

# **VR326 Color Monitor Service Guide**

Order Number EK-VR326-SV.001

**Digital Equipment Corporation**

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## Preface

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This manual describes how to service the VR326 color monitor in the field.

### Manual Organization

This manual covers the following topics:

- Chapter 1 provides a general overview of the product and includes a list of spare parts.
- Chapter 2 provides troubleshooting procedures.
- Chapter 3 provides the removal and replacement procedures for the field replaceable units (FRUs).
- Chapter 4 provides the alignment procedures.
- Appendix A shows sample alignment screens.
- Appendix B lists the VR326 specifications.
- Appendix C describes the related documentation.

### Audience

The procedures in this manual are for service technicians trained only by Digital Equipment Corporation.

### Conventions

<b>Warning</b>	Provides information on personal safety.
<b>Caution</b>	Provides information to prevent damage to the equipment.
<b>Note</b>	Provides general information.
<b>PN</b>	Refers to a part number.
<b>❶</b>	Refers to an item in an illustration.

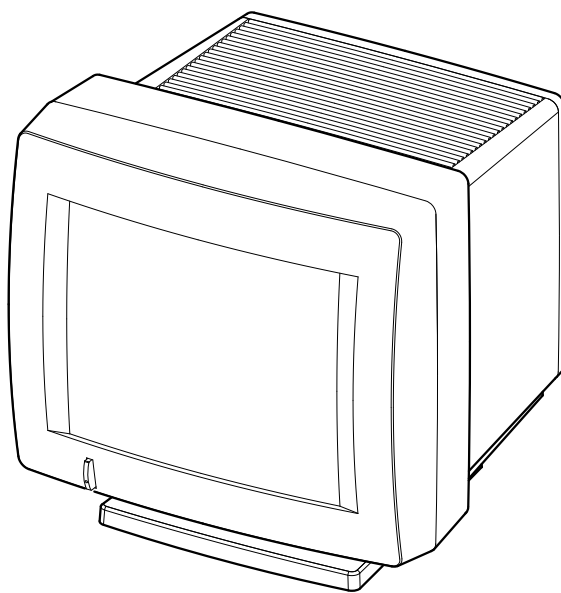
# 1

## Overview

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### 1.1 Product Description

The VR326 color monitor (Figure 1–1) has a direct viewed antiglare screen with an auto-ranging power supply for worldwide operation. Its built-in tilt-swivel stand lets the user adjust the screen for viewing comfort. When connected to a host system, the VR326 can display information sent by the host.



MA-0299-90.DG

**Figure 1–1 VR326 Color Monitor**



## 1-2 Overview

### 1.1.1 Model Variations

The monitor is available in the following models:

Model	Applicable Area
VR326-DA 15" Color monitor	Northern Hemisphere
VR326-D4 15" Color monitor	Southern Hemisphere

## 1.2 Tools and Equipment

You need the following tools and equipment to service the VR326 monitor:

**Table 1-1 Tools and Equipment**

Item	Part Number
Terminal technician tool kit	29-27340-01
Static protection kit	29-26246-00
Anode discharge tool	29-24717-00
Metric measuring tape	29-25342-00
Safety goggles	29-16141-00
Gloves	29-16146-00

## 1.3 Recommended Spare Parts

The following are the recommended spare parts for the VR326 monitor:

**Table 1-2 VR326 Recommended Spare Parts**

Part	Part Number
Power supply	54-19629-04
Deflection module	54-19828-01
Video assembly	70-27072-01
Module interconnect cable	70-27000-02
CRT/Bezel/Chassis assembly	70-27070-01

# 2

## Troubleshooting

---

This chapter describes how to troubleshoot a VR326 color monitor problem through fault isolation.

### 2.1 Before You Start

The following information will help you troubleshoot the monitor easily and effectively:

#### **WARNING**

**If you detect burning components, turn power to the monitor off and disconnect the power cord from the power source.**

- If a customer calls with a display quality type of problem, ask the customer to leave the monitor on until you arrive to minimize the warm-up time.
- Magnetic fields affect monitor performance and can give a false indication of a monitor failure. Place the monitor away from any electromagnetic devices, such as printers and terminals, or away from large magnetized objects, such as filing cabinets and steel beams in walls.

#### **NOTE**

**Any time you replace a video assembly, deflection module, or power supply module, perform all the necessary adjustments. Refer to Chapter 3.**

## 2.2 Troubleshooting Procedures

These procedures assume that only one assembly has failed or only one problem exists. Always troubleshoot the most obvious symptom first; however, one symptom may indicate multiple failures. Problems may come from either the host system or the monitor.

Troubleshoot the VR326 color monitor as follows:

1. Ask the operator to describe the problem.
2. Identify the problem. The screen display often indicates which problem is occurring.
3. Isolate the problem. Refer to the troubleshooting tables to find the suggested solutions.
4. Display the host system alignment test patterns to make sure that no other problem exists. Refer to the host system service guide for displaying test patterns.

## 2.3 Troubleshooting Tables

The troubleshooting tables list the possible cause in order of probability. This troubleshooting information applies to five types of video problems your VR326 monitor may exhibit:

- A blank screen, without video or raster (Table 2-1)
- A blank screen, without video, but with raster present (Table 2-2)
- Loss of synchronization (Table 2-3)
- Color problems (Table 2-4)
- Poor display quality: color, brightness, geometry, or focus (Table 2-5)

Use the troubleshooting tables as follows:

1. Note the general symptom of the problem.
2. Check the Symptom column in the referenced table for a match.
3. Check the conditions in the Possible Cause column in the order given.
4. Perform the action in the Suggested Solution column in the order given.

**Table 2-1 Blank Screen, No Video or Raster**

Symptom	Possible Cause	Suggested Solution
Blank screen, no video or raster. The monitor is on (power switch is in), but the power indicator is off.	The power cord is not connected.	Connect the power cord to the power source or monitor.
	Low or no power exists at wall outlet.	Use another wall outlet. If the problem continues, call the facilities person.
	The power supply module is faulty.	Replace the power supply module (Section 3.2.2).
	The deflection module is faulty.	Replace the deflection module (Section 3.2.4).
	The video assembly is faulty.	Replace the video assembly (Section 3.2.5).
There is no video or raster, but the power indicator is on.	The brightness or contrast control is set incorrectly.	Adjust the brightness and contrast controls.
	Power to the host system is off.	Turn power to the host system on.
	The host signal cables are disconnected.	Connect the signal cables to the host and the monitor.
	Internal cabling is loose or faulty.	Check all cabling going to and from the deflection module and the video assembly, including the CRT socket. If necessary, secure the cables.
	The signal cable is faulty.	Replace the signal cable.
	Cutoff is set incorrectly.	Perform the Cutoff alignment procedures (Section 4.3.4).
	The deflection module is faulty.	Replace the deflection module (Section 3.2.4).
	The video assembly is faulty.	Replace the video assembly (Section 3.2.5).

**Table 2-1 (Continued) Blank Screen, No Video or Raster**

Symptom	Possible Cause	Suggested Solution
	The CRT/Bezel /Chassis assembly is faulty.	Replace the CRT/Bezel /Chassis assembly (Section 3.2.6) only after trying all the previous solutions.

**Table 2-2 Blank Screen, No Video but Raster Present**

Symptom	Possible Cause	Suggested Solution
No video or cursor can be seen even when the contrast control is set to maximum; however, the raster can be displayed by adjusting the brightness control.	The host screen saver is activated.	Press any key to reactivate the display
	The signal cable is faulty.	Replace the signal cable. Refer to the host system documentation.
	The host system is not supplying video signals to the monitor.	Connect the monitor to a known working host and verify the problem before replacing any monitor modules.
	The host system is faulty.	Repair the host system.
	Internal cabling is loose or faulty.	Check all cabling going to and from the deflection module and the video assembly. If necessary, secure the cables.
	The video assembly is faulty.	Replace the video assembly (Section 3.2.5).
	The deflection module is faulty.	Replace the deflection module (Section 3.2.4).
	The CRT/Bezel /Chassis assembly is faulty.	Replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after trying all the previous solutions.

**Table 2-3 Loss of Synchronization**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Suggested Solution</b>
The video display with 4-bar color pattern is out of sync.	The video cables are faulty or connected incorrectly.	Connect the video cables.
The 4-bar color pattern is out of sync and green is not present.	The video cables are connected incorrectly.	<p>Swap the red and green video cables to both the monitor and the host system, then:</p> <ol style="list-style-type: none"> <li>1. If green is present and in sync, replace the video cable.</li> <li>2. If green is not present, swap the red and green video cables to the monitor. If green is displayed and in sync, repair the host system.</li> </ol> <p>After swapping the red and green video cables, if the display comes up green and out of sync, go to the next probable cause.</p>
The 4-bar color pattern is out of sync and green is present.	<p>The monitor or host system is faulty.</p> <p>The deflection module is faulty.</p>	<p>If another VR326 monitor is available, swap the monitors to determine if the problem continues.</p> <p>If the problem continues, repair the host system. If the problem does not reoccur, the problem is in the monitor.</p> <p>If another VR326 monitor is not available, replace the deflection module (Section 3.2.4).</p> <p>Replace the deflection module (Section 3.2.4).</p>

**Table 2-3 (Continued) Loss of Synchronization**

Symptom	Possible Cause	Suggested Solution
	The deflection module is functioning correctly, but the video assembly is faulty.	Replace the video assembly (Section 3.2.5).
	The deflection module and the video assembly are functioning correctly, but the host system is faulty.	Repair the host system.

**NOTE**

**Make sure the monitor has warmed up for at least 20 minutes before using Table 2-4. See Appendix A for the color patterns.**

**Table 2-4 Color Problems**

Symptom	Possible Cause	Suggested Solution
The wrong color displays. When the 4-color bar pattern displays, the primary colors do not display in their proper sequence.	The video cables are crossed.	Swap the video cables.
Red or blue color is missing. The missing color is restored when the red and blue cables are swapped at both the monitor and the host system. The color that was present is now missing.	The signal cable is faulty.	Replace the signal cable. Be sure the cables are installed in the correct connectors.

**Table 2-4 (Continued) Color Problems**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Suggested Solution</b>
Red or blue color is missing. The missing color is restored when the red and blue cables are swapped at the monitor.	The host system is faulty.	Repair the host system.
Green color is missing, but the video is in sync.	Swap the red and green video cables at the monitor. If green is still missing, the problem is in the monitor.	Repair the monitor.
	If green is restored, the problem is in the host system.	Repair the host system.
	The video assembly is faulty.	Replace the video assembly (Section 3.2.5).
	The CRT/Bezel /Chassis assembly is faulty.	Replace the CRT/Bezel /Chassis assembly (Section 3.2.6) only after trying all the previous solutions.



**Table 2-5 Poor Display Quality: Color, Brightness, Geometry, or Focus**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Suggested Solution</b>
Poor centering.	The centering controls on top of the monitor or on the deflection module are set incorrectly.	Adjust the centering controls on top of the monitor and check the deflection adjustments. Refer to Chapter 4.
Poor geometry or linearity.	The monitor is out of adjustment.	Perform the appropriate adjustments. Refer to Chapter 4.
	The deflection module is faulty.	Replace the deflection module (Section 3.2.4) and perform all deflection adjustments.
Poor color purity. Different colors can be seen when an all-red pattern displays.	The monitor needs to be degaussed.	Press the degauss button to correct color distortions.
	Local magnetic fields are present.	Remove any electro-mechanical devices from the vicinity of the monitor, or move the monitor to another location.
	CRT/Bezel/Chassis assembly is faulty.	Replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after trying all the previous solutions.

**Table 2-5 (Continued) Poor Display Quality: Color, Brightness, Geometry, or Focus**

Symptom	Possible Cause	Suggested Solution
Poor light output (using the all-white diagnostic pattern).	The brightness or contrast controls are set incorrectly.	Adjust the brightness and contrast controls.
	The video assembly is out of adjustment.	Perform the color adjustments. Refer to Chapter 4.
	The host system is not supplying the correct signal levels.	Repair the host system.
	The video assembly is faulty.	Replace the video assembly (Section 3.2.5).
	CRT wearout	Replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after all trying all the previous solutions.
Poor color balance.	The video assembly is not adjusted correctly.	Perform all the color adjustments. Refer to Chapter 4.
	Signal levels from the host system are not properly balanced.	Repair the host system.
	The video assembly is faulty.	Replace the video assembly (Section 3.2.6).
	The CRT/Bezel/Chassis assembly is faulty.	Replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after trying all the previous solutions.

**Table 2-5 (Continued) Poor Display Quality: Color, Brightness, Geometry, or Focus**

<b>Symptom</b>	<b>Possible Cause</b>	<b>Suggested Solution</b>
The display is not clear or sharp.	Focus is out of adjustment.	Perform the Focus adjustment. Refer to Section 4.3.3.
	Cutoff and Gain settings are incorrect.	Readjust the Cutoff and Gain settings. Refer to Section 4.3.4.
	Internal cabling is loose or faulty.	Check all cabling going to and from the deflection module and the video assembly. If necessary, secure the cables.
	The power supply module is faulty.	Replace the power supply module (Section 3.2.2).
	The video assembly is faulty.	Replace the video assembly (Section 3.2.6).
	The CRT/Bezel/Chassis assembly is faulty	Replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after trying all the previous solutions.
Display characters seem to flicker or "swim."	There is ac electromagnetic interference from adjacent power lines or appliances.	If possible, remove any electromagnetic devices from the vicinity of the monitor, or move the monitor to another location.
	The power supply module is faulty.	Replace the power supply module (Section 3.2.2).
	The deflection module is faulty.	Replace the deflection module (Section 3.2.4).

**NOTE**

**If the monitor cannot be internally degaussed and the problem is not caused by external magnetic fields, replace the CRT/Bezel/Chassis assembly (Section 3.2.6) only after trying all the previous solutions.**

# 3

## Removing and Replacing FRUs

---

### 3.1 Introduction

This chapter describes how to remove and replace the VR326 color monitor field replaceable units (FRUs).

Perform all the removal and replacement procedures from the rear of the monitor. Tilt the monitor from the back to the front allowing easier access to the modules.

#### NOTE

**If you twist the monitor while applying the tilt pressure, the monitor moves more easily.**

The procedures describe how to prepare the terminal to remove the FRUs. To install each item, do the reverse of the removal procedure.

#### WARNING

**Turn power to the monitor off. Disconnect the power cord from the power source before performing any of these procedures.**

#### NOTE

**Any time you replace a video assembly, deflection module, or power supply module, perform all the necessary adjustments in Chapter 4.**

## 3-2 Removing and Replacing FRUs

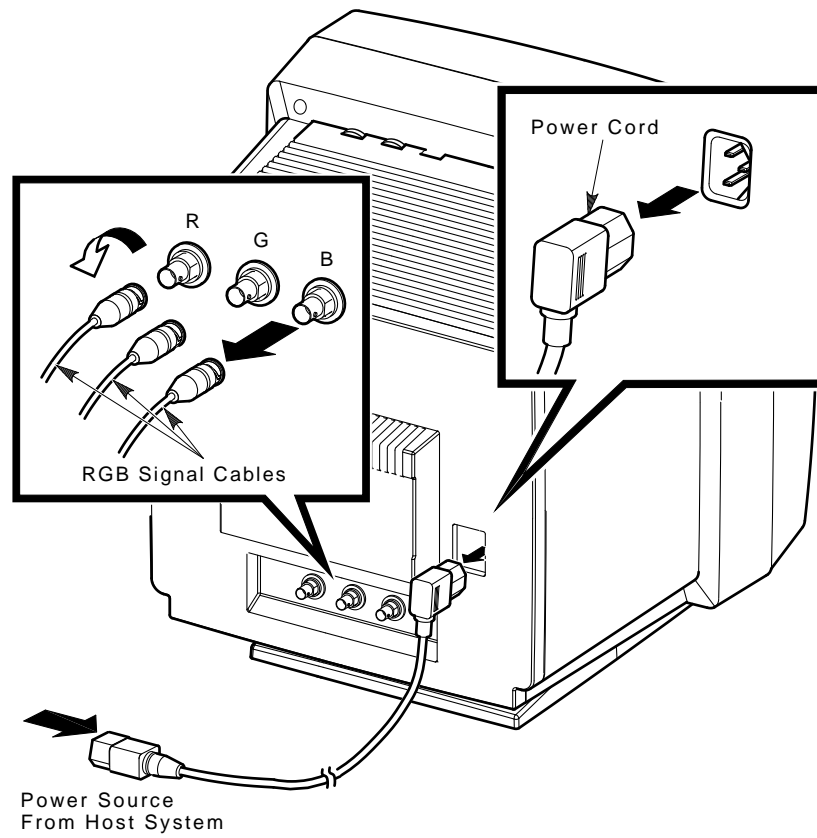
### 3.1.1 Removing External Cables

Remove the external cables (Figure 3-1) as follows:

1. Make sure the power switch is off (out).
2. Unplug the power cord from the wall outlet first, then from the monitor. Turn the power switch on and off after removing the power cord to discharge the internal modules.
3. Remove the three video signal cables from the rear of the monitor.

#### **NOTE**

**Push each connector in and rotate it counter-clockwise until the signal cable is released from the connector.**



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**Figure 3-1 Removing the Cables from the Monitor**

## 3-4 Removing and Replacing FRUs

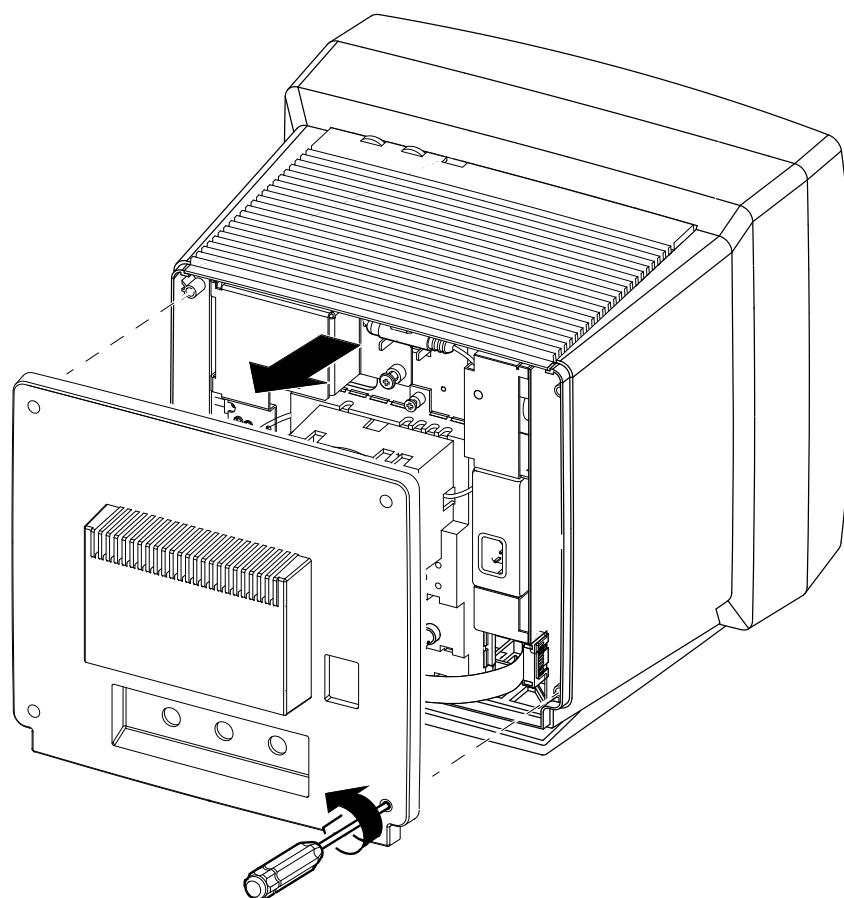
### 3.1.2 Removing the Rear Cover

#### NOTE

**Before removing any FRUs, you must remove the rear cover and the top cover.**

Remove the rear cover as follows:

1. Remove the external cables (Section 3.1.1).
2. Use a Phillips screwdriver to remove the four screws that hold the rear cover to the enclosure (Figure 3-2).
3. Remove the rear cover by pulling the cover towards you.



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**Figure 3-2 Removing the Rear Cover**

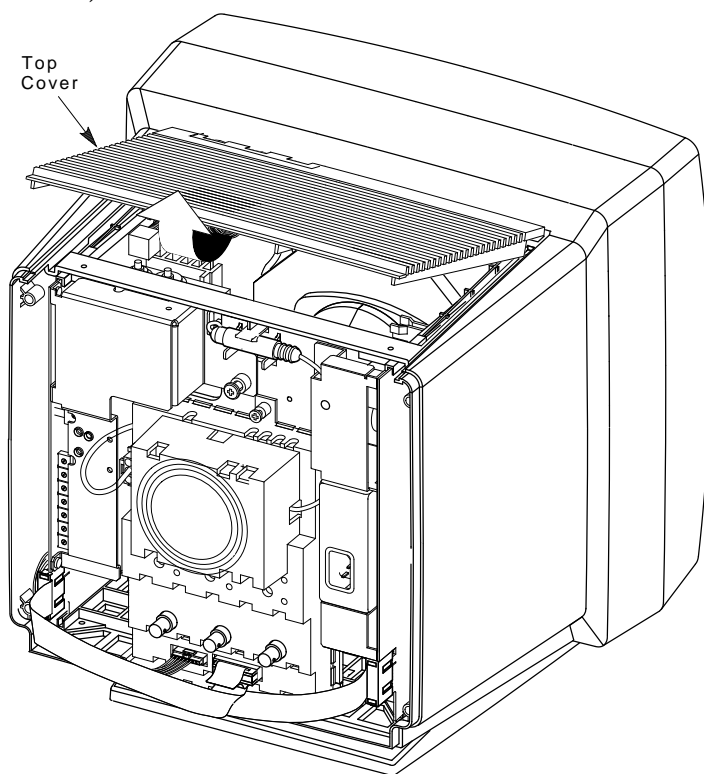


## 3-6 Removing and Replacing FRUs

### 3.1.3 Removing the Top Cover

Remove the top cover as follows:

1. Remove the rear cover (Section 3.1.2).
2. Tilt the top cover up and slide it toward the rear of the monitor. (Figure 3-3).



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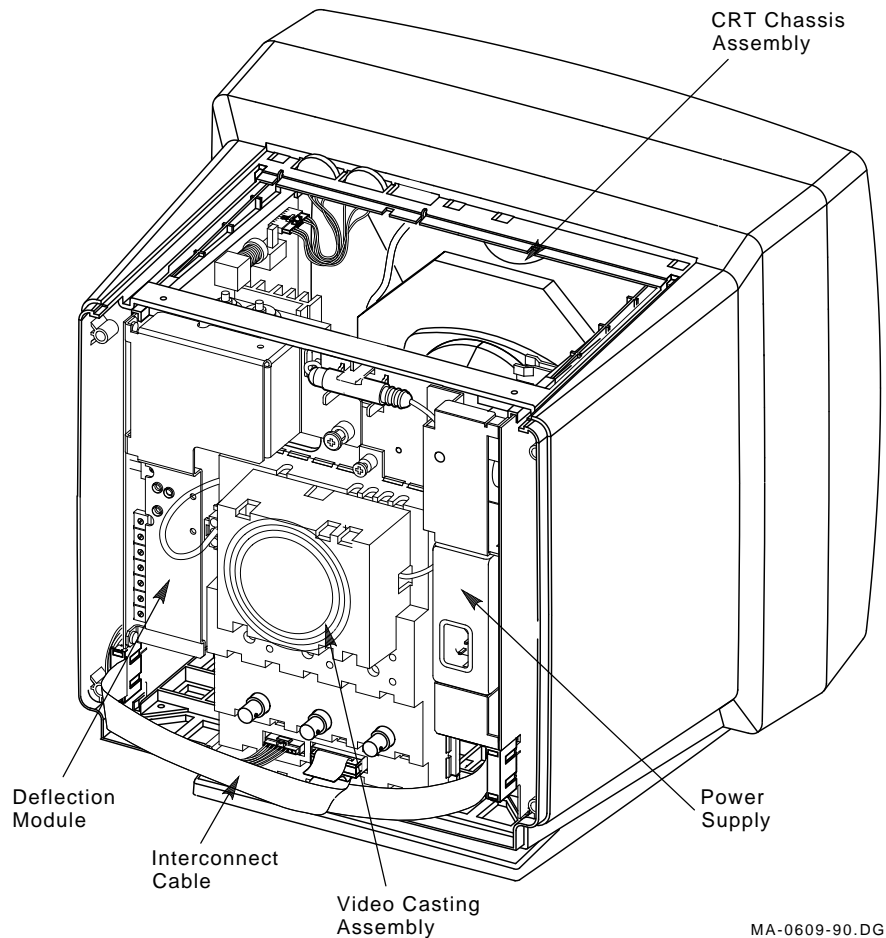
**Figure 3-3 Removing the Top Cover**

## 3.2 Field Replaceable Units (FRUs)

The VR326 monitor FRUs are shown in Figure 3-4. The video assembly may look different in newer models.

### WARNING

**Turn the power off and disconnect the power cord from the wall outlet before disconnecting or replacing any FRU.**



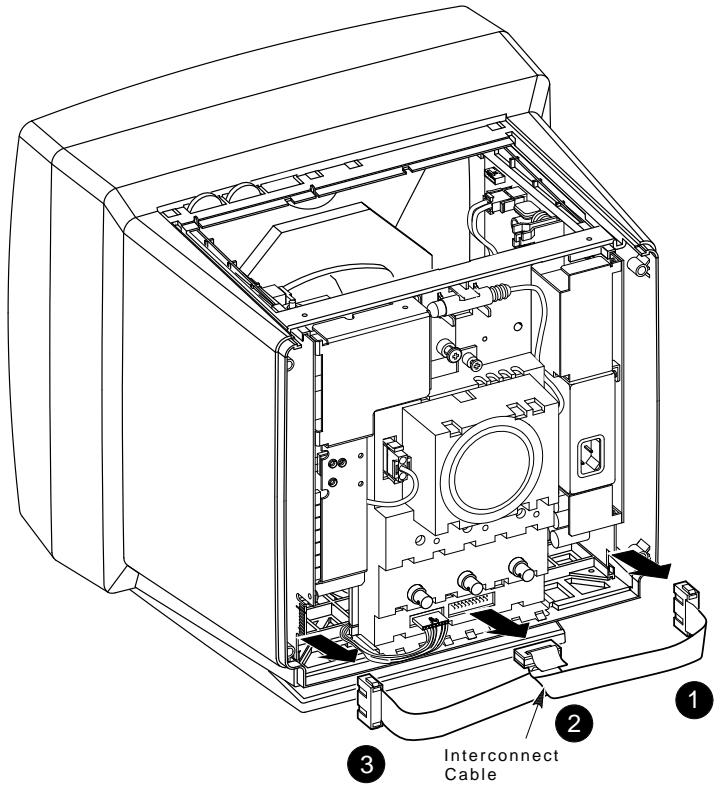
MA-0609-90.DG

**Figure 3-4 VR326 Field Replaceable Units**

### 3.2.1 Removing the Interconnect Cable

Remove the rear cover (Section 3.1.2) and unplug the interconnect cable. Refer to (Figure 3-5)) for the plug locations.

FRU	Connector	Interconnect Cable Plug
Power supply (right)	J1	P1 ❶
Video assembly (center)	J2	P2 ❷
Deflection module (left)	J3	P3 ❸



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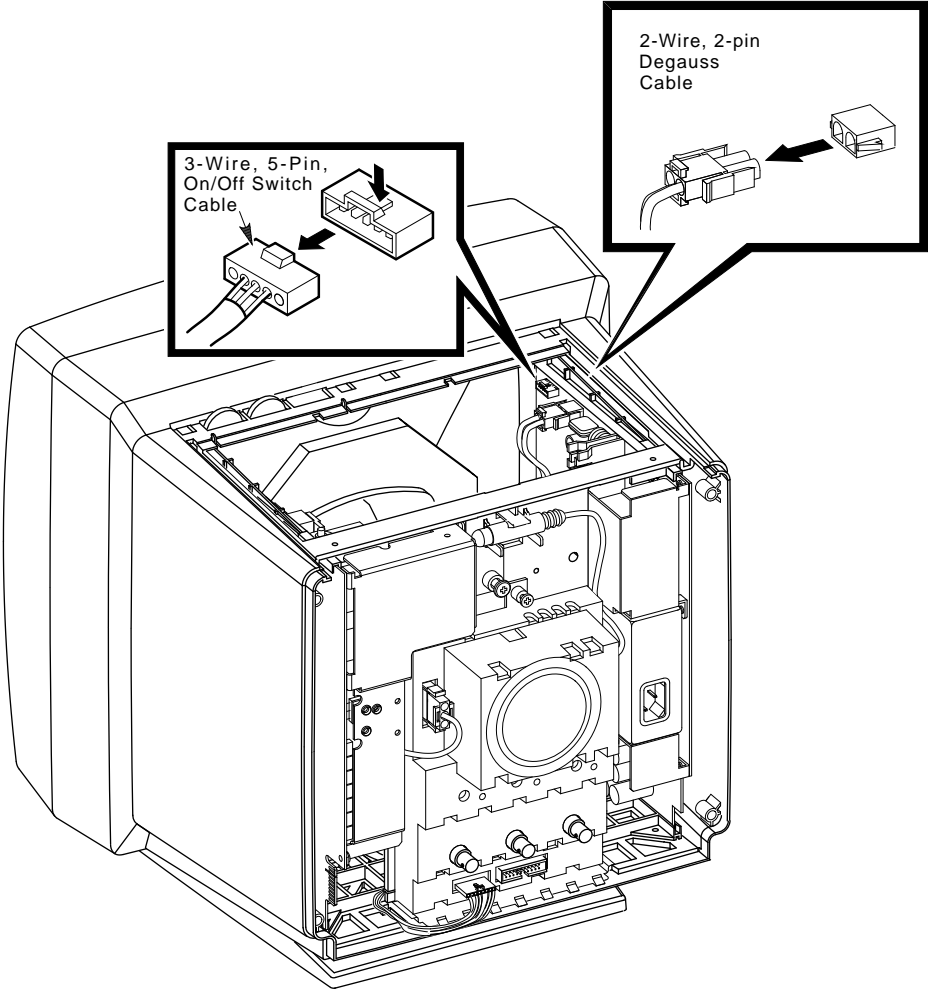
Figure 3-5 Removing the Interconnect Cable

### **3.2.2 Removing the Power Supply Module**

Remove the power supply module as follows:

1. Remove the rear cover (Section 3.1.2), the top cover (Section 3.1.3), and the interconnect cable (Section 3.2.1).
2. Disconnect the 3-wire, 5-pin on/off switch cable (P4) from the connector (J4) at the top of the power supply module by pressing the tab on top of the connector (Figure 3–6).
3. Disconnect the 2-wire, 2-pin degauss cable (P10) from the connector (J10) on the power supply module by pressing the tabs on the sides of the plug (Figure 3–6).

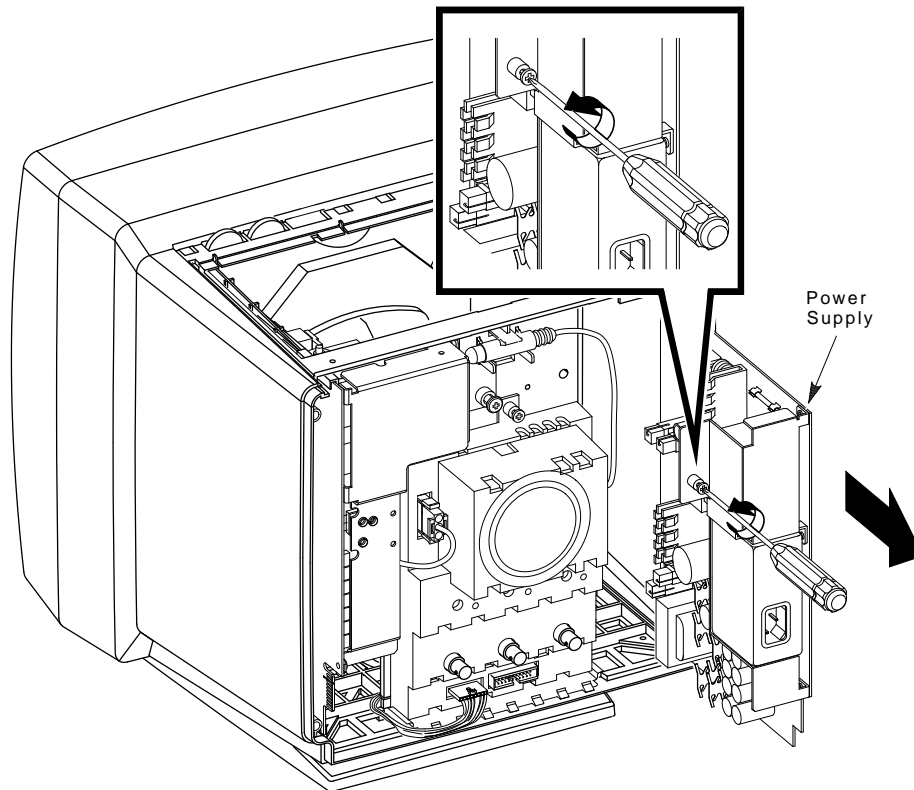
3-10 Removing and Replacing FRUs



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**Figure 3-6 Removing Cables from the Power Supply**

4. Loosen the captive screw that holds the power supply to the chassis (Figure 3-7).
5. Slide the power supply module out of the card guides.



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**Figure 3-7 Removing the Power Supply Module**

### 3.2.3 Discharging the CRT and Removing the Anode Cap

Discharging the CRT drains to ground any leftover voltages that remain in the extra-high tension (EHT) cable after power is removed. Discharge the CRT as follows:

1. Remove the rear cover (Section 3.1.2) and the top cover (Section 3.1.3).

**WARNING**

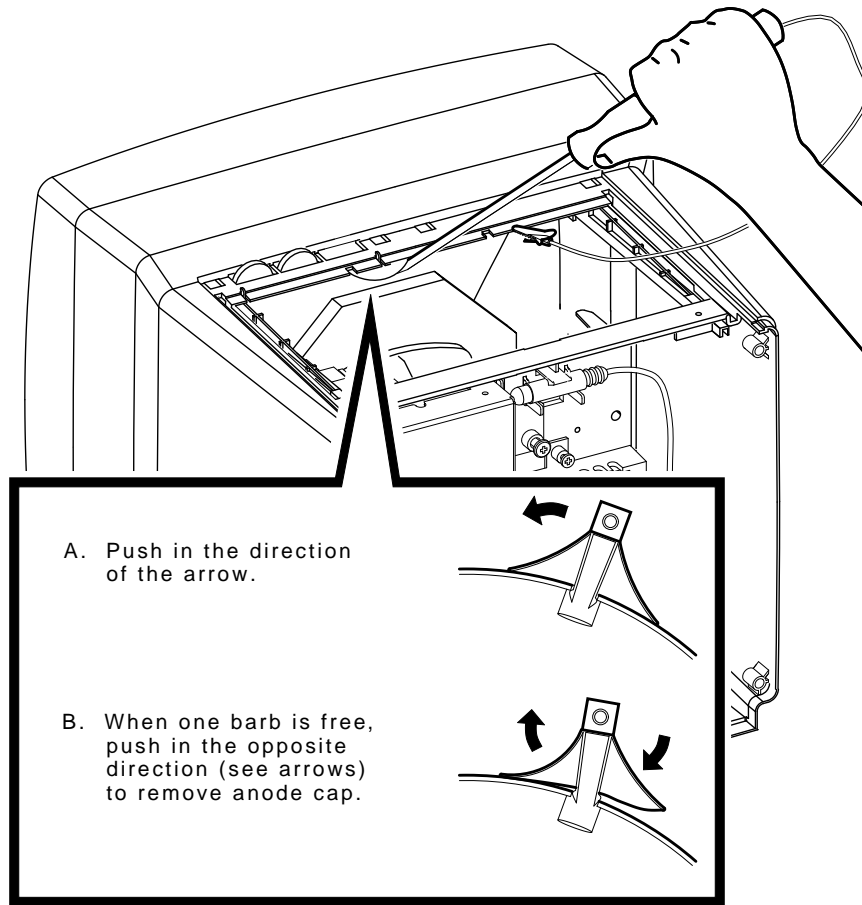
**The following steps expose you to the CRT anode, which may store a high voltage. Keep your free hand away from any part of the monitor during the anode discharge process.**

2. Attach the clip end of the anode discharge tool (PN 29-24717-00) to a chassis ground point near the CRT anode.
3. Using one hand, carefully slip the anode discharge tool under the CRT anode connector cup until it touches the connector prongs. Maintain contact for at least 10 seconds.

**NOTE**

**Be careful when you use the anode discharge tool. Do not tap the CRT. Avoid scratching or marring the CRT glass when you insert or remove the tool.**

4. Remove the CRT anode cap from the CRT (Figure 3-8).



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**Figure 3-8 Discharging the CRT and Removing the Anode Cap**



### 3.2.4 Removing the Deflection Module

Remove the deflection module as follows:

**CAUTION**

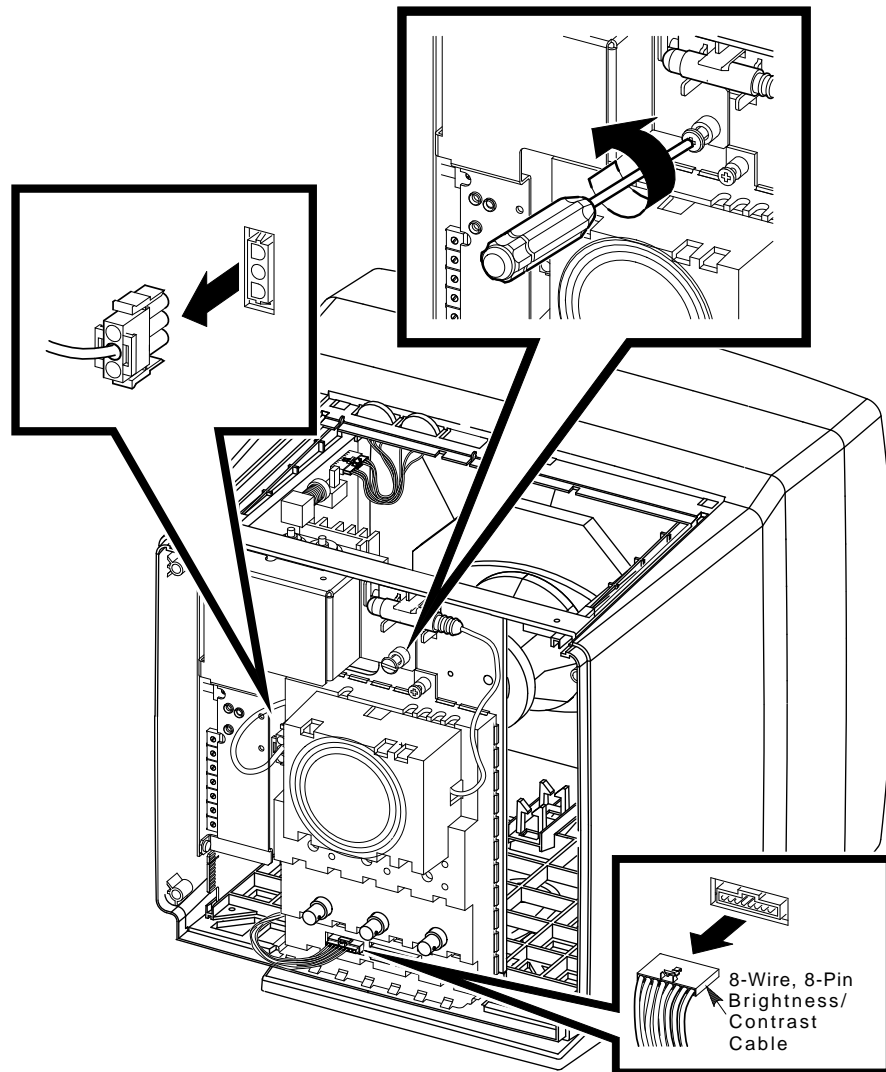
**Use a static protection kit (PN 29-26246-00) when handling the deflection module.**

1. Remove the rear cover (Section 3.1.2), the top cover (Section 3.1.3), and the interconnect cable (Section 3.2.1).
2. Discharge the CRT and remove the anode cap (Section 3.2.3).

**WARNING**

**You must discharge the CRT before removing the anode.**

3. Loosen the captive screw that holds the deflection module to the chassis (Figure 3-9).
4. Disconnect the 1-wire, 3-pin G2 cable (P7) from the connector (J7) on the left side of the video assembly by pressing on the sides of the connector and pulling.

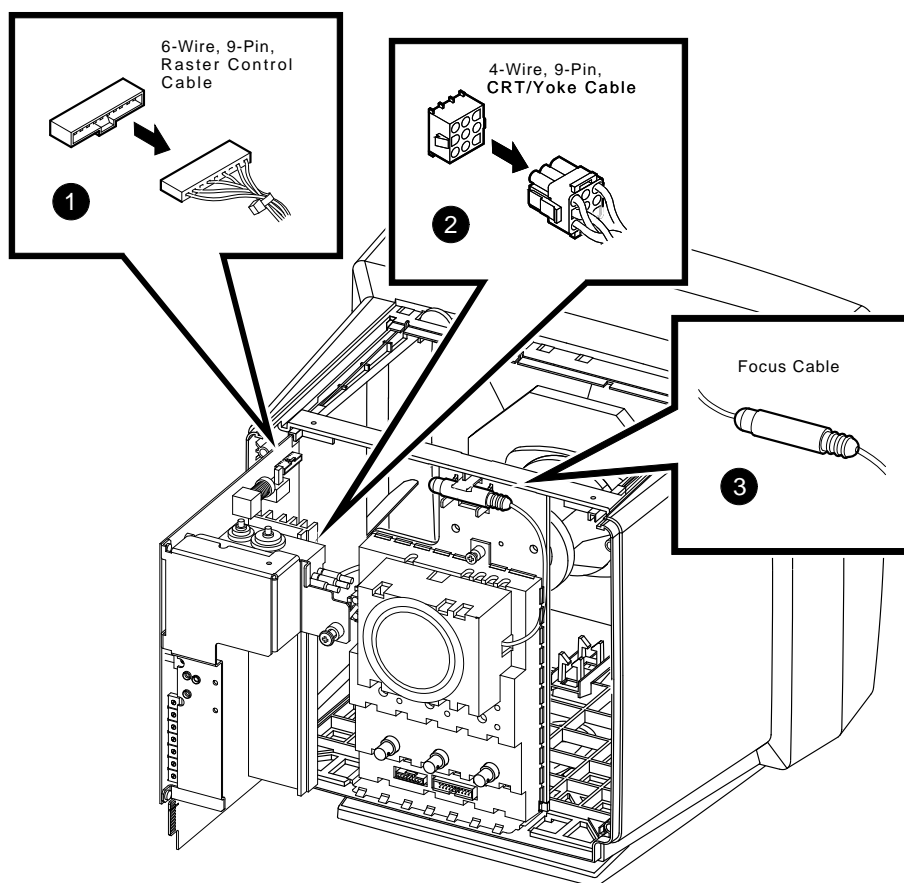


LJ-00781-T10

Figure 3-9 Unplugging the Deflection Module Cables

### 3-16 Removing and Replacing FRUs

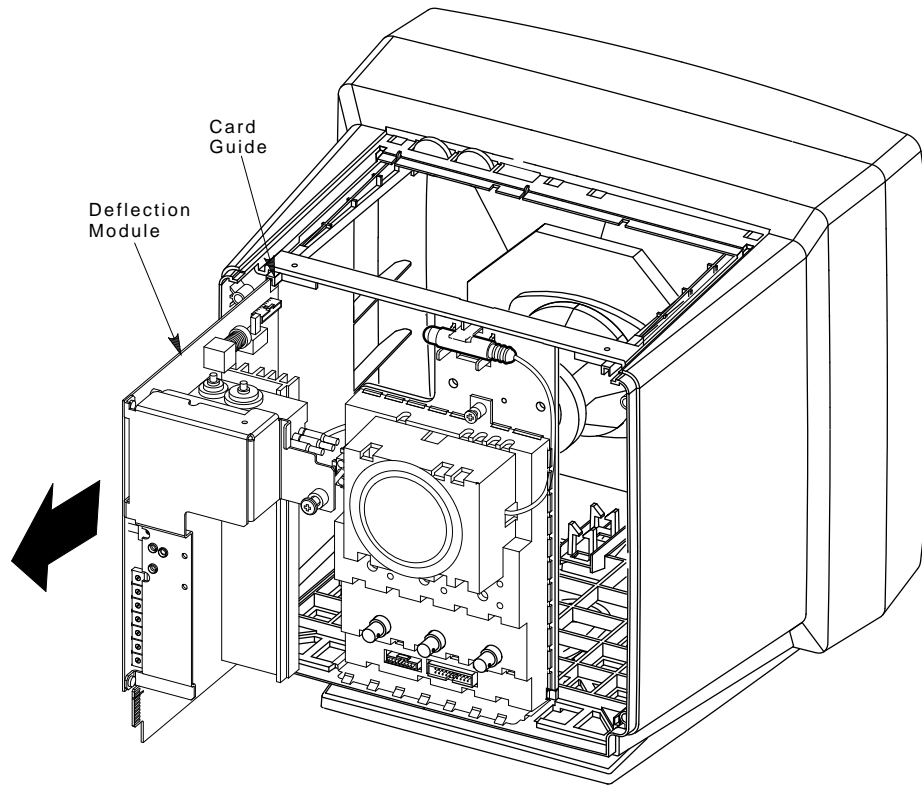
5. Disconnect the 6-wire, 9-pin raster control cable (P6) from the connector (J6) ❶ (Figure 3-10).
6. Disconnect the 4-wire, 9-pin CRT/Yoke cable (P11) from connector (J11) ❷.
7. Remove the Focus cable from the bracket assembly above the video assembly and disconnect the cable (P8) from (J8) ❸.



MA-0534-90.DG

**Figure 3-10 Disconnecting Cables from the Deflection Module**

8. Slide the deflection module out of the card guides (Figure 3-11) being careful to move any cables out of the way.



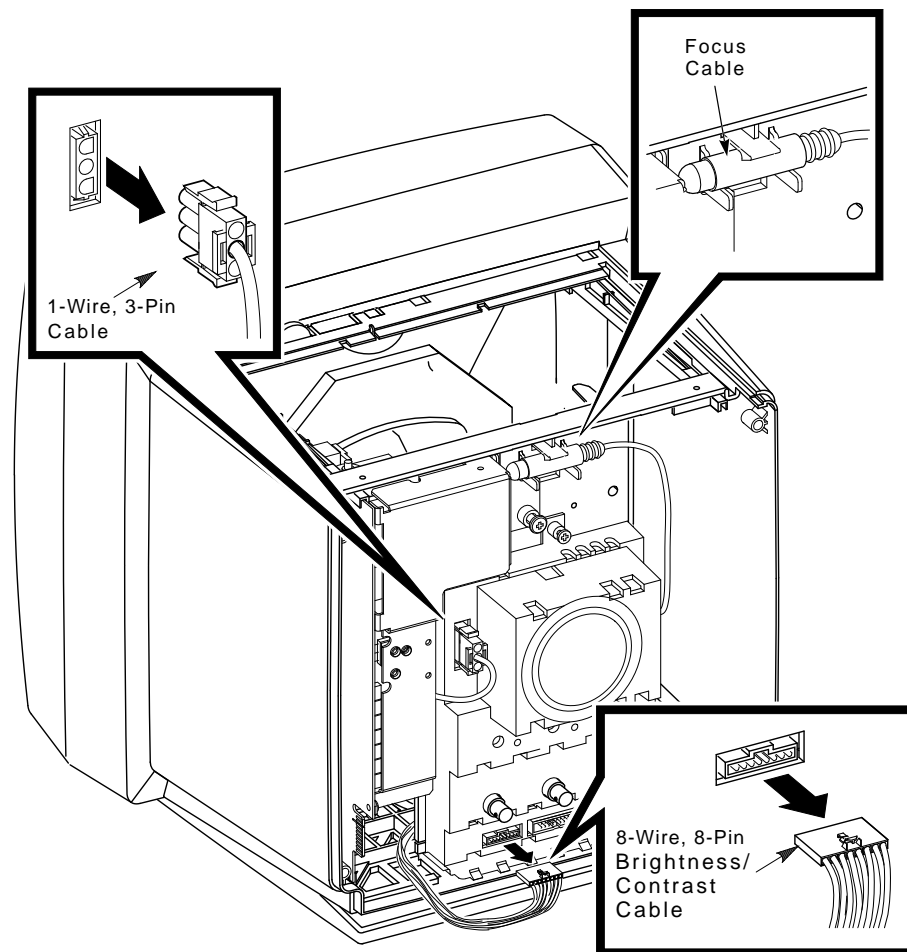
MA-0615-90.DG

**Figure 3-11 Removing the Deflection Module**

### **3.2.5 Removing the Video Assembly**

Remove the video assembly as follows:

1. Remove the rear cover (Section 3.1.2), the top cover (Section 3.1.3), and the interconnect cable (Section 3.2.1).
2. Disconnect the 1-wire, 3-pin G2 cable (P7) from the connector (J7) to the left of the video assembly (Figure 3-12). (The Video Assembly may look different in newer models.)
3. Disconnect the 8-wire, 8-pin brightness/contrast cable (P5) from the connector (J5) at the bottom of the video assembly by pressing the top center tab on the connector. Place it out of the way behind the video assembly.

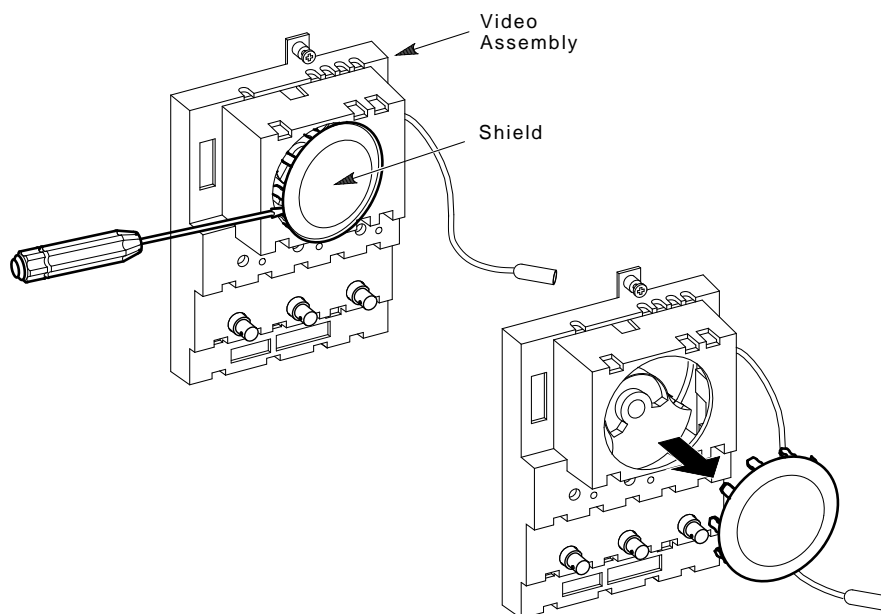


MA-0616-90.DG  
LJ-00782-T10

**Figure 3-12 Removing Cables from the Video Assembly**

### 3-20 Removing and Replacing FRUs

4. Remove the Focus cable from the bracket assembly above the video assembly and disconnect the cable (P8) from (J8).
5. If present, pry the shield off the video assembly with a flat-blade screwdriver (Figure 3-13).



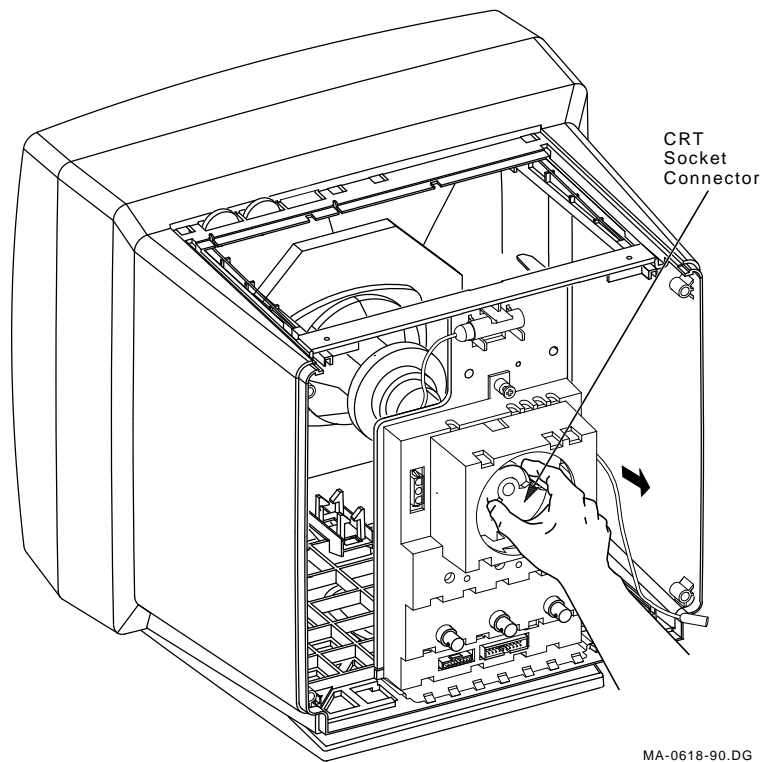
LJ-00783-T10

**Figure 3-13 Removing the Shield from the Video Assembly**

6. Pull the CRT socket connector straight toward you and off the pins (Figure 3-14).

**CAUTION**

Use care not to bend the pins when you disconnect the CRT socket from the neck of the CRT.



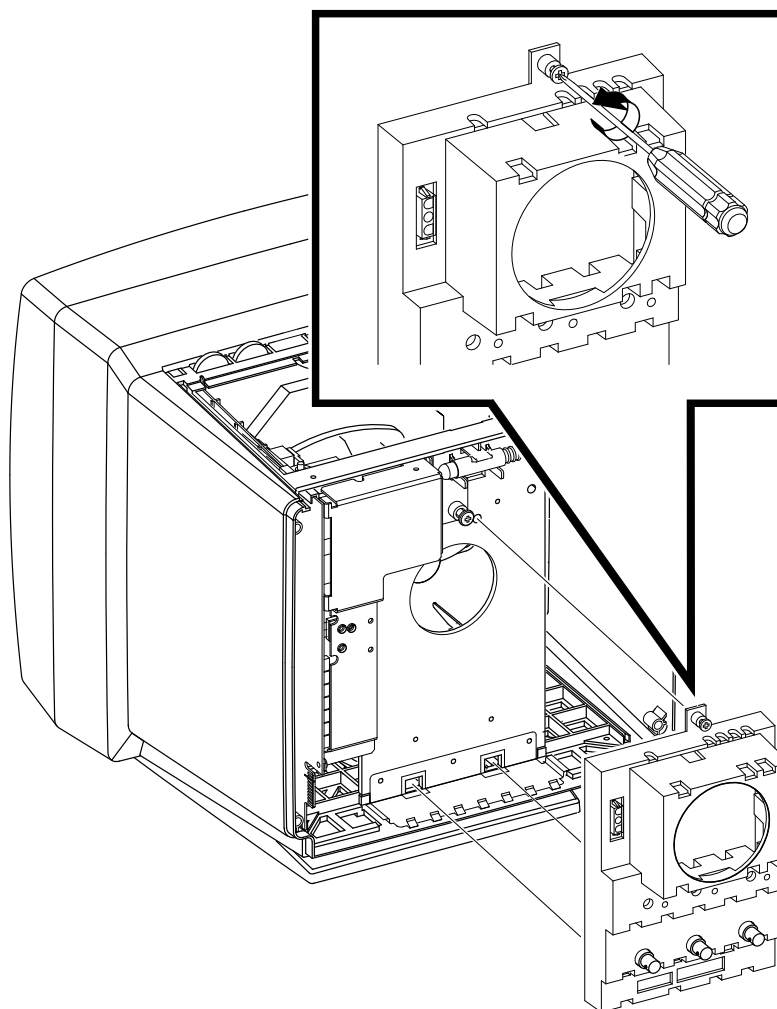
MA-0618-90.DG

**Figure 3-14** Removing the CRT Socket Connector



### 3-22 Removing and Replacing FRUs

7. Loosen the captive screw at the top of the video assembly (Figure 3-15).
8. Gently pull the top of the video assembly towards you and lift it up and out of the chassis.



MA-0646-90.DG

**Figure 3-15 Removing the Video Assembly**

**CAUTION**

**When you install the video assembly, carefully push the CRT socket connector onto the CRT neck. Use care not to bend the pins during this procedure.**

### **3.2.6 Removing the CRT/Bezel/Chassis Assembly**

Remove the CRT/Bezel/Chassis assembly as follows:

1. Remove the rear cover (Section 3.1.2), the top cover (Section 3.1.3), and the interconnect cable (Section 3.2.1).
2. Remove the power supply module (Section 3.2.2)
3. Discharge the CRT and remove the anode cap (Section 3.2.3).

**WARNING**

**You must discharge the CRT and remove the anode cap (Section 3.2.3) before removing the deflection module.**

4. Remove the deflection module (Section 3.2.4)
5. Remove the video assembly (Section 3.2.5)

**NOTE**

**After removing these FRUs, the CRT/Bezel/Chassis assembly is all that remains to be removed.**

### 3.3 CRT Disposal (Trained Service Personnel Only)

This section describes how to safely dispose of the monitor cathode-ray tube (CRT). CRTs are glass vacuum tubes. Because air pressure outside the tube is greater than air pressure inside, there is always the possibility of accidental implosion.

#### **WARNING**

**You must handle CRTs very carefully to avoid accidental implosion and shattering glass. Use the following guidelines and disposal procedure to remove and dispose of a CRT. These guidelines and procedure are Digital policy for all CRTs more than three inches in diameter.**

#### **NOTE**

**This procedure supersedes all other "tech tips" about replacing and disposing of CRTs. This procedure is for Digital personnel only, and is not intended for use by OEM and self-maintenance customers.**

#### **Location**

Work in areas where risks and exposure are limited to trained Digital personnel. Only Digital personnel should be in the area while removing and replacing a CRT.

#### **Handling a CRT**

- Never handle the CRT by the neck. Always use two hands and hold the CRT by the sides near the face. CRT's build a charge even while idle.
- Keep the CRT away from your body during handling.
- Do not let the neck strike anything.
- Do not rest the CRT on its neck.
- Do not let the CRT touch any tools, such as screwdrivers and soldering irons.

#### **Stocking and Storage**

All CRTs must be kept in a closed container or mounted in the device cabinetry.

#### **CRT Disposal**

Use the following procedure to safely dispose of CRTs. Always perform this procedure at a Digital facility.

**WARNING**

**Do not dispose of any CRT until it is rendered inoperative and safe to dispose.**

**Never perform the following disposal procedure at the customer site. Return the defective CRT to the local Digital facility for disposal.**

At the Digital facility you must:

- Clear the area of nonessential personnel.
- Have a second person in the area in case of emergency.
- Wear safety goggles (PN 29-16141-00).
- Wear gloves (PN 29-16146-00).
- Use pliers.

**WARNING**

**To avoid injuring your eyes or hands, always wear goggles and gloves when you work with a CRT. Never handle pieces of phosphor-coated glass without wearing protective gloves.**

1. Remove the FRUs listed in Section 3.2.6.
2. Place the old CRT/Bezel/Chassis assembly and the original packing material in the container from which you removed the new CRT/Bezel/Chassis assembly.
3. Using pliers, slowly crush, **but do not snap**, the evacuation point (Figure 3-16). Do not move or disturb the CRT until the hissing sound of in-rushing air has stopped.

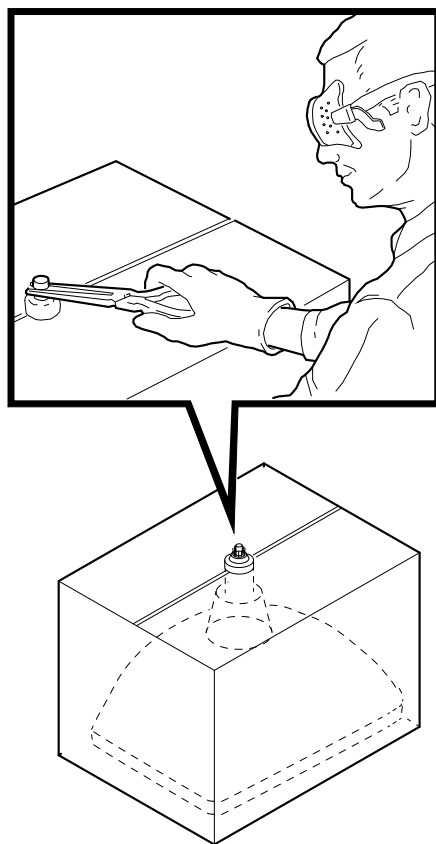
**CAUTION**

**Use care not to break the unprotected glass area of the CRT neck that surrounds the evacuation point.**

**NOTE**

**The evacuation point is a protrusion that extends from the circular area defined by the CRT neck pins. The glass protrusion is sometimes encased in a protective plastic cap, and more force is required to crush it.**

### 3-26 Removing and Replacing FRUs



MA-X0667-88

**Figure 3-16 Crushing the Evacuation Point**

4. Seal the carton with packing tape and dispose of it in the Digital site's trash receptacle.

**NOTE**

**The safe removal of air from the CRT is necessary to prevent safety problems that may arise from accidental CRT implosion.**

### 3.4 Tilt-Swivel Base

**Helpful Hint:** During normal use the tilt-swivel base should not come off the unit. There is a retainer plug in the center of the swivel retainer (74-39791-01) to hold the base on. If the tilt-swivel base should come off and the retainer teeth are not broken, you do not have to take the monitor apart. Use the following procedure to put the tilt-swivel base back on the monitor.

1. Place the monitor, screen side down, on a soft pad.
2. Align the tilt-swivel base with the wider part downward toward the screen (Figure 3-17).
3. Place a curved tool, like a long hex-head wrench, through the center of the swivel retainer inside the base.
4. While pressing on the base with one hand, pull the swivel retainer toward the base until the retainer's teeth click into position.
5. Install a retainer plug (74-41176-01) in the retainer to keep the teeth apart.

3-28 Removing and Replacing FRUs

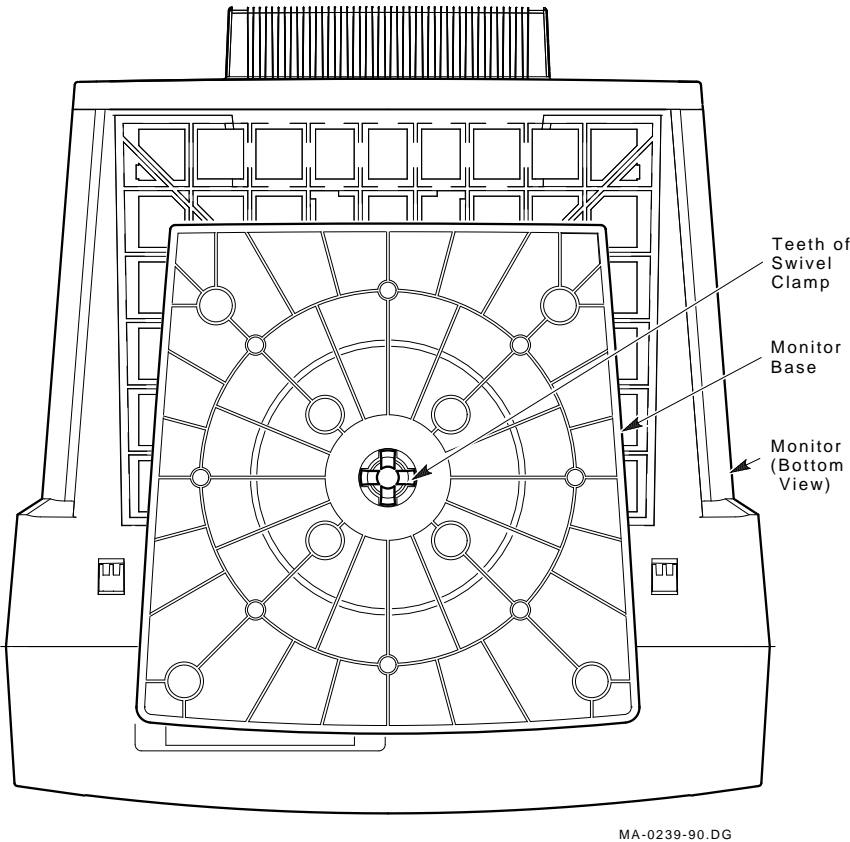


Figure 3-17 Tilt-Swivel Base

# 4

## Aligning the Video Monitor

---

### 4.1 Introduction

This chapter describes the monitor alignment procedures. Depending on which FRU has been replaced and the symptom indicated by the customer, perform the procedures for that part.

#### NOTE

**If a customer calls with a display quality type of problem, ask the customer to leave the monitor on until you arrive to minimize the warm-up time.**

For these procedures, you need the following equipment:

- Metric measuring tape (PN 29-25342-00)
- 19XE radiance meter
- Video screen cleaner (PN VT3XX-SC)
- Low-tack adhesive tape (not provided)
- Red china pencil (not provided).

Check the adjustments in the order presented, as the success of one adjustment may depend on the accuracy of the preceding adjustments (except the Focus and G2 adjustments). If a setting is already correct, you can skip that adjustment and go on to the next one.



## 4-2 Aligning the Video Monitor

### 4.1.1 Before You Start

You must use specific alignment screens to make adjustments. The alignment screens are shown in Appendix A. Refer to your host system service guide to set up these screens.

#### Clean the Screen

Clean the screen using a soft tissue or cloth and a non-abrasive, nonflammable glass cleaner, or use Digital's video screen cleaner (PN VT3XX-SC).

#### Remove the Monitor Covers

Before you perform any adjustments, set up the monitor as follows:

1. Place the monitor on a nonconductive surface.
2. Remove the rear cover (Section 3.1.2)
3. Remove the top cover (Section 3.1.3).
4. Rotate the monitor so it faces east.
5. Reconnect the video cable.
6. Reconnect the power cord.

### 4.1.2 Warm-Up Time

If you replaced any FRU, refer to Section 4.1.4; otherwise, turn the power on and wait for a raster video pattern.

If the customer had the system on when you arrived, after you remove the rear cover and reconnect the power cord, only a 5 minute warm-up is needed to check the monitor. Otherwise, let the monitor warm up for at least 20 minutes before performing any adjustments. The warm-up time ensures that the electron gun is at a stable temperature before you do any adjustments.

### 4.1.3 LEDs and Heater Filament

Visually check the monitor to ensure that the following components are on:

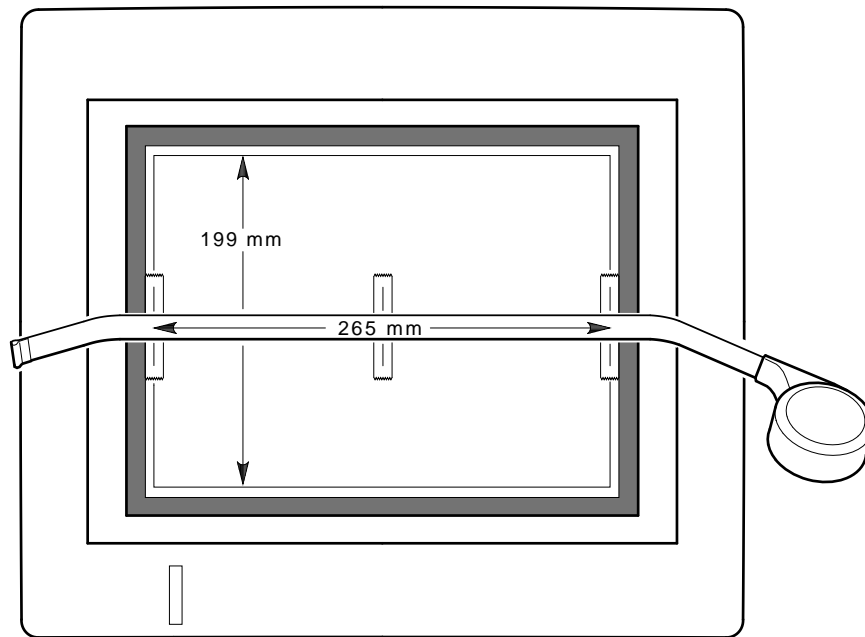
- LED on the power switch
- LED on the deflection module
- CRT heater filament.

#### 4.1.4 Video Screen Alignment Preparation

Use a metric measuring tape to measure the dimensions on the screen display. To avoid scratching the screen with the tape's metal clip, start the measurement at the 10 cm. mark on the tape. See Figure 4-1.

Use low-tack adhesive tape to mark off positions on the bezel window as follows:

1. Horizontal and vertical center position
2. Right and left side, 265 mm apart, centered approximately at the horizontal-vertical center position (Figure 4-1)



LJ-00784-T10

Figure 4-1 Mark Center, Left, and Right Sides of Video Screen

## 4.2 Using the Radiance Meter

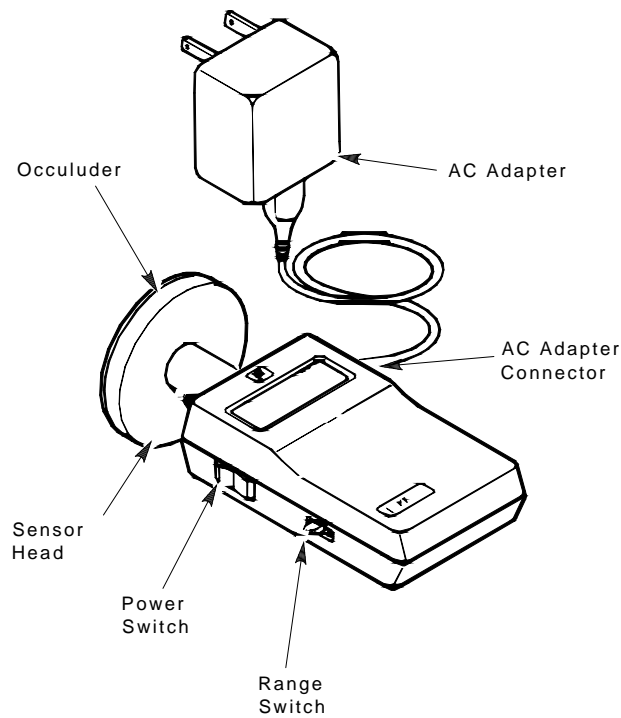
Use the radiance meter as follows:

1. Remove the cap from the radiance meter sensor head and connect the occluder to the radiance meter (Figure 4-2).

### CAUTION

**Avoid excessive force when tightening the occluder or you may damage the radiance meter. Do not touch the exposed filter after the protective cap is removed.**

2. Connect the ac line adapter to the radiance meter and plug it into a wall outlet.



MA-0647-90.DG

**Figure 4-2 Radiance Meter**

3. Turn the power on.

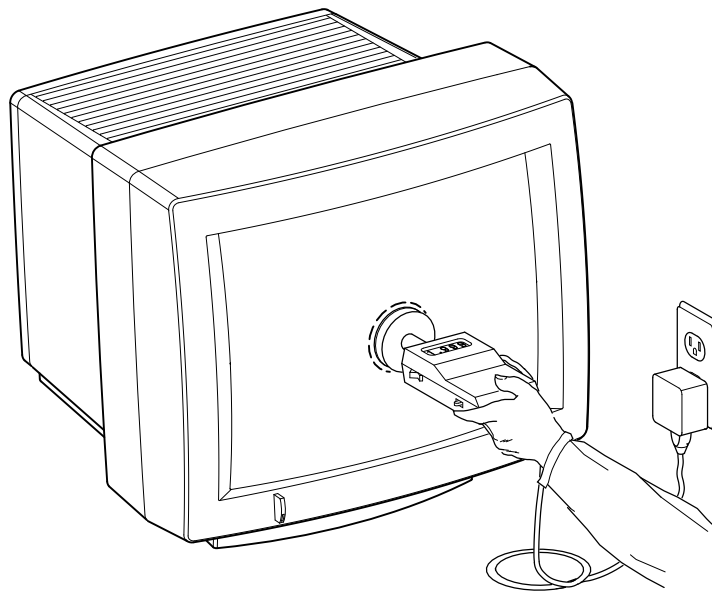
**NOTE**

**Do not use the POWER ON W/BACKLIGHT position when you are using the radiance meter with batteries.**

4. Ensure that your radiance meter is in calibration. Set the range switch to the second position from the top (1.999).
5. Place the occluder firmly against the center of the screen (Figure 4-3). Use a red china pencil to draw a circle around the occluder.

**NOTE**

**You must take all meter readings with the meter centered in this circle.**



MA-1350-89.DG

**Figure 4-3 Using the Radiance Meter**

## 4.3 Monitor Adjustments

The location of the internal controls and adjustments are shown in Figure 4-4. If possible, position yourself so the screen is on your left and the adjustments are on your right.

### 4.3.1 Before Applying Power

#### **If the Deflection Board has been replaced...**

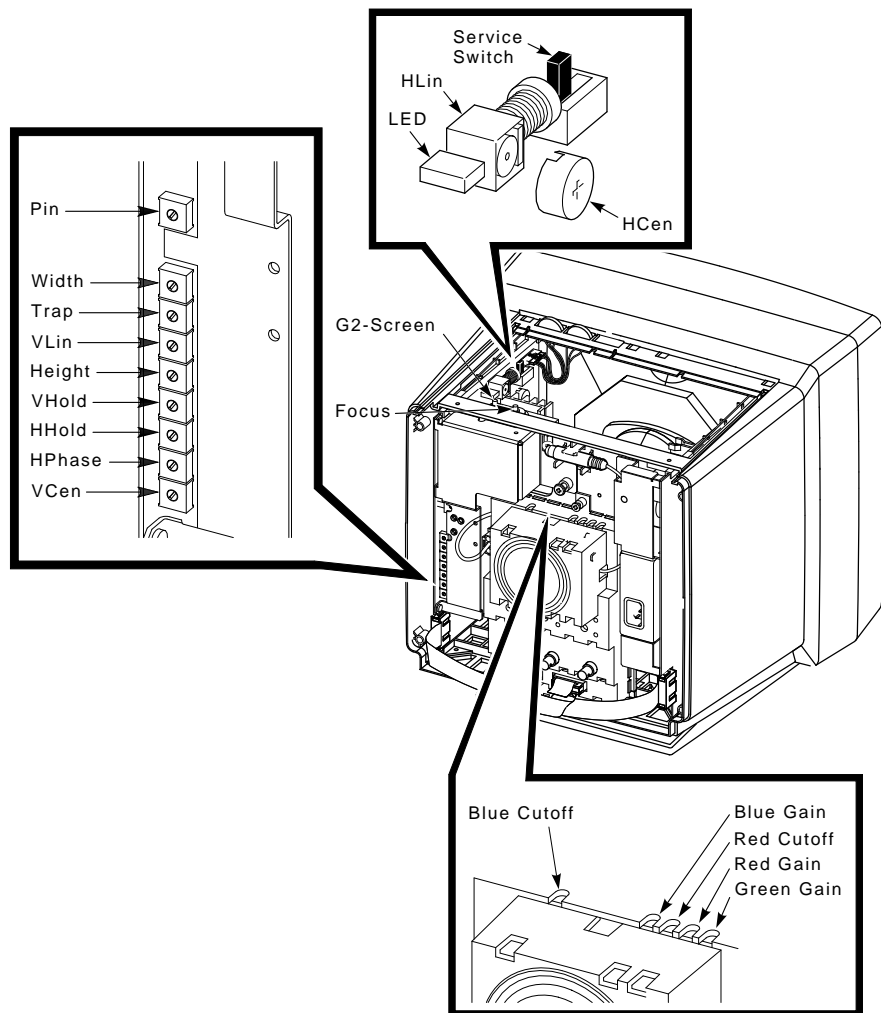
Perform steps 1 and 2; otherwise, go to step 3.

1. Mark off the screen as described in Section 4.1.4.
2. Set the G2-SCREEN control to minimum (fully CCW).

#### **If the Video Board has been replaced...**

Perform steps 3 through 5; otherwise, continue with step 6.

3. Set the R CUTOFF and B CUTOFF adjustments at their midpoints.
4. Set the R GAIN, G GAIN, and B GAIN adjustments at their midpoints.
5. On the deflection board:
  - a. Set the G2-SCREEN control to minimum (fully CCW).
  - b. Set the SERVICE switch to the Normal position.



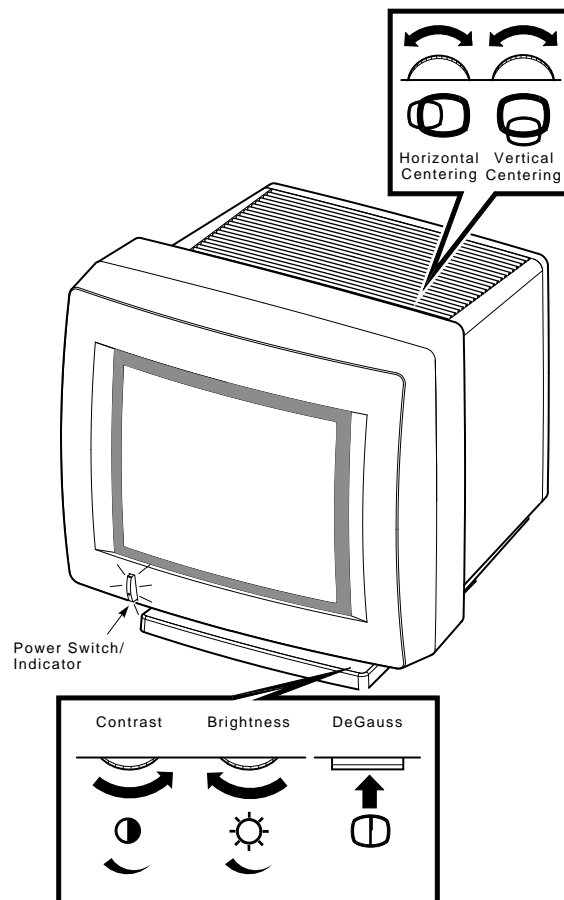
LJ-00785-T10

Figure 4-4 Adjustment Locations

#### 4-8 Aligning the Video Monitor

##### Set User Controls...

6. Set the CONTRAST control to minimum (CCW).
7. Set the BRIGHTNESS control to maximum (CW).
8. Set the HORIZONTAL CENTERING and VERTICAL CENTERING thumbwheels at their mid-points (detents).
9. Turn the power on.



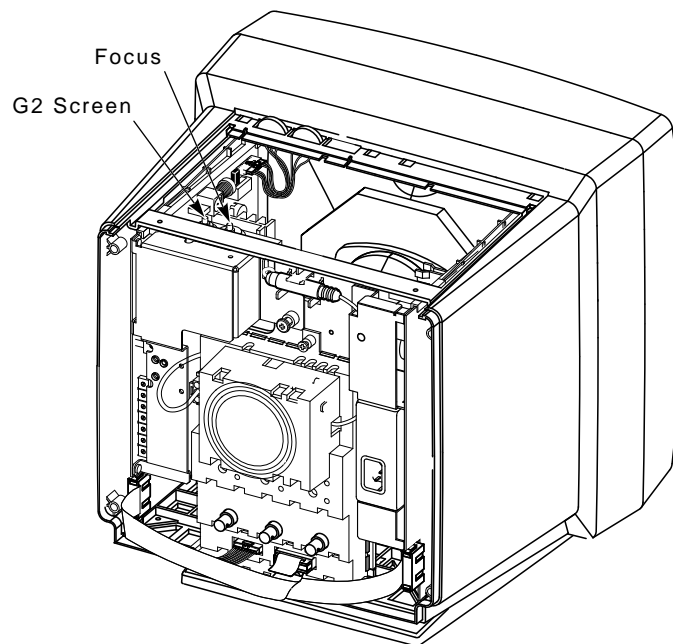
LJ-00786-T10

Figure 4-5 User Controls

### 4.3.2 Geometry Adjustments

If the deflection board has been replaced, adjust the geometry of the display as follows. Unless otherwise noted, all adjustments are performed on the deflection board.

1. Slowly turn CW (G2-SCREEN) until a raster with white horizontal retrace lines displays.
2. Now back off G2 *just until* only the white horizontal retrace lines disappear. The resulting raster display should be light gray with no visible retrace lines.



LJ-00787-T10

Figure 4-6 G2-Screen and Focus Adjustment Locations



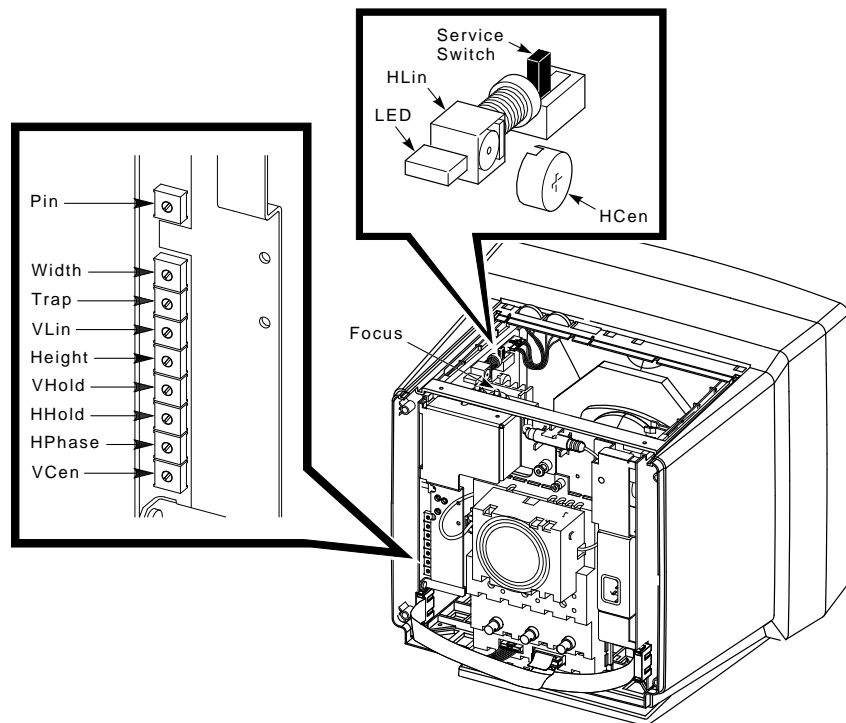
#### 4-10 Aligning the Video Monitor

3. Adjust WIDTH fully CCW for minimum raster width.
4. Adjust HLIN so that the left edge of the raster is at maximum width. (You may have to adjust HCEN to see the left edge of the raster.)
5. Now back off HLIN to reduce the left edge of the raster by approximately 5 mm.
6. Adjust HCEN to center the raster in the CRT glass. If needed, decrease the WIDTH adjustment so that both edges of the raster are visible.
7. Set the CONTRAST control to maximum.
8. Display the Circle/Crosshatch video pattern and, while observing an area at the center of the screen, adjust FOCUS.
9. Adjust VCEN so that the pattern is vertically centered in the bezel.
10. Adjust HEIGHT so that the top and bottom lines of the pattern are 199 mm apart.
11. Adjust VLIN so that the height of all squares on the center vertical axis, from top to bottom, are equal.
12. Adjust HPHASE so that the center vertical line of the pattern is aligned with the adhesive tape marking the horizontal-vertical center reference position.
13. Adjust WIDTH so that the right side of pattern is aligned with the marked right side reference position.
14. Adjust HLIN so that the left side of the pattern is aligned with the marked left side reference position.
15. Adjust TRAP so the viewing area of the screen does not form a trapezoid (top edge smaller or larger than bottom edge).
16. Adjust PIN so the sides do not bow in or bow out.
17. Go back to step 12 and repeat this procedure until all three positions are aligned with the reference positions.
18. Remove the reference adhesive tape from the screen. With a suitable cleaner, remove any marks or residual adhesive from the screen.

### 4.3.3 Focus Adjustment

Display a convenient focusing pattern, such as an “All Es” pattern or the Circle/Crosshatch video pattern and proceed as follows:

1. Set the CONTRAST control to minimum (CCW).
2. Adjust the BRIGHTNESS control to raster extinction.
3. Set the CONTRAST control to maximum.
4. While observing the upper-left corner of the screen, adjust FOCUS.



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Figure 4-7 Adjustment Locations

#### 4.3.4 Cutoff Adjustments

If the video board has been replaced, adjust the cutoff controls as follows. Unless otherwise noted, all adjustments are performed on the video board.

1. Set R CUTOFF and B CUTOFF adjustments fully CCW.
2. Set R GAIN, G GAIN, and B GAIN adjustments fully CCW.
3. Position the radiance meter in the middle of the screen.
4. On the deflection board, slowly turn CW (G2-SCREEN) for 0.0046 reading on the radiance meter. The resulting raster should be green in color with no horizontal retrace lines.
5. Adjust the BRIGHTNESS control to minimum.
6. On the deflection board, set the SERVICE switch to "Service" position.
7. Adjust the BRIGHTNESS control *just until* a single green horizontal line appears.

**CAUTION**

**Do not over adjust; a very bright line may permanently burn the screen.**

8. Adjust the BRIGHTNESS control *just until* the green horizontal line disappears. Do not adjust the BRIGHTNESS control for the remainder of this Cutoff Control adjustment procedure.
9. Turn CW (R CUTOFF) *just until* a single red horizontal line appears.

**CAUTION**

**Do not over adjust.**

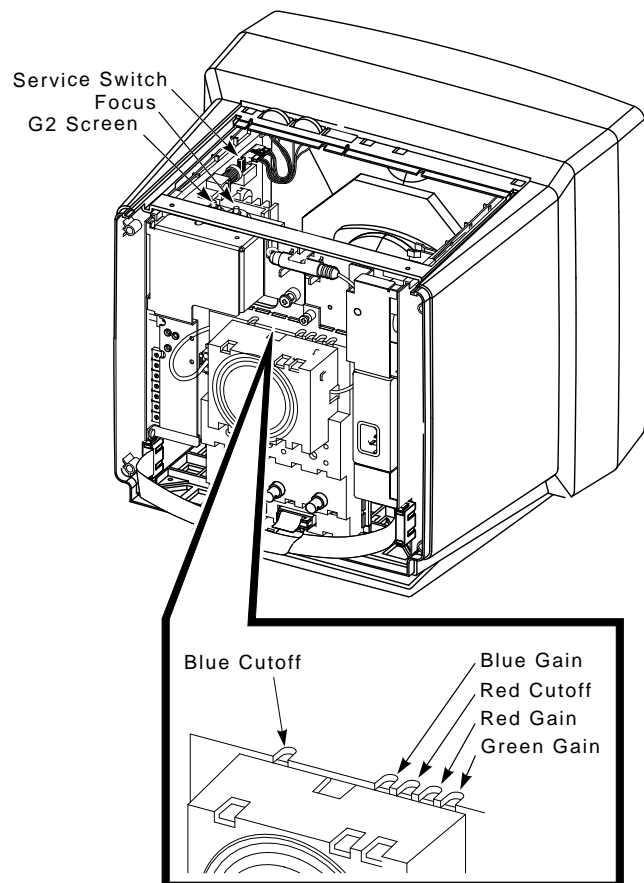
10. Adjust R-CUTOFF *just until* the red horizontal line disappears.
11. Turn CW (B CUTOFF) *just until* a single blue horizontal line appears.

**CAUTION**

**Do not over adjust.**

12. Adjust B CUTOFF *just until* the blue horizontal line disappears.
13. On the deflection board, set the SERVICE switch to Normal position.

14. If the previous adjustments are correct, the screen should be totally black with an absence of raster. If not, repeat Section 4.3.4 until the screen is black.



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**Figure 4-8 Cutoff Adjustment Locations**

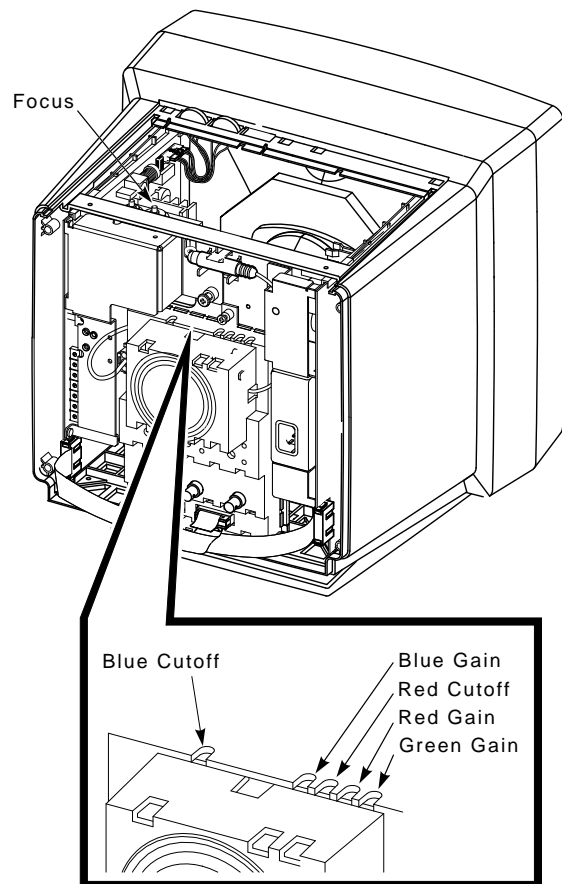
### 4.3.5 Color/White Balance Adjustments

If the video board has been replaced, adjust the color and white balance as follows. Unless otherwise noted, all adjustments are performed on the video board.

1. Adjust the CONTRAST control to minimum.
2. Adjust the BRIGHTNESS control to raster extinction.
3. Set the CONTRAST control to maximum.
4. Position the radiance meter in the middle of the screen and complete steps 5 through 8 in the next table. Repeat steps 5 through 8 until you achieve the final check of approximately 0.451 meter reading.

Step	Display Video Pattern...	Adjust...	Turn	Radiance Meter Reading...
5.	Red-50%-Central-Rectangle	R GAIN	CW	0.135
6.	Green-50%-Central-Rectangle	G GAIN	CW	0.159
7.	Blue-50%-Central-Rectangle	B GAIN	CW	0.159
8.	White-50%-Central-Rectangle	-	-	0.451 (final check)

9. Repeat the FOCUS adjustment (Section 4.3.3).



LJ-00790-T10

**Figure 4-9 Gain Adjustment Locations**

# A

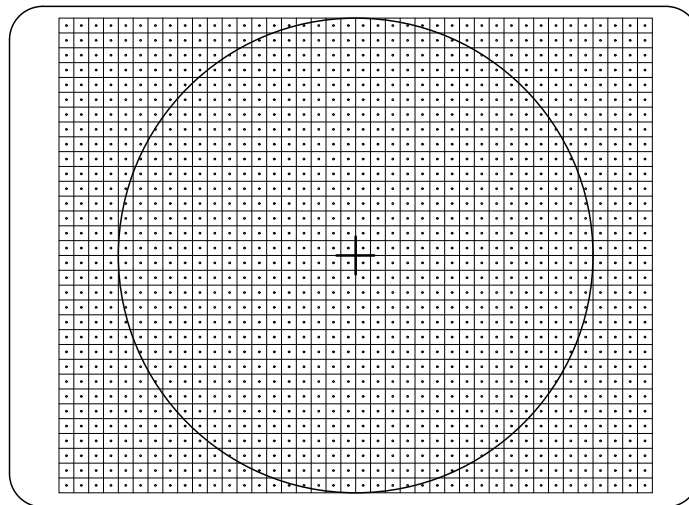
## Alignment Screens

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This appendix describes the screen patterns used to diagnose color and deflection problems, as well as to perform deflection, color checks, and adjustments.

### A.1 Circle-Crosshatch Pattern

Use the circle-crosshatch pattern (Figure A–1) for all your alignment tests. Use this pattern as a reference for customers who work primarily with graphic applications.

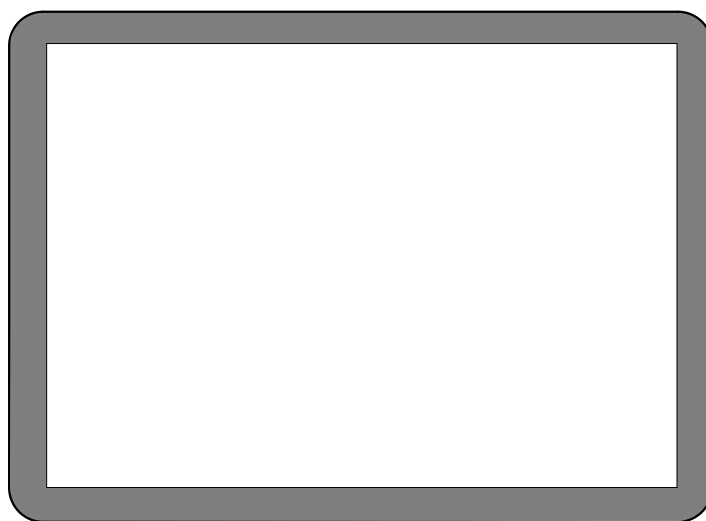


MA-X0889-88

**Figure A–1 Circle-Crosshatch Pattern**

## A.2 All-White Pattern

Use the all-white pattern (Figure A-2) to check for the correct setting of the horizontal and vertical controls.



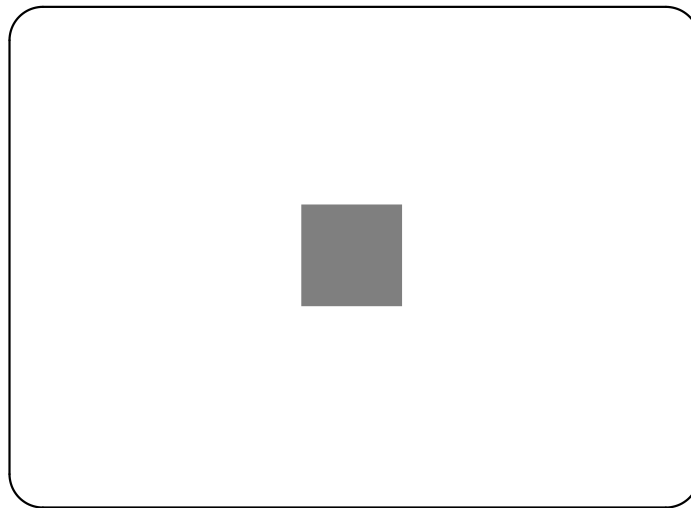
MA-1254-89.DG

**Figure A-2 All-White Pattern**



### A.3 Central Rectangle Pattern

Use the red, green, and blue central rectangle pattern (Figure A-3) when performing the gain adjustments.

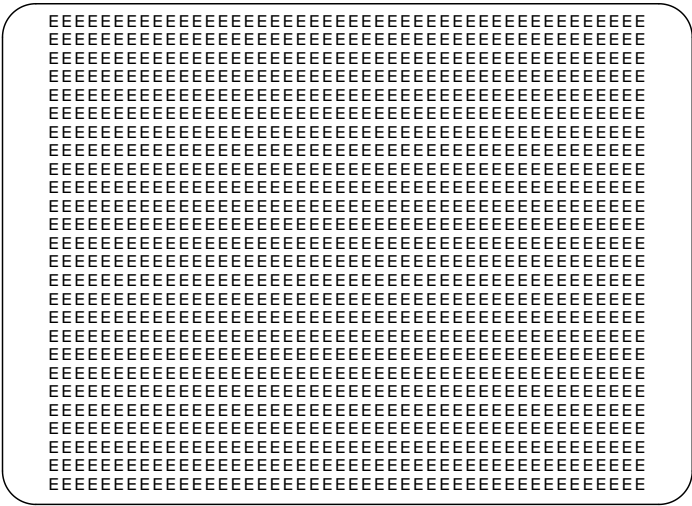


MA-X0928-88

**Figure A-3 Central Rectangle Pattern**

### A.4 All “Es” Pattern

Use the screen of “Es” (Figure A-4) as a secondary reference for customers who work primarily with text.



MA-X0938-88

**Figure A-4 All “Es” Pattern**

**A.5 Color Bars I Pattern**

You can use this 4-bar color pattern (Figure A-5) to check for the presence of all colors, and to check if the colors are in the correct order.

BLUE	RED	GREEN	WHITE
------	-----	-------	-------

MA-X0935-88

**Figure A-5 Color Bars I Pattern**

**A.6 Color Bars II Pattern**

You can use this 8-bar color pattern (Figure A-6) to check for the presence of all colors, and to check if the colors are in the correct order.

BLACK	BLUE	RED	MAGENTA	GREEN	CYAN	YELLOW	WHITE
-------	------	-----	---------	-------	------	--------	-------

MA-X0936-88

**Figure A-6 Color Bars II Pattern**

# B

## VR326 Specifications

The following are the physical specifications for the VR326 color monitor.

**Table B-1 Monitor Physical Specifications**

Specifications	Value
Height	38 cm (15 in)
Width	38 cm (15 in)
Depth	39.6 cm (15.6 in)
Weight	17.2 kg (38 lbs)
Tilt range	20° (5° forward to 15° backward)
Swivel range	±90° (left and right)
Cathode ray tube (CRT)	38 cm (15 in) diagonal
Display area	1024 pixels horizontal x 768 lines vertical. Approximate picture size = 199 mm (7.8 in) x 265 mm (10.4 in) with a 4:3 aspect ratio.

## B-2 VR326 Specifications

The following are the electrical requirements for the VR326 color monitor.

**Table B-2 Monitor Electrical Requirements**

Requirement	Value
AC input voltage	90 to 128 Vac or 190 to 256 Vac, auto-ranging, single phase, 3-wire
Line frequency	49 to 61 Hz
Power consumption	240 watts maximum
Video timing	See Table B-4.
Video output	53.5% nominal (light transmissivity)
Video input	Red (with sync) 1 Vpp, 75 ohm, ac or dc coupled Green (with sync) 1 Vpp, 75 ohm, ac or dc coupled Blue (with sync) 1 Vpp, 75 ohm, ac or dc coupled

The following are the environmental specifications for the VR326 color monitor.

**Table B-3 Monitor Environmental Specifications**

Specifications	Value
Operating temperature	10° to 40° C (50° to 104° F)
Humidity	10% to 90% relative humidity Maximum wet bulb = 28° C Minimum dew point = 2° C (noncondensing)

Table B-4 lists the horizontal and vertical timing specifications.

**Table B-4 Video Timing—1024 x 768 Resolution**

Horizontal frequency	57.384 kHz	
Vertical frequency	72.033 Hz	
Pixel frequency	74.370 MHz	
Pixel period	13.446 ns	

<b>Horizontal Timing</b>	<b>no. pixels</b>	<b>μs</b>
Entire line	1296	17.43
Active visible line	1024	13.77
Blanking interval	272	3.66
Sync front porch	16	0.215
Sync pulse	128	1.721
Sync back porch	128	1.721

<b>Vertical Timing</b>	<b>no. lines</b>	<b>ms</b>
Vertical period (entire frame)	797	13.889
Visible raster	768	13.384
Blanking interval	29	0.505
Sync front porch	1	0.0174
Sync pulse	6	0.1046
Sync back porch	22	0.3834

# C

## VR326 Documentation

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In addition to this guide, you can order the following VR326 documents from Digital. Some of the documents listed are available in several languages. Please contact your sales representative for availability and more information.

***Installing and Using the VR326 Color Monitor***  
**EK-VR326-IN**

This guide provides users with the information needed to install, operate and maintain the VR326 monitor. The manual also describes all controls and indicators.

***VR326 Color Monitor IPB***  
**EK-VR326-IP**

This document provides a detailed parts breakdown of the VR326 field replaceable parts. The documents do not contain part numbers for components on the printed circuit modules. However, these components are listed in the *Field Maintenance Print Set*, ordered separately.

***VR326 Field Maintenance Print Set***  
**MP-03005-01**

This document provides a field maintenance set of electrical and mechanical schematic diagrams for the VR326 color monitor.

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