
VREO1

VRE01 Flat Panel Display Monitor Service Guide

Order Number EK-VRE01-SV-001

digital equipment corporation
maynard, massachusetts

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About This Guide

This guide describes how to troubleshoot and repair a VRE01 Flat Panel Display monitor.

Guide Organization

The guide is organized as follows:

- Chapter 1 provides a general overview of the product, spares list, and the self-test.
- Chapter 2 describes the troubleshooting procedures.
- Chapter 3 provides the removal/replacement procedures for Field Replaceable Units (FRUs).

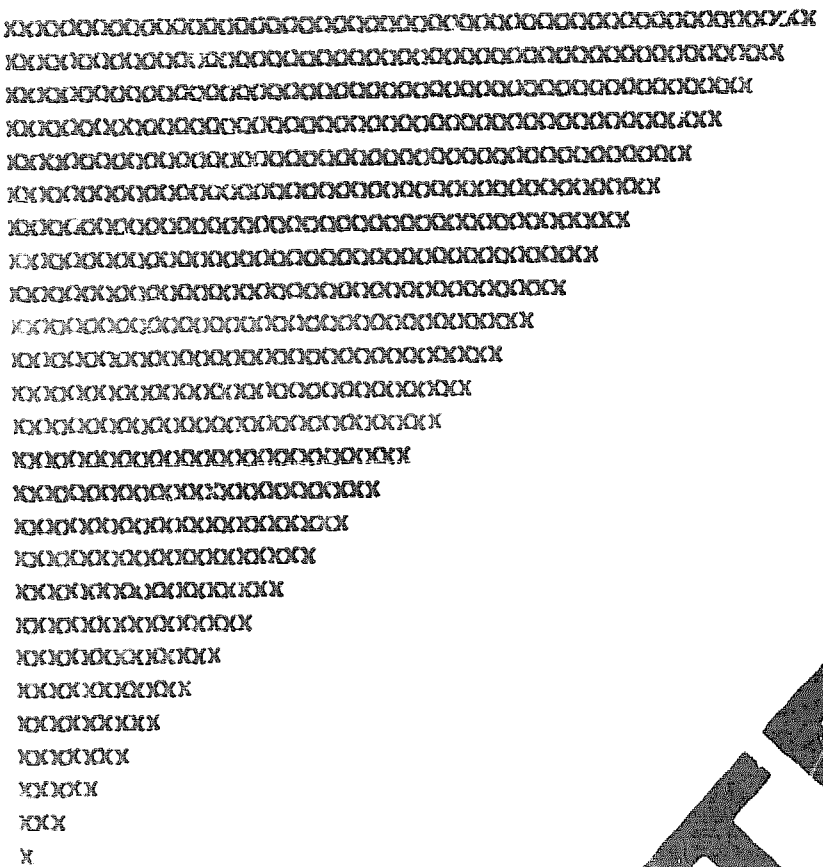
Audience

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

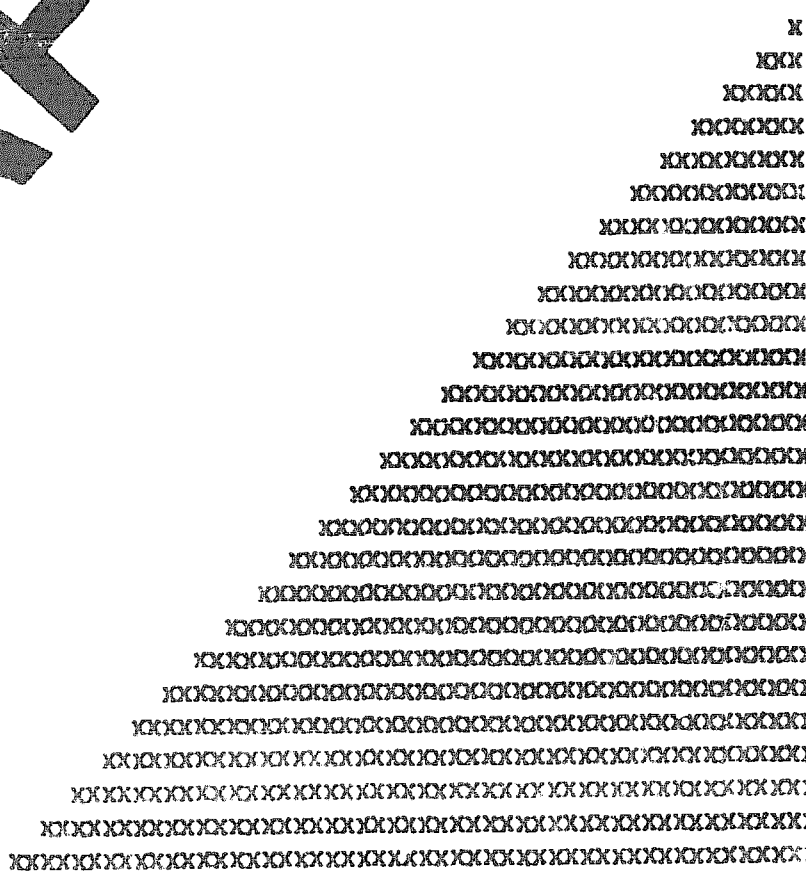
Conventions

The following conventions are used in this guide:

Convention	Meaning
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



CHAPTER 1



1
Overview

1.1 Introduction

The VRE01 monitor has an electro-luminescent, monochrome, flat panel display. The monitor consists of two major units: the display assembly and the power supply board. The housing is a compact plastic case, which tilts, and has a replaceable screen filter to reduce glare. The monitor operates in a 100 to 240 Vac, 50/60 Hz range with automatic voltage selection and uses a 3A, slow blow fuse rated for 250 Vac.

The VRE01 can be used in standard or RF* configurations. For either configuration, use the video cable supplied with the host system.

Video tapes are available on the theory and operation of the VRE01 monitor from Digital Educational Services, *VRE01 Desktop Monitor Support Training*, part number EY-8909E-VU.

1.2 Product Description

The monitor display provides 884,736 individually addressable pixels consisting of 1024 columns by 864 rows. The display assembly consists of a controller board connected by drivers to a flat, glass panel. The controller uses the drivers to enable each row and column of electrodes etched onto the glass panel.

Figure 1–1 is a functional block diagram of the VRE01 monitor.

* RF configurations provide special protection from external electromagnetic radio frequency interferences.

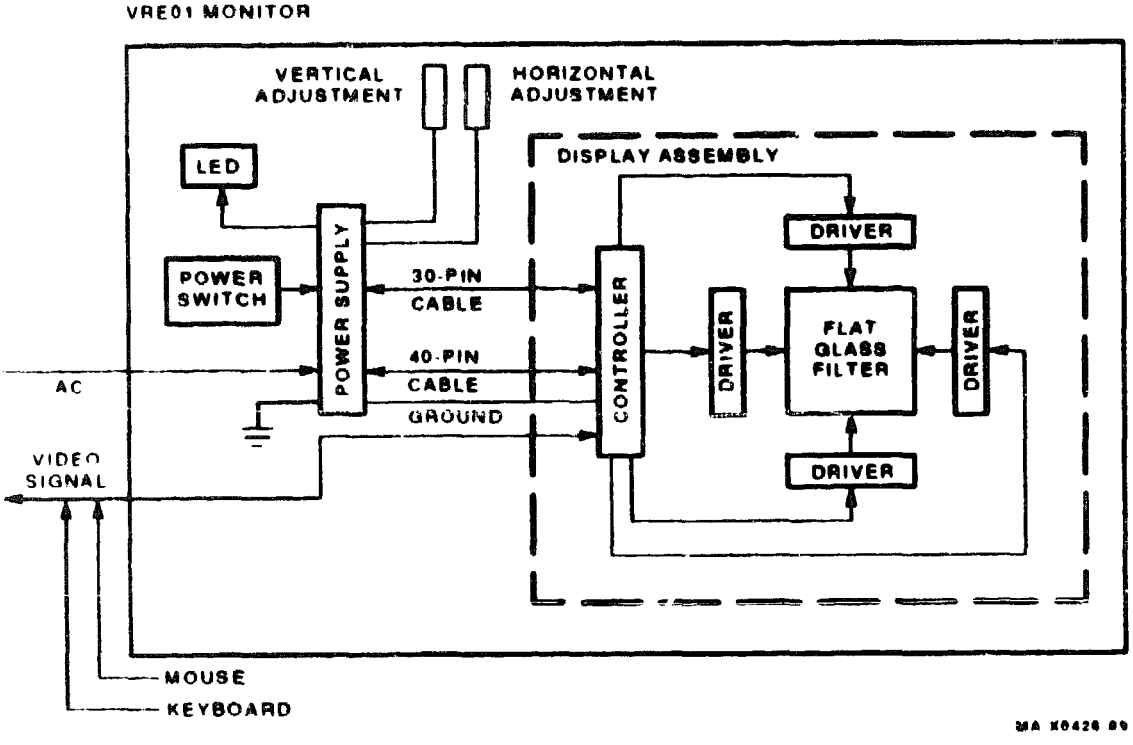


Figure 1–1 VRE01 Functional Block Diagram

ADVISORY NOTE

Brightness, Hue, Flicker, Dark Line, or Reverse-Video Complaints:

The VRE01 monitor uses an electro-luminescent display, which may exibit from unit to unit subtle variations in hue or brightness, a "flicker" when viewed from beyond the optimum viewing range, or a dark horizontal center line when in reverse video mode. None of these inherent characteristics of the current technology affects the product's performance and may not be noticed under normal operating conditions. To minimize the effect of these conditions, we recommend that the customer use only the normal video mode (white or amber print on a black background).

1.3 Model Variations

Table 1-1 lists the different VRE01 monitors and the host systems with which they are intended for use.

Table 1–1 Model Variations and Applicable Systems

If the host system is a....	Use monitor number...	
VT1000 XWT or DECstation 3100	VRE01-BA VRE01-B3	RFVRE01-BA RFVRE01-B3
VAXstation	VRE01-AA VRE01-A3	RFVRE01-AA RFVRE01-A3

1.4 Cleaning the Monitor

1.4.1 Antiglare Filter

Clean the monitor screen using a soft tissue or cloth and a non-abrasive, non-flammable glass cleaner.

Occasionally, there may be a need to clean the internal antiglare filter. To do this, remove the filter (Section 3.11), then wipe the filter with a lint-free, non-abrasive pad (PN 29-25298-97 or -99).

1.4.2 Oil Spillage

If the glass breaks or the glass panel leaks oil, return the unit to the factory for repair. To clean up any oil spilage, use a special fluorocarbon solvent, such as Freon TMS solvent, PN 29-28090-01.

CAUTION
When using any solvent cleaner, allow plenty of ventilation to avoid breathing the toxic fumes.

1.5 Controls and External Cabling

Figure 1–3 shows the controls and external cabling in a standard monitor configuration. Figure 1–2 shows the external cabling for an EMI monitor configuration.

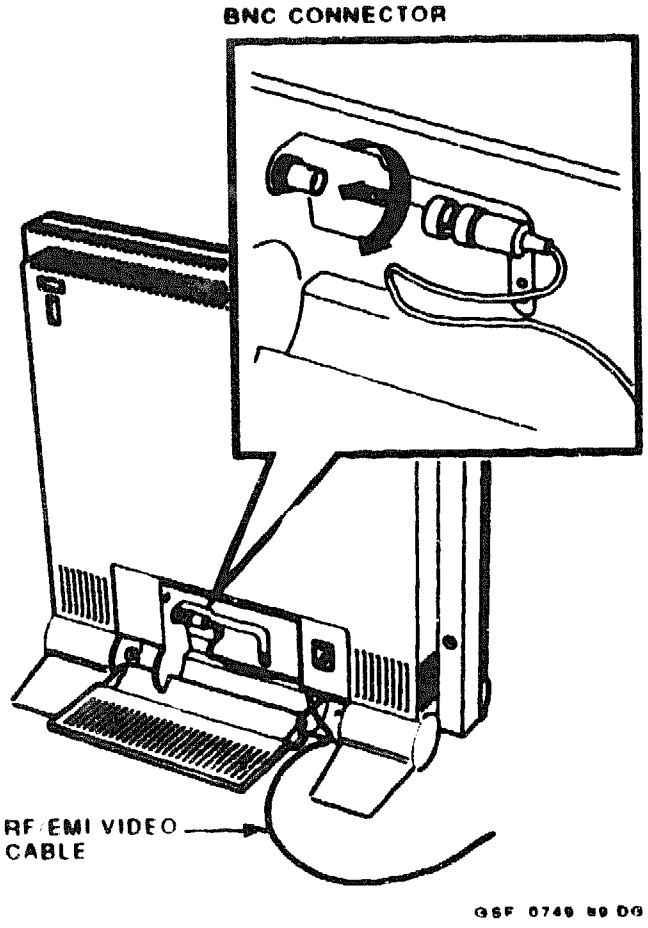


Figure 1–2 External Cabling in EMI Configuration

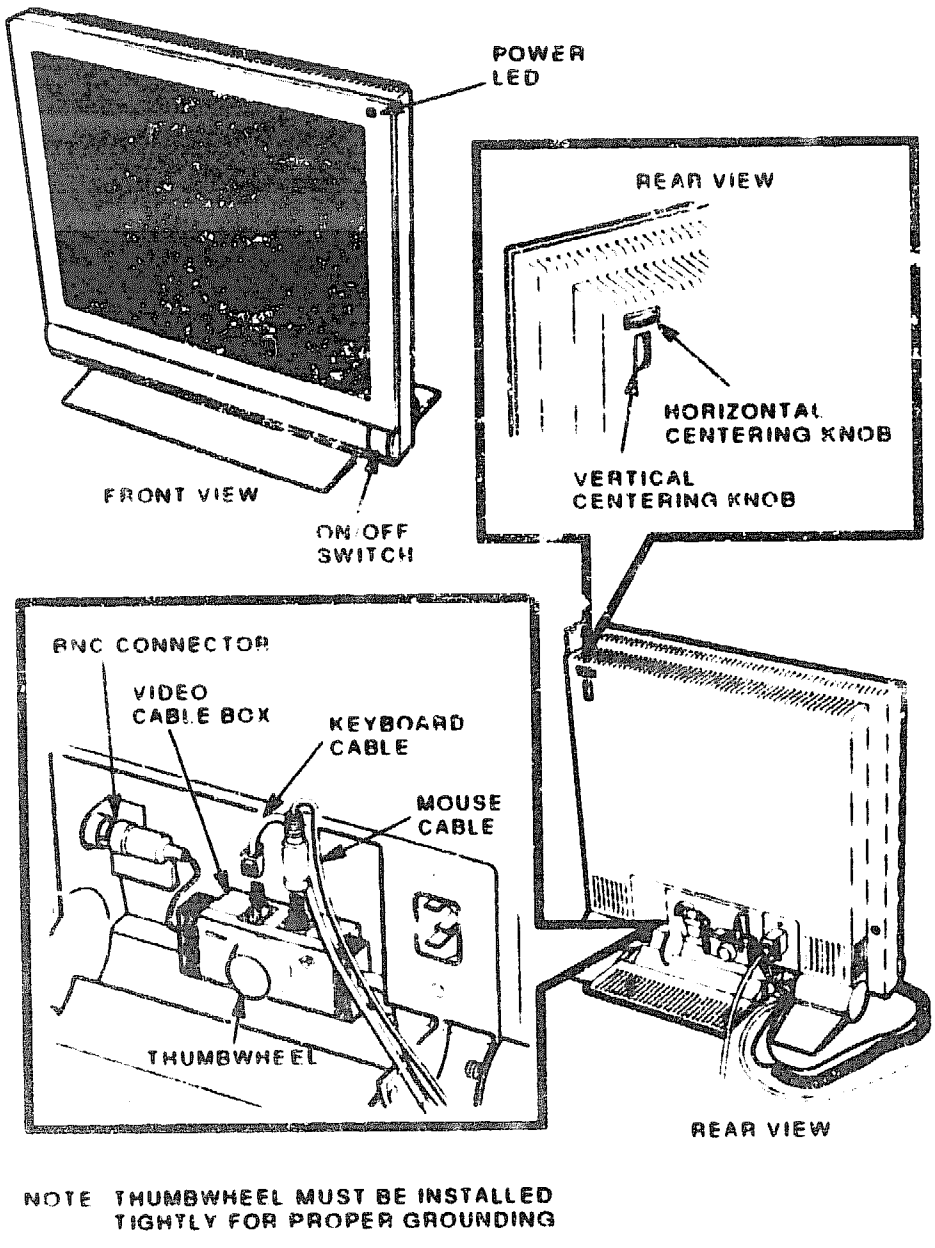
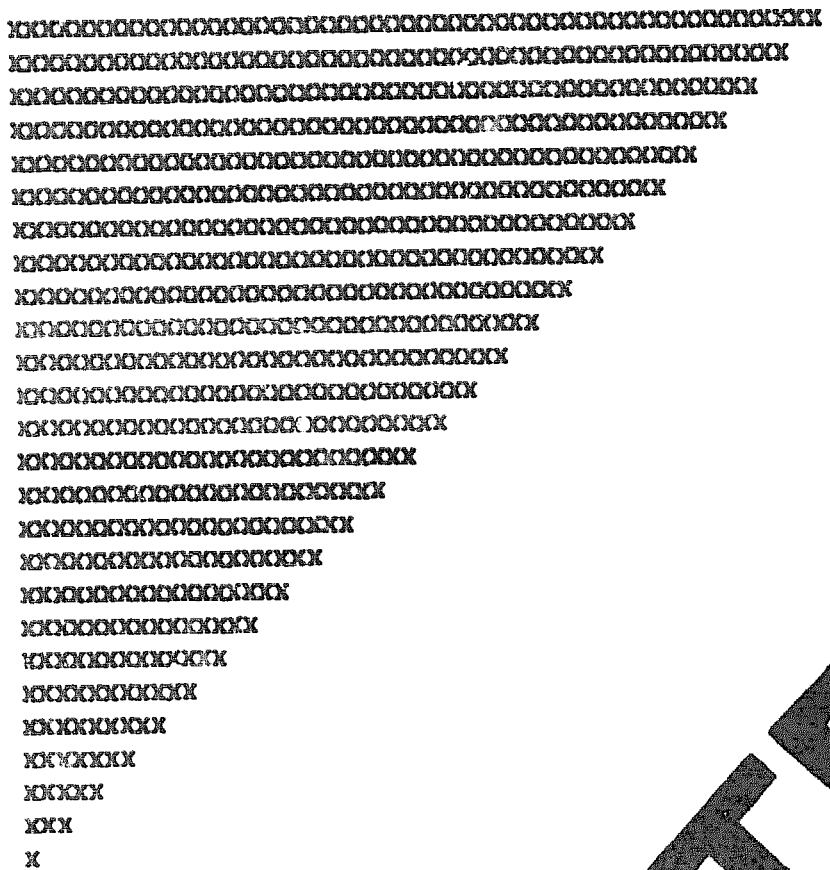
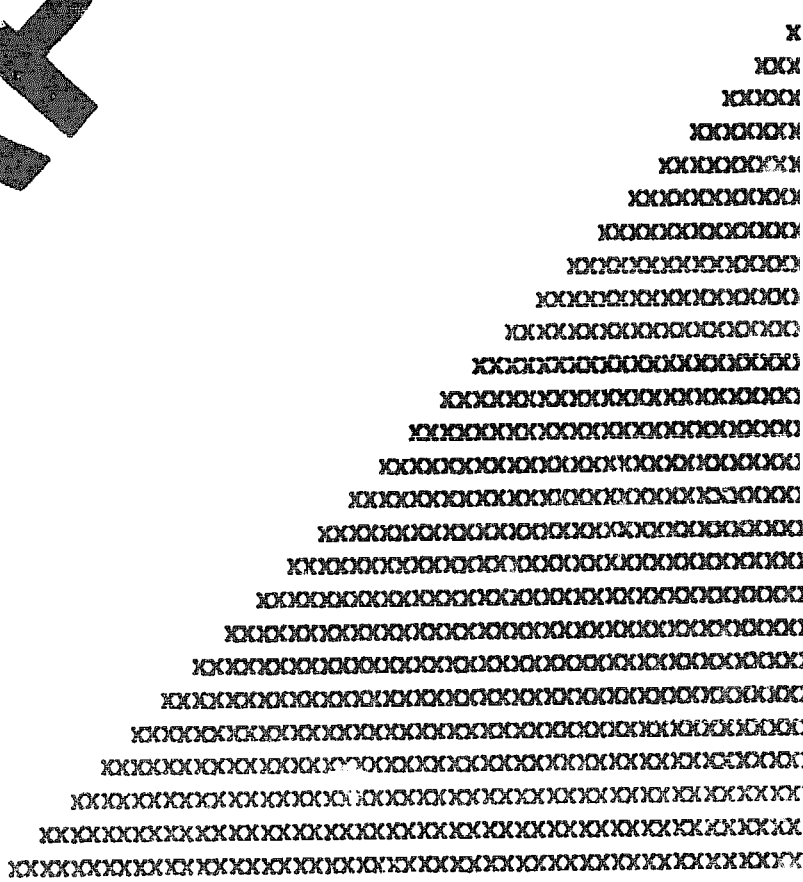


Figure 1–3 VRE01 Controls and External Cabling in Standard Configuration



CHAPTER 2



2
TROUBLESHOOTING PROCEDURES

This chapter describes how to examine problems and troubleshoot the VRE01 monitor.

2.1 Tools and Test Equipment

To repair a VRE01 monitor, you need the Terminal Tool Kit (PN 29-27340-01) and a multimeter to check voltages. You can track most problems by observing the symptoms.

2.2 Power-Up Self-Test

The VRE01 monitor has a power-up self-test to test the power supply, internal logic circuitry, and connections for proper functioning. The self-test can only be done when the monitor is disconnected from a host system. This avoids receiving host system messages or prompts.

To run the self-test:

1. Turn power to the monitor off.
2. Disconnect the external video signal cable.
3. Turn power to the monitor on.

   The power LED should illuminate. If it does not, refer to Table 2–3.
4. Wait a few seconds for the self-test pattern to display (Figure 2–1). All pixels should illuminate. If the self-test pattern does not display, refer to Table 2–1.

NOTE
If the self-test pattern displays while connected to the host system during normal operation, the VRE01 monitor may have become disconnected from the host system. Check the video cable connection and the host system status, as it may be in screen saver mode.

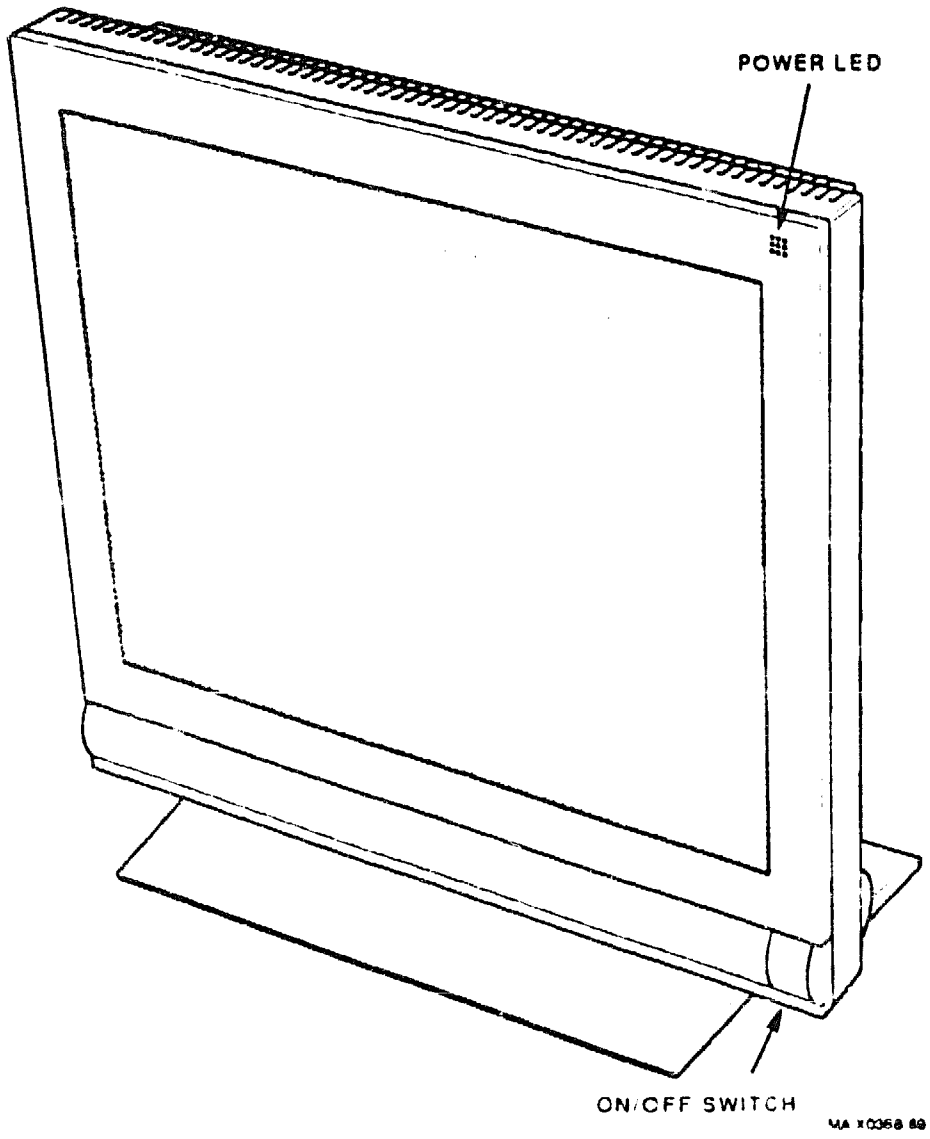


Figure 2–1 Self-Test Pattern

2.3 System Test and Alignment Patterns

The host system has several utilities to test and align video images. Examples are the E-pattern or the Circle-crosshatch Alignment pattern.

With the VT100C XWT, you can select these patterns from the screen menu. With other systems, you must attach a loopback connector to the host system I/O port to run these utilities.

Example:

> The VAXstation 3100 uses an MMJ loopback connector (PN 122-25083-01).

Refer to the host system service guide to run these tests.

Use the centering knobs on the VRE01 monitor to align the pattern if necessary. If you cannot align the pattern, refer to Table 2–4.

2.4 Troubleshooting the Problem

Problems may come from either the host system or the monitor. The following sections deal primarily with monitor problems.

The monitor should illuminate within 10 seconds after turning power on.

After troubleshooting the VRE01 monitor, display the host system alignment test patterns to ensure that no other problems exist. Refer to the host system service manual for displaying test patterns.

If the VRE01 monitor exhibits a problem, it usually has one of the following main symptoms:

- No Display, No Video - Table 2–1
- Problem Occurs While Video is Present - Table 2–3
- Poor Display Quality - Table 2–4

2.4.1 Using the Troubleshooting Tables

The troubleshooting tables list the possible causes in order of probability. Use these tables as follows:

1. Check the Symptom column for the problem encountered with the monitor.
2. Check the Possible Cause column.

3. Perform the action in the Suggested Solution column. If there is more than one cause or solution, follow them in the order given. Check each suggested solution before replacing a FRU.

WARNING
Do not open the monitor with the power cord connected to the wall outlet. Hazardous voltages are present inside the monitor.

CAUTION
Do not separate the controller from the display assembly. Replace them as one unit. The display assembly contains a silicon oil that will contaminate other parts if the glass is damaged.

Table 2–1 No Display, No Video

Symptom	Possible Cause	Suggested Solution
Power light is not on. No video display.	Power cord is not connected.	Reconnect the power cord to the power source or monitor.
	No power at outlet.	Use a functioning wall outlet.
	Power cord is faulty.	Replace the power cord.
	Monitor fuse is blown.	Replace the fuse (Section 3.5).
	Power switch is faulty.	Check or replace the power switch. (Section 3.6).
	Power supply is faulty.	Replace the power supply (Section 3.9).
	Controller is faulty.	Replace the display assembly (Section 3.11). (The controller is part of the display assembly.)
Power light is on. No video display.	Host system screen saver feature is on.	Press any key to reactivate the display.
	Host system is faulty.	Remove the external video cable. If a normal VRE01 self-test pattern appears on the screen, refer to the host system service guide for troubleshooting procedures.

Table 2–1 (Cont.) No Display, No Video

Symptom	Possible Cause	Suggested Solution
	Internal interface cables are loose or faulty.	Internally, check for loose cables between the power supply and the display assembly. If necessary, secure the cables. (Section 3.4).
	Power supply or signal voltages are faulty.	Open the monitor (Section 3.4), but do not disconnect the internal cables yet. Measure dc voltages at all test points on the power supply board (Figure 2–2). See Table 2–2 for each allowable voltage range. If any voltage is not correct, disconnect the 40-pin internal flat cable from J501 on the power supply. Recheck the voltages.
	• If any voltage is still incorrect, the power supply is faulty.	Replace the power supply board (Section 3.9).
	• If all voltages are now correct, the cables may be faulty.	Replace the internal flat cables (Section 3.4). Recheck the voltages.
	• If the voltage problem persists, the controller board is faulty.	Replace the display assembly (Section 3.11), which contains the controller board.

Table 2–1 (Cont.) No Display, No Video

Symptom	Possible Cause	Suggested Solution
Power to the monitor turns on and off several times by itself.	Power supply or controller is faulty.	Open the monitor (Section 3.4). Disconnect the 40-pin internal flat cable from J501. Check the -5.2 V, +5 V, and +12 V test points on the power supply board (Figure 2–2). See Table 2–2 for each allowable voltage range. • If any voltage is not correct, replace the power supply (Section 3.9). • If the voltages are correct, replace the display assembly (Section 3.11).

Table 2–2 Power Supply Voltages

Voltage	Voltage Range
215 Vac	195V to 235V
110 Vac	99.8V to 120V
+40 Vdc	+36.3V to +43.7V
+12 Vdc	+11.05V to +13V
+5 Vdc	+4.75V to +5.25V
-5 Vdc	-4.9V to -5.5V
-90 Vdc	-81.6V to -98.4V
-175 Vdc	-159V to -191V

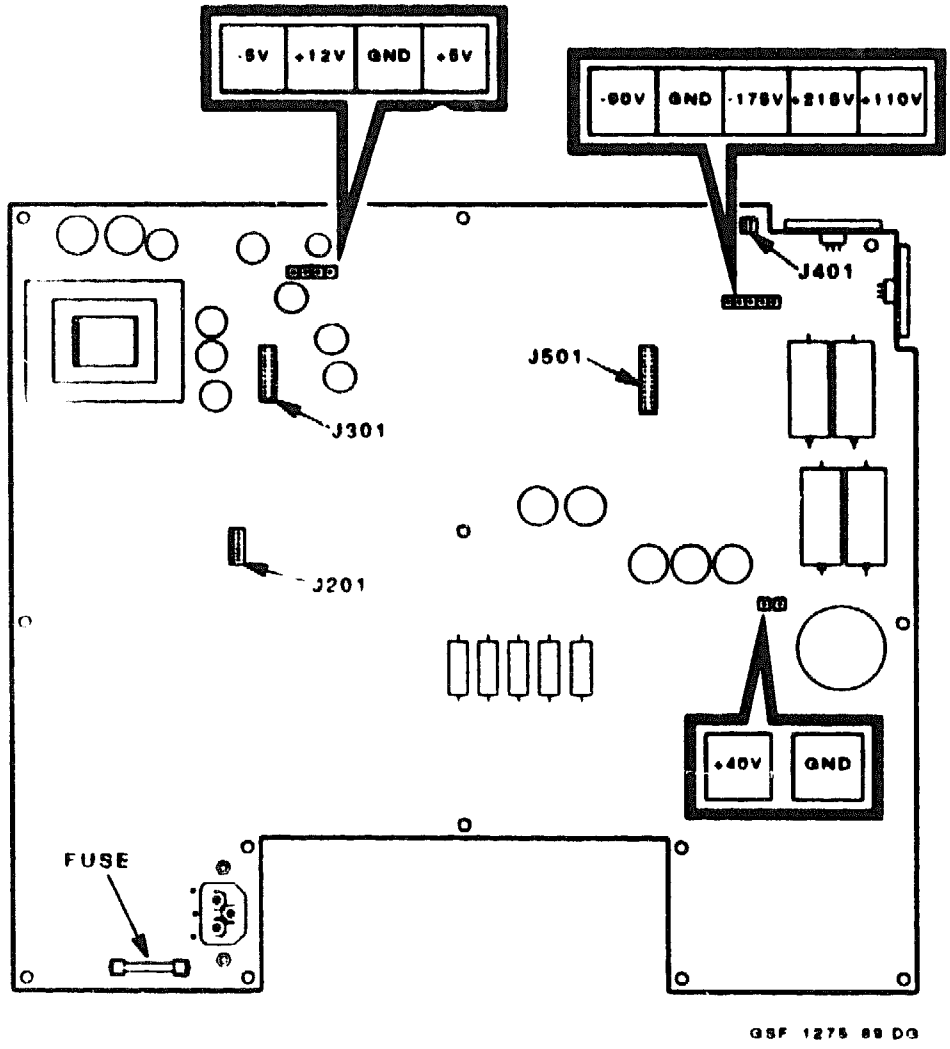


Figure 2-2 Test Points on the Power Supply Board

Table 2–3 Problem Occurs While Video Is Present

Symptom	Possible Cause	Suggested Solution
The power LED is off.	Power LED is faulty.	Replace the power LED assembly (Section 3.7).
Self-test display is present, but there is no prompt from the host system.	Host system is not connected.	Connect the host system.
	Power to the host system is off.	Turn power to the host system on.
	External video signal cable is disconnected.	Reconnect the signal cable.
	The host system is faulty or is not supplying video signals to the monitor.	Verify this by connecting the monitor to a known working host (if available). Check and repair (or replace) the host system.
	Internal video cable is disconnected.	Reconnect the internal video cable (Section 3.8).
	Controller is faulty.	Replace the display assembly (Section 3.11). (The controller board is part of the display assembly.)
The video signal is suddenly lost and the self-test pattern displays.	Host system is in screen saver mode.	Type any key to restore video signal.
	Host system is not connected.	Check and secure the external signal cabling (Section 3.13).

Table 2–3 (Cont.) Problem Occurs While Video Is Present

Symptom	Possible Cause	Suggested Solution
	Internal video cable becomes disconnected or faulty.	Open the monitor (Section 3.4) and check the internal video cable (Section 3.8). Reconnect it to the display assembly or tighten at the BNC connector. If the cable is broken, replace it (Section 3.8).
	The host system is faulty.	Repair or replace the host system.

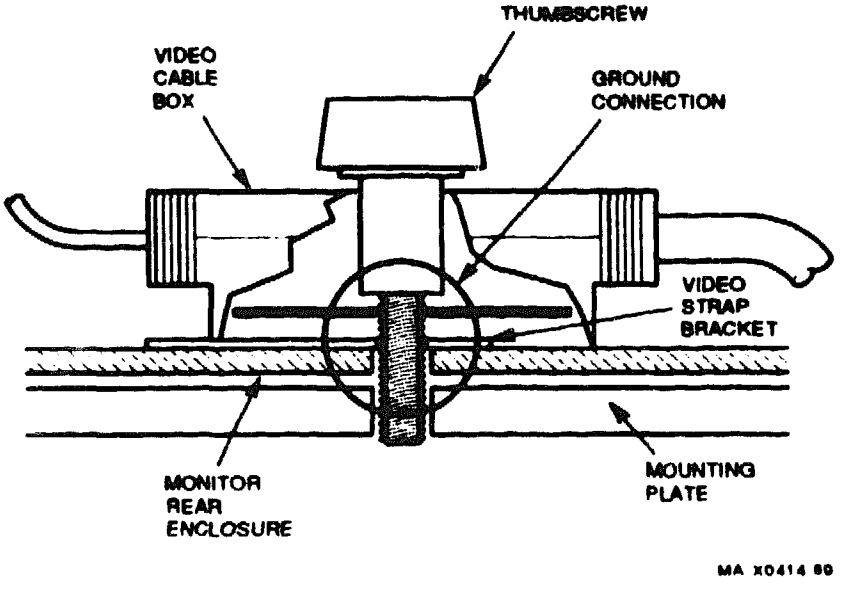


Figure 2–3 Ground Connection Through Standard Video Cable Block

Table 2–4 Poor Display Quality

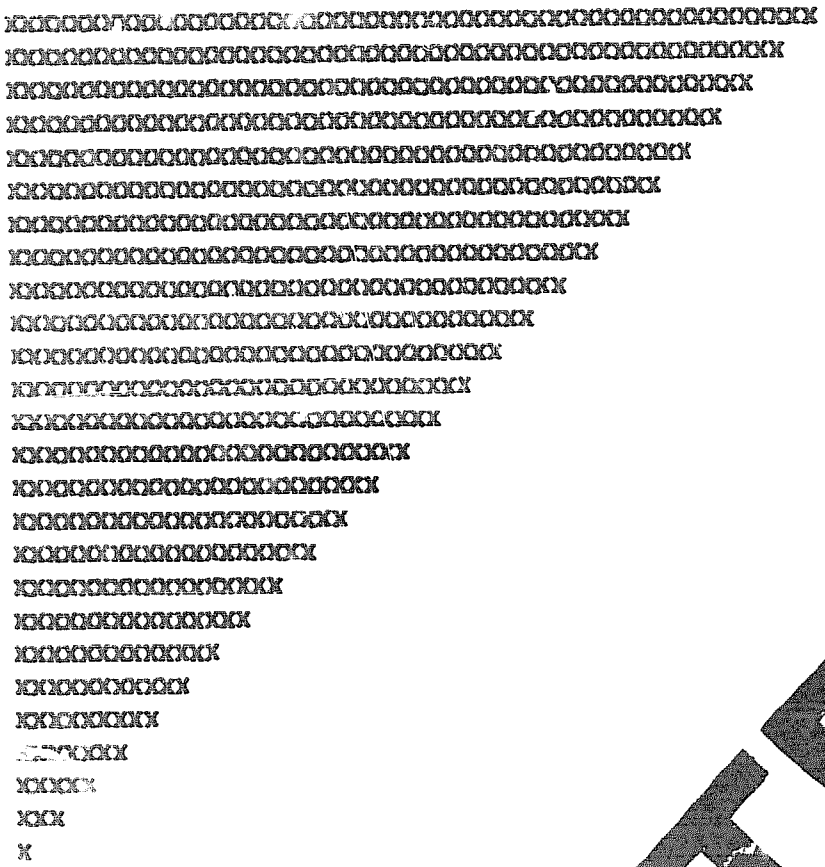
Symptom	Possible Cause	Suggested Solution
Video noise.	Vertical centering knob is not adjusted.	Adjust the vertical centering knob on the rear of the monitor.
	External video signal cable is faulty.	Ensure that the video signal cable is properly connected to the monitor and the host system.
		Ensure that there is a proper ground connection through the thumbwheel in the standard video cable block (Figure 2–3). Tighten the thumbwheel as necessary.
NOTE **In an RF-VRE01 unit, the ground connection is through the video cable.**		
		Also check for a secure connection at the BNC connector with the internal video cable (see Section 3.8 and Section 3.13).
		Replace the external video cable (Section 3.3).
	Grounding wire is disconnected.	Reconnect the grounding wire to the display assembly.
	PROM on controller board is faulty.	Replace the display assembly (Section 3.11). (The controller board is part of the display assembly.)
	Host system is faulty.	Repair or replace the host system.
Bright spots are visible on the screen.	These spots are caused during the processing of the glass.	The problem neither deteriorates nor impacts the functionality of the monitor; however, if there are more than three spots per square centimeter or more than 22 on the screen, return the monitor for repair.

Table 2–4 (Cont.) Poor Display Quality

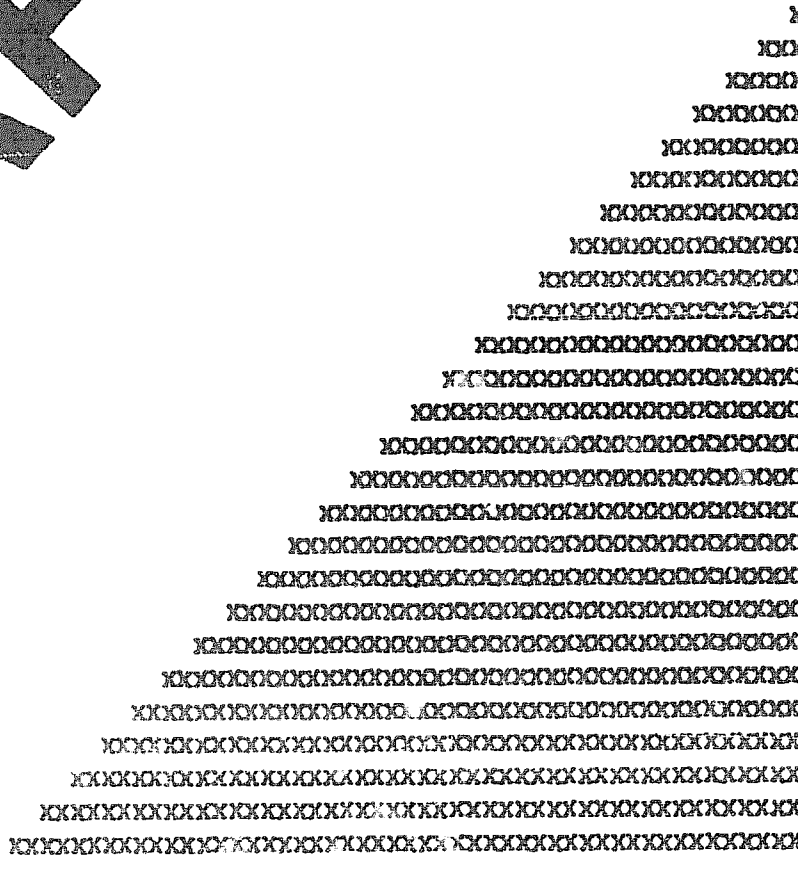
Symptom	Possible Cause	Suggested Solution
Parts of characters, rows, or columns are missing. Or screen displays double images—top and bottom.	Centering knobs are not adjusted properly.	Adjust centering knobs on the rear of the monitor.
	The 40-pin flat cable is not plugged in or is faulty.	Connect or replace the cable (Section 3.3).
		If the problem persists, obtain a circle-crosshatch alignment pattern from the host system. Use the centering knobs to adjust the pattern (Section 2.2).
	Centering knobs are defective.	Replace the power supply (Section 3.9). (These knobs are on the power supply board.)
	Controller board is defective.	Replace the display assembly (Section 3.11). (The controller board in part of the display assembly.)
Character or line is broken, or an unexpected character displays.	Glass panel or drivers are faulty.	Perform the power-up self-test and the system test (Section 2.2 and Section 2.3).
		If the error is intermittent, check the host system (Section 2.3). Repair or replace the host system.
		If an error persists in the same screen location, replace the display assembly (Section 3.11).

WARNING

If the glass breaks or the glass panel leaks oil, return the unit to the factory for repair. To clean up any oil spilage, use a special fluorocarbon solvent, such as Freon TMS. Remember when using any solvent cleaner to allow plenty of ventilation to avoid breathing the toxic fumes.



CHAPTER 3



3
REMOVAL/REPLACEMENT PROCEDURES

3.1 Introduction

This chapter describes how to remove and replace the FRUs and other spare parts on the VRE01 monitor. Each procedure provides steps for removing the parts. To replace them, perform the steps in reverse order.

3.2 Recommended Spare Parts

The following is a list of the recommended spare parts (including FRUs) for the VRE01 monitor.

Part	Part Number	Used On
Display head	70-26645-01	VRE01-AA/A3
	70-26645-02	VRE01-BA/B3
	70-26645-03	RFVRE01-AA
	70-26645-04	RFVRE01-BA
Power supply	54-17443-01	all models
Harness assy, switch	70-26644-01	all models
Harness, LED assy	70-27407-01	all models
Fuse	90-07217-00	all models
Filter, glass (circular, polar)	12-30696-00	all models
Cable assy, video	70-27064-00	all models
Low-voltage/signal cable (30-pin)	70-26697-01	all models
High-voltage/signal cable (40-pin)	70-26696-01	all models

3.3 Removing External Cables

Remove the external cables as follows:

1. Turn power to the monitor and system off.
2. Disconnect the power cord from the wall outlet, then unplug the power cord from the monitor.
3. Open the rear cover at the back of the monitor (Figure 3–1).
4. Remove the external interface cables as follows:
   - When using the standard VRE01 video cable, turn the video cable connector counterclockwise and unplug it from the monitor. Then, release the thumbwheel on the video cable connector box and disconnect the video cable box from the monitor.
   - When using the RF/EMI-type video cable, turn the video cable connector counterclockwise and unplug it from the monitor.

     WARNING
     To maintain safety integrity of the enclosure, the rear (detachable) cover must be in place and closed for operation.

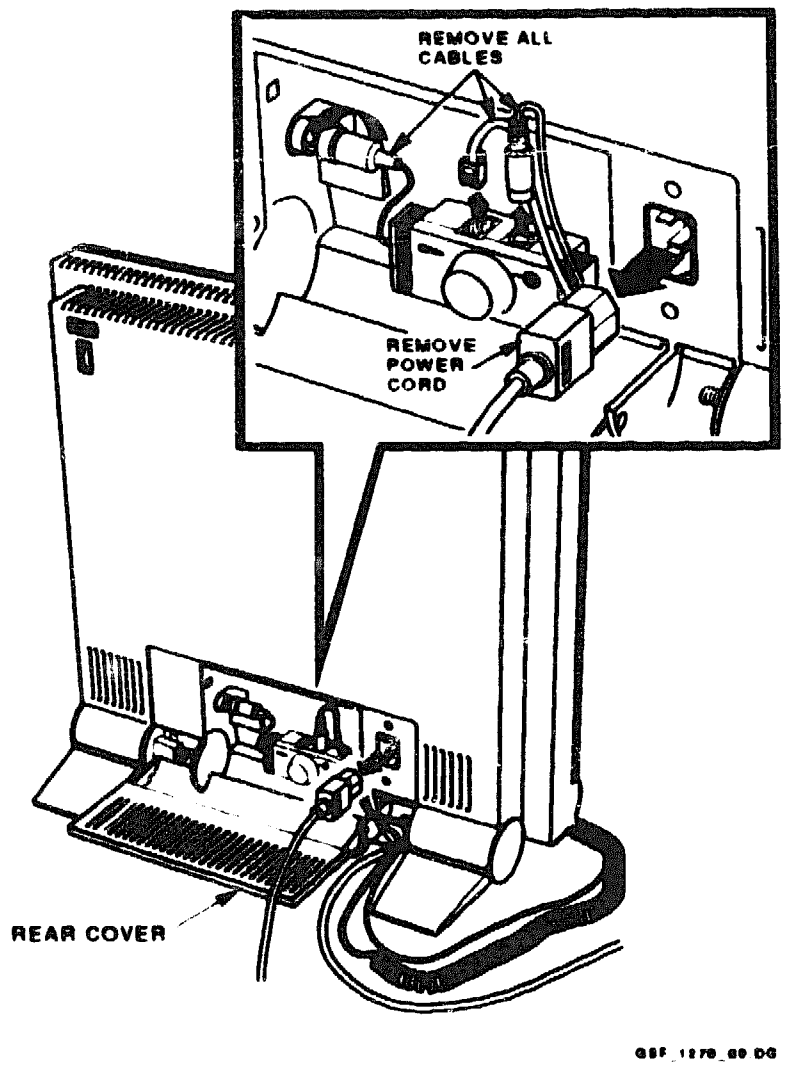


Figure 3–1 Opening Rear Cover and Removing External Cables

3.4 Opening the VRE01 Monitor

CAUTION
The glass screen display is very fragile. Avoid scratching the screen surface and be sure to place the unit on a flat surface before opening the monitor.

Open the monitor as follows:

1. Place the monitor, with the screen facing down, on clean paper on smooth, flat surface.
2. Remove the plastic screw from the video strap bracket (Figure 3–2). Remove the other two screws from this video cable area.

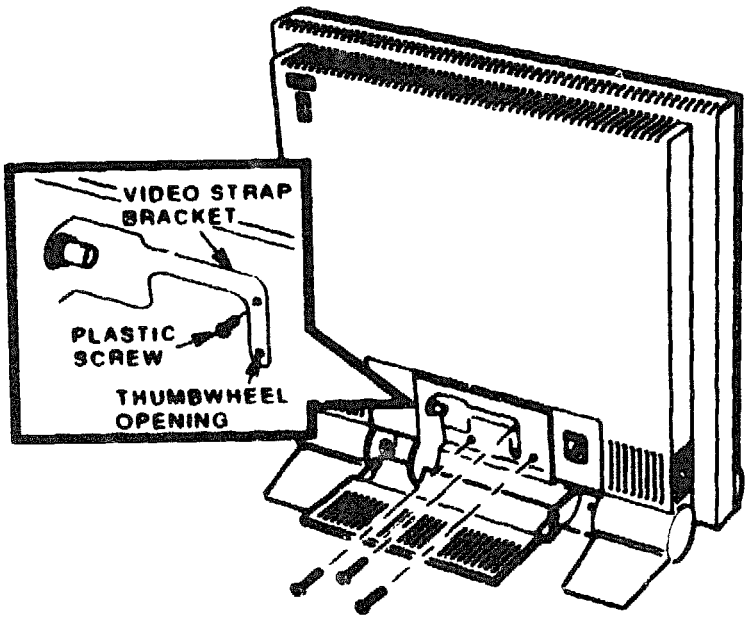


Figure 3–2 Location of Plastic Screw in Video Strap Bracket

3. Remove the other four screws from the rear cover (Figure 3–3).
4. Loosen the two captive screws that hold the tilt block to the display assembly.

   NOTE
   There is a total of nine screws: Seven screws are removable; two are captive.

5. Carefully lift and separate the rear cover from the display assembly a couple of inches so that you can access the inside of the monitor.

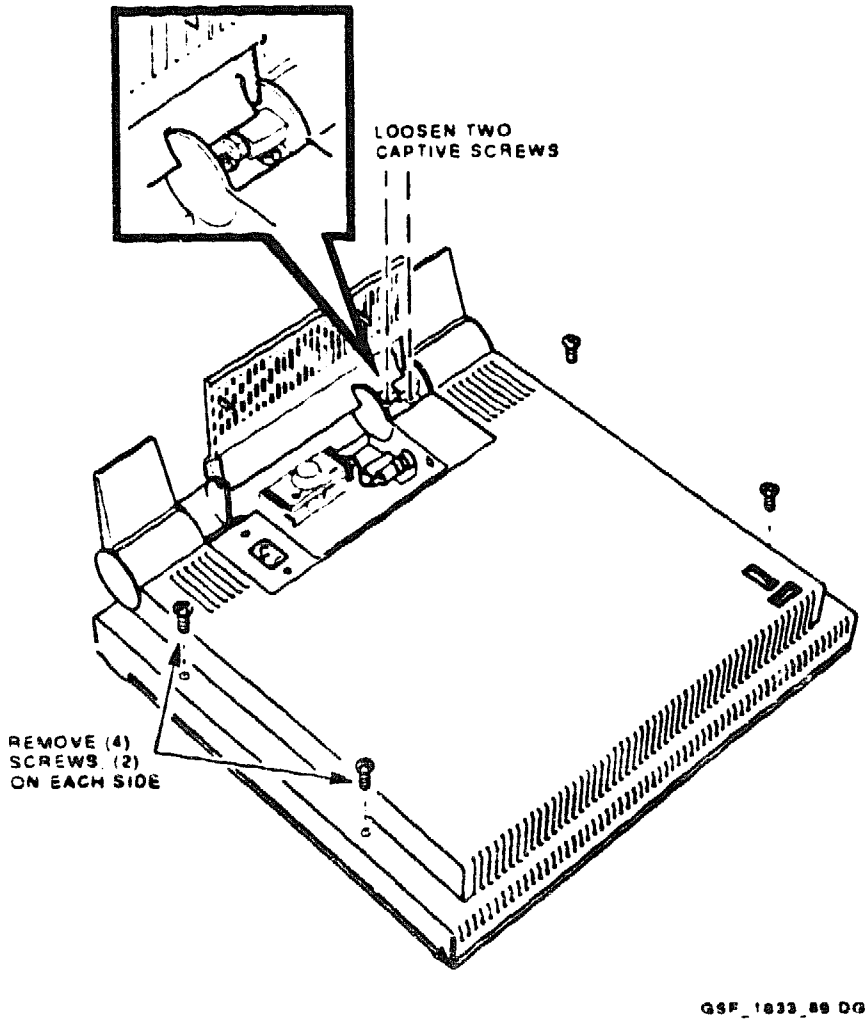


Figure 3–3 Removing Screws from Back of Monitor

6. Unplug the round internal video cable ❶ from the display assembly (Figure 3–4).

7. Depress the side tabs of the 40- and 30-pin connectors to detach the two internal flat power cables ❷ from the display assembly (or the power supply board).

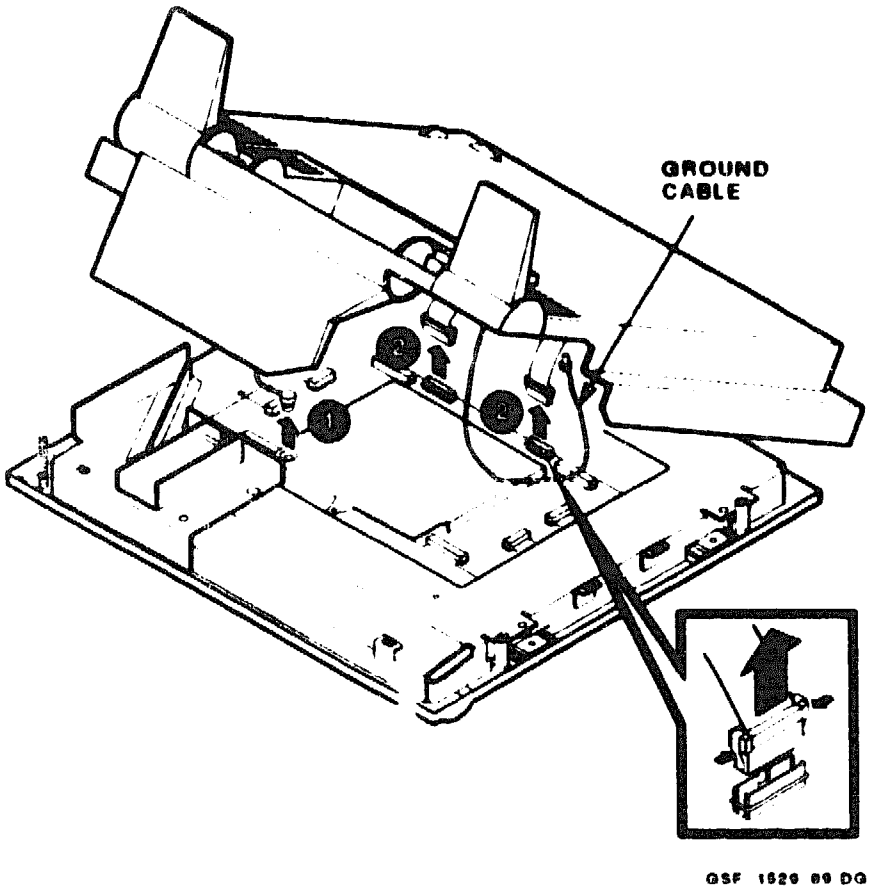


Figure 3–4 Disconnecting Cables from Inside the Monitor

8. Remove the nut on the display assembly, and pull the ground cable off the grounding stud (Figure 3–5).
9. Carefully detach the rear cover and put it aside on a clean, flat surface.

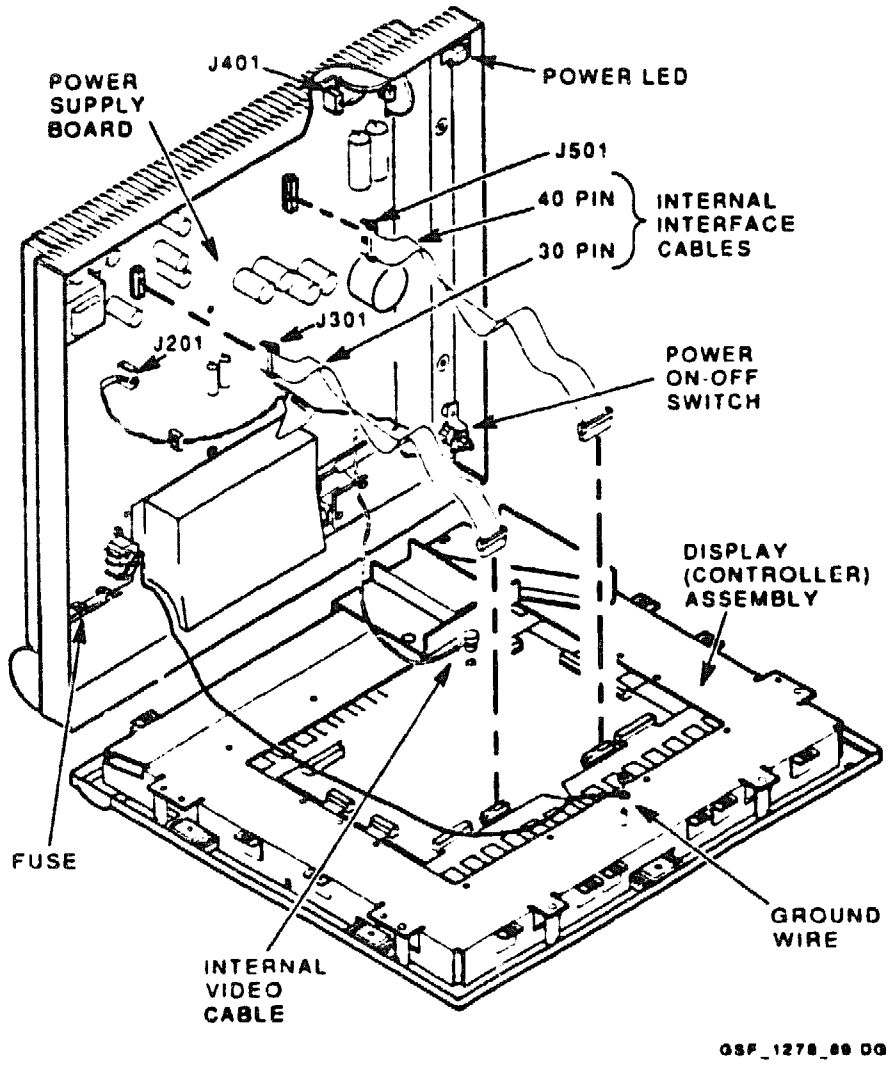


Figure 3–5 Internal Cables and Modules

CAUTION
To close the monitor, refer to Section 3.13 and make note of the proper installation of all cables, power switch spring, cable clamp, and display assembly. Note this for all FRU replacement and removal.

3.5 Fuse Removal

Remove the fuse as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).
3. Remove the fuse (Figure 3–6).

To replace the fuse, perform these steps in reverse order.

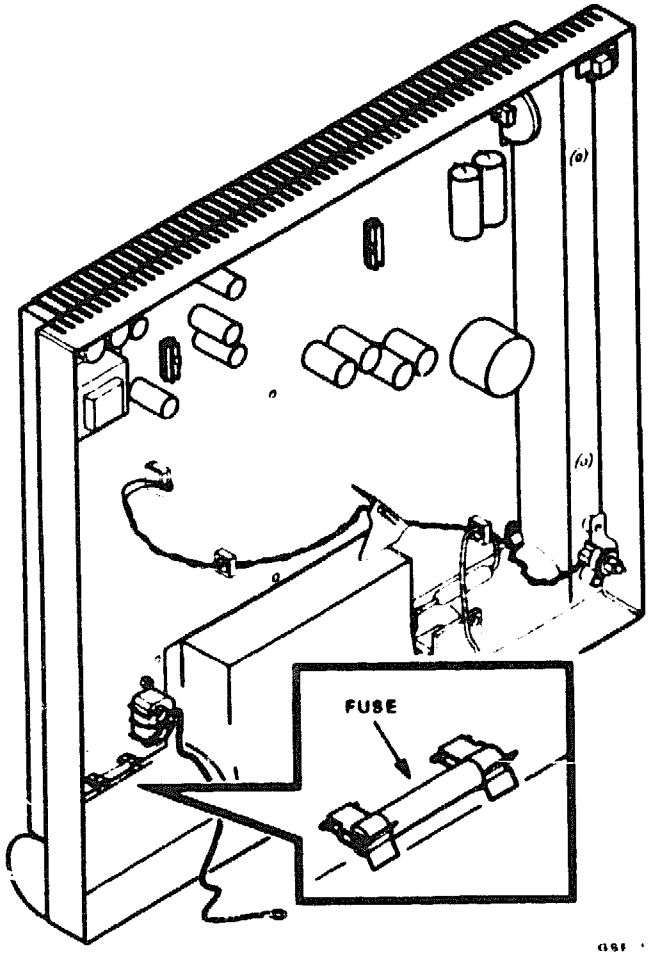


Figure 3–6 Removing the Fuse

3.6 Power Switch Assembly Removal

The power switch assembly consists of a push-button switch and a wire harness with a 6-pin connector (Figure 3–7).

CAUTION
Before removing the power switch, note how its harness is positioned so you install the new harness and cable clamp the same way. This avoids cutting the harness when reassembling the unit.

Remove the power switch assembly as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).
3. Unplug the 6-pin power harness connector from J201 on the power supply board.
4. Remove the harness from the retaining clips and from under the center metal bracket.
5. Remove the cable clamp screw near the power switch and remove the power switch harness assembly.

To replace the power switch assembly, perform these steps in reverse order. See the detail drawing in Figure 3–7 to correctly install the power switch, cable clamp, and harness.

From the bottom of the switch, install the harness between the switch and the spring stud, and tight against the monitor rear cover.

Check the illustration for correct orientation of the cable clamp.

To close the monitor, refer to Section 3.12.

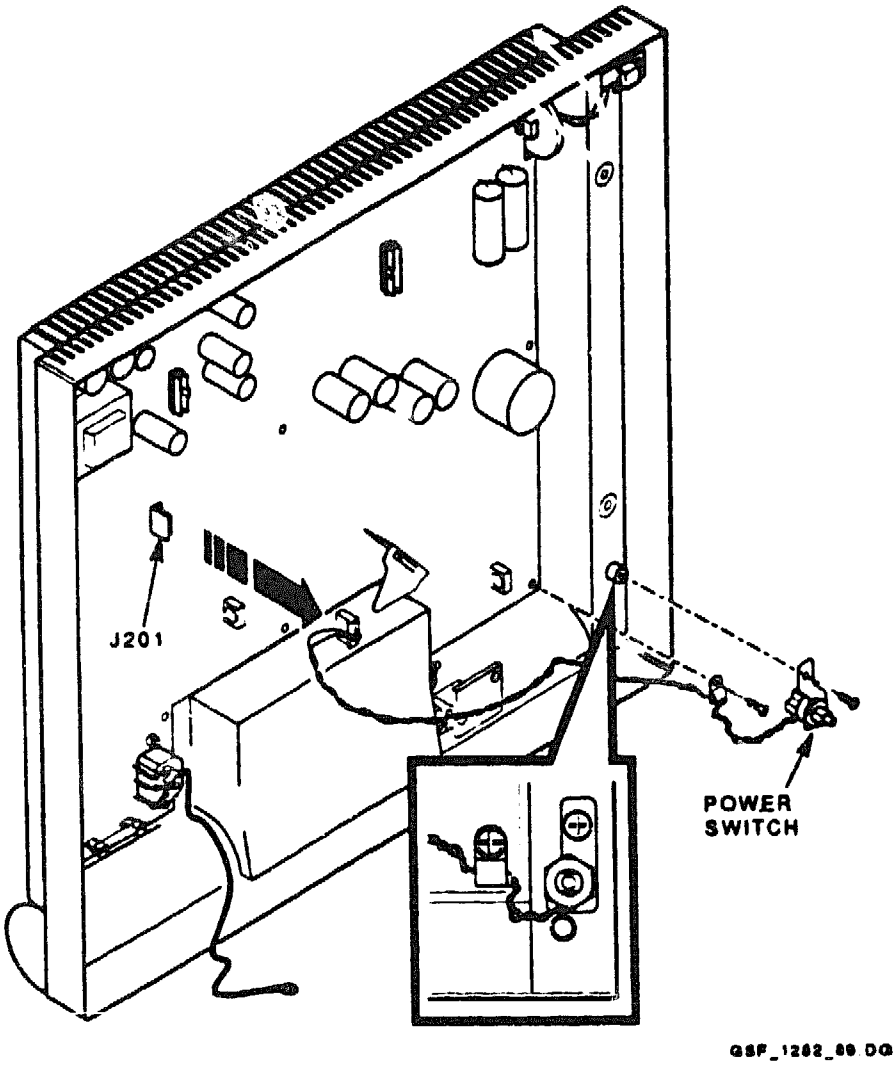


Figure 3–7 Removing the Power Switch

3.7 Power LED Assembly Removal

CAUTION
Before removing the power LED assembly, note how its harness is positioned so you install the new LED assembly the same way. This avoids cutting the harness when reassembling the unit.

Remove the power LED assembly as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).

3. Unplug the 2-pin LED harness connector from J401 on the power supply board (Figure 3–8).
4. Remove the retaining screws near the power LED and remove the power LED assembly.

To replace the power LED assembly, perform these steps in reverse order. Install the LED harness tightly against the monitor rear cover.

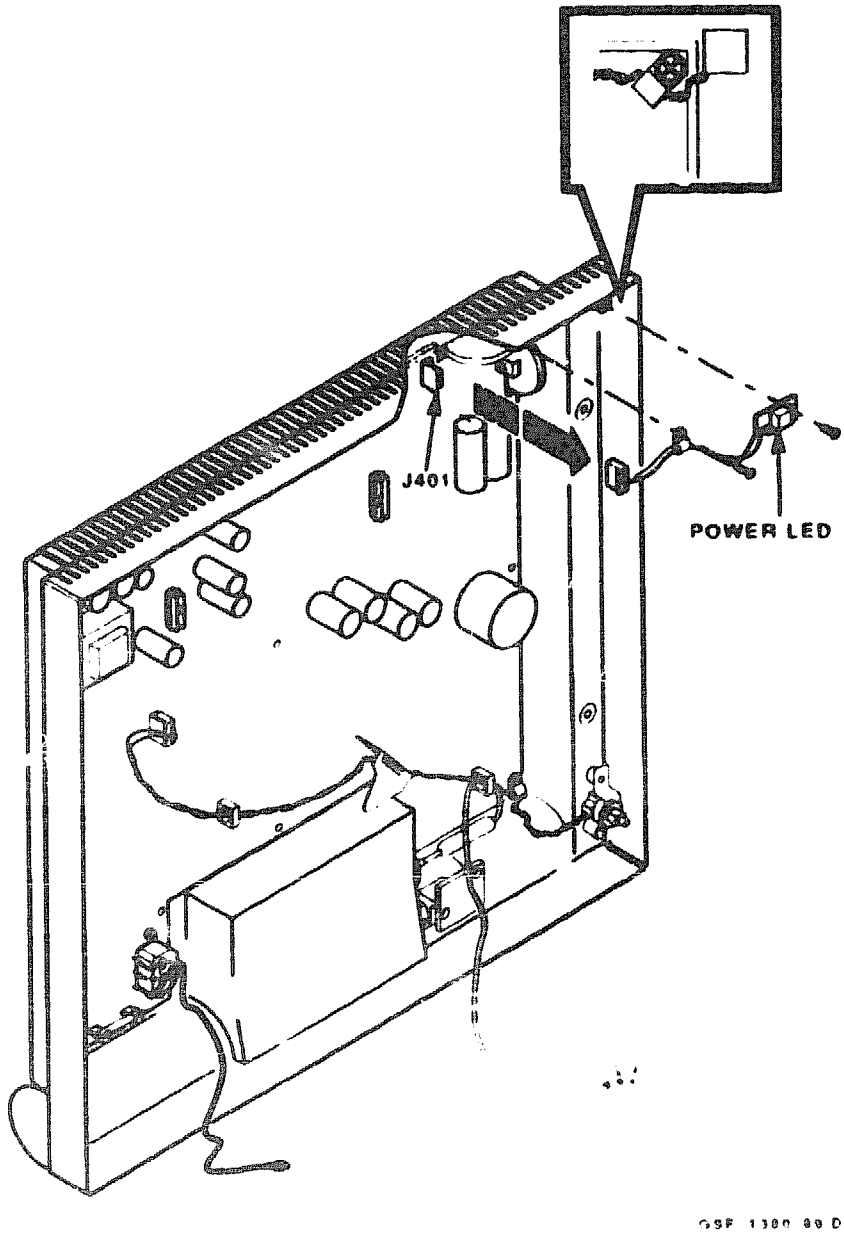


Figure 3–8 Removing the Power LED Assembly

3.8 Internal Video Cable Removal

Remove the internal video cable as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).
3. Use an open-end wrench or suitable pliers to remove the nut holding the BNC connector to the bracket on the rear cover (Figure 3–9).
4. Remove the internal video cable.

NOTE

Before you install a new video cable, remove the rubber gasket that fits around the BNC connector.

To replace the internal video cable, perform these steps in reverse order. Keep the BNC connector in place with one hand while installing and tightening the nut with the other hand.

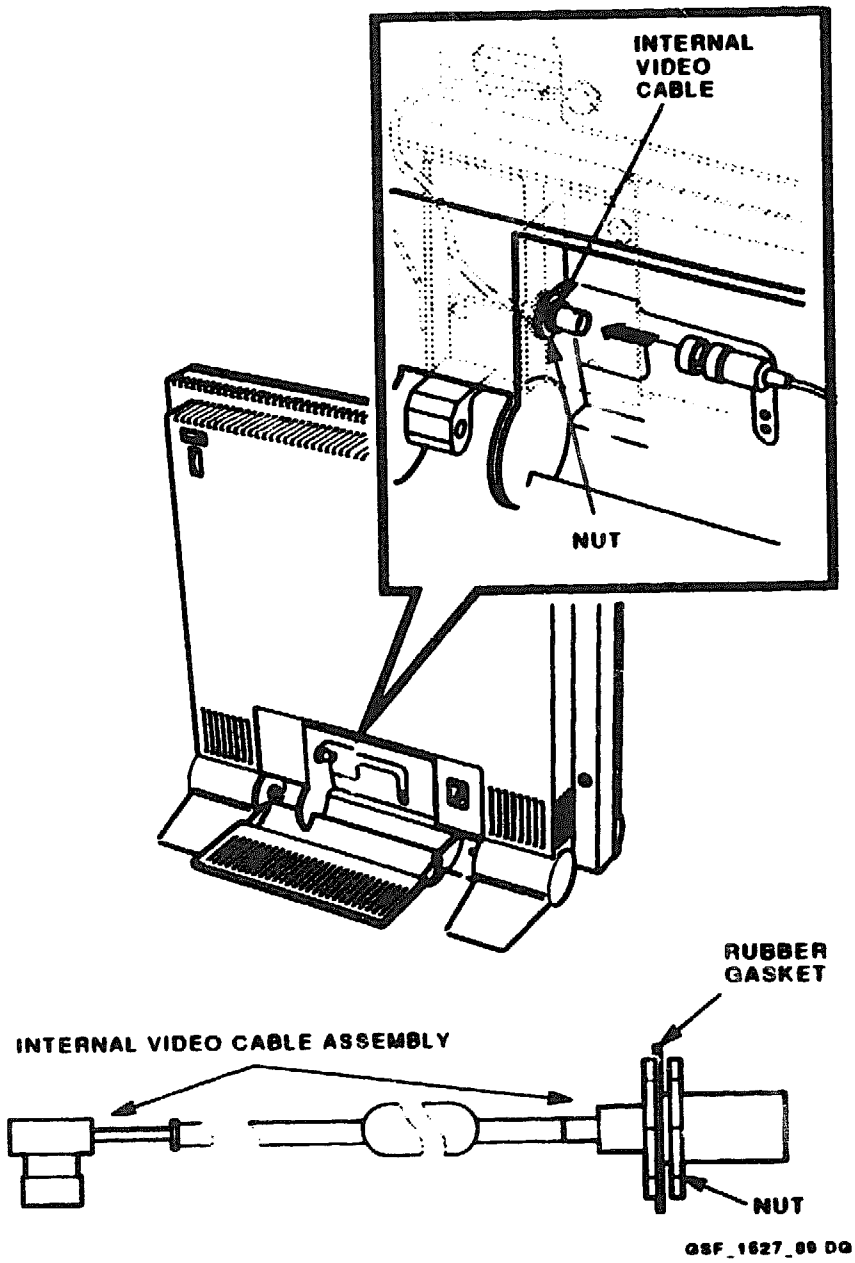


Figure 3–9 Removing the Internal Video Cable Assembly

3.9 Power Supply Removal

Remove the power supply as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).
3. Unplug the 6-pin power harness connector from J201 from the power supply board (Section 3.6).
4. Remove this harness from the retaining clips and from under the center metal bracket.
5. Unplug the 2-pin LED harness connector from J401 on the power supply board (Figure 3–10).
6. Remove the 13 screws that secure the power supply to the rear cover (Figure 3–10.
7. Remove the power supply.

To replace the power supply, perform these steps in reverse order.

3.10 Rear Enclosure Removal

Remove the rear enclosure as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).
3. Remove the power supply (Section 3.9).
4. Remove the power supply protector (74-39344-01)).
5. Remove the ground contact (74-40131-01).
6. Replace the rear enclosure (74-38576-01).

To replace the rear enclosure, perform these steps in reverse order.

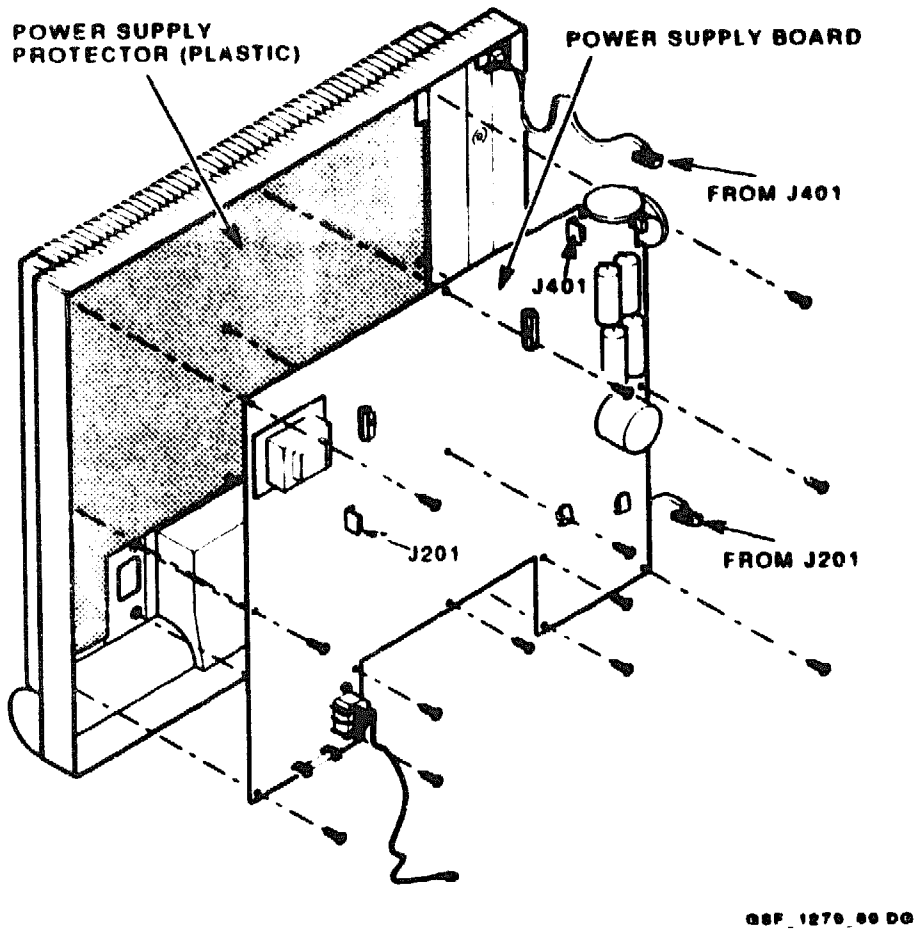


Figure 3–10 Removing the Power Supply

NOTE
Do not discard the plastic power supply protector that is located behind the power supply. Re-use it when replacing the power supply.

If for any reason you replace the rear enclosure, to ensure compatibility also replace the power switch push button, 74-38493-01.

3.11 Display Assembly Removal

Remove the display assembly as follows:

1. Disconnect the external cables (Section 3.3).
2. Open the monitor (Section 3.4).

CAUTION
The glass screen display is very fragile. Use care to avoid scratching its surface.

3. Remove the six screws securing the display assembly to the front bezel (Figure 3–11).

CAUTION
Do not attempt to separate the controller board and the glass panel. They are matched at the factory and must always be replaced as one unit.

4. Lift and remove the display assembly.

To replace the display assembly, perform these steps in reverse order.

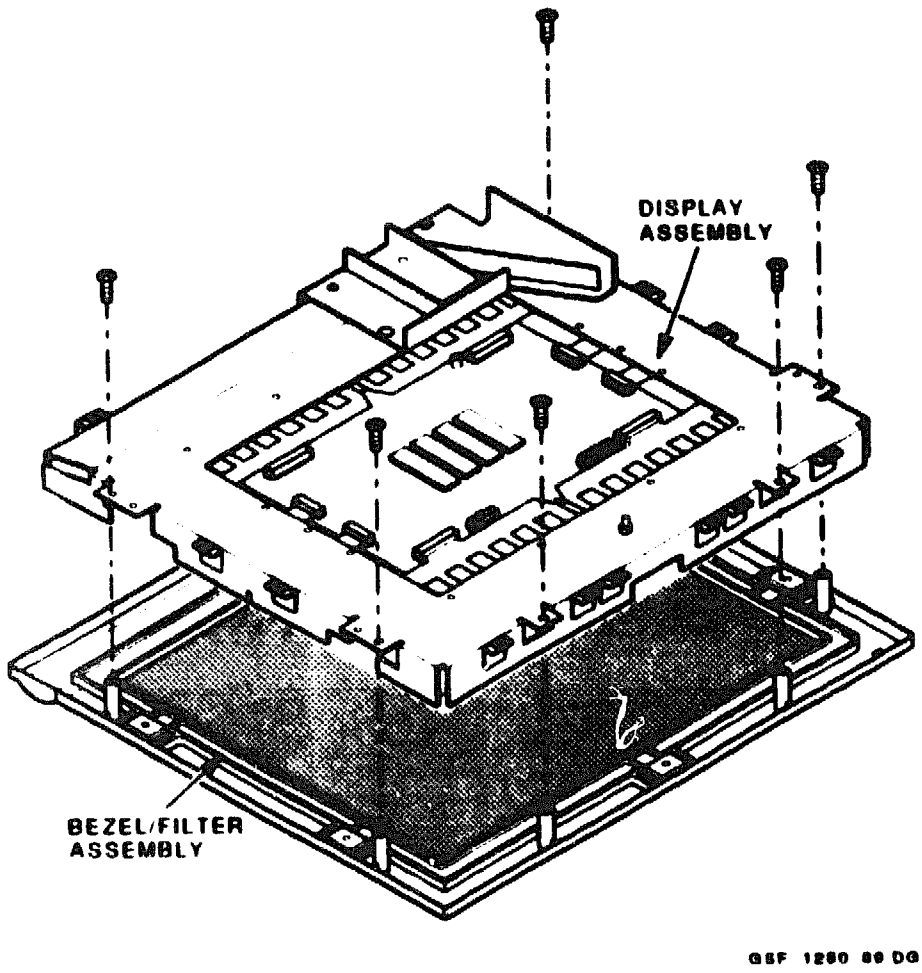


Figure 3–11 Removing the Display Assembly

3.12 Glass Filter Screen Removal

Remove the glass filter screen as follows:

1 Disconnect the external cables (Section 3.3).

2 Open the monitor (Section 3.4).

3 Remove the display assembly (Section 3.10).

CAUTION
The glass screen display is very fragile. Use care to avoid scratching its surface.

4 Remove the six screws that secure the retainer to the bezel (Figure 3–12).

5 Remove the retainer and the filter screen.

To replace the glass filter screen, perform these steps in reverse order.

NOTE
When installing a new filter, be sure the glass (antiglare) side is facing the user. Check the proper position of the filter by looking through it. The filter is positioned correctly if the glare of any shiny object behind it is reduced.

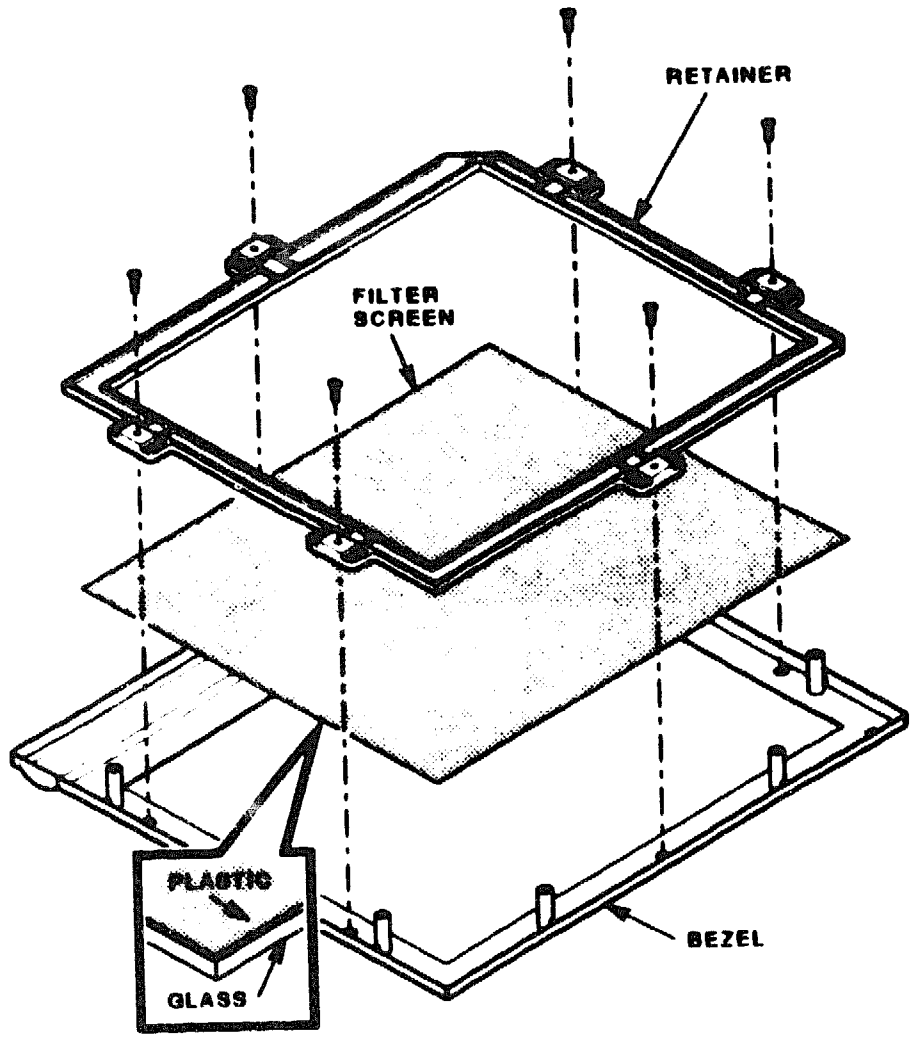


Figure 3–12 Retainer and Glass Filter Screen Removal

3.13 Closing the VRE01 Monitor

Close the VRE01 monitor as follows:

1. Be sure the power LED harness and the switch harness are positioned tight against the monitor rear cover. Make sure the switch harness is routed as shown in Figure 3–13.

CAUTION
If the power LED harness and the switch harness are not routed correctly, the sharp edges of the display assembly will cut these harnesses when you close the monitor.

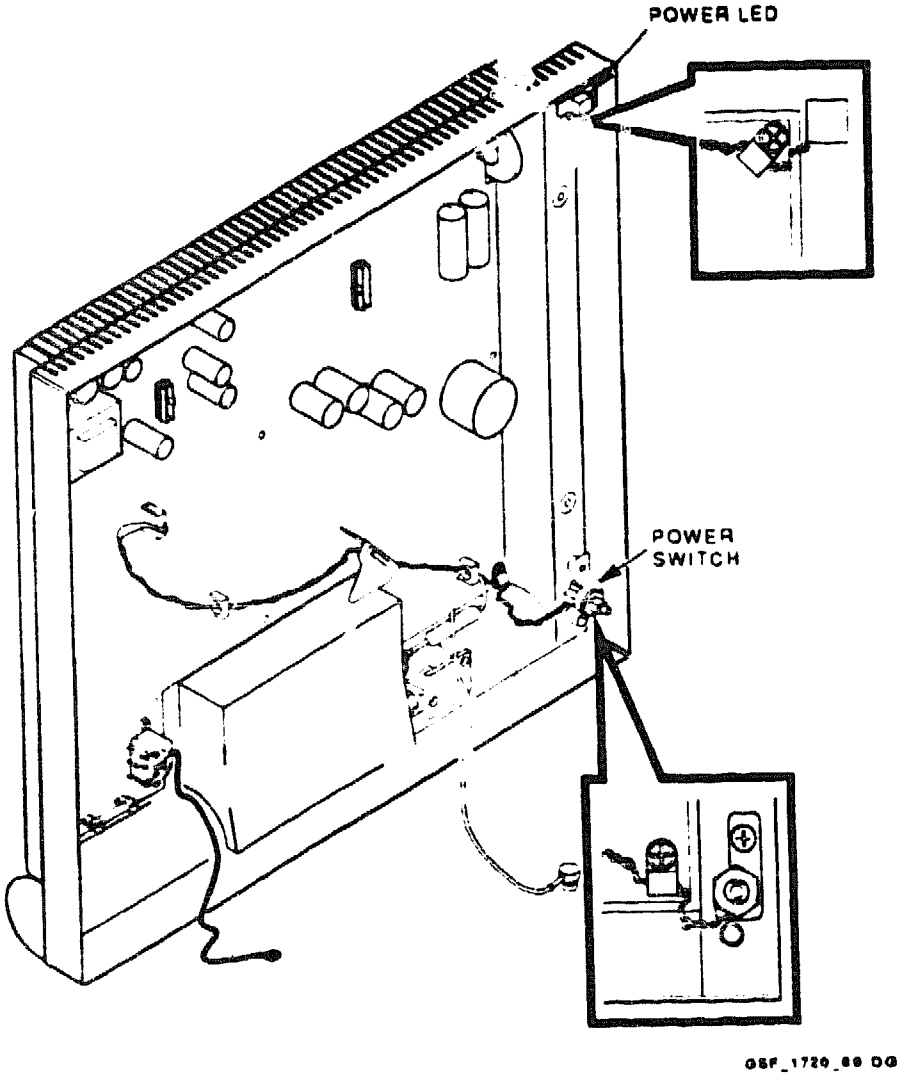


Figure 3–13 Positioning Harnesses to Avoid Damage

2. Ensure that all cables are connected, especially the internal video cable and the grounding wire. When installing the internal flat cables, depress the side tabs of the connectors before you plug them in.

   NOTE
   If for any reason you replace the rear enclosure, to ensure compatibility also replace the power switch cover button (PN 74-38493-01).

3. Ensure the spring from the power switch cover button is properly installed in the spring stud in the rear cover below the power switch. See Figure 3–14. (Early units may vary on location of spring stud.)

4. Close and keep the rear cover and the display assembly together with one hand while you carefully install and tighten the two captive screws into the tilt block with the other hand.

5. Install and tighten the six screws on the rear cover.

6. Install the plastic screw into the video strap bracket.

7. Attach the external cables and the power cord (Figure 3–15).

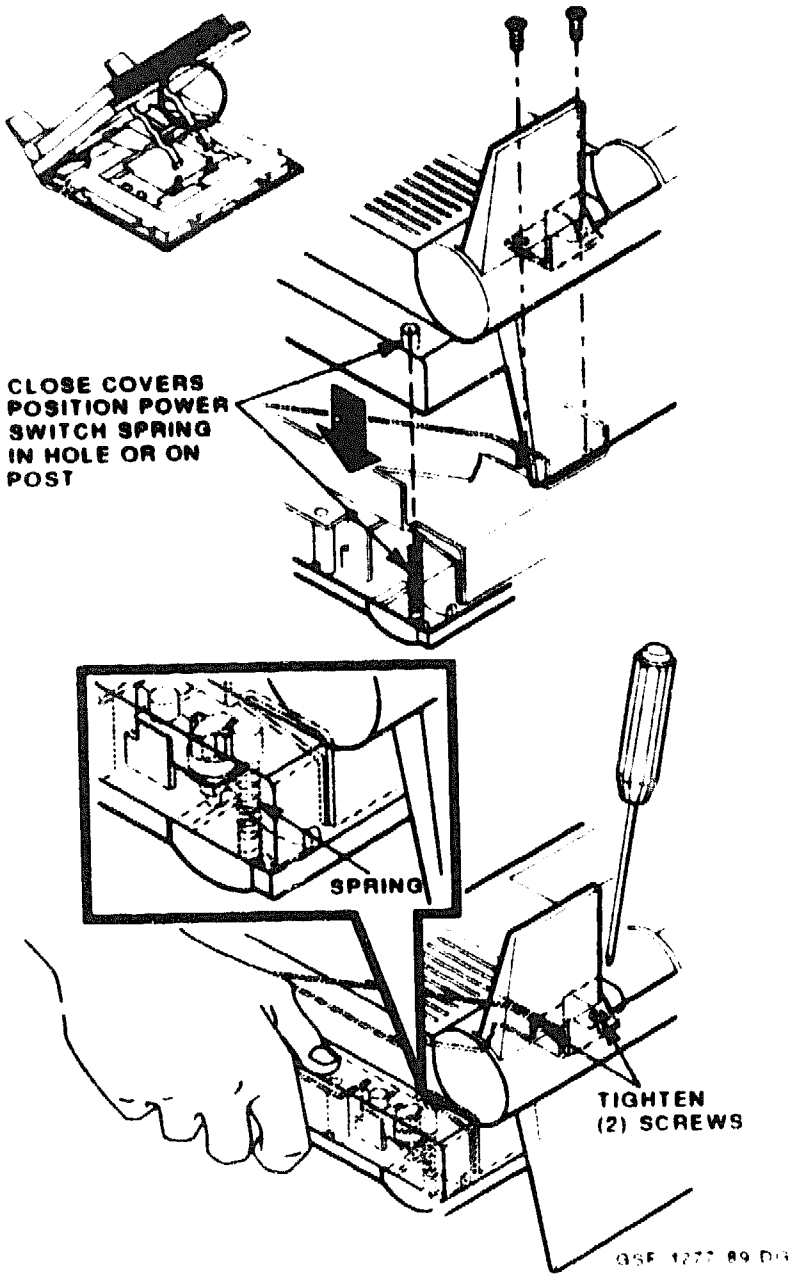


Figure 3–14 Closing the VRE01 Monitor

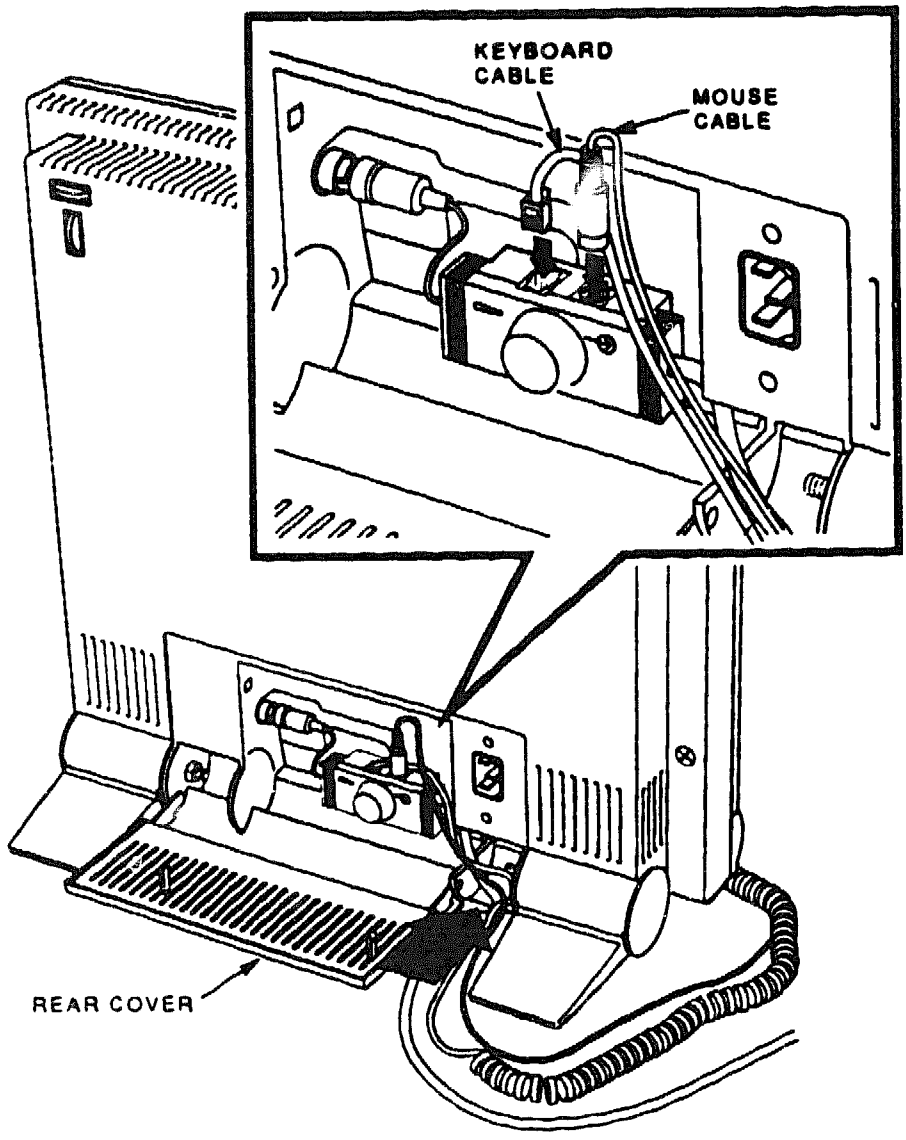


Figure 3–15 Connecting External Cables and Closing Rear Cover

WARNING
To maintain safety integrity of the enclosure, the rear (detachable) cover must be in place and closed for operation.

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