

VR319 Monitor Service Guide

Order Number EK-VR319-SV-001

Digital Equipment Corporation

1st Edition, May 1990

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

The software described in this document is furnished under a license and may be used or copied only in accordance with the terms of such license.

No responsibility is assumed for the use or reliability of software on equipment that is not supplied by Digital Equipment Corporation or its affiliated companies.

Restricted Rights: Use, duplication, or disclosure by the U. S. Government is subject to restrictions as set forth in subparagraph (c) (1) (ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013.

Copyright © Digital Equipment Corporation 1990

All Rights Reserved.
Printed in U.S.A.

The following are trademarks of Digital Equipment Corporation:

DEC	DIBOL	UNIBUS
DEC/CMS	EduSystem	VAX
DEC/MMS	IAS	VAXcluster
DECnet	MASSBUS	VMS
DECsystem-10	PDP	VT
DECSYSTEM-20	PDT	
DECUS	RSTS	
DECwriter	RSX	

This document was prepared and published by Educational Services Development and Publishing, Digital Equipment Corporation.

Contents

- About This Manual** vii

- 1 Overview**
 - 1.1 Product Description 1-1
 - 1.1.1 Refresh Rate 1-2
 - 1.1.2 Model Variations 1-2
 - 1.2 Tools and Equipment 1-2
 - 1.3 Recommended Spares List 1-3

- 2 Troubleshooting**
 - 2.1 Before You Start 2-1
 - 2.2 Troubleshooting Procedures 2-2
 - 2.3 Troubleshooting Tables 2-2

- 3 Removing and Replacing FRUs**
 - 3.1 Procedures 3-1
 - 3.1.1 Rear Cover Removal 3-2
 - 3.1.2 Top Cover Removal 3-6
 - 3.2 Field Replaceable Units (FRUs) 3-8
 - 3.2.1 Interconnect Cable 3-9
 - 3.2.2 Deflection Module 3-10
 - 3.2.3 Video Casting Assembly 3-15
 - 3.2.4 CRT Discharge 3-19
 - 3.2.5 Power Supply Module 3-21
 - 3.2.6 CRT/Chassis Assembly 3-25
 - 3.3 CRT Disposal (Trained Service Personnel Only) 3-25

4 Aligning the Video Monitor

4.1	Introduction	4-1
4.1.1	Before You Start	4-1
4.1.2	Displaying Screen Tests	4-2
4.2	Monitor Adjustments	4-3
4.3	Height Adjustments	4-6
4.3.1	Vertical Centering (VCEN) and Vertical Linearity (VLIN)	4-6
4.3.2	Vertical Height (HEIGHT)	4-8
4.4	Width Adjustments	4-9
4.4.1	Horizontal Phase, Horizontal Linearity, and Horizontal Centering (HPHASE, HLIN, HCEN)	4-9
4.4.2	Horizontal Width (WIDTH)	4-12
4.5	Vertical Hold Adjustment (VHOLD)	4-13
4.6	Bias Adjustment (G2)	4-15
4.7	Using the Radiance Meter	4-16
4.8	Gain Adjustment (GGAIN)	4-18
4.9	Focus Adjustments (G4)	4-19
4.9.1	Vertical Dynamic Focus (VPARAB)	4-21
4.9.2	Horizontal Dynamic Focus (HPARAB)	4-21

5 Changing the Refresh Rate

5.1	VR319 Monitor Refresh Rates	5-1
5.2	Changing the Refresh Rate	5-1
5.2.1	Adjusting the Monitor for a New Refresh Rate	5-2
5.3	Product Conversion Label	5-2

A Alignment Screens

A.1	Circle-Crosshatch Pattern	A-1
A.2	All-White Pattern	A-2

B VR319 Documentation

Index

Figures

1-1	VR319 Monochrome Monitor	1-1
3-1	Power Switch/Indicator	3-2
3-2	Removing the Power Cord	3-3
3-3	Sample Signal Cable	3-4
3-4	Removing the Rear Cover	3-5
3-5	Tilting the Top Cover	3-6
3-6	Removing the Top Cover	3-7
3-7	VR319 Field Replaceable Units	3-8
3-8	Removing the Interconnect Cable	3-9
3-9	Removing the 2-wire, 3-pin Cable	3-11
3-10	Disconnecting Cables from the Deflection Module	3-12
3-11	Removing the Deflection Module	3-13
3-12	Refresh Rate Jumper on Deflection Module	3-14
3-13	Disconnecting the Interconnect Cable	3-15
3-14	Disconnecting the Brightness/Contrast Cable	3-16
3-15	Removing the CRT Socket Connector	3-17
3-16	Removing the Video Casting	3-18
3-17	Discharging the CRT and Removing the Anode Cap	3-20
3-18	Disconnecting the Interconnect Cable	3-21
3-19	Removing the LED Cable from the Power Supply	3-22
3-20	Removing the Power Supply	3-23
3-21	Refresh Rate Jumper on the Power Supply	3-24
3-22	CRT Disposal Procedure	3-28
4-1	User Controls	4-3
4-2	Adjustment Locations	4-4
4-3	Using the Metric Measuring Tape	4-5
4-4	Circle-Crosshatch Pattern	4-6
4-5	VCEN, VHOLD, HEIGHT, and VLIN Controls	4-7
4-6	Height Control	4-8
4-7	Circle-Crosshatch Pattern	4-9

vi Contents

4-8	Width Controls	4-10
4-9	Measuring the Width of the Viewing Area	4-12
4-10	VHOLD Control	4-14
4-11	Bias Adjustment (G2)	4-15
4-12	Radiance Meter	4-16
4-13	Using the Radiance Meter	4-17
4-14	Gain Adjustment	4-18
4-15	Circle-Crosshatch Pattern	4-19
4-16	Focus Control (G4)	4-20
5-1	Product Conversion Label	5-3
A-1	Circle-Crosshatch Pattern	A-1
A-2	All-White Pattern	A-2

Tables

1-1	Refresh Rates of Monitor Models	1-2
1-2	Tools and Equipment	1-2
1-3	VR319 Recommended Spares	1-3
2-1	Blank Screen, No Video or Raster	2-3
2-2	Blank Screen, No Video but Raster Present	2-4
2-3	Poor Display Quality	2-5
5-1	Monitor Model Refresh Rates	5-1
5-2	Completing the Product Conversion Label	5-2

About This Manual

This manual describes how to service your VR319 monitor.

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 describes the troubleshooting procedures.
- Chapter 3 describes how to remove and replace the Field Replaceable Units (FRUs).
- Chapter 4 describes the alignment procedures.
- Chapter 5 describes the procedures to change the refresh rate of the monitor.
- Appendix A describes the alignment screens.
- Appendix B describes related documentation.

Audience

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

Conventions

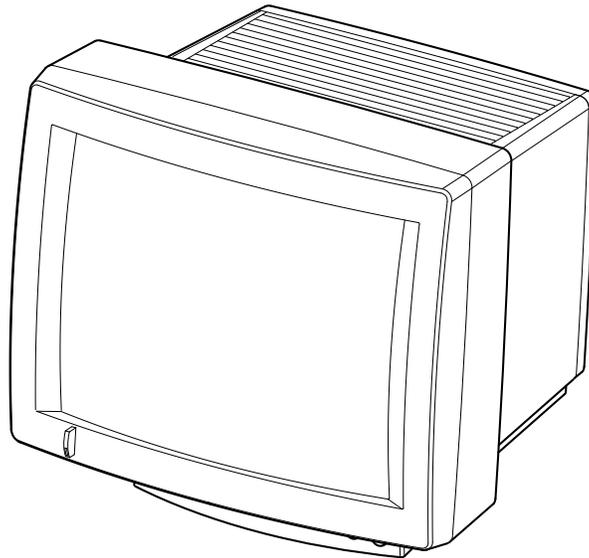
Warning	Provides information to prevent personal injury.
Caution	Provides information to prevent damage to the equipment.
Note	Provides general information you should be aware of.
PN	Part number.

1

Overview

1.1 Product Description

The VR319 monochrome monitor (Figure 1-1) has a direct viewed, 500 mm, antiglare CRT. The built-in tilt/swivel assembly lets the user adjust the screen for viewing comfort. When connected to a host system, the monitor can display information that the host system sends to it.



MA-0243-90.DG

Figure 1-1 VR319 Monochrome Monitor

1.1.1 Refresh Rate

The monitor operates at either a 66 Hz or 72 Hz refresh rate. The refresh rate is preset for the system as ordered. If you change the monitor to another system, check the refresh rate of the new system and then set the jumpers on the deflection module and power supply module to match the new system. Refer to Chapter 5.

1.1.2 Model Variations

Table 1-1 lists the different VR319 models and their refresh rates.

Table 1-1 Refresh Rates of Monitor Models

Model	Pixels x Lines	Refresh Rate	Applicable Area
VR319-CA	1280 x 1024	66 Hz	Northern Hemisphere
VR319-C4	1280 x 1024	66 Hz	Southern Hemisphere
VR319-DA	1280 x 1024	72 Hz	Northern Hemisphere
VR319-D4	1280 x 1024	72 Hz	Southern Hemisphere

1.2 Tools and Equipment

You need the following tools and equipment to service the VR319 monitor:

Table 1-2 Tools and Equipment

Tools and Equipment	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 Spares List

The following are the recommended spares for the VR319 monitor:

Table 1-3 VR319 Recommended Spares

Spares	Part Number
Power supply module	54-19703-00
Deflection module	54-19303-01
Video casting assembly	70-27010-02
Interconnect cable	70-27000-01
CRT/Chassis assembly (Northern Hemisphere)	70-27429-07
CRT/Chassis assembly (Southern Hemisphere)	70-27429-08

2

Troubleshooting

This chapter describes how to troubleshoot a VR319 monitor problem through fault isolation.

2.1 Before You Start

WARNING

If you smell burning components, turn power to the monitor off and disconnect the power cord.

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

- If you are going to service a display-quality type of problem, tell the customer to let the monitor warm up for at least 20 minutes, if possible, before you arrive and begin the troubleshooting procedures.
- 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 casting 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 VR319 monitor as follows:

1. Ask the operator to describe the problem. The operator often is the most knowledgeable person.
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 possible causes in order of probability. This troubleshooting information applies to three types of video problems that the VR319 monitor may exhibit:

- A blank screen, without video or raster (Table 2-1)
- A blank screen, without video, but raster present (Table 2-2)
- Poor display quality (Table 2-3)

Use the troubleshooting tables as follows:

1. Note the symptom of the problem.
2. Check the Symptom column 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. Power to the monitor is on (power switch is in), but the power indicator LED is off.	Power cord is not connected to the power source or monitor.	Connect the power cord to the power source or monitor.
	CRT protection circuit has turned monitor off.	Push the on/off switch off; then set it to the on position.
	Low or no power at wall outlet.	Use another power source. If the problem continues, call the facilities person.
	Power supply module is faulty.	Replace the power supply module (Section 3.2.5).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
Both the power indicator LED and the deflection module LED are on.	Contrast or brightness is set too low.	Adjust the contrast and brightness controls.
	Internal cabling is loose or faulty.	Check all cabling going to the deflection module and the video casting assembly. If necessary, secure the cables.
	G2 Bias is set too low.	Adjust the G2 Bias (Section 4.6).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
The power indicator LED is on; the deflection module LED is off.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
	CRT/chassis assembly is faulty.	Replace the CRT/chassis assembly (Section 3.2.6) only after trying the previous solutions.

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

Symptom	Possible Cause	Suggested Solution
Raster can be displayed by adjusting the brightness control, but no video or cursor can be seen even when the contrast control is at maximum.	Host system's CRT screen saver feature is activated.	Press any key to reactivate the display.
	Power to the host system is off.	Turn power to the host system on.
	External signal cable is disconnected.	Connect the signal cable to the monitor and host.
	Internal cabling is loose or faulty.	Check all cabling to the deflection module and the video casting assembly.
	The host system is not supplying video signals to the monitor.	Connect the monitor to a known working host system (if available) to verify the problem before replacing any monitor module or cable.
	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
Faulty CRT/chassis assembly	Replace the CRT/chassis assembly (Section 3.2.6) only after trying the previous solutions.	

NOTE
Make sure the monitor has warmed up for at least 20 minutes before you use Table 2-3.

Table 2-3 Poor Display Quality

Symptom	Possible Cause	Suggested Solution
Poor geometry, centering, and/or linearity.	Centering controls on top of the monitor are out of adjustment.	See section 4.1.
	Local magnetic fields.	Remove any electro-mechanical devices from the vicinity of the monitor, or move the monitor to another location.
	Monitor is out of adjustment.	Align the video monitor. Refer to Chapter 4.
Display is not centered on screen.	Adjustment is incorrect.	Perform the horizontal center adjustment (Section 4.4.1). Perform the horizontal phase adjustment (Section 4.4.1). Perform the vertical center adjustment (Section 4.4.1).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Adjustment is incorrect.	Perform the height adjustment (Section 4.3.2).
Display is too short.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Adjustment is incorrect.	Perform the height adjustment (Section 4.3.2).
Display is too tall.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Adjustment is incorrect.	Perform the width adjustment (Section 4.4.2).
Display is too wide.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Adjustment is incorrect.	Perform the width adjustment (Section 4.4.2).
Display is too narrow.	Adjustment is incorrect.	Perform the width adjustment (Section 4.4.2).

Table 2-3 (Cont.) Poor Display Quality

Symptom	Possible Cause	Suggested Solution
Poor light output (using the all-white diagnostic pattern), or display is not bright enough.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Power supply module is faulty.	Replace the power supply module (Section 3.2.5).
	Brightness or contrast controls are set too low.	Adjust the brightness and contrast controls.
	Host system is not supplying correct signal levels.	Repair the host system.
	G2 and GAIN adjustments may be incorrect.	Perform the G2 adjustment (Section 4.6) and GAIN adjustment (Section 4.8).
	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
Display is too bright.	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	CRT wearout.	Replace the CRT/chassis assembly (Section 3.2.6) only after trying the previous solutions.
	Brightness control is set to high.	Adjust the brightness control to the optimum range.
	G2 adjustment may be incorrect.	Perform the G2 adjustment (Section 4.6).
Vertical lines are not straight.	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Local magnetic fields are present.	Remove any electro-mechanical devices from the vicinity of the monitor, or move the monitor.

Table 2-3 (Cont.) Poor Display Quality

Symptom	Possible Cause	Suggested Solution
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Faulty CRT/chassis assembly	Replace the CRT/chassis assembly (Section 3.2.6) only after trying the previous solutions.
Linearity is incorrect.	Adjustment is incorrect.	Perform the vertical and horizontal linearity adjustments (Section 4.3.1 and Section 4.4.1).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
Video noise	CRT/chassis assembly is faulty.	Replace the CRT/chassis assembly (Section 3.2.6) after trying the previous solutions.
	Signal cable is faulty.	Replace the signal cable.
	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Power supply module is faulty.	Replace the power supply module (Section 3.2.5).
Focus is not sharp.	Host system is faulty.	Repair the host system.
	Adjustment is incorrect.	Perform the focus adjustment (Section 4.9).
	Deflection module is faulty.	Replace the deflection module (Section 3.2.2).
	Video casting assembly is faulty.	Replace the video casting assembly (Section 3.2.3).
	CRT/chassis assembly is faulty.	Replace the CRT/chassis assembly (Section 3.2.6) after trying the previous solutions.

3

Removing and Replacing FRUs

This chapter describes how to remove and replace the VR319 monitor field replaceable units (FRUs).

3.1 Procedures

WARNING

Turn power to the monitor off and remove the power cord before disconnecting or replacing any FRU.

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

NOTE

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

The procedures only describe how to remove FRUs; to install each FRU, reverse the removal procedure. Before removing any FRUs, you must remove the rear cover and the top cover.

NOTE

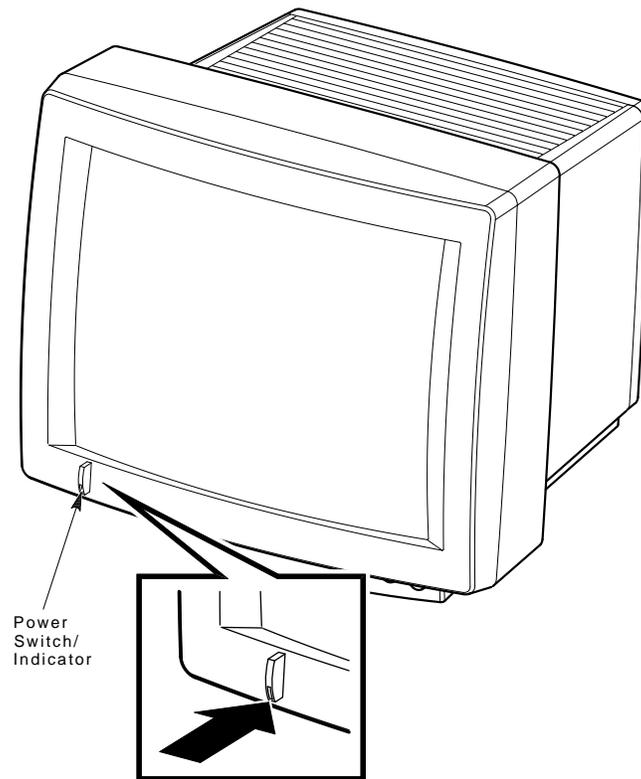
Any time you replace a video casting assembly, deflection module, or power supply module, perform all the necessary adjustments.

3-2 Removing and Replacing FRUs

3.1.1 Rear Cover Removal

Remove the rear cover as follows:

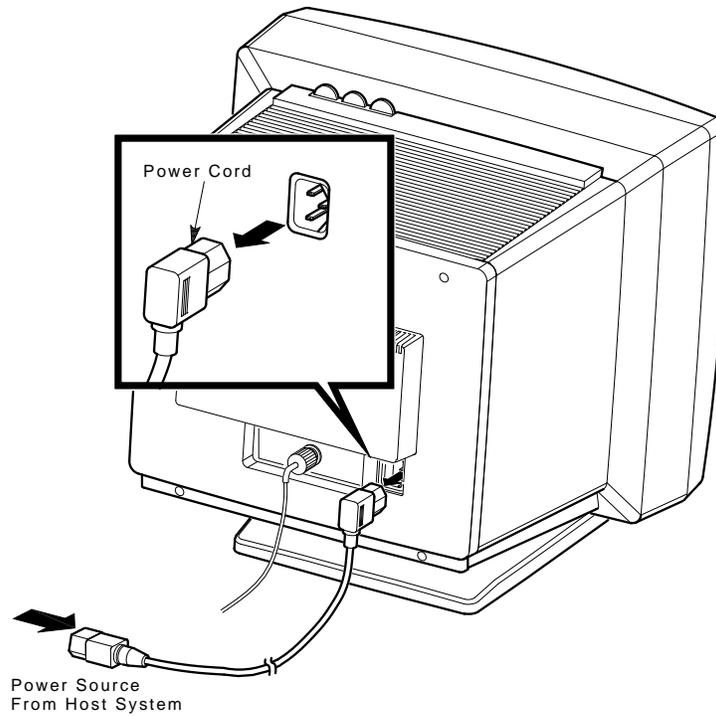
1. Turn power to the monitor off (Figure 3-1).



MA-1239-89.DG

Figure 3-1 Power Switch/Indicator

2. Unplug the power cord from the wall outlet first, then from the monitor (Figure 3-2).

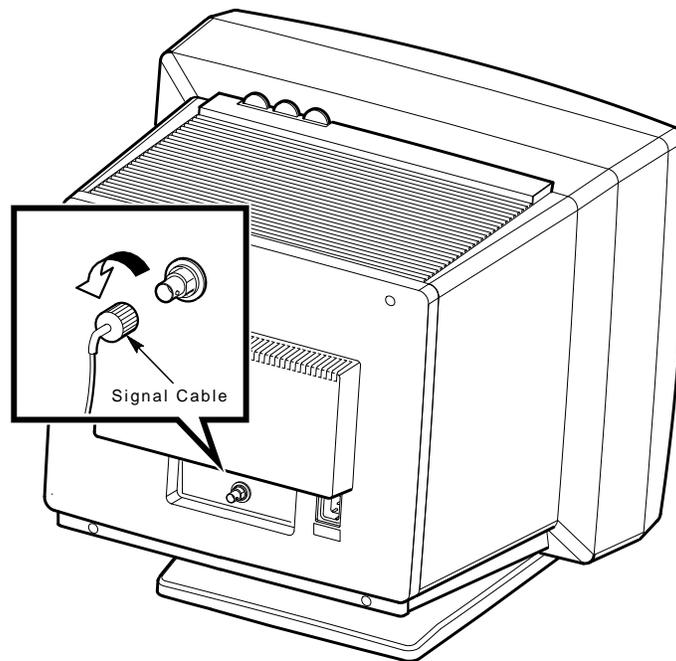


MA-1223-89.DG

Figure 3-2 Removing the Power Cord

3-4 Removing and Replacing FRUs

3. Remove the signal cable from the rear of the monitor. Push the connector in and turn it left until the signal cable is released from the connector (Figure 3-3).



MA-1224-89.DG

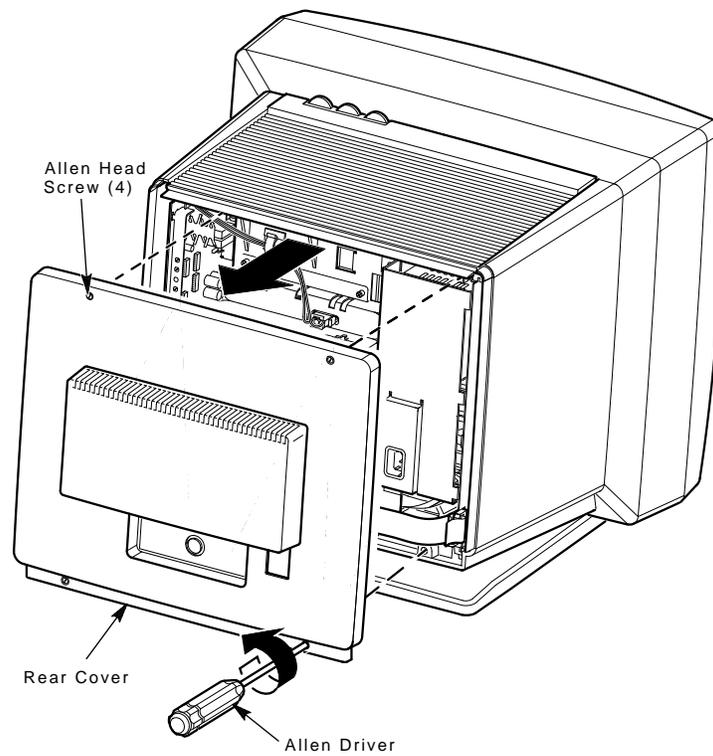
Figure 3-3 Sample Signal Cable

4. Use a 9/32 Allen driver to *loosen* the four captive screws that hold the rear cover to the enclosure (Figure 3-4).

NOTE

The rear cover may be difficult to pull off.

5. Remove the rear cover by pulling the cover towards you.



MA-1225-89.DG

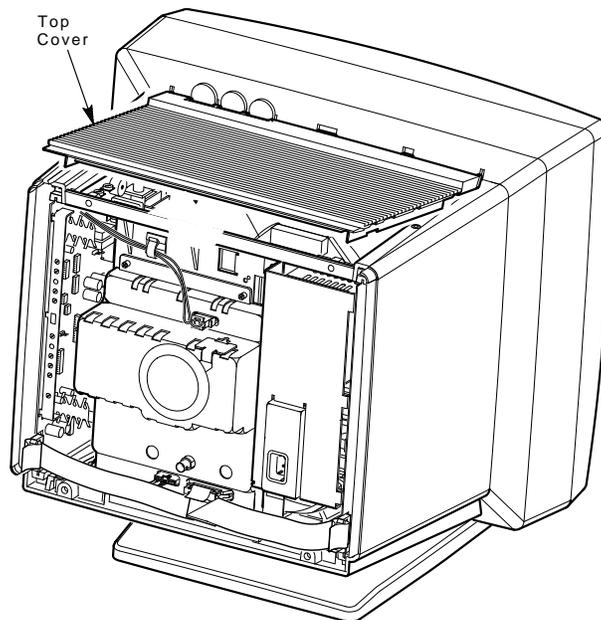
Figure 3-4 Removing the Rear Cover

3-6 Removing and Replacing FRUs

3.1.2 Top Cover Removal

Remove the top cover as follows:

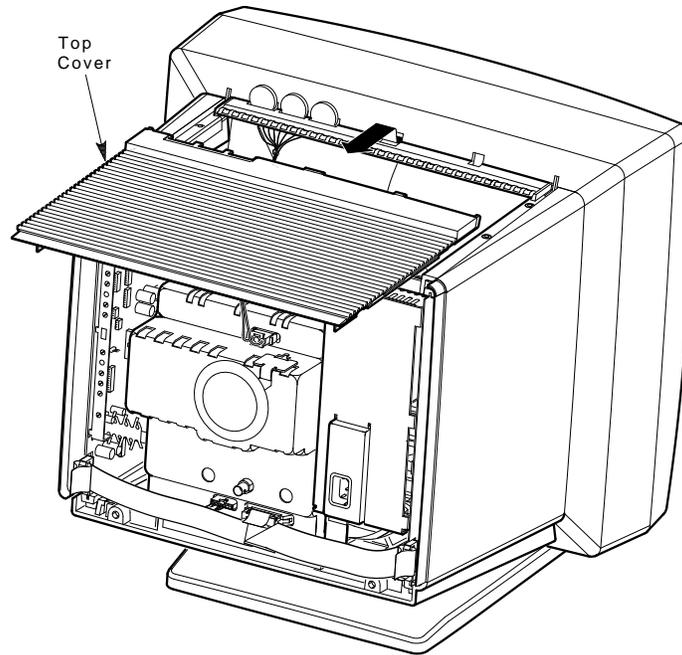
1. Remove the rear cover (Section 3.1.1).
2. Tilt the top cover up (Figure 3-5).



MA-1227-89.DG

Figure 3-5 Tilting the Top Cover

3. Slide the top cover toward the back of the monitor (Figure 3-6).



MA-1226-89.DG

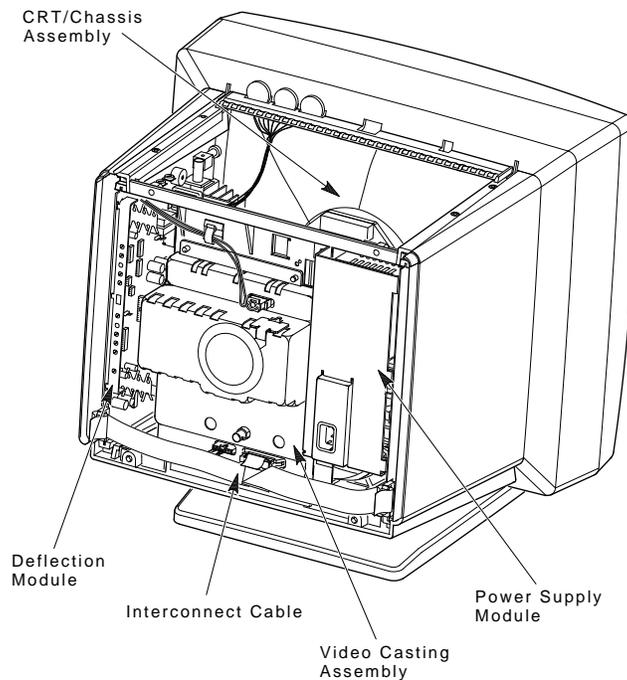
Figure 3-6 Removing the Top Cover

3.2 Field Replaceable Units (FRUs)

The VR319 monitor FRUs are shown in Figure 3-7. Before replacing any FRUs, see Section 3.1.

WARNING

Turn power to the monitor off and disconnect the power cord before disconnecting or replacing any FRU.



MA-1222-89.DG

Figure 3-7 VR319 Field Replaceable Units

3.2.1 Interconnect Cable

Remove the interconnect cable as follows:

1. Remove the rear cover (Section 3.1.1) and the top cover (Section 3.1.2).
2. Disconnect the interconnect cable (P3) by pulling the connector off the deflection module (J3) (Figure 3-8).
3. Disconnect the interconnect cable (P2) by pressing the plastic tabs outward and then removing the cable from the video casting (J2).
4. Disconnect the interconnect cable (P1) by pulling the connector off the power supply (J1).

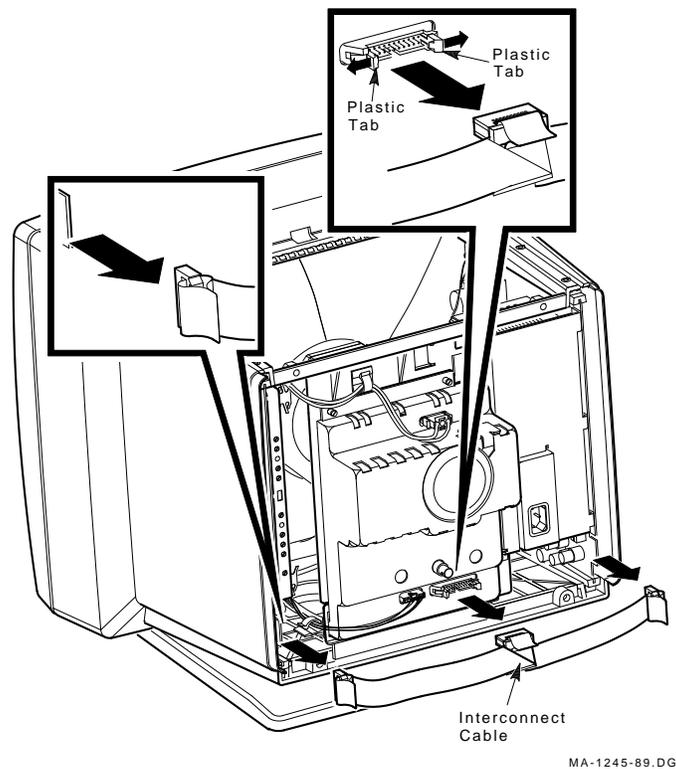


Figure 3-8 Removing the Interconnect Cable

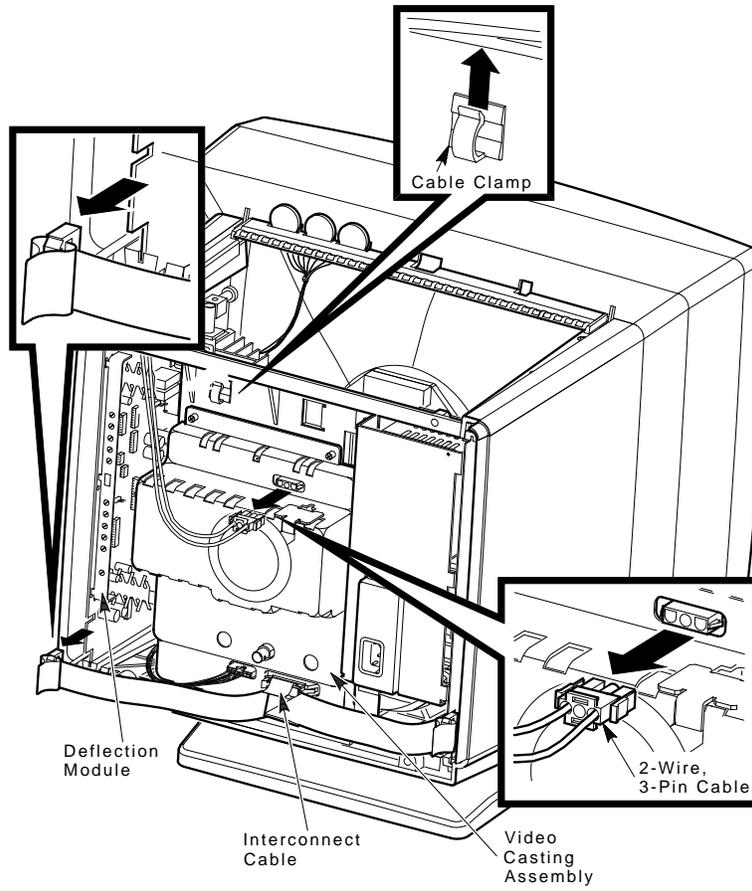
3.2.2 Deflection Module

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 3.1.1).
2. Remove the top cover (Section 3.1.2).
3. Disconnect the interconnect cable (P3) by pulling the connector off the deflection module (J3).
4. Disconnect the 2-wire, 3-pin cable (P7) on the video casting assembly by pressing the tabs on the connector (J7) (Figure 3-9).
5. Remove the 2-wire, 3-pin cable from the cable clamp on the video casting.

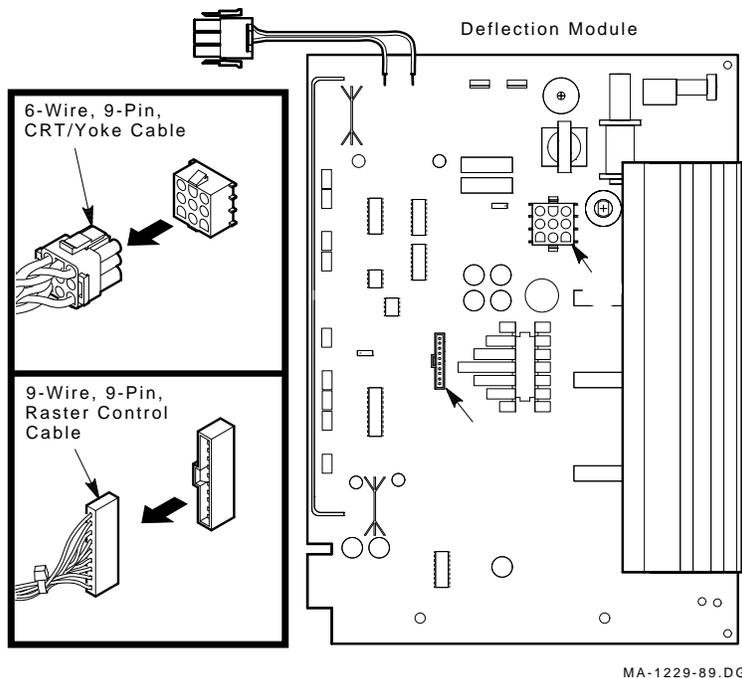


MA-1228-89.DG

Figure 3-9 Removing the 2-wire, 3-pin Cable

3-12 Removing and Replacing FRUs

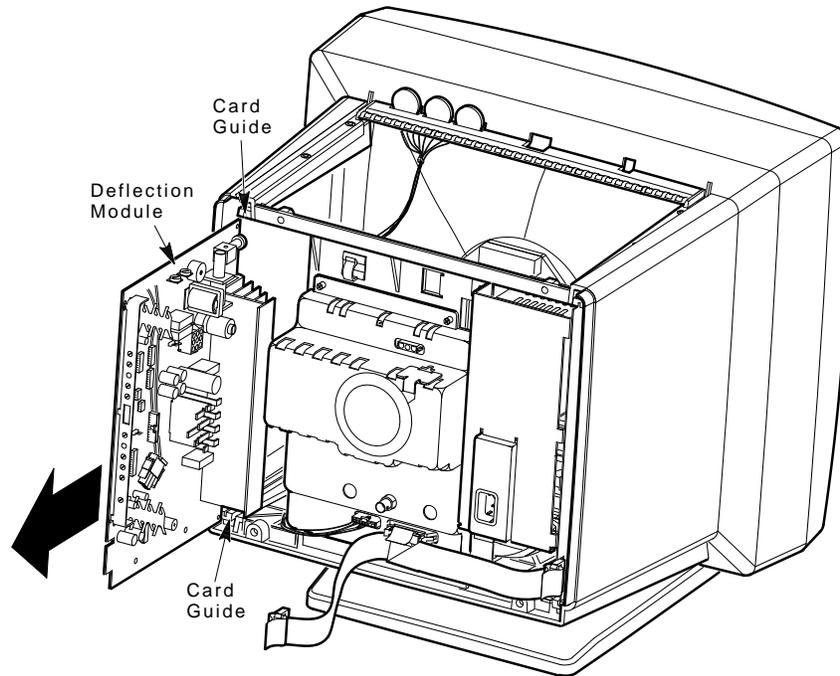
6. Disconnect the 6-wire, 9-pin braided CRT/yoke cable (P11) on the deflection module by pressing the tabs on the connector (J11) (Figure 3-10).
7. Disconnect the 9-wire, 9-pin raster control cable (P6) on the deflection module by pressing the tab on top of the connector (J6).



MA-1229-89.DG

Figure 3-10 Disconnecting Cables from the Deflection Module

8. Slide the deflection module out of the card guides (Figure 3-11).



MA-1231-89.DG

Figure 3-11 Removing the Deflection Module

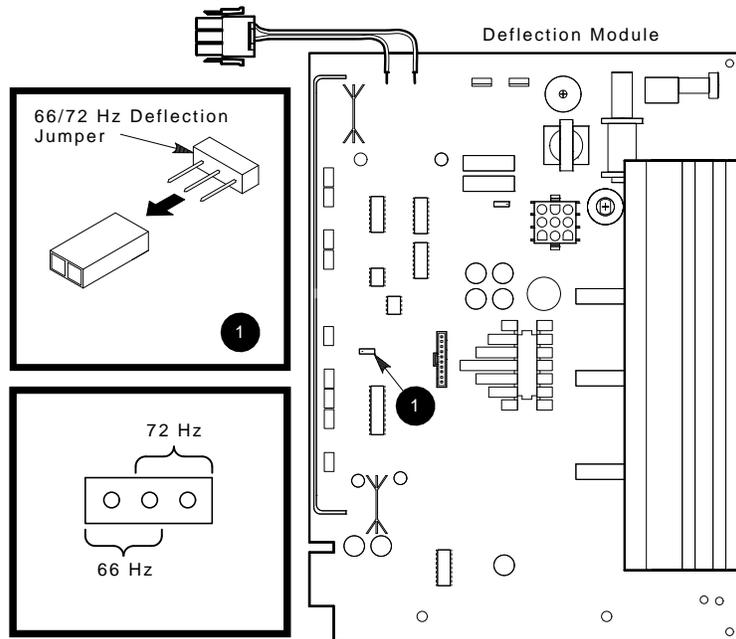
3-14 Removing and Replacing FRUs

NOTE

Before you replace the deflection module, make sure that the 66/72 Hz refresh jumper ❶ near the left side of the module (Figure 3-12) is set correctly for your system. Check the refresh rate setting on the module you are replacing and move the jumper if needed.

Refresh Rate	Install Jumper On
66 Hz	Left two pins, 1 and 2
72 Hz	Right two pins, 2 and 3

If you need to change the refresh rate, also check the setting of the power supply refresh jumper, Figure 3-21.



MA-1230-89.DG

Figure 3-12 Refresh Rate Jumper on Deflection Module

3.2.3 Video Casting Assembly

Remove the video casting assembly as follows:

1. Remove the rear cover (Section 3.1.1 and the top cover.)
2. Disconnect the interconnect cable (P3) at the deflection module (J3).
3. Disconnect the interconnect cable (P2) by pressing the plastic tabs outward and then removing the cable from the video casting (J2) (Figure 3-13).

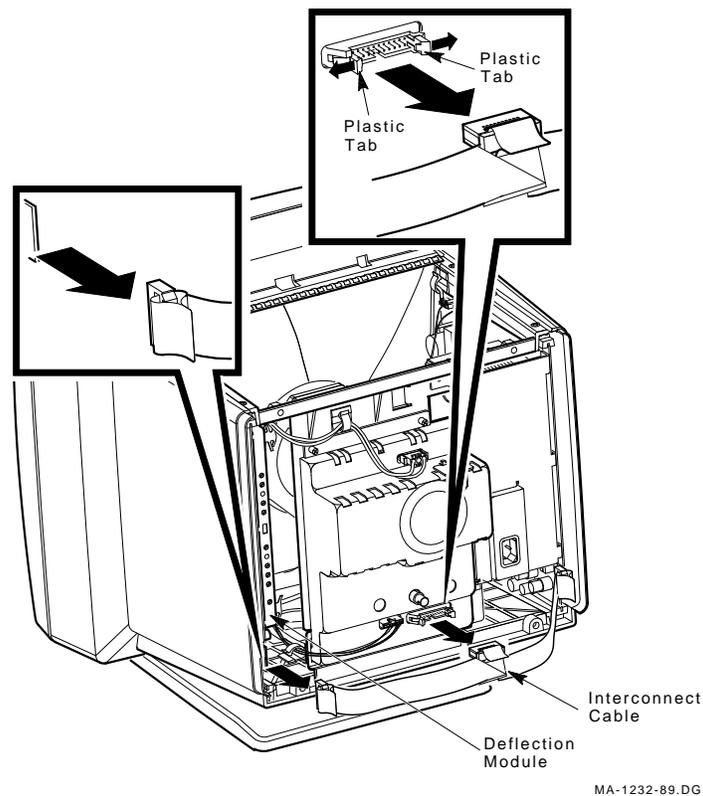
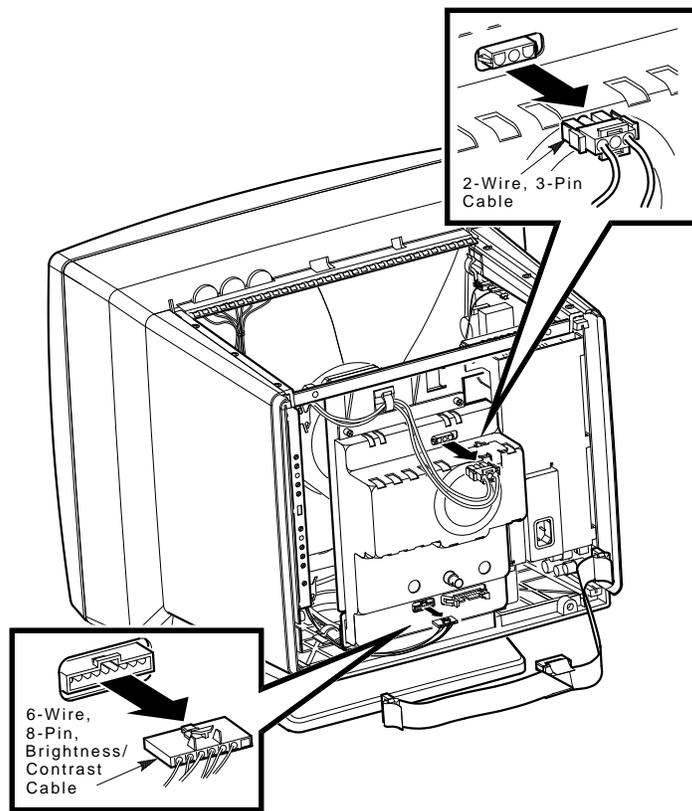


Figure 3-13 Disconnecting the Interconnect Cable

3-16 Removing and Replacing FRUs

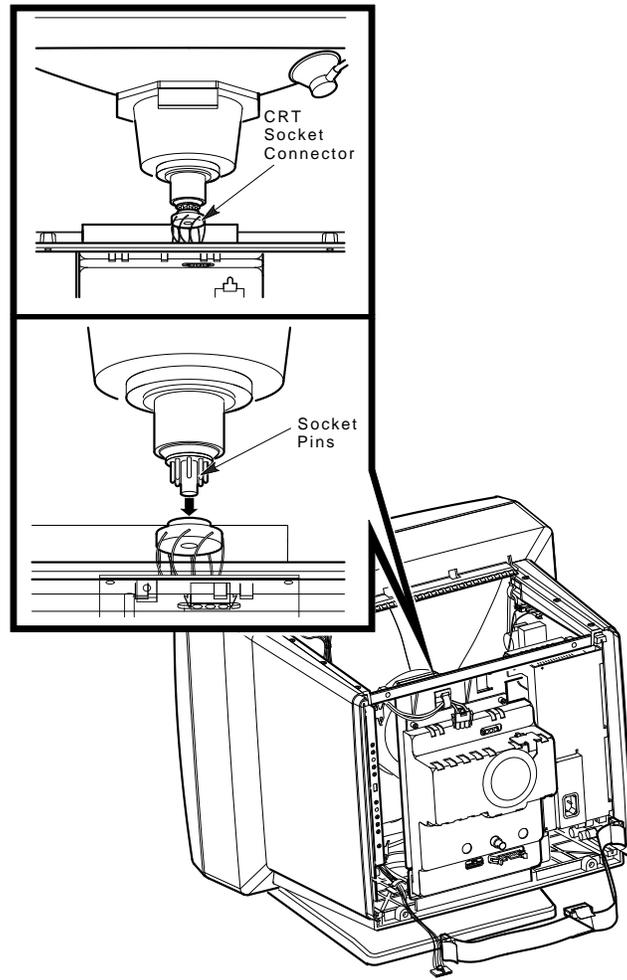
4. Disconnect the 2-wire, 3-pin cable (P7) by pressing the tabs on the connector (J7).
5. Position the 2-wire, 3-pin cable connector next to the cable clamp so it does not interfere with the video casting removal procedure.
6. Disconnect the 6-wire, 8-pin brightness/contrast cable (P5) by pressing the tab on top of the connector (J5) (Figure 3-14).



MA-1233-89.DG

Figure 3-14 Disconnecting the Brightness/Contrast Cable

7. Gently push the CRT socket connector off the socket pins (Figure 3-15).



MA-1235-89.DG

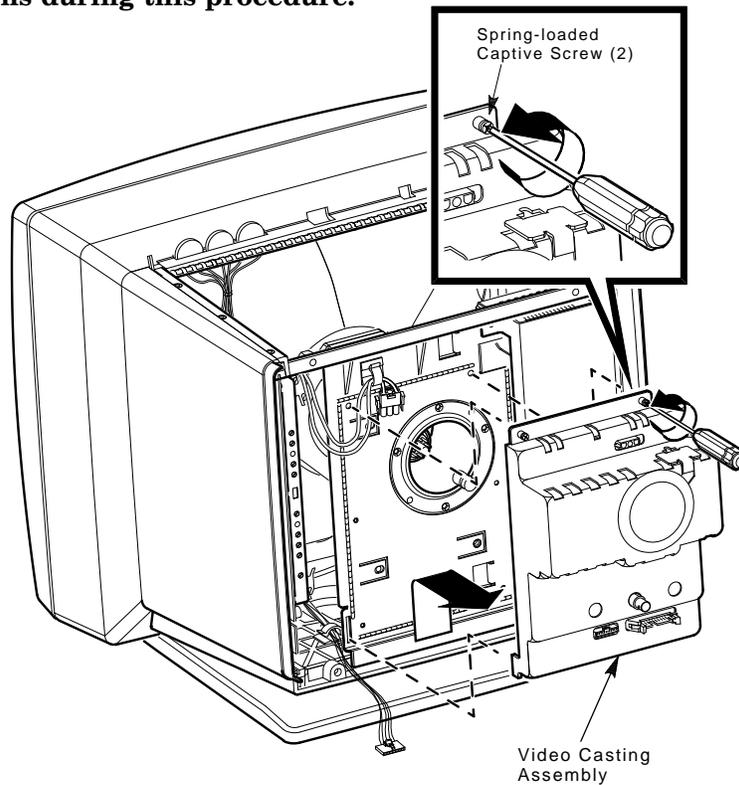
Figure 3-15 Removing the CRT Socket Connector

3-18 Removing and Replacing FRUs

8. Loosen the two spring-loaded captive screws until they spring out toward you. The screws hold the video casting assembly to the chassis.
9. Gently pull the top of the video casting assembly towards you.
10. Gently lift the video enclosure assembly up and out of the chassis (Figure 3-16).

CAUTION

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



MA-1237-89.DG

Figure 3-16 Removing the Video Casting

3.2.4 CRT Discharge

Discharging the CRT is a process that drains to ground any leftover voltages remaining in the extra-high tension (EHT) cable after power is removed.

Discharge the CRT as follows:

WARNING

The following steps expose you to the CRT anode, which may store a high voltage.

1. Remove the rear cover (Section 3.1.1 and the top cover.)
2. Attach the clip end of the anode discharge tool (PN 29-24717-00) to the metal on the power supply or the video casting assembly. (Do not put the clip on the painted surface of the monitor.)

WARNING

Keep your free hand away from any part of the monitor during the anode discharge process.

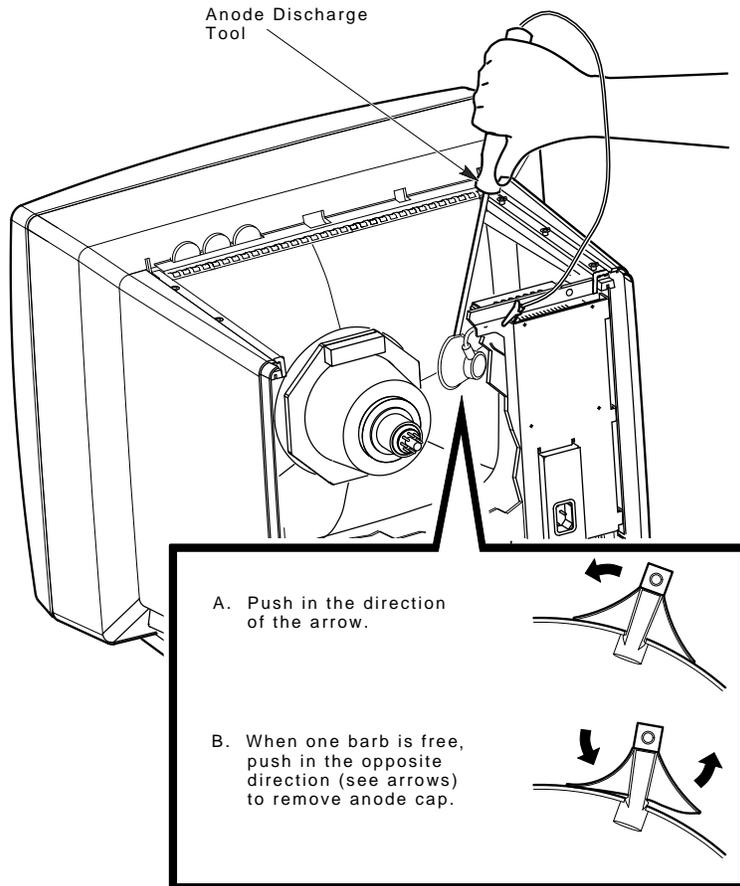
3. Using one hand, carefully slip the anode discharge tool under the CRT anode connector cup until it touches the connector prongs. Maintain contact for at least 10 seconds.

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. Using only one hand, remove the CRT anode cap by pushing the anode cap in one direction. When one barb is free, push the cap in the opposite direction. (See Figure 3-17.)

3-20 Removing and Replacing FRUs



MA-1238-89.DG

Figure 3-17 Discharging the CRT and Removing the Anode Cap

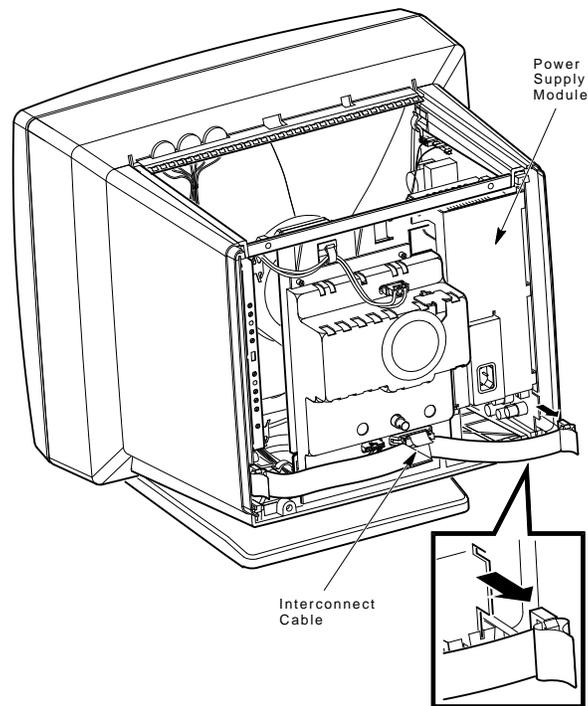
3.2.5 Power Supply Module

Remove the power supply module as follows:

WARNING

You must discharge voltages from the CRT (Section 3.2.4) before removing the power supply module.

1. Remove the rear cover (Section 3.1.1).
2. Remove the top cover (Section 3.1.2).
3. Disconnect the interconnect cable from the power supply (Figure 3-18).



MA-1240-89.DG

Figure 3-18 Disconnecting the Interconnect Cable

3-22 Removing and Replacing FRUs

4. Disconnect the 3-wire, 5-pin LED cable (P4) by pressing the tab on top of the connector (J4) (Figure 3-19).

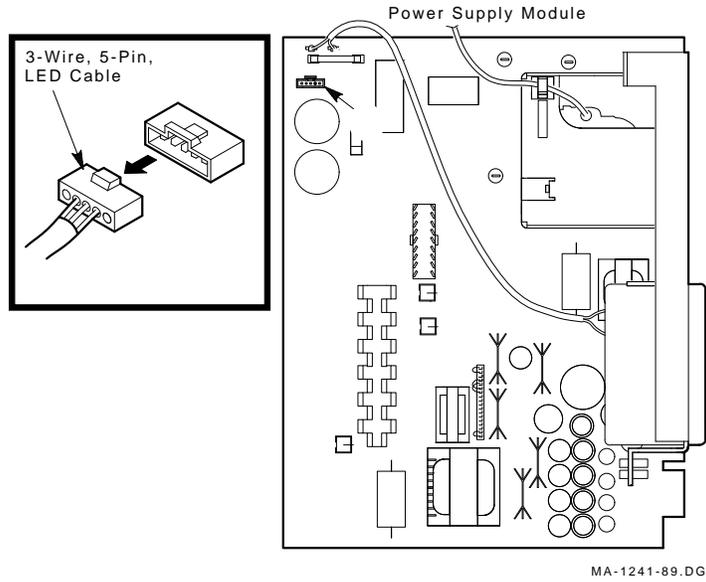
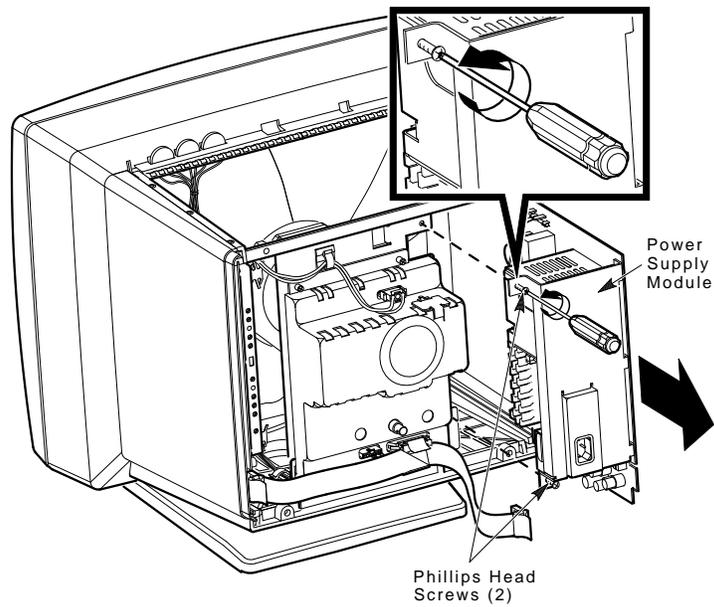


Figure 3-19 Removing the LED Cable from the Power Supply

5. Loosen the two captive screws on the power supply.
6. Slide the power supply module out of the card guides (Figure 3-20).



MA-1242-89.DG

Figure 3-20 Removing the Power Supply

3-24 Removing and Replacing FRUs

NOTE

Before you replace the power supply, make sure that the 66/72 Hz jumper (P9) ❶ near the bottom of the module (Figure 3-21) is set correctly for your system. The jumper covers all but one pin.

Refresh Rate	Move Jumper To Cover
66 Hz	Bottom pins (top pin is free)
72 Hz	Top pins (bottom pin is free)

If you change the refresh rate, also check the setting of the deflection module jumper, Figure 3-12.

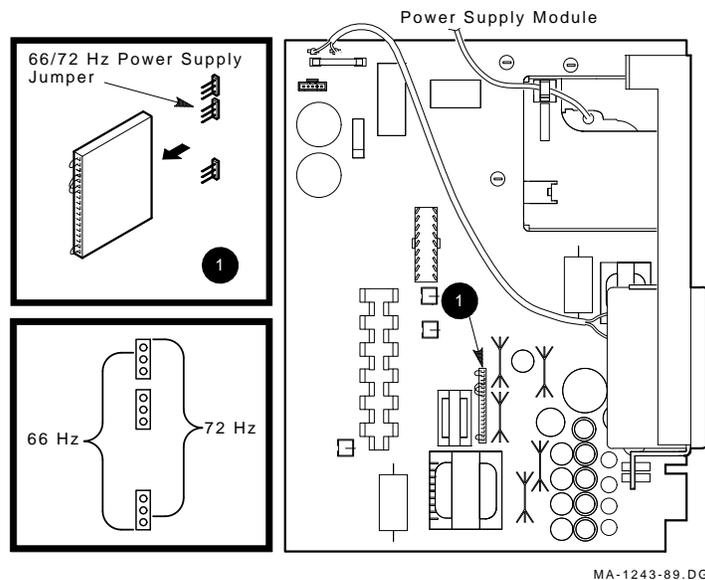


Figure 3-21 Refresh Rate Jumper on the Power Supply

3.2.6 CRT/Chassis Assembly

Remove the CRT/chassis assembly as follows:

- Remove the rear cover (Section 3.1.1).
- Remove the top cover (Section 3.1.2).
- Remove the deflection module (Section 3.2.2).
- Remove the video casting assembly (Section 3.2.3).

WARNING

You must discharge voltage from the CRT (Section 3.2.4) before removing the power supply module.

- Remove the power supply module (Section 3.2.5).

3.3 CRT Disposal (Trained Service Personnel Only)

This section describes how to safely dispose of the monitor 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 7.6 cm (3 in) 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 during CRT removal and replacement.

Handling a CRT

- Never handle the CRT by the neck. Always use two hands and hold the CRT by the sides near the face.
- 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 non-essential 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 eye or hand injury always wear goggles and gloves when you work with a CRT. Never handle pieces of phosphor-coated glass without wearing protective gloves.

Before you perform the following procedure, remove the FRUs listed in Section 3.2.6.

1. Place the old CRT/chassis assembly and the packing material in the container from which you removed the new CRT/chassis assembly.
2. Using pliers, slowly crush, **but do not snap**, the evacuation point (Figure 3-22). Do not move or disturb the CRT until the hissing sound of in-rushing air has stopped.

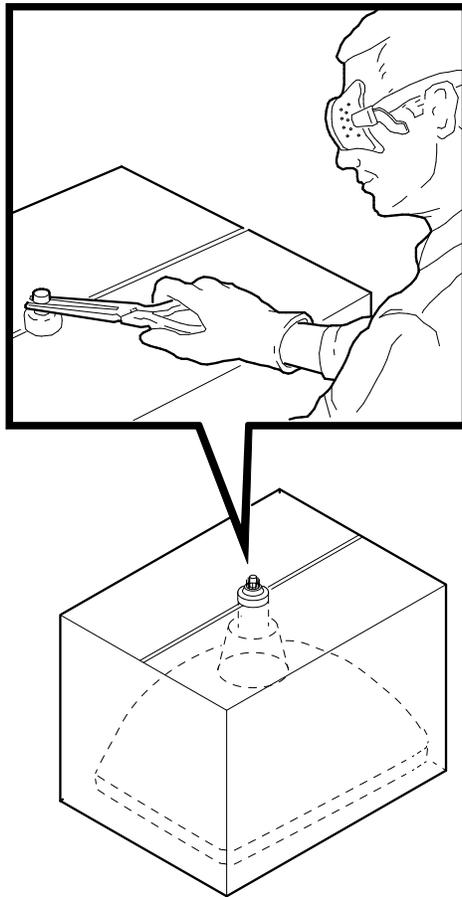
CAUTION

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.

3-28 Removing and Replacing FRUs



MA-X0667-88

Figure 3-22 CRT Disposal Procedure

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

NOTE

The safe "gassing" of the CRT is necessary to prevent liability and safety problems that may arise from accidental CRT implosion.

4

Aligning the Video Monitor

4.1 Introduction

This chapter describes how to align the monitor display. You do not have to perform every adjustment procedure each time you align the monitor. However, you should check all adjustments in the order shown.

The success of one adjustment may depend on the accuracy of the preceding adjustments with the exception of the focus and G2 adjustments. If a setting is already correct, you can skip that adjustment and go on to the next one.

Use Section 4.1.1 to prepare the monitor for adjustments. You must use the screen alignment test patterns to make all adjustments. Refer to the host system documentation to set up test patterns.

Use a metric measuring tape (PN 29-25342-00) to measure the dimensions of the screen display. To avoid scratching the screen with the tape's metal clip, start the measurement at 10 cm. Use a video alignment tool to make all adjustments except when noted. Make sure all adjustments are made under these conditions.

4.1.1 Before You Start

NOTE

If a customer calls with a display-quality type of problem, ask the customer to leave the monitor on until you arrive. Then, after removing the rear cover, only a 5 minute warm-up is needed.

Before you start any adjustment procedures, make sure that the power supply and deflection module are configured for the correct setting (66 or 72 Hz) for the system. Refer to Chapter 3 for the locations of the 66/72 Hz refresh rate jumpers.

4-2 Aligning the Video Monitor

Clean the Screen

A dirty screen may distort a focused display. 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).

Prepare the Monitor

Before you make any adjustments, prepare the monitor as follows:

1. Place the monitor on a non-conductive surface.
2. Remove the rear cover (Section 3.1.1).
3. Remove the top cover (Section 3.1.2).
4. Reconnect the video cable.
5. Reconnect the power cord.
6. Turn power to the monitor on. Wait for video to display on the screen.
7. Verify that the user controls on the top of the monitor are in the center position of the thumbwheels.
8. Slide the deflection module out one-half inch to read the labels for the adjustment potentiometers.
9. Rotate the monitor so the adjustments are on the right and the screen to view the test pattern is on the left.

4.1.2 Displaying Screen Tests

The procedures in this chapter refer to the circle-crosshatch alignment test pattern and the all-white test pattern, shown in Appendix B. Display these patterns on the screen as needed by using procedures for your host system.

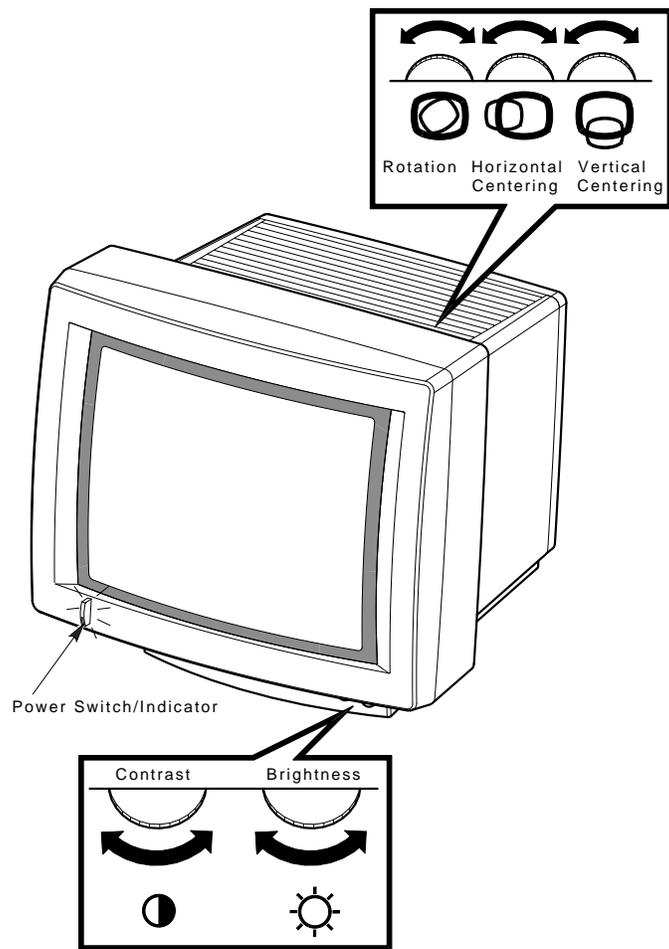
Refer to the host system service guide for accessing these diagnostic screen patterns.

NOTE

Before continuing, display the circle-crosshatch pattern on the screen.

4.2 Monitor Adjustments

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. The user adjustments are shown in Figure 4-1.



MA-1246-89.DG

Figure 4-1 User Controls

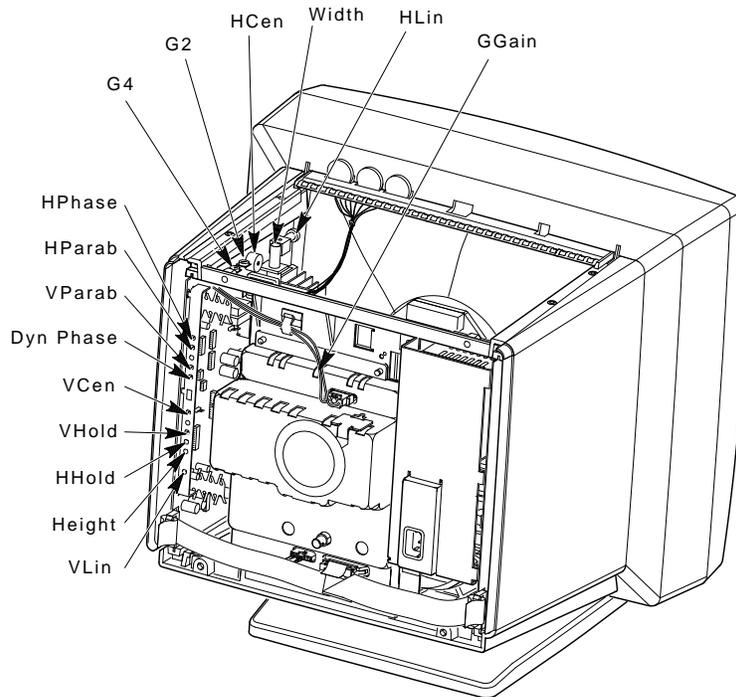
4-4 Aligning the Video Monitor

The location of the internal controls and adjustments are shown in Figure 4-2.

NOTE

The HHOLD and DFOCUS phase adjustments are set at the factory. Therefore, adjustment procedures for these controls are not included in this guide.

Slide the deflection module out one-half inch to read the labels for the adjustment potentiometers (Figure 4-2).

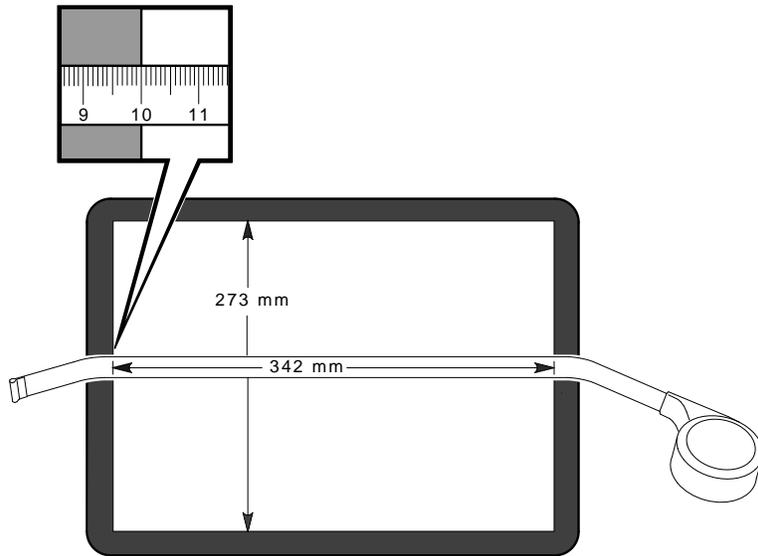


MA-1247-89.DG

Figure 4-2 Adjustment Locations

NOTE

In the following steps, use a metric measuring tape (PN 29-25342) to measure the dimensions of the screen display. To avoid scratching the screen with the tape's metal clip, start the measurement at 10 cm. See Figure 4-3.



MA-1256-89.DG

Figure 4-3 Using the Metric Measuring Tape

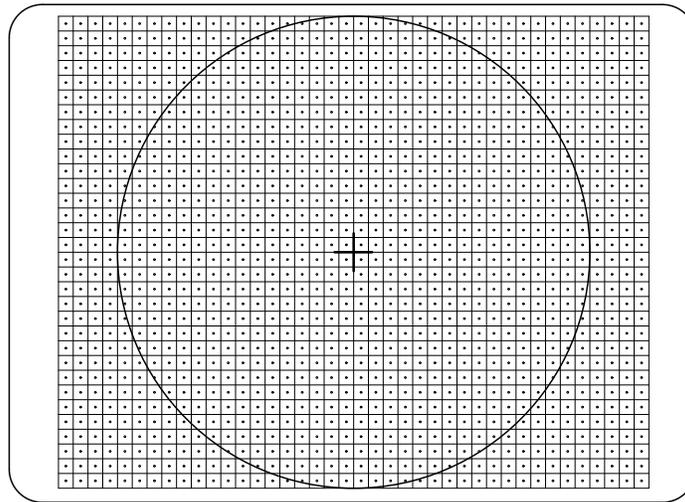
4.3 Height Adjustments

Check the height of the display using the following adjustments.

4.3.1 Vertical Centering (VCEN) and Vertical Linearity (VLIN)

Check and adjust vertical centering and linearity as follows:

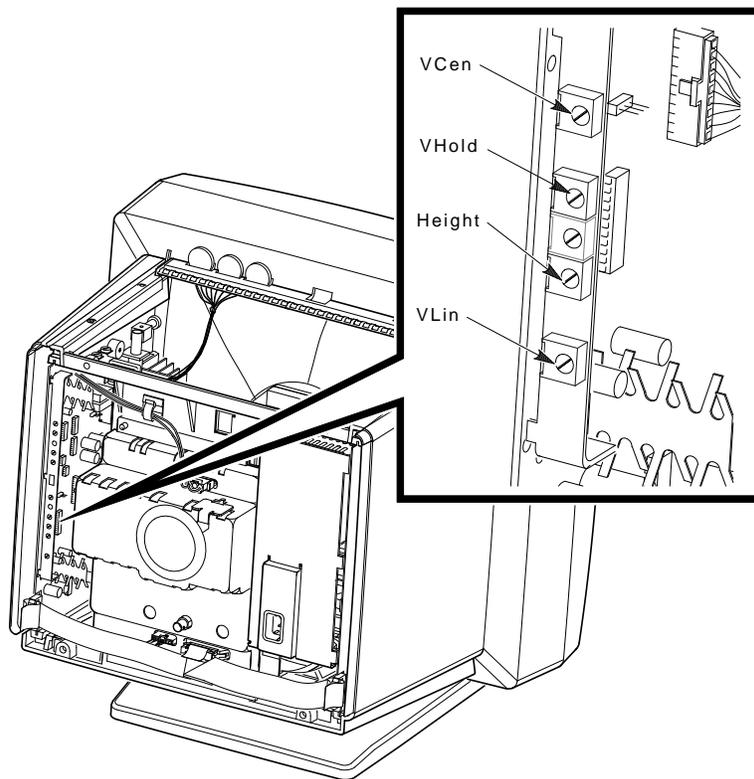
1. Display the circle-crosshatch pattern (Figure 4-4).
2. Check to see if the circle-crosshatch pattern is in the vertical center of the screen. If not, go to the next step.
3. Adjust VCEN (Figure 4-5) until the circle-crosshatch pattern is in the vertical center of the screen.
4. Check to see if 3 or 4 rows at the top of screen are of equal height with 3 or 4 rows at the bottom of the screen. If not, go to the next step.



MA-X0889-88

Figure 4-4 Circle-Crosshatch Pattern

5. Turn the VHOLD adjustment (Figure 4-5) until the height of the top squares equals the height of the bottom squares. (Do not be concerned about the height of the pattern in this step.)
6. Turn the VLIN adjustment until all the squares on the screen are of equal height.
7. Again, adjust VCEN so that the circle-crosshatch pattern is in the vertical center of the screen.



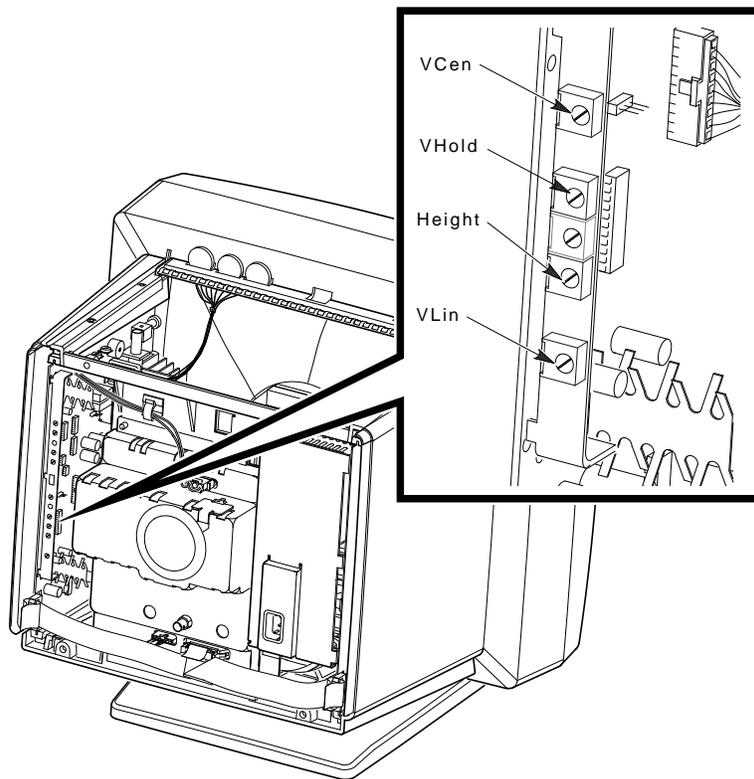
MA-1248-89.DG

Figure 4-5 VCEN, VHOLD, HEIGHT, and VLIN Controls

4.3.2 Vertical Height (HEIGHT)

Check and adjust the vertical height as follows:

1. Check the circle-crosshatch pattern or the all-white pattern for a vertical height of 273 mm (± 2.0 mm).
2. If necessary, adjust the HEIGHT control (Figure 4-6) until the display height is 273 mm.



MA-1248-89.DG

Figure 4-6 Height Control

4.4 Width Adjustments

Centering, width, and linearity adjustments interact with each other. When you complete one, recheck the others. Check the width of the display using the following adjustments.

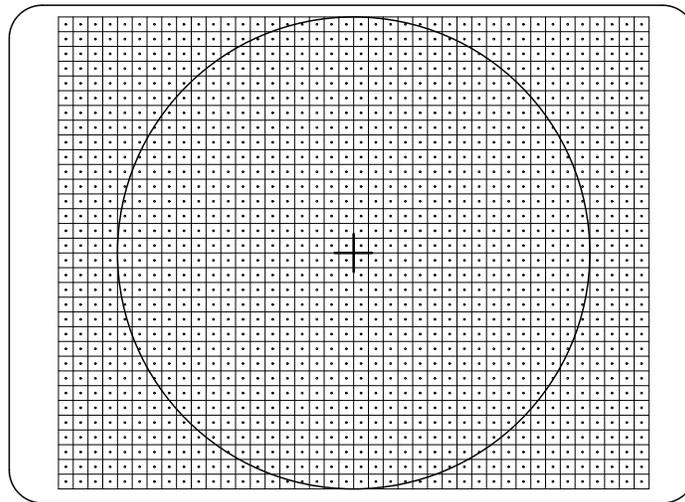
4.4.1 Horizontal Phase, Horizontal Linearity, and Horizontal Centering (HPHASE, HLIN, HCEN)

Check and adjust the horizontal centering of the screen display as follows:

NOTE

Refer to the troubleshooting chart in Chapter 2 for solutions to screen display problems.

1. Verify that the user controls on the top of the monitor are in the center position of the thumbwheels.
2. Display the circle-crosshatch pattern (Figure 4-7).

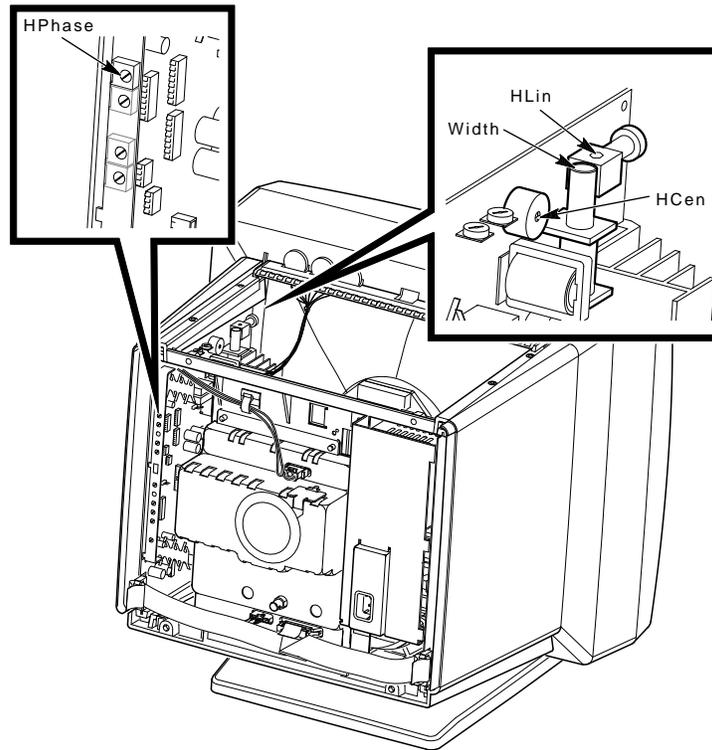


MA-X0889-88

Figure 4-7 Circle-Crosshatch Pattern

4-10 Aligning the Video Monitor

3. Turn the brightness control until the raster is visible. You may have to decrease the contrast control to see the raster. (If you cannot get the raster to display on the screen, adjust G2 (Section 4.6).
4. Check the circle-crosshatch pattern to see if it is centered on the raster.
5. If necessary, adjust the HPHASE control (Figure 4-8) to center the pattern on the raster.
6. If the raster is too wide or too narrow, perform the horizontal width (WIDTH) adjustment (Section 4.4.2) before continuing.



MA-1249-89.DG

Figure 4-8 Width Controls

7. Decrease the brightness just until the raster disappears.
8. Adjust HLIN for maximum width of the circle-crosshatch pattern.
9. Readjust HLIN *slightly* until all the squares are of equal width across the screen.
10. If the raster is too wide or too narrow, perform the horizontal width (WIDTH) adjustment (Section 4.4.2) before continuing.
11. Set contrast to minimum and brightness to maximum.
12. Use a Phillips screwdriver to adjust HCEN until the raster is centered within the bezel.

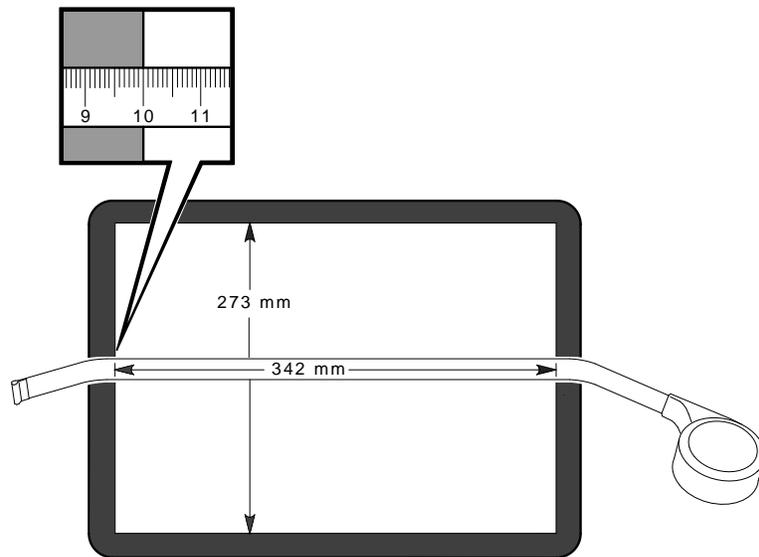
4.4.2 Horizontal Width (WIDTH)

Check and adjust the horizontal width as follows:

NOTE

In the following steps, use a metric measuring tape (PN 29-25342) to measure the dimensions of the screen display. To avoid scratching the screen with the tape's metal clip, start the measurement at 10 cm (100 mm).

1. Check the circle-crosshatch pattern or the all-white pattern for a horizontal width of 342 mm (± 2.0 mm).
2. If necessary, adjust the horizontal width control until the display width is 342 mm (± 1.0 mm) (Figure 4-9).



MA-1256-89.DG

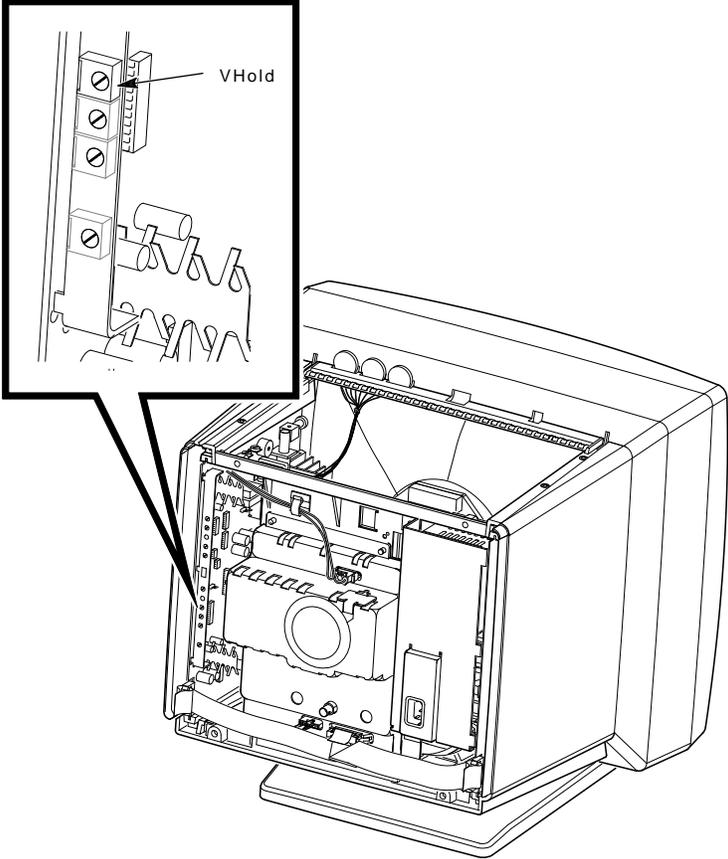
Figure 4-9 Measuring the Width of the Viewing Area

4.5 Vertical Hold Adjustment (VHOLD)

This procedure prevents rolling of the screen display. It also affects Vertical Linearity (VLIN) and Vertical Height (Height).

1. Set the contrast and brightness controls for comfortable viewing.
2. Display the circle/crosshatch pattern.
3. Look at the monitor. The screen display should lock in quickly with no rolling. If the screen display is rolling, go to the next step.
4. Turn VHOLD (Figure 4-10) until the screen display stops rolling.
5. Readjust the Vertical Linearity (VLIN) control (Section 4.3.1) until all the squares on the screen are of equal height.
6. Recheck the Vertical Height (Height) adjustment (Section 4.3.2).

4-14 Aligning the Video Monitor



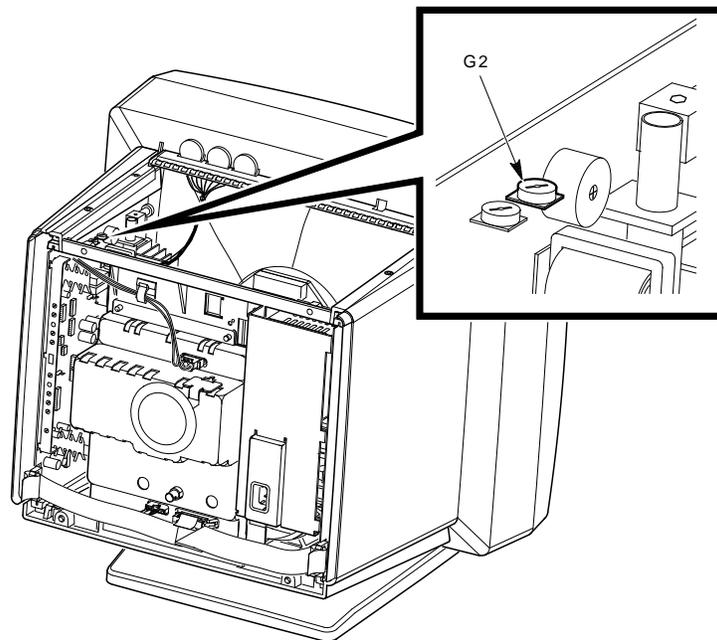
MA-1250-89.DG

Figure 4-10 VHOLD Control

4.6 Bias Adjustment (G2)

Perform the following procedure to adjust the G2 bias control (Figure 4-11):

1. Set the brightness control to maximum and contrast control to minimum.
2. Slowly turn the G2 counter clockwise until the vertical retrace lines are visible.
3. Turn G2 back until the diagonal vertical retrace lines are no longer visible while the raster (the bright area produced by the scan lines) remains visible.
4. Adjust the brightness and contrast for normal viewing.



MA-1252-89.DG

Figure 4-11 Bias Adjustment (G2)

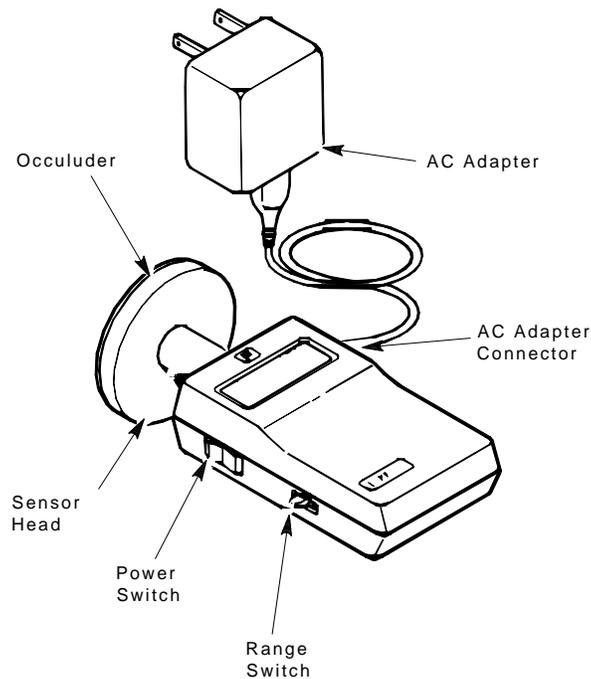
4.7 Using the Radiance Meter

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 4-12).

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.



MA-0647-90.DG

Figure 4-12 Radiance Meter

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

NOTE

Be sure that your radiance meter is in calibration.

3. Turn power to the monitor on.

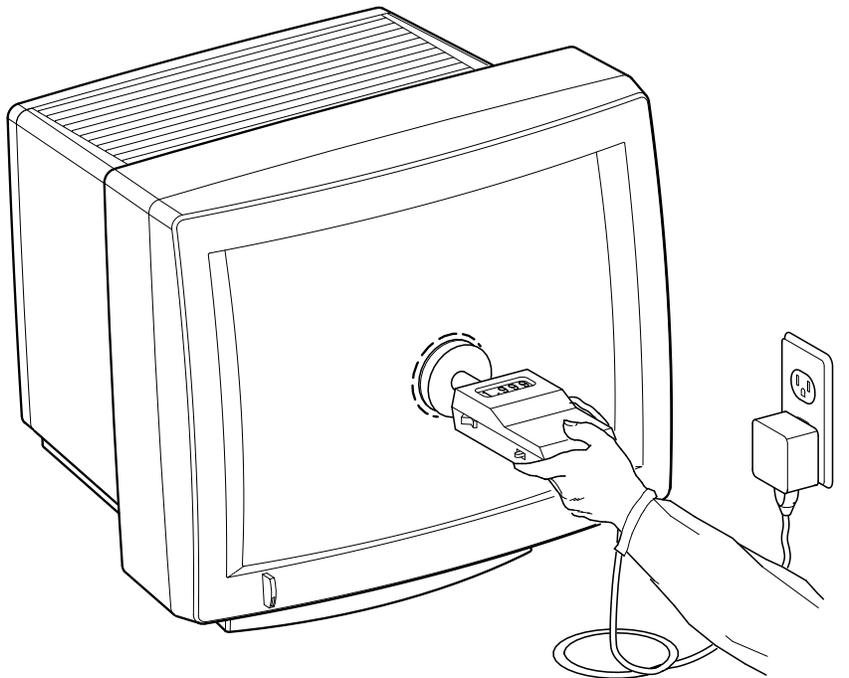
NOTE

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

4. 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 4-13). Take a red china pencil to draw an arc or circle around the occluder.

NOTE

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



MA-1349-89.DG

Figure 4-13 Using the Radiance Meter

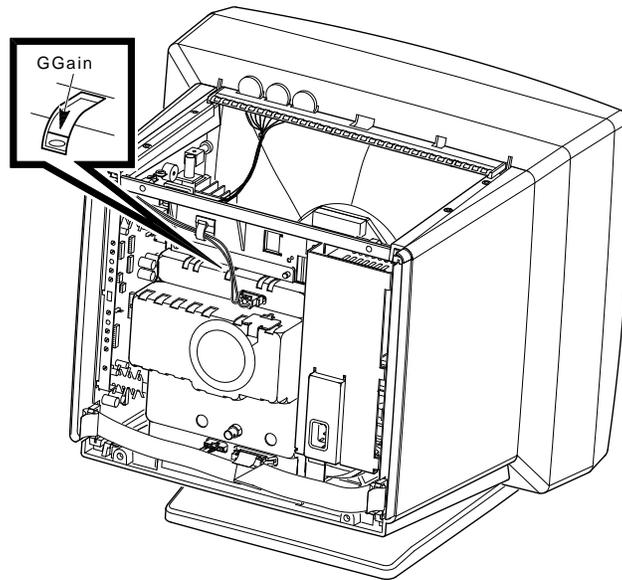
4.8 Gain Adjustment (GGAIN)

To adjust and verify the gain control, use the radiance meter on the all-white pattern on the screen (Figure 4-13). Check and adjust the gain (Figure 4-14) as follows:

1. Increase the contrast setting.
2. Be sure that the Bias adjustment (G2) is set correctly (Section 4.6).
3. Set the brightness control so the raster (bright area produced by the scan lines) is not visible.
4. Place the occluder in the center of the screen (Section 4.7).
5. Adjust GGAIN for the value of 0.276.

NOTE

If you cannot get the 0.276 value, you may have a faulty video casting assembly, CRT/chassis assembly, or system.



MA-1257-89.DG

Figure 4-14 Gain Adjustment

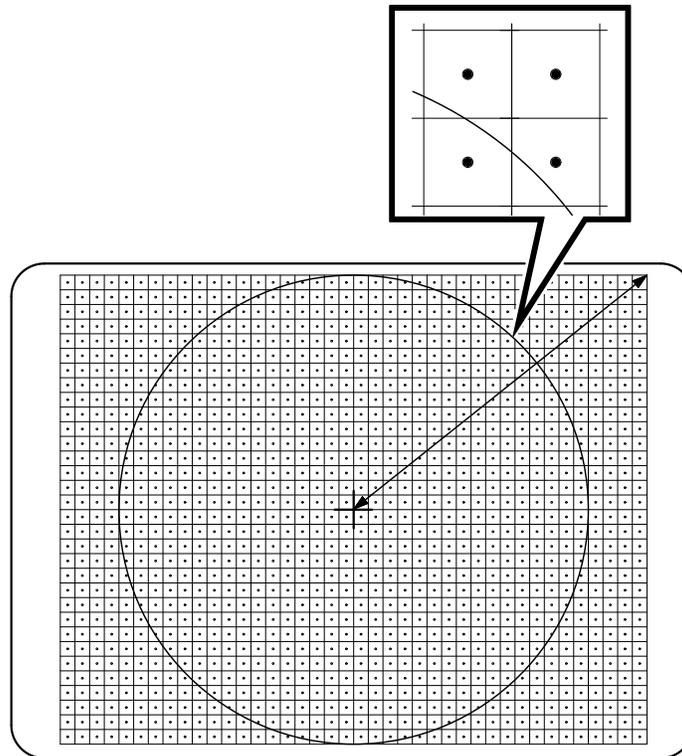
4.9 Focus Adjustments (G4)

NOTE

Make sure the screen is clean. A dirty screen can distort a focused display. Use a soft tissue or cloth and a non-abrasive, nonflammable glass cleaner, or use Digital's video screen cleaner (PN VT3XX-SC).

Check and adjust the focus (Figure 4-15) as follows:

1. Display the circle-crosshatch screen.
2. Choose an intersection on the crosshatch pattern that is halfway between the center and the corner of the screen display.
3. Examine the intersecting lines for sharpness.

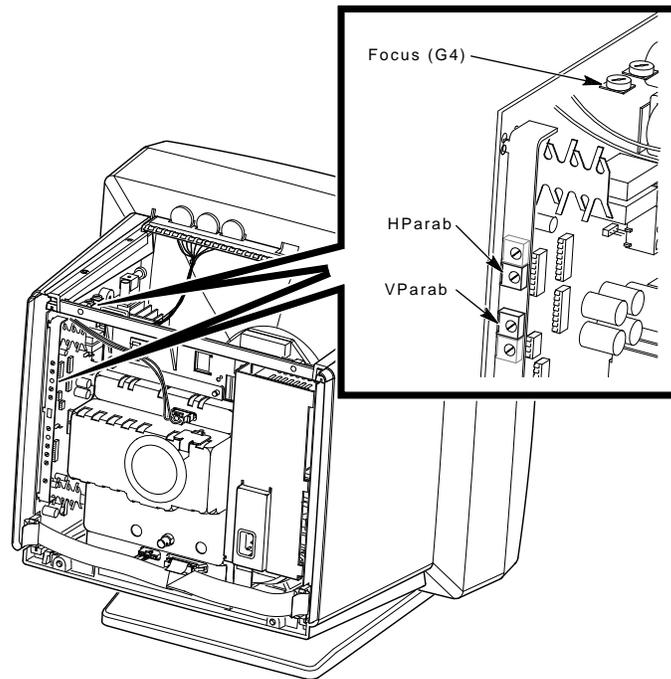


MA-X0891-88

Figure 4-15 Circle-Crosshatch Pattern

4-20 Aligning the Video Monitor

4. If necessary, adjust the FOCUS (G4) control (Figure 4-16) so the intersecting lines are sharp.



MA-1253-89.DG

Figure 4-16 Focus Control (G4)

4.9.1 Vertical Dynamic Focus (VPARAB)

Examine the top center and bottom center for sharpness. Adjust VPARAB for the best focus at the top and bottom center.

4.9.2 Horizontal Dynamic Focus (HPARAB)

Check and adjust the horizontal dynamic focus as follows:

1. Examine the corners for sharpness.
2. Adjust HPARAB for best focus on the sides.
3. Readjust the FOCUS control (G4) to get the best compromise focus for the top, side, and corners.

5

Changing the Refresh Rate

This chapter describes how to change the refresh rate of the monitor.

5.1 VR319 Monitor Refresh Rates

Table 5–1 lists the different VR319 models and their refresh rates.

Table 5–1 Monitor Model Refresh Rates

Model	Pixels x Lines	Refresh Rate	Applicable Area
VR319-CA	1280 x 1024	66 Hz	Northern Hemisphere
VR319-C4	1280 x 1024	66 Hz	Southern Hemisphere
VR319-DA	1280 x 1024	72 Hz	Northern Hemisphere
VR319-D4	1280 x 1024	72 Hz	Southern Hemisphere

5.2 Changing the Refresh Rate

You must do the following if you change the monitor refresh rate to meet the needs of a different system from the system you ordered,

1. Refer to Table 5–1 for the VR319 model refresh rates.
2. Perform the FRU procedures listed in Section 5.2.1.
3. Complete the information on the product conversion label.

5.2.1 Adjusting the Monitor for a New Refresh Rate

Use the following procedures to change the monitor refresh rate:

1. Change the refresh jumper on the deflection module. (Section 3.2.2).
2. Change the refresh jumper on the power supply module. (Section 3.2.5).
3. Adjust the WIDTH control as necessary. (Section 4.4.1 and Section 4.4.2).
4. Adjust the VHOLD control so that the height of the top squares equals the height of the bottom squares. (Section 4.5).
5. Adjust the VLIN control until all the squares on the screen are of equal height. (Section 4.3.1).
6. Adjust the HEIGHT control for 273 mm. See Section 4.3.2.

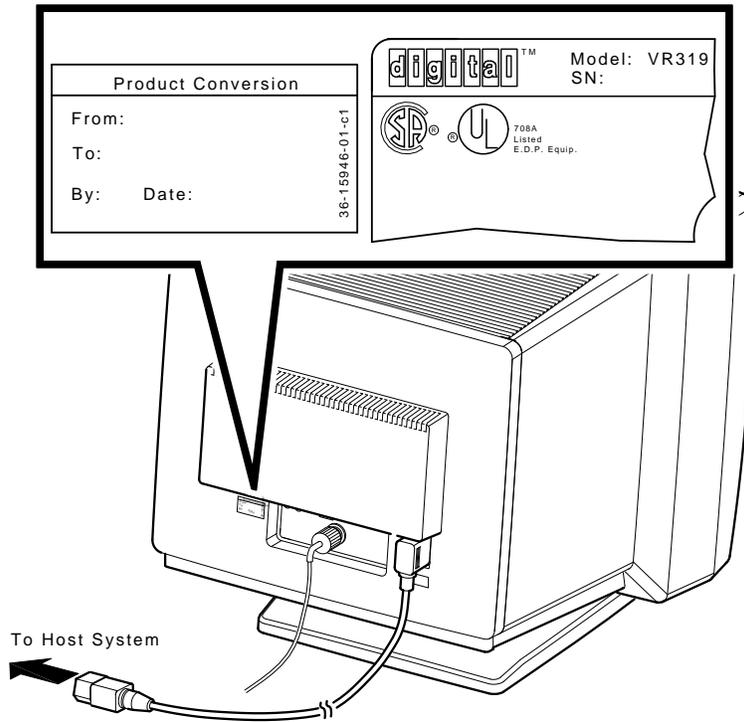
5.3 Product Conversion Label

After you changing the refresh rate and test the system, complete the product conversion label using information from the following table.

Table 5-2 Completing the Product Conversion Label

Label Entry	Action
From	Write the model designation that is on the original serial tag.
To	Write the new model designation of the completed product.
By	Write the two character site code of the facility that performed the conversion as listed in the Digital telephone directory.
Date	Write a three character code for the date on which the conversion was implemented.

Affix the product conversion label to the back of the monitor as shown in Figure 5-1.



MA-0152-90.DG

Figure 5-1 Product Conversion Label

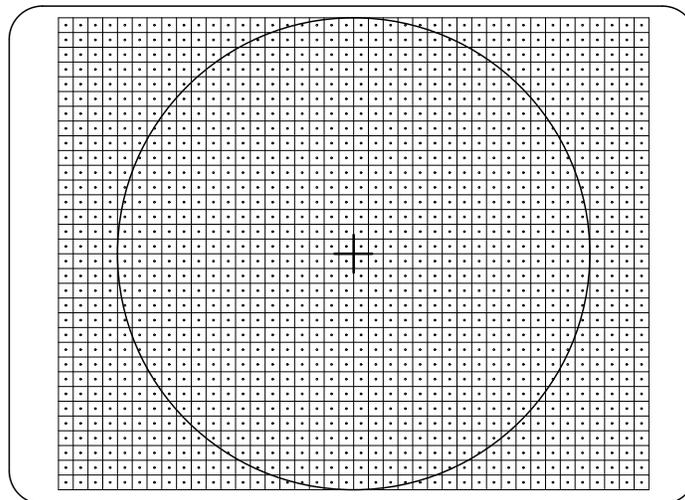
A

Alignment Screens

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

A.1 Circle-Crosshatch Pattern

Use the circle-crosshatch pattern for all alignment tests. Use this pattern as a reference for customers who work primarily with graphic applications.

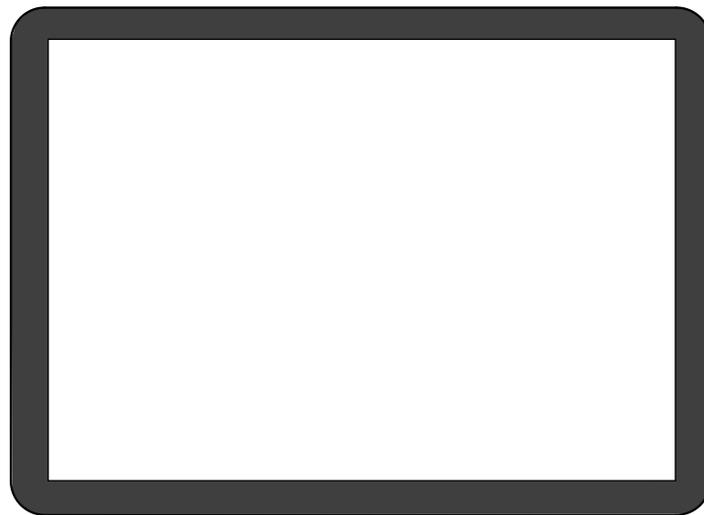


MA-X0889-88

Figure A-1 Circle-Crosshatch Pattern

A.2 All-White Pattern

Use this pattern to check for the correct setting of the horizontal and vertical controls, as well as the Gain adjustment.



MA-1254-89.DG

Figure A-2 All-White Pattern

B

VR319 Documentation

In addition to this guide, you can order the following VR319 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 VR319 Monochrome Monitor

Part Number EK-VR319-IN

This guide provides users with the information needed to install, operate, and maintain the VR319 monitor. The manual also describes all controls and indicators.

VR319 Monitor IPB

Part Number EK-VR319-IP)

This document provides a detailed, illustrated parts breakdown of the VR319 monitor field replaceable units. Part numbers for components on the printed circuit modules are not included, however, these components are listed in the *Field Maintenance Print Set*, ordered separately.

VR319 Field Maintenance Print Set

Part Number MP-03004-01)

This document provides a field maintenance print set of electrical and mechanical schematic diagrams for the VR319 monitor.

Index

A

Adjustments
 bias (G2), 4–15
 dynamic focus, 4–21
 focus (G4), 4–19
 GGAIN, 4–18
 HCEN, 4–9
 HEIGHT, 4–8
 HLIN, 4–9
 HPARAB, 4–21
 HPHASE, 4–9, 4–10
 screen
 height, 4–6
 width, 4–9
 VCEN, 4–6
 VHOLD, 4–13
 VLIN, 4–6, 4–13
 VPARAB, 4–21
 WIDTH, 4–12
Alignment
 procedure, 4–1
 screens
 all-white pattern, A-2
 circle-crosshatch pattern,
 A-1
All-white pattern, A-2
Anode discharge tool, 1–2
Audience, vii

B

Bias (G2) adjustment, 4–15
Blank screen
 without video but raster present
 See Table 2–2.
 without video or raster
 see Table 2–1.
Brightness/contrast
 cable, 3–16

C

Circle-crosshatch pattern, 4–2, 4–6,
 4–9, 4–20, A-1
Cleaning monitor, 4–2, 4–19
Conventions, vii
CRT
 discharge, 3–19
 disposal, 3–25, 3–27
 handling, 3–26
 socket removal, 3–17
 storage, 3–26
CRT/Chassis assembly
 northern hemisphere, 1–3
 part number, 1–3
 removal, 3–25
 southern hemisphere, 1–3

2 Index

D

- Deflection module
 - part number, 1-3
 - removal, 3-10, 3-13
- DFOCUS adjustment, 4-4
- Discharging CRT, 3-19, 3-20
- Displaying test screens, 4-2
- Disposing of CRT, 3-25
- Documentation
 - IPB, B-1
 - print set, B-1
- Dynamic focus
 - horizontal adjustment, 4-21
 - vertical adjustment, 4-21

F

- Field maintenance print set, B-1
- Field replaceable units (FRUs), 3-8
- Focus (G4) adjustment, 4-19

G

- GGAIN adjustment, 4-18
- Gloves
 - handling CRT, 3-27
 - part number, 1-2

H

- HCEN adjustment, 4-9
- HEIGHT adjustment, 4-8
- Height adjustments
 - HEIGHT, 4-8
 - VCEN, 4-6
 - VLIN, 4-6, 4-13
- HHOLD adjustment, 4-4
- HLIN adjustment, 4-9
- HPARAB adjustment, 4-21
- HPHASE adjustment, 4-9, 4-10

I

- Interconnect cable
 - part number, 1-3
 - removal, 3-9

J

- Jumpers, refresh rate
 - deflection module, 3-14
 - power supply, 3-24

M

- Magnetic fields
 - affect on monitor, 2-1
- Metric measuring tape, 1-2
- Model variations
 - Northern Hemisphere, 1-2
 - Southern Hemisphere, 1-2

N

- Northern Hemisphere
 - CRT/chassis assembly, 1-3
 - models, 1-2, 5-1
 - refresh rate, 5-1

O

- Occluder, 4-17

P

- Phase adjustments
 - DFOCUS, 4-4
 - HHOLD, 4-4
- Pixels, 1-2, 5-1
- Poor display quality
 - see Table 2-3.

Power supply
 part number, 1-3
 refresh rate jumpers, 3-24
 removal, 3-21, 3-23
 Print set, B-1
 Product description, 1-1
 Product label, 5-2
 Protective gear
 gloves, 3-28
 safety goggles, 3-28

R

Radiance meter
 using, 4-16, 4-17
 Recommended spares, 1-3
 Refresh rate
 jumpers
 deflection module, 3-14
 power supply, 3-24
 preset condition, 1-2
 Refresh rates
 changing, 5-1
 models, 5-1
 Removal procedure
 CRT/chassis assembly, 3-25
 CRT socket, 3-17
 deflection module, 3-10
 interconnect cable, 3-9
 power supply, 3-21, 3-23
 rear cover, 3-2, 3-5
 top cover, 3-6
 video casting assembly, 3-15,
 3-18

S

Safety goggles
 handling CRT, 3-27
 part number, 1-2
 Schematics, B-1
 Southern Hemisphere
 CRT/chassis assembly, 1-3

Southern Hemisphere (Cont.)

models, 1-2, 5-1
 refresh rate, 5-1
 Spares, 1-3
 Static protection kit, 1-2

T

Terminal technician tool kit, 1-2
 Test screens
 all-white pattern, A-2
 circle-crosshatch pattern, A-1
 Tools and equipment
 anode discharge tool, 1-2
 gloves, 1-2
 metric measuring tape, 1-2
 safety goggles, 1-2
 static protection kit, 1-2
 terminal technician tool kit, 1-2
 Troubleshooting
 before you start, 2-1
 fault isolation, 2-1
 procedures, 2-2
 tables, 2-2

U

User controls, 4-3

V

VCEN adjustment, 4-6
 Vertical hold adjustment, 4-13
 VHOLD adjustment, 4-13
 Video casting assembly
 part number, 1-3
 removal, 3-15, 3-18
 VLIN adjustment, 4-6, 4-13
 VPARAB adjustment, 4-21
 VR319 monitor
 adjustments, 4-3
 aligning, 4-1
 alignment screens, A-1

4 Index

VR319 monitor (Cont.)

- changing refresh rates, 5-1
- cleaning, 4-2, 4-19
- description, 1-1
- documentation, B-1
- models, 1-2
- pixels, 1-2
- product label, 5-2
- refresh rates, 1-2
- removal and replacement procedures, 3-1

- troubleshooting, 2-5
- user controls, 4-3

W

Width adjustments

- HCEN, 4-9
- HLIN, 4-9
- HPHASE, 4-9, 4-10
- WIDTH, 4-12