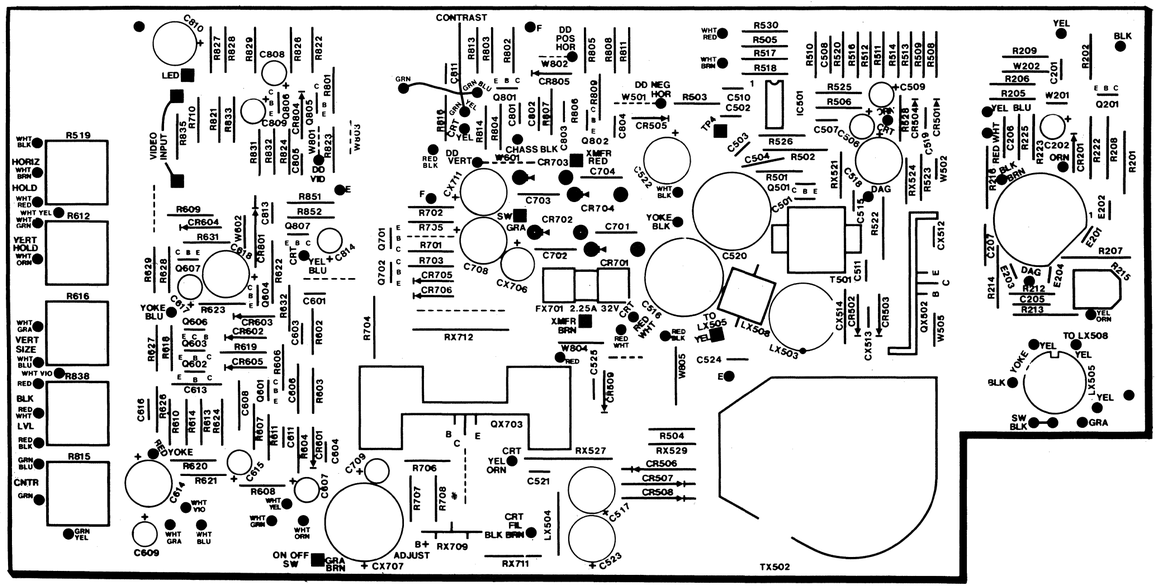

Figure 9.2
Component Location,
Circuit Boards (204-1075)

by board layout. Since this is the case in this monitor, no attempt has been made to organize the parts list by board. Refer to Figure 9.2.

Table 9.2
Component Parts List

CIRCUIT REF. DES.	ZDS PART NUMBER	DESCRIPTION
		Capacitors
C201	22-7864-03	3.3 uF electrolytic
C202	22-7864-06	22 uF electrolytic
C204	22-7859-05	10 uF electrolytic
C205	22-3748	1000 pF disc
C206	22-4782	.0047 uF disc
C207	22-3748	1000 pF disc
CX208	22-7889	4700 pF special
CX209	22-7889	4700 pF special
C211	22-7862-01	1 uF electrolytic
C213	22-7859-05	10 uF electrolytic
C216	22-7614-06	330 pF disc
C501	22-7614-24	.01 uF ceramic
C502	22-7613-05	270 pF ceramic
C503	22-7615-08	.022 uF ceramic
C504	22-7179	.022 uF polyester
C506	22-7862-01	1 uF electrolytic
C507	22-7614-24	.01 uF ceramic
C508	22-7739-08	.0047 uF polyester
C509	22-7862-01	1 uf electrolytic
C510	22-7433	.001 uF ceramic
C511	22-7433	.001 uF ceramic
CX512	22-3255	330 pF ceramic
CX513	22-7433	.001 uF ceramic
CX514	22-7798-04	.022 uF polypropylene
C515	22-7433	.001 uF ceramic
C516	22-7313	10 uF electrolytic
C517	22-7859-10	220 uF electrolytic
C518	22-7864-04	4.7 uF electrolytic
C519	22-4782	.0047 uF ceramic
C520	22-7313	10 uF electrolytic
C521	22-3512	.01 uF ceramic
C522	22-7861-12	470 uF electrolytic
C523	22-7859-10	220 uF electrolytic
C524	22-7860-11	330 uF electrolytic
C525	22-4782	.0047 uF ceramic
C601	22-7613-24	.01 uF ceramic
C603	22-7613-24	.01 uF ceramic
C604	22-7613-08	470 pF ceramic
C606	22-7547	0.1 uF polyester
C607	22-7859-03	10 uF electrolytic
C608	22-7547	0.1 uF polyester
C609	22-7859-05	10 uF electrolytic
C611	22-7613-24	.01 uF ceramic
C613	22-7179	.022 uF polyester
C614	22-7859-10	220 uF electrolytic
C615	22-7862-01	1 uF electrolytic
C616	22-7613-24	.01 uF ceramic
C617	22-7859-05	22 uF electrolytic
C618	22-7860-08	47 uF electrolytic

Table 9.2 (continued)
Component Parts List

CIRCUIT REF. DES.	ZDS PART NUMBER	DESCRIPTION
C701	22-7244	.0015 uF ceramic
C702	22-7244	.0015 uF ceramic
C703	22-7244	.0015 uF ceramic
C704	22-7244	.0015 uF ceramic
CX706	22-7862-05	10 uF electrolytic
CX707	22-7860-14	2200 uF electrolytic
C708	22-7858-10	220 uF electrolytic
C709	22-7859-05	10 uF electrolytic
CX711	22-7859-10	220 uF electrolytic
C801	22-7748-26	39 pF, axial lead
C802	22-7748-26	39 pF, axial lead
C804	22-7613-04	220 pF ceramic
		Diodes
CR201	103-261-04	
CR202	103-319	LED
CR502	103-261-02	
CR503	103-261-02	
CR504	103-295-02	
CR505	103-295-03	
CR506	103-323-04	
CR507	103-263	
CR508	103-263	
CR509	103-295	
CR510	103-323-04	
CR601	103-142-01	
CR602	103-142-01	
CR603	103-142-01	
CR604	103-142-01	
CR605	103-142-01	
CRX701	103-261-04	
CRX702	103-261-04	
CRX703	103-261-04	
CRX704	103-261-04	
CR705	103-142-01	
CR706	103-279-09	Zener, 4.7 volts, 5 watts
CR707	103-142-01	
		Spark Gap Cables
E201	52-958-02	
E202	52-958-02	
E203	52-958-02	
E304	52-958-02	
		Fuses
FX201	136-133-07	0.160 amp, 250 volt (ZVM-124-E)
FX201	136-114-23	4 amp, 250 volt
FX701	136-120-07	2.25 amp, 32 volt
		Integrated Circuit
IC501	221-141	CRT horizontal processor

Table 9.2 (continued)
Component Parts List

CIRCUIT REF. DES.	ZDS PART NUMBER	DESCRIPTION
		Inductors
L201	20-3907-12	Choke, 10 uH
LX503	20-4090	RCF coil, tunable, linearity
LX504	20-3984	RCF coil, parasitic suppressor
LX505	95-3643	RCF transformer, tunable, width control
LX508	20-3824-02	Choke, coil
L801	149-509	Ferrite sleeve
L802	149-509	Ferrite sleeve
		Transistors
Q201	121-1058	NPN, video output
Q202	121-895	NPN, DC contrast amplifier 1
Q203	121-895	NPN, DC contrast amplifier 2
Q204	121-895	NPN, highlight amplifier driver
Q205	121-895	NPN, video amplifier driver
Q501	121-819	NPN, horizontal driver
QX502	121-1039	NPN, horizontal output
Q601	121-699	PNP, vertical oscillator
Q602	121-699	PNP, vertical amplifier 1
Q603	121-699	PNP, vertical amplifier 2
Q604	121-819-01	NPN, vertical output 1
Q606	121-1036	PNP, vertical output 2
Q607	121-819	NPN, vertical blanking
Q701	121-699	PNP, error amplifier 1
Q702	121-975	NPN, error amplifier 2
QX703	121-992-01	NPN, regulator
Q802	121-895	NPN, sync separator
		Resistors
R201	63-7764	330 ohms, 1/2 watt, 10%
R202	63-10234-96	10K ohms
R203	63-10236	15K ohms
R204	63-10235-80	2.2 ohms
R205	63-10243-28	15 ohms, 1/2 watt, 5%
R206	63-10235-74	1.2K ohms
R207	63-7848	33K ohms
R208	63-10235-72	1K ohms
R209	63-10235-48	100 ohms
R210	63-10235-48	100 ohms
R211	63-10235-48	100 ohms
R212	63-10235-72	1K ohms
R213	63-10235-72	1K ohms
R214	63-7848	33K ohms, 1/2 watt, 10%
R215	63-10651-14	2M ohms, control, focus
R216	63-7834	15K ohms, 1/2 watt, 10%
R217	63-10235-72	1K ohms
R218	63-10235-72	1K ohms
R219	63-10235-40	47 ohms
R220	63-10235-58	270 ohms
R222	63-10836-72	1K ohms, 2 watt, 5%
R223	63-10235-40	47 ohms
R228	63-10235-50	150 ohms
R229	63-10235-40	47 ohms
R230	63-10235-72	1K ohms
R231	63-10235-40	47 ohms

Table 9.2 (continued)
Component Parts List

CIRCUIT REF. DES.	ZDS PART NUMBER	DESCRIPTION
R501	63-10235-56	220 ohms
R502	63-10235-80	2.2K ohms
R503	63-10235-96	10K ohms
R504	63-10235-98	12K ohms
R505	63-10236-20	100K ohms
R506	63-10236	10K ohms
R508	63-10236-08	33K ohms
R509	63-10236-08	33K ohms
R510	63-10236-24	150K ohms
R511	63-10236-08	33K ohms
R512	63-10236-01	16K ohms
R513	63-10236-01	16K ohms
R514	63-10235-79	2K ohms
R516	63-10235-76	1.5K ohms
R517	63-10234	15K ohms
R518	63-10236-20	100K ohms
R519	63-9697-28	3K ohms, control, horizontal hold
R520	63-10236-20	100K ohms
RX521	63-10559-20	6.8 ohms
R522	63-7740	82 ohms
R523	63-10565-44	68 ohms, 1/2 watt, 5%, failsafe
RX524	63-10559	1 ohm
R525	63-10236-46	1.2M ohms
R526	63-10236-24	150K ohms
RX527	63-10565-68	680 ohms
R528	63-10235-52	150 ohms
RX529	63-10559-24	10 ohms
R530	63-10235-56	220 ohms
R531	63-7778	680 ohms, 1/2 watt, 10%
R602	63-10236	15K ohms
R603	63-10236-20	100K ohms
R604	63-10236-36	470K ohms
R606	63-10236-50	1.8M ohms
R607	63-10236-56	3.3M ohms
R608	63-10235-98	12K ohms
R609	63-10235-96	10K ohms
R610	63-10235-64	470 ohms
R611	63-10235-82	2.7K ohms
R612	63-9697-35	250K ohms, control, vertical hold
R613	63-10236-41	750K ohms
R614	63-10236-44	1M ohms
R616	63-9697-36	300K ohms, control, vertical size
R618	63-10235-92	6.8K ohms
R619	63-10236-12	47K ohms
R620	63-10235-60	330 ohms
R621	63-10236-06	27K ohms
R622	63-10243-92	6.8K ohms, 1/2 watt, 5%
R623	63-10559-12	3.3 ohms
R624	63-10235-25	11 ohms
R626	63-10235-75	1.3K ohms
R627	63-10235-52	150 ohms
R628	63-10235-98	12K ohms
R629	63-10235-42	56 ohms
R631	63-10235-58	270 ohms
R632	63-10235-48	100 ohms

Table 9.2 (continued)
Component Parts List

CIRCUIT REF. DES.	ZDS PART NUMBER	DESCRIPTION
R701	63-10235-74	1.2K ohms
R702	63-10235-76	1.5K ohms
R703	63-10235-60	330 ohms
R704	63-7743	100 ohms, 1/2 watt, 10%
R705	63-10236-04	22K ohms
R706	63-10235-98	12K ohms
R707	63-10236-06	27K ohms
R708	63-10236-08	33K ohms
RX709	63-10521-01	10K ohms, control, B+
R710	63-10235-72	1K ohms
RX712	63-10918-01	15 ohms, wirewound, 7 watt, 5%
R805	63-10235-58	270 ohms
R809	63-10235-64	470 ohms
R811	63-10235-78	1.8K ohms
R815	63-9697-28	3K ohms, control, contrast
R838	63-9697-35	250K ohms, control, black level
		Transformers
TX201	95-3578-03	Power transformer (ZVM-124-E)
TX201	95-3388-04	Power transformer
TX202	95-3397-02	Deflection yoke
T501	95-3136-03	Transformer, horizontal driver
TX502	95-3638-02	Transformer, sweep
		Miscellaneous
J201	52-2550	Signal connector and cable
J202	78-2206	CRT socket
SX201	85-1646	Switch
VX201	N/A	CRT, vacuum tube
Clip	19-840-01	Fuse holder clip