

# VT 240 Series

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Pocket Service Guide

digital



EK-VT240-PS-001

# VT 240 Series

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## Pocket Service Guide

Digital Equipment Corporation

1st Edition, January 1984

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## INTRODUCTION

### PURPOSE

This pocket service guide provides the following information for servicing the VT240 series terminal.

- Testing and troubleshooting the field replaceable units (FRU)
- FRU removal and replacement
- Video monitor alignment
- Related documentation
- Cable information
- Physical functional diagrams

### Notes, Cautions, and Warnings

Notes, cautions, and warnings appear throughout this pocket service guide. They are defined as follows:

- Note: Contains an important message alerting you to information you should be aware of.
- Caution: Contains information essential to the safety of the equipment and software.
- Warning: Contains information essential to the safety of personnel.

### PRODUCT

The VT240 is a 1/4 page, customer installable, conversational terminal providing both text and graphics capabilities. This terminal features VT102 and VT125 compatibility.

The VT240 terminal supports multiple language versions of the LK201 corporate keyboard. The VT240 has an anti-glare monochromatic 12-inch (305 mm) monitor and is capable of displaying 24 rows of text in either 80- or 132-column formats. The ergonomically designed monitor tilt mechanism permits the user to adjust the screen for optimum viewing comfort. A color monitor and an integral modem are offered as options. Appendix E provides information for servicing the VT240 color monitor, model VR241-A.

The VT240 features three standard interface connectors: The EIA host port, a 25-pin (EIA RS-232-C and RS-423) male connector, is one method used to connect the terminal to the host computer. The

20 mA host port is another method of connecting the VT240 to the host computer. This connector is an 8-pin 20 mA female connector. The printer port, a 9-pin (EIA RS-232-C) male connector, is used to connect the terminal to a hard-copy printer. The VT240 operates only on full-duplex asynchronous communication lines.

#### TOOLS REQUIRED

The following tools are required to service the VT240 video terminal.

Tool	Part Number
VOM (volt ohmmeter)	29-13510-00
Slotted screwdriver, 3/16 inch	29-10988-00
Phillips screwdriver, no. 2	29-11005-00
Tuning wand	29-23189-00
Video alignment tool	29-23190-00
Video alignment template	29-24371-00
CRT screen cleaner	29-24791-00
Anode discharge tool	29-24717-00
VR241 adjustment tool	29-24746-00
EIA data loopback connector	12-15336-00
Printer port loopback connector	29-24795-00
20 mA loopback connector	70-15503-00

1  
TESTING AND TROUBLESHOOTING  
THE VT240 SERIES VIDEO TERMINAL

1.1 GENERAL

This chapter contains the information needed to perform the self-test functions and troubleshoot the VT240 series terminal. Refer to Appendix E if you have a color monitor.

1.2 TESTING AND TROUBLESHOOTING

There are a series of self-tests to help you isolate failures to the field replaceable units (FRUs). (See Appendix B.) These tests are designed to address 95% of the VT240's functionality. They are listed in Table 1-1.

If a test discloses a faulty FRU, adjust or replace the faulty unit. After adjusting or replacing a FRU, repeat all of the tests listed in Table 1-1 to ensure that your terminal operates properly.

NOTE

Each self-test forces a RESET of the terminal Set-Up features back to the saved defaults. The prerequisites must be Set-Up before invoking each self-test.

NOTE

IT IS IMPERATIVE THAT THE EIA PORT NOT BE CONNECTED TO A HOST WHEN INVOKING THE VT240 SELF-TESTS AND ALIGNMENT PATTERNS.

Table 1-1 Self-test Chart

Self-tests	Prerequisites	Sequence (See Note)
Power-up self-test (Para. 1.3)	None	Turn terminal power on.
Power-up self-test (Invoked after terminal is operating)	● SET-UP - Local - VT100	Once: ESC [ 4 ; 1 y Continuously: ESC [ 4 ; 1 ; 9 y
EIA Port Data Lines Loopback Self-test (Para. 1.4)	● SET-UP - Local - VT100 ● EIA loopback connector	Once: ESC [ 4 ; 2 y Continuously: ESC [ 4 ; 2 ; 9 y

**Table 1-1 Self-test Chart (Cont)**

Self-tests	Prerequisites	Sequence (See Note)
Printer Port External Loopback Self-test (Para. 1.5)	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Local</li> <li>- VT100</li> </ul> </li> <li>● Printer port loopback connector</li> </ul>	Once: ESC [ 4 ; 3 y Continuously: ESC [ 4 ; 3 ; 9 y
EIA Port Control Lines Loopback Self-test (Para. 1.6)	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Local</li> <li>- VT100</li> </ul> </li> <li>● EIA loopback connector</li> </ul>	Once: ESC [ 4 ; 6 y Continuously: ESC [ 4 ; 6 ; 9 y
20 mA Port Loopback Self-test (Para. 1.7)	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Local</li> <li>- VT100</li> </ul> </li> <li>● 20 mA loopback connector</li> </ul>	Once: ESC [ 4 ; 7 y Continuously: ESC [ 4 ; 7 ; 9 y
Integral Modem External Loopback Self-test (Para. 1.8)	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Local</li> <li>- VT100</li> </ul> </li> <li>● External modem</li> </ul>	Once: ESC [ 4 ; 15 y Continuously: ESC [ 4 ; 15 ; 9 y
Test Patterns	Prerequisites	Sequence (See Note)
Screen of Es	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Local</li> <li>- VT100</li> <li>- 80 columns/line</li> <li>- Monochrome Display</li> </ul> </li> </ul>	ESC # 8
Graphics Alignment Pattern	<ul style="list-style-type: none"> <li>● SET-UP                             <ul style="list-style-type: none"> <li>- Clear Display</li> <li>- Local</li> <li>- VT100</li> <li>- 80 columns/line</li> <li>- Reverse video</li> <li>- Monochrome Display</li> </ul> </li> </ul>	ESC Pp P [390,240] C [200]

**NOTE:**

Do not type spaces between the parameters of any escape sequence. The parameters are spaced as shown for clarity only.

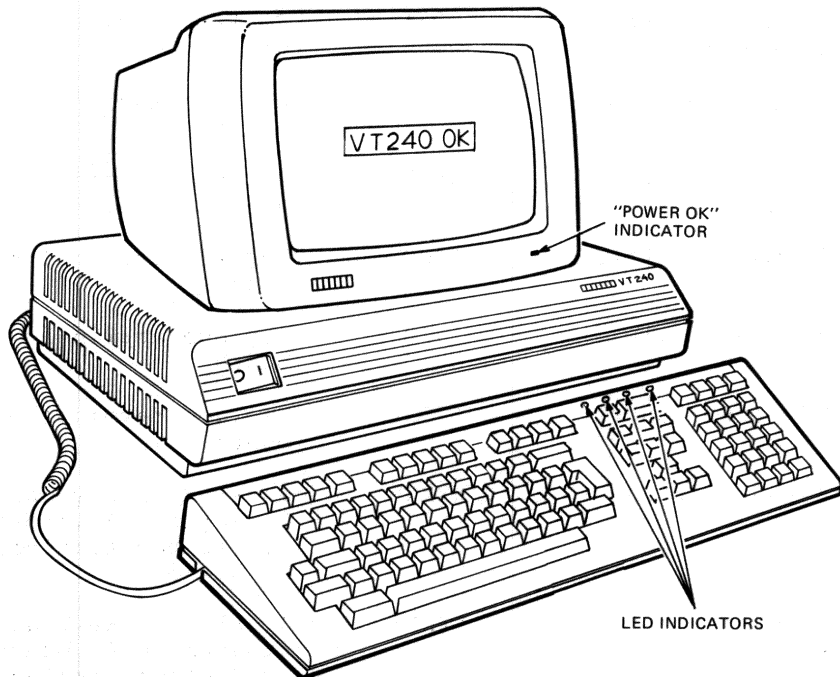
### 1.3 POWER-UP SELF-TEST

The power-up self-test checks the terminal's internal memory, the video circuitry, the keyboard, and makes a partial check of the communication and printer ports to see if they are operating properly.

A successful power-up self-test ends when:

- (1) the keyboard LED indicators are off (See Figure 1-1.)
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen. (See Figure 1-1.) This message will disappear from the screen the moment any character except X-ON is received by your terminal or if you let 30 minutes elapse.

Should an error occur, check your monitor first. Your monitor will display on the screen "VT240" accompanied by an error message, and your keyboard will generate two bell tones. The error messages are defined in Table 1-2. (See Paragraph 1.11.)



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Figure 1-1 Indication of Successful Self-test

Table 1-2 VT240 Error Messages

Error Message	LED Indicators Pattern	Corrective Action†
**NO ERROR MESSAGES - FATAL ERROR**	0000	Replace terminal controller board
**NO ERROR MESSAGES - FATAL ERROR**	0001	Replace terminal controller board
**NO ERROR MESSAGES - FATAL ERROR**	0010	Replace terminal controller board
**NO ERROR MESSAGES - FATAL ERROR**	0011	Replace terminal controller board
**NO ERROR MESSAGES - FATAL ERROR**	0100	Replace terminal controller board
**NO ERROR MESSAGES - FATAL ERROR**	0101	Replace terminal controller board
VT240 Display Processor Error -- 1	0110	Replace terminal controller board
VT240 Printer Port Error -- 2	0111	Replace terminal controller board
VT240 20 mA Port Error -- 3	1000	Replace terminal controller board
VT240 EIA Port Data Error -- 4	1000	Replace terminal controller board
VT240 EIA Port Control Error -- 5	1001	Replace terminal controller board
VT240 Keyboard Error -- 6	XXXX‡	1. Plug in keyboard 2. Replace keyboard 3. Replace terminal controller board
VT240 Keyboard Port Error -- 7	XXXX‡	1. Plug in keyboard 2. Replace keyboard 3. Replace terminal controller board
VT240 Modem Error -- 8	1010	See Modem Troubleshoot
VT240 Monitor Error -- 9	1011	1. Plug in VR201 monitor (LED indicator only) 2. Reverse monitor cable

Table 1-2 VT240 Error Messages (Cont)

Error Message	LED Indicators Pattern	Corrective Action†
VT240 NVR Error -- 10	1100	3. Replace monitor cable Replace terminal controller board
VT240 Display Memory Error -- 11	1101	Replace terminal controller board
VT240 Video Error -- 12	1110	Replace terminal controller board

† To replace terminal controller board, see Paragraph 2.3.

† X denotes varying LED display. To replace keyboard, see Paragraph 2.8.

NOTE:

1 = on, 0 = off

If an error occurs that makes it impossible for you to continue operating your monitor, the keyboard LED indicators will also display the error code, which is defined in Table 1-2. (See Paragraph 1.11.)

Should a problem occur, consult Paragraph 1.12 where Table 1-3 relates common symptoms and their probable causes and suggests appropriate corrective actions.

Start the power-up self-test with one of the following two methods:

1. Turn the power to the VT240 on (the power-up self-test is invoked automatically each time the terminal is turned on);
2. Or type one of the following sequences to conduct the power-up self-test. (Read the following NOTE first.)

NOTE

If you are already operating your terminal, enter SET-UP and put your terminal in local and in the VT100 mode.

ESC [ 4 ; 1 y (Performs test once)

ESC [ 4 ; 1 ; 9 y (Performs test continuously)

NOTE

The continuously running power-up self-test ends only if an error occurs or the power is turned off. As each test in the sequence ends successfully, the keyboard generates a single bell tone.

When you invoke the power-up self-test:

- Initially, all LED indicators go on. When the test has been completed successfully, the LED indicators go off
- The keyboard generates a single bell tone
- A "VT240 OK" message enclosed by a rectangle will appear on the screen.

**1.4 EIA PORT DATA LINES LOOPBACK SELF-TEST**

In the EIA port data lines loopback self-test, the terminal's transmit and receive lines are connected together with a data loopback connector. (See Figure 1-2.) The terminal transmits a predefined set of characters on its transmit line and receives them on its receive line. It then compares the output characters to the input characters and displays an error code at the LEDs and an error message on the screen if the characters do not match. (See Paragraph 1.10.)

A successful test ends when:

- (1) the keyboard LED indicators are off;
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen.

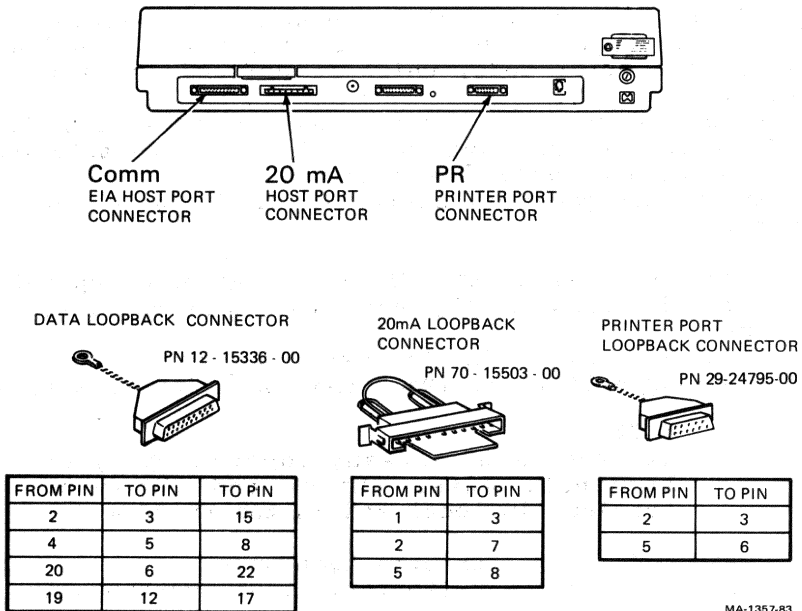


Figure 1-2 Rear Connector Panel of VT240



Perform the following steps to run the EIA port data lines loopback self-test.

1. Enter SET-UP and put your terminal in local and in the VT100 mode.
2. Connect the data loopback connector (PN 12-15336-00) to the host port. (See Figure 1-2.)
3. Type one of the following sequences to perform the data loopback self-test.

ESC [ 4 ; 2 y (Performs test once)

ESC [ 4 ; 2 ; 9 y (Performs test continuously)

#### NOTE

The continuously running test ends only if an error occurs or the power is turned off. The keyboard generates a bell tone each time the test is completed successfully.

If the EIA port data lines loopback self-test finds an error, your terminal will display "VT240 EIA Port Data Error -- 4" on the screen and an error code at the keyboard LED indicators. (See paragraph 1.11.)

#### 1.5 PRINTER PORT EXTERNAL LOOPBACK SELF-TEST

In the printer port loopback self-test, the printer port transmit and receive lines are connected together using the printer port loopback connector. (See Figure 1-2.) The terminal transmits a predefined set of characters on its transmit line and receives them on its receive line. It then compares the input characters with the output characters and displays an error message on the screen and an error code at the LED indicators if they do not match. (See Paragraph 1.11.)

A successful test ends when:

- (1) the keyboard LED indicators are off;
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen.

Perform the following steps to run the printer port loopback self-test.

1. Enter SET-UP and put your terminal in local and in the VT100 mode.
2. Connect the printer port loopback connector to the printer port. (See Figure 1-2.)
3. Type one of the following sequences to perform the printer port external loopback test.

ESC [ 4 ; 3 y (Performs test once)

ESC [ 4 ; 3 ; 9 y (Performs test continuously)

NOTE

The continuously running test ends only if an error occurs or the power is turned off. The keyboard generates a bell tone each time the test is completed successfully.

If the printer port loopback self-test finds an error, your terminal will display "VT240 Printer Port Error -- 2" on the screen and an error code at the keyboard LED indicators. (See Paragraph 1.11.)

1.6 EIA PORT CONTROL LINES LOOPBACK SELF-TEST

This procedure tests data terminal ready, request to send, carrier detect, data set ready, and clear to send.

A successful test ends when:

- (1) the keyboard LED indicators are off;
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen.

Perform the following steps to run the EIA port control lines loopback self-test.

1. Enter SET-UP and put your terminal in local and in the VT100 mode.
2. Install EIA loopback connector (PN 12-15336-00) to EIA host port. (See Figure 1-2.)
3. Type one of the following sequences to perform the EIA port control lines loopback self-test.

ESC [ 4 ; 6 y (Performs test once)

ESC [ 4 ; 6 ; 9 y (Performs test continuously)

NOTE

The continuously running test ends only if an error occurs or the power is turned off. The keyboard generates a bell tone each time the test is completed successfully.

If the EIA port control lines loopback self-test finds an error, your terminal will display "VT240 EIA Port Control Error -- 5" on the screen and an error code at the keyboard LED indicators. (See Paragraph 1.11.)

1.7 20 mA PORT LOOPBACK SELF-TEST

In the 20 mA port loopback self-test, the VT240's transmit and receive lines are connected together with a 20 mA data loopback connector. (See Figure 1-2.) The terminal transmits a predefined set of characters on its transmit line and receives them on its

receive line. It then compares the output characters to the input characters and displays an error message on the screen and an error code at the LED indicators if the characters do not match. (See Paragraph 1.11.)

A successful test ends when:

- (1) the keyboard LED indicators (See Figure 1-1.) are off;
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen.

Perform the following steps to run the 20 mA port loopback self-test.

1. Enter SET-UP and put your terminal in local and in the VT100 mode.
2. Connect the 20 mA loopback connector (PN 70-15503-00) to 20 mA port. (See Figure 1-2.)
3. Type one of the following sequences.

ESC [ 4 ; 7 y (Performs test once)

ESC [ 4 ; 7 ; 9 y (Performs test continuously)

#### NOTE

The continuously running test ends only if an error occurs or the power is turned off. The keyboard generates a bell tone each time the test is completed successfully.

If the 20 mA port loopback self-test finds an error, your VT240 will display "VT240 20 mA Port Error -- 3 on the screen and an error code at the keyboard LED indicators. (See Paragraph 1.11.)

#### 1.8 INTEGRAL MODEM EXTERNAL LOOPBACK SELF-TEST

In the integral modem external loopback self-test, a predefined set of characters is transmitted to the modem by the VT240 and looped back to the VT240 again. The VT240 then compares the transmitted characters to the received characters and displays an error message on the screen and an error code at the LED indicators (See Figure 1-1.) if the characters do not match. (See Paragraph 1.11.)

A successful test ends when:

- (1) the keyboard LED indicators (See Figure 1-1.) are off;
- (2) the keyboard generates a bell tone; and
- (3) a "VT240 OK" message enclosed by a rectangle appears on the screen.

Perform the following steps to run the integral modem external loopback self-test.

1. Enter SET-UP and put your terminal in local and in the VT100 mode.
2. Connect the VT240 modem to the EIA host computer port. (See Figure 1-2.)
3. Type one of the following sequences to perform the integral modem external loopback self-test.

ESC [ 4 ; 15 y (Performs test once)

ESC [ 4 ; 15 ; 9 y (Performs test continuously)

#### NOTE

The continuously running test ends only if an error occurs or the power is turned off. The keyboard generates a bell tone each time the test is completed successfully.

If the integral modem external loop self-test finds an error, your terminal will display "VT240 Modem Error -- 8" on the screen and an error code at the keyboard LED indicators. (See Paragraph 1.11.)

#### 1.9 SCREEN ALIGNMENT TEST

The screen alignment test fills the screen with uppercase Es for making display height, width and linearity adjustments.

Perform the following steps to conduct the screen alignment self-test.

1. Enter SET-UP and put terminal in:
  - a. 80 columns per line
  - b. VT100 mode
  - c. Local
  - d. Normal video (light text, dark screen)
  - e. Monochrome display
2. Type ESC # 8. (Your screen will display all capital Es.)
3. Refer to Chapter 3 for a complete description of all monitor adjustments used with this test pattern.
4. To remove the test pattern from the screen, enter SET-UP and select "CLEAR DISPLAY."

#### 1.10 PRINTER PROBLEMS

If the printer does not print, perform the following steps to isolate the problem to the printer or to the video terminal.

1. Perform the power-up self-test. (See Paragraph 1.3.) If the terminal passes the self-test, go to step 2.
2. Perform the printer port external loopback self-test. (See Paragraph 1.5.) If your terminal passes this test, go to step 3.

#### NOTE

If your terminal passes the above tests, it is running correctly; the problem is not a malfunctioning terminal.

3. Test the printer. (Consult your printer pocket service guide for the correct procedure.) If your printer is operational, proceed to step 4.
4. Check the following SET-UP features to make certain that your VT240 and your printer are compatible.
  - Baud rate (VT240 and printer)
  - Data bits per character (VT240 and printer)
  - Parity (VT240 and printer)
  - "Printer Ready" must appear on VT240 SET-UP status line.
  - Printer must be set to "Full Duplex."
5. Check for correct cable between your terminal and the printer. (See Appendix C.) Make certain the connectors are securely fastened at both ends of the cable.
6. Perform steps 1 and 2 of the Screen Alignment Test, Paragraph 1.9.
7. Press the PRINT SCREEN key. The video display should be printed out on the printer if the printer is operating correctly.

#### 1.11 SELF-TEST ERROR CODES

Should your monitor display an error message on the screen, refer to Table 1-2. Each error message includes a reference to the FRU that must be replaced to correct the problem.

In the event of a video problem refer to Table 1-2 where the encoding for the LED indicators (See Figure 1-1.) will also disclose the faulty component. The LED indicators will always display the error code for the test currently being run. Only upon completing this test successfully will your VT240 terminal clear the error readout.

Refer to Table 1-3 for other troubleshooting procedures.

#### 1.12 TROUBLESHOOTING MISCELLANEOUS PROBLEMS

Table 1-3 relates common symptoms to their probable causes and suggests appropriate corrective actions.

Table 1-3 VT240 Symptom/Solution Troubleshooting Chart

Symptom	Probable Cause	Corrective Action
No "VT240 OK" DISPLAY "POWER OK" INDICATOR OFF NO KEYBOARD BELLTONE FAN OFF	Not plugged in, or no power at wall outlet	Plug in VT240, or try another outlet.
	Voltage Selection Switch on wrong setting	Set switch to correct setting.
	Power fuse	Replace if fuse open.
	Power supply connection	Check power supply connections.
	Power supply faulty	Replace power supply chassis.
	System box	Replace system box.
	AC line cord	Check for opens/shorts.
NO "VT240 OK" DISPLAY "POWER OK" INDICATOR ON NO KEYBOARD BELLTONE FAN ON	Terminal controller board	Replace terminal controller board.
NO "VT240 OK" DISPLAY "POWER OK" INDICATOR ON KEYBOARD BELLTONE PRESENT	Brightness set too low	Adjust contrast and brightness knobs on VR201 monitor.
	Terminal controller board	Replace terminal controller board.
	Monitor	Replace VR201 monitor.
"VT240 OK" DISPLAY PRESENT "POWER OK" INDICATOR ON KEYBOARD BELLTONE PRESENT VT240 CANNOT COMMUNICATE WITH HOST FAN IS ON	VT240 host port connection loose	Check to see if host plugged in.
	Host port circuits faulty	Run EIA or 20 mA loopback test. If no failure occurs, enter SET-UP and check parity, data bits, and baud rate.
	Wrong comm. settings	
"VT240 OK" DISPLAY PRESENT "POWER OK" INDICATOR ON KEYBOARD BELLTONE PRESENT FAN OFF	Fan faulty	Replace power supply chassis.

Table 1-3 VT240 Symptom/Solution Troubleshooting Chart (Cont)

Symptom	Probable Cause	Corrective Action
RANDOM CHARACTERS APPEAR ON SCREEN	Wrong comm. settings	Enter SET-UP and check parity, data bits, and baud rate.
	Terminal controller board	Replace terminal controller board.
ONLY A HORIZONTAL OR VERTICAL LINE APPEARS ON SCREEN	Monitor faulty	Replace VR201 monitor.
	Terminal controller board	Replace terminal controller board.
SCREEN DISPLAY DISTORTED	Monitor is out of alignment	Align monitor.
	Monitor faulty	Replace VR201 monitor.
SCREEN DISPLAY JITTERY	Monitor is out of alignment	Align monitor.
	Monitor faulty	Replace VR201 monitor.
NO KEYBOARD BELLTONE	Keyboard speaker bad	Replace keyboard.
DIFFERENT CHARACTERS APPEAR ON SCREEN THAN WERE TYPED ON KEYBOARD IN LOCAL MODE	Alternate character set selected	Clear with RESET field in Set-up.
	Keyboard	Replace keyboard.
	Terminal controller board	Replace terminal controller board.
DIFFERENT CHARACTERS APPEAR ON SCREEN THAN WERE TYPED ON KEYBOARD ON LINE WITH HOST (TERM OK IN LOCAL)	Transmit and receive speeds are set wrong	Set speeds to match host.
	Bits per character set wrong	Set bits to match.
	Parity is set wrong	Set parity to match host.
	Stop bits set wrong	Set to match host.
TERMINAL DISPLAY DOES NOT SCROLL HOLD SCREEN INDICATOR IS ON	"Hold Screen" mode enabled	Press the "Hold Screen" key to disable.

Table 1-3 VT240 Symptom/Solution Troubleshooting Chart (Cont)

Symptom	Probable Cause	Corrective Action
TERMINAL APPEARS "LOCKED" DOES NOT RESPOND TO DATA FROM HOST		Clear terminal with "CLEAR COMM" field in Set-up.  Cycle power.
SCREEN GOES BLANK AFTER SUCCESSFUL POWER UP THEN INACTIVITY FOR HALF HOUR POWER OK LED ON	CRT saver feature on	Press any key to reactivate screen.
MESSAGES ARE INCOMPLETE	XON/XOFF not selected	Enable in Set-up.
	Terminal controller board	Replace terminal controller board.
	Host port connections	Check host ports.
TERMINAL DOES NOT RESPOND TO ESCAPE SEQUENCES	Incorrect mode selected	Ensure that terminal Set-up prerequisites are correct for escape sequence desired. Refer to Table 1-1.



## 2

### FRU REMOVAL AND REPLACEMENT

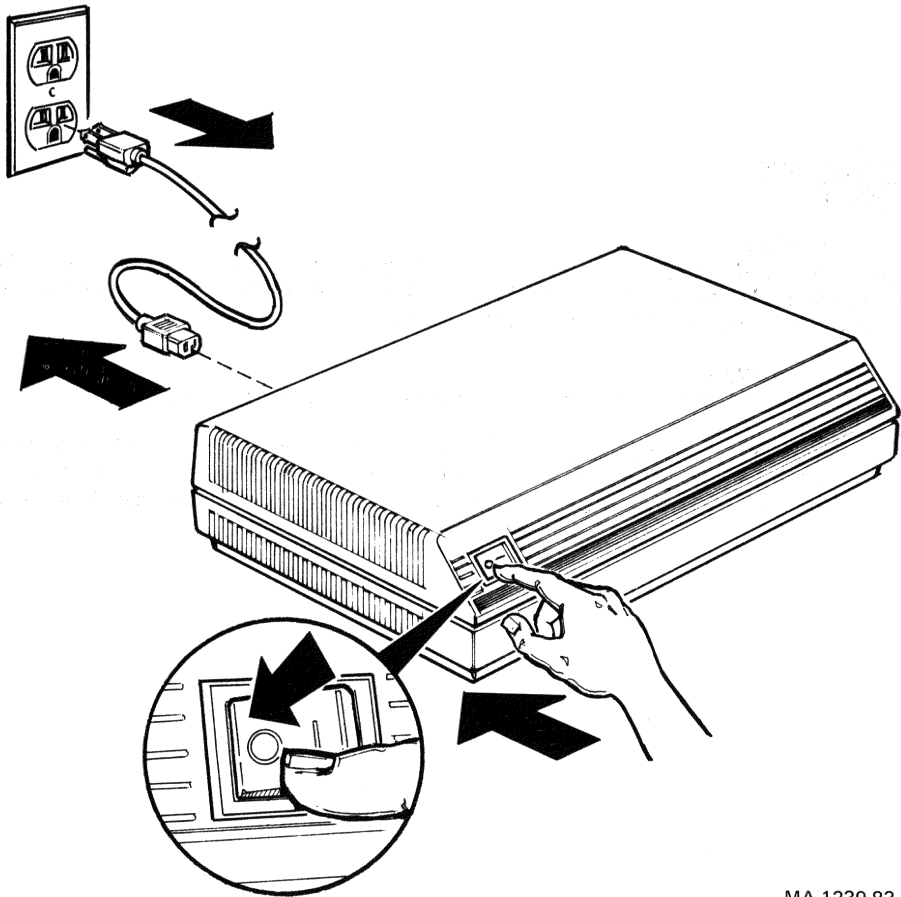
#### 2.1 GENERAL

The removal and replacement procedures of FRUs for the VT240 series terminal are described in this chapter. The Recommended Spares List is given in Paragraph 2.9.

#### 2.2 TOP COVER

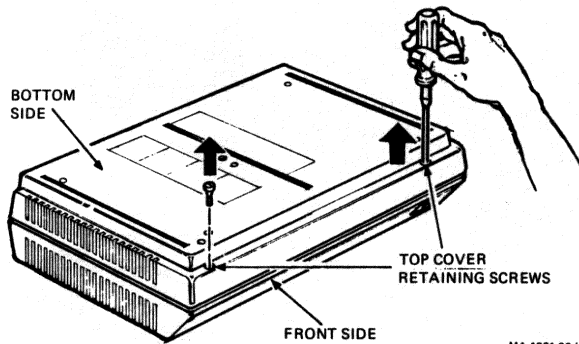
Perform the following steps to remove the top cover.

1. Turn the system box power switch to "0" (off position) and remove the power cord from the wall outlet and from the power cord connector on the rear of the system box.



MA-1230-83

2. Disconnect all other cables, if applicable, from the rear panel of the system box including:
  - EIA host port cable
  - 20 mA host port cable
  - composite video output cable
  - video monitor cable
  - printer port cable
  - keyboard cable
  - modem cables
  
3. Position system box with bottom side up as shown below and remove the two top cover retaining screws with a 7/32 inch slotted screwdriver.



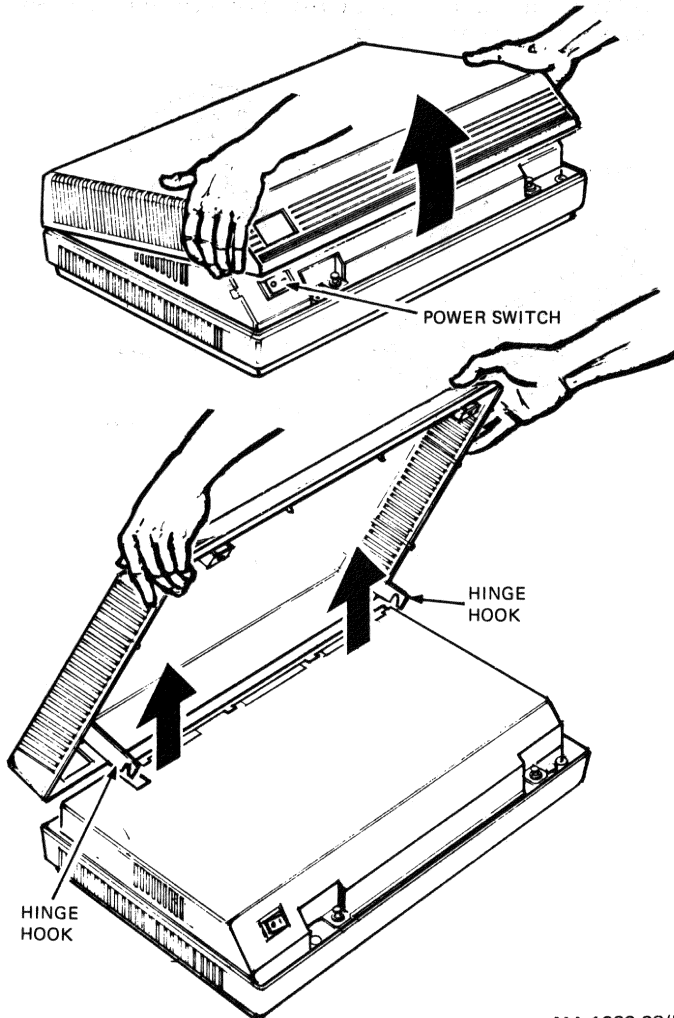
MA-1231-83 (P)

4. Reposition the system box as shown below. Lift the cover up from the front and pull forward to release the hinge hooks.

**NOTE**

You may have to press the power switch on the front of the system box before the top cover can be lifted free of the bottom cover.

5. To install the top cover, perform steps 1--4 in reverse.

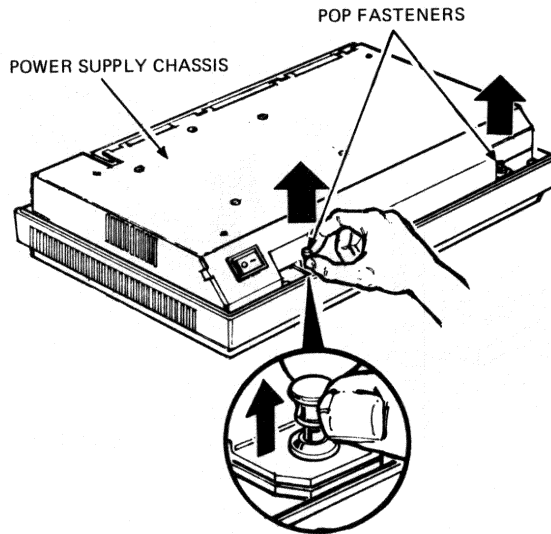


MA-1232-83(P)

### 2.3 POWER SUPPLY CHASSIS

Perform the following steps to remove the power supply chassis.

1. Remove the top cover. (See Paragraph 2.2.)
2. Pull up on the two pop fasteners located on the front of the power supply chassis.

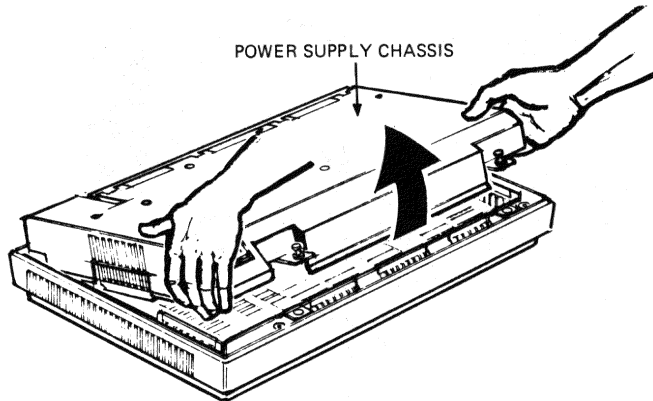


MA-1233-83(P)

3. Lift front of power supply chassis just enough to get your fingers under the front edge as shown below.

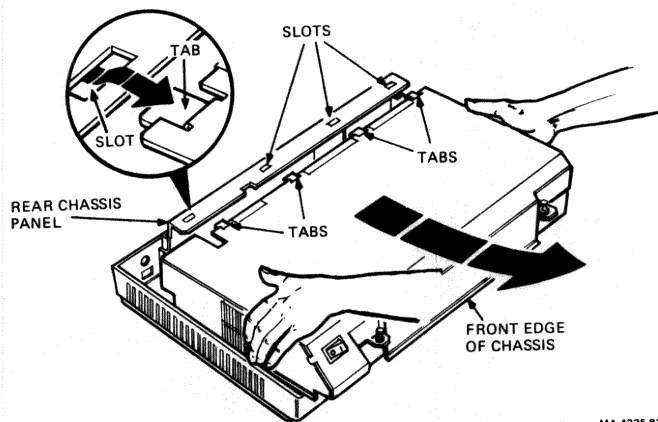
**NOTE**

Power supply chassis is firmly in place and may require firm pressure to free it once the pop fasteners have been released.



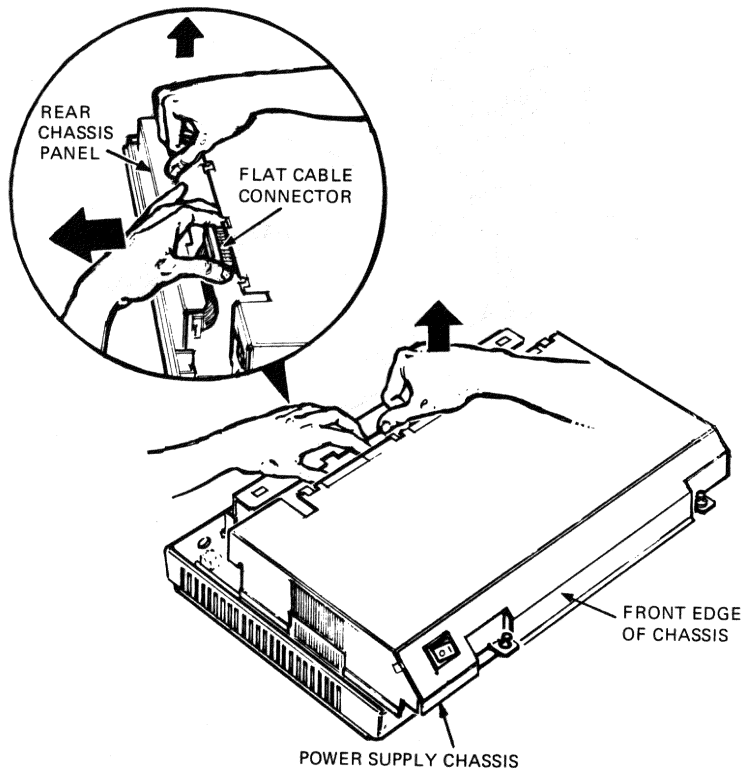
MA-1234-83(P)

4. Cautiously work the power supply chassis away from the rear chassis panel until the tabs on the power supply chassis are disengaged from the slots in the rear chassis panel.



MA-1236-83

5. Disconnect the power supply cable connector from the power supply, which is mounted on the bottom side of the power supply chassis. Put the power supply chassis aside.



MA-1236-83(P)



6. To install the power supply chassis, perform steps 1--5 in reverse.

#### 2.4 TERMINAL CONTROLLER BOARD

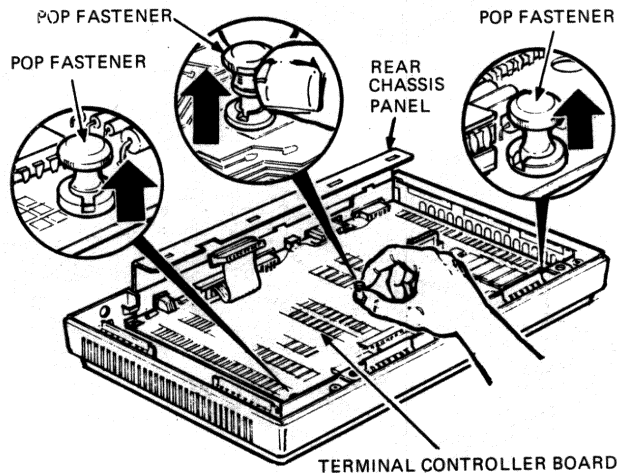
Perform the following steps to remove the terminal controller board.

1. Remove the access cover. (See Paragraph 2.2.)
2. Remove the power supply chassis. (See Paragraph 2.3.)

#### NOTE

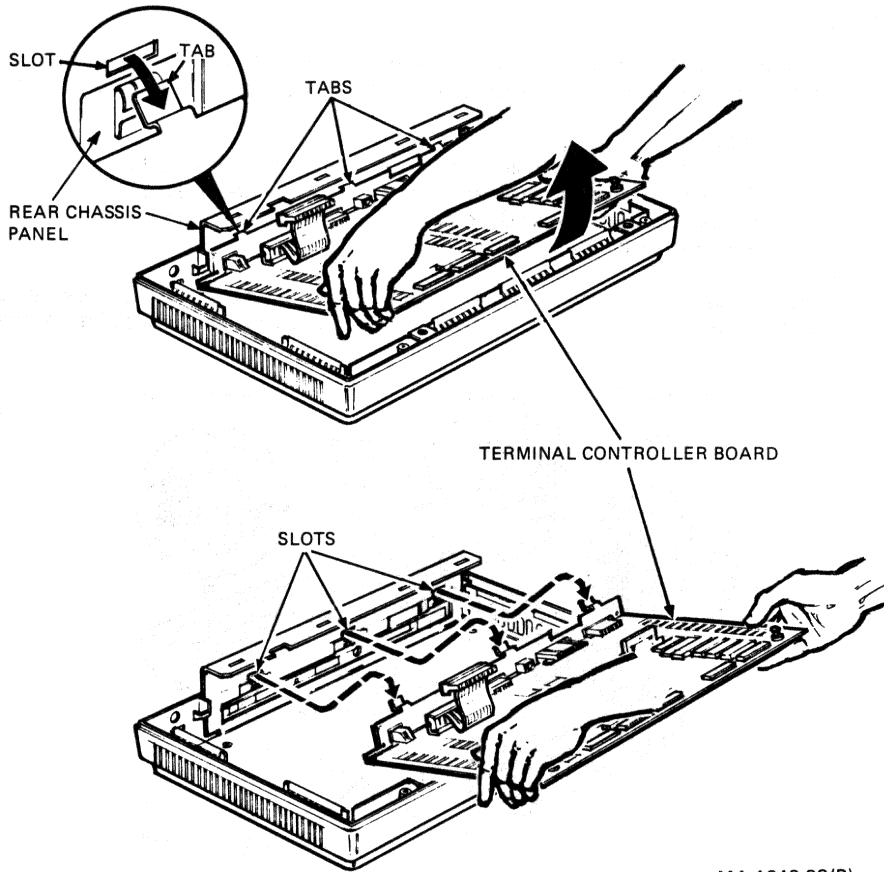
If an integral modem has been installed, it must be removed before the terminal controller board can be replaced. (See Paragraph 2.7.)

3. Pull up on the three pop fasteners that secure the terminal controller board to the bottom chassis panel.



MA-1248-83(P)

4. Remove the terminal controller board by disengaging the tabs from the rear chassis panel. Remove DC power cable from terminal controller board.



MA-1249-83(P)

5. To install the terminal controller board, perform steps 1--7 in reverse.

**CAUTION**

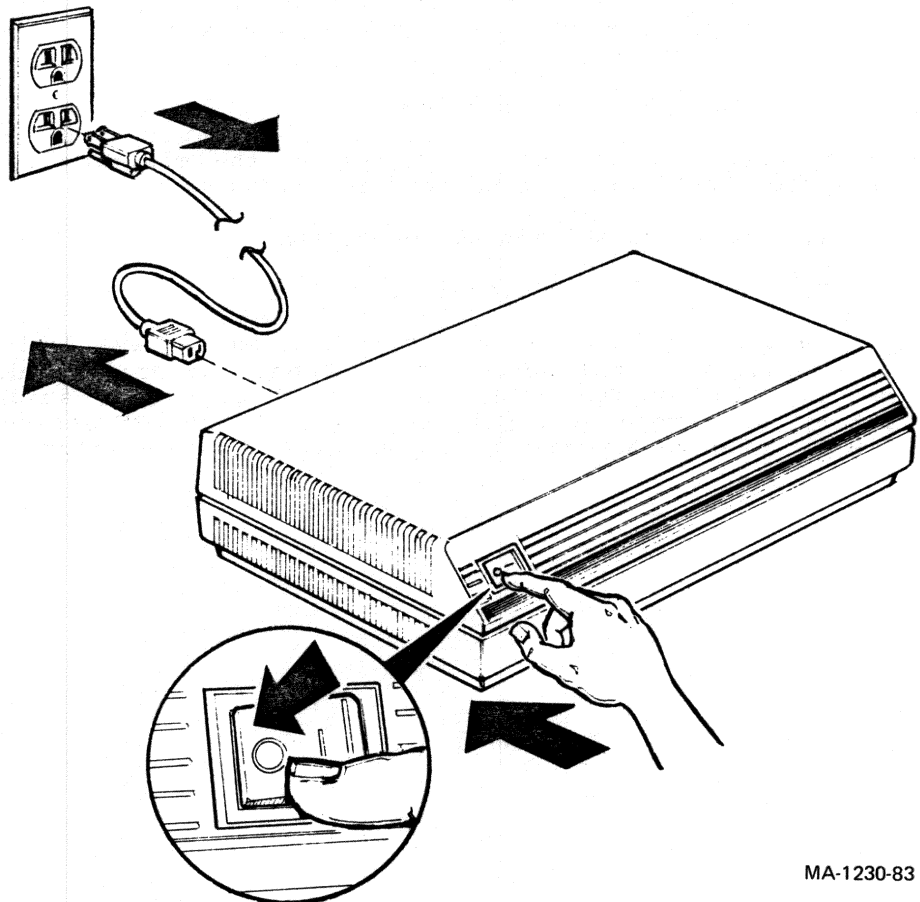
Before pressing down the pop fasteners, make certain that the bottom of the fasteners are well-seated in their retaining holes.

**2.5 SYSTEM BOX**

If the screen is blank or if the "Power OK" indicator on the rear panel of the system box is off, and a check of the probable defective devices such as the wall socket, power cord, fuse, terminal controller board, and power supply have not corrected the problem, exchange the system box (whole option swap).

Perform the following steps to exchange the system box.

1. Turn the system box power switch off and remove the power cord from the wall outlet and from the power cord connector on the rear of the system box.



MA-1230-83

2. Disconnect the following cables from the rear panel of the system box, including:
  - EIA host port cable
  - 20 mA host port cable
  - composite video output cable
  - video monitor cable
  - printer port cable
  - keyboard cable
  - modem cables
3. To install the new system box, perform steps 1 and 2 in reverse.

#### 2.6 VT240 SERIES MONITOR

If the error message on your screen indicates, "VT240 MONITOR ERROR -- 9," the system has failed to sense the "monitor present" pin on the monitor cable. When this occurs one of two conditions exist:

1. Cable is connected in reverse of normal. (The cable end with the 90° bend must be connected to the VR201 monitor.)
2. The cable is defective.

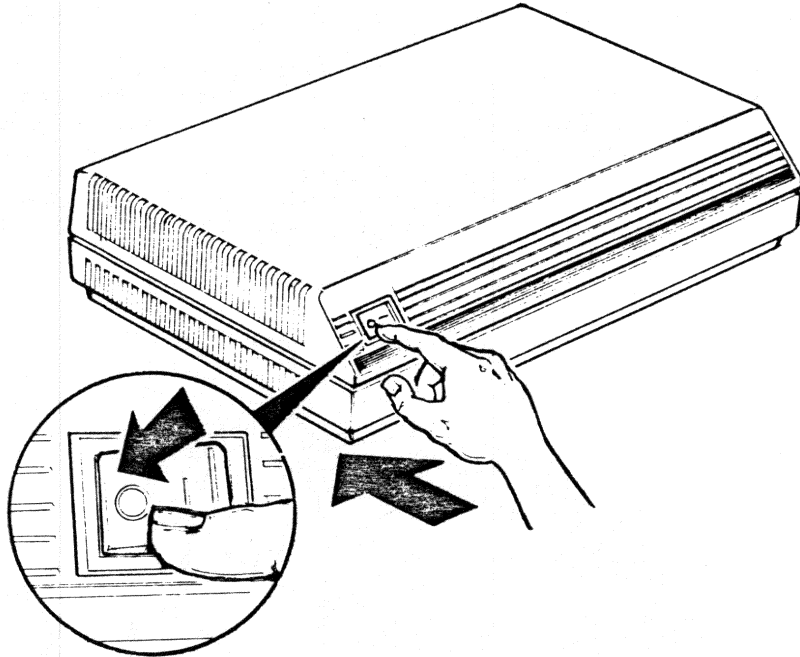
If no error indication is present on the monitor yet the LEDs indicate "1011" then one of two conditions exist:

1. Monitor cable is NOT connected.
2. The cable is defective.

If the VT240 series monitor is determined to have failed, and if video alignment and adjustment did not correct the difficulty, exchange the entire VT240 monitor (whole option swap). Do not attempt to remove or repair any part of the CRT assembly in the field. Refer to Appendix E if you have a color monitor.

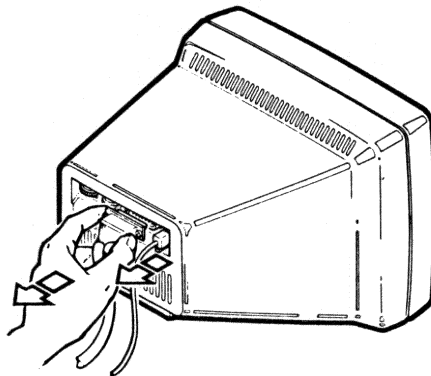
Perform the following steps to exchange the VT240 video monitor.

1. Turn the system box power switch to "0" (off position).



MA-1230-83A

2. Disconnect both the video monitor and keyboard cables from the rear of your VT240 monitor.
3. To install the new VT240 monitor, perform steps 1 and 2 in reverse.



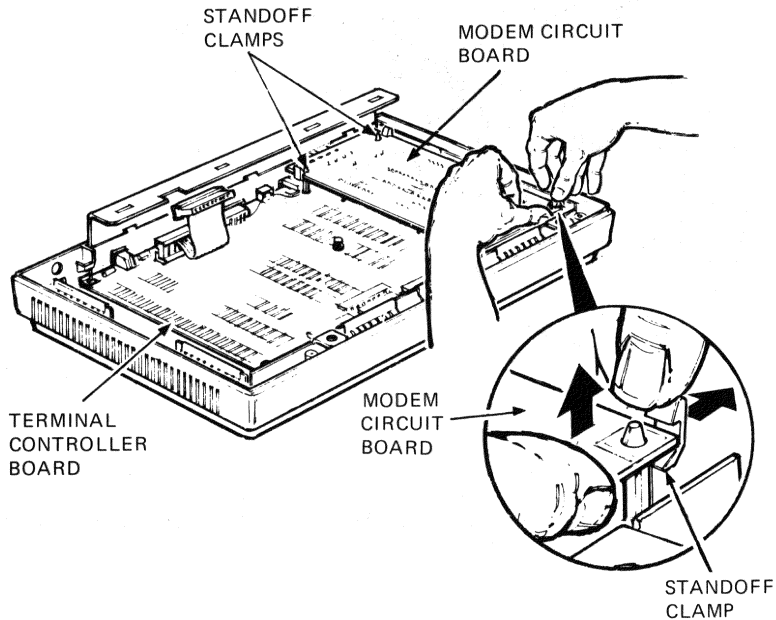
MA-0009A82

## 2.7 INTEGRAL MODEM

If the error message on your screen reads "VT240 Modem Error -- 8" or if the LED indicators indicate a faulty modem (See Table 1-2.), replace the modem.

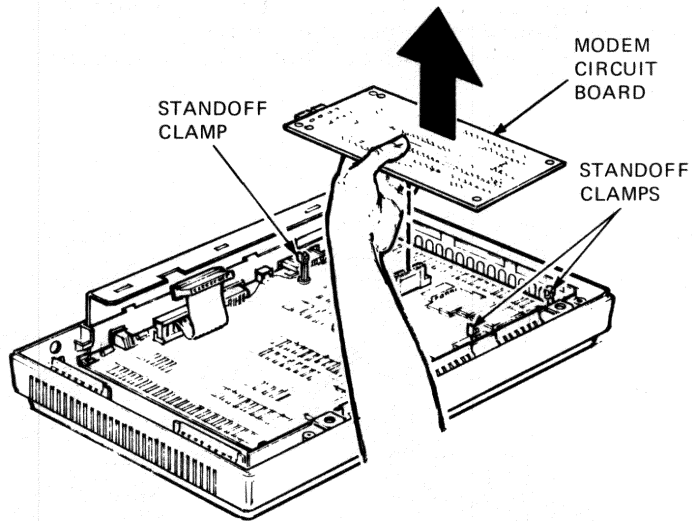
Perform the following steps to remove the modem.

1. Remove the top cover. (See Paragraph 2.2.)
2. Remove the power supply chassis. (See Paragraph 2.3.)
3. While holding the standoff clamp away from the modem circuit board with your thumb, lift the board free of the standoff with your free hand. (See illustration below.) In this manner, free the modem circuit board from all four (4) of the standoff clamps that secure it to the terminal controller board.



MA-1240-83(P)

4. Grasp the modem circuit board in the middle (as shown below) and lift it up to free it from the connector that secures the modem board to the terminal controller board.

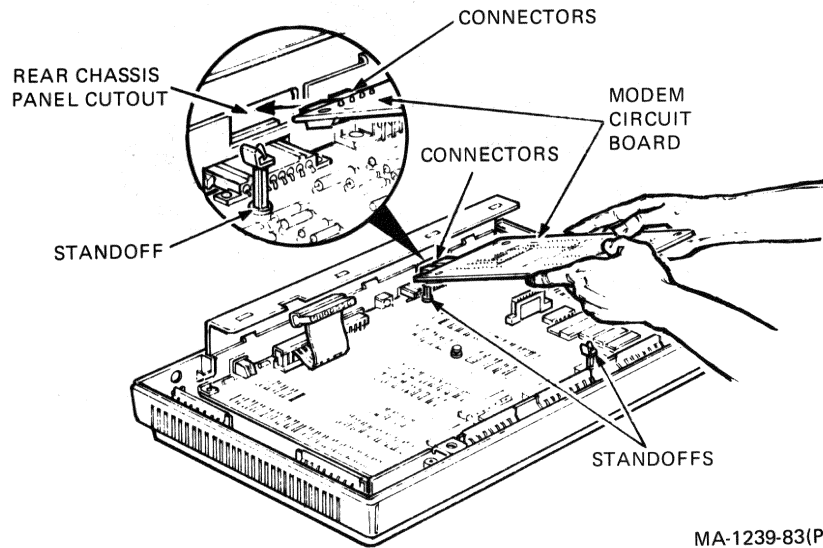


MA-1251-83(P)

5. To install the modem circuit board, perform steps 1--7 in reverse.

**NOTE**

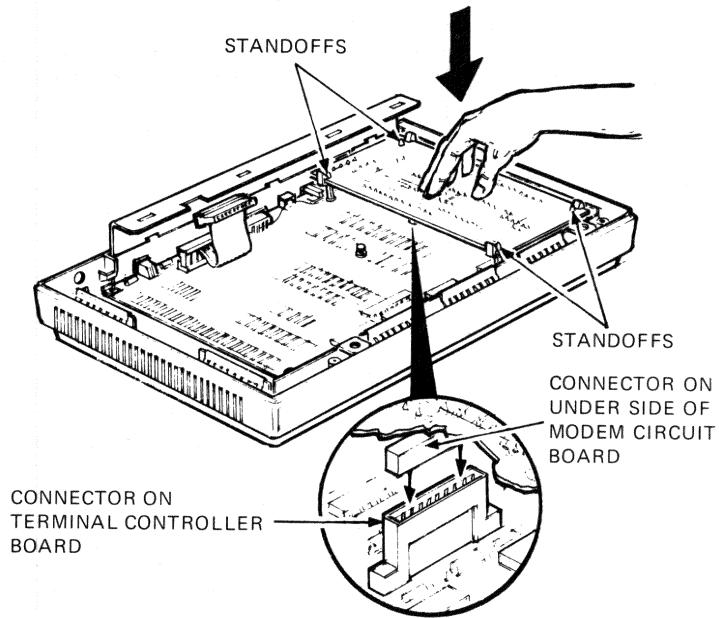
Before mounting the modem circuit board onto the standoffs, fit the connectors on the board through the cutout in the rear chassis panel. See illustration below.



MA-1239-83(P)



6. Once the modem circuit board has been positioned on the standoffs, press the board in the middle (See below.) to engage the connector on the terminal controller board.

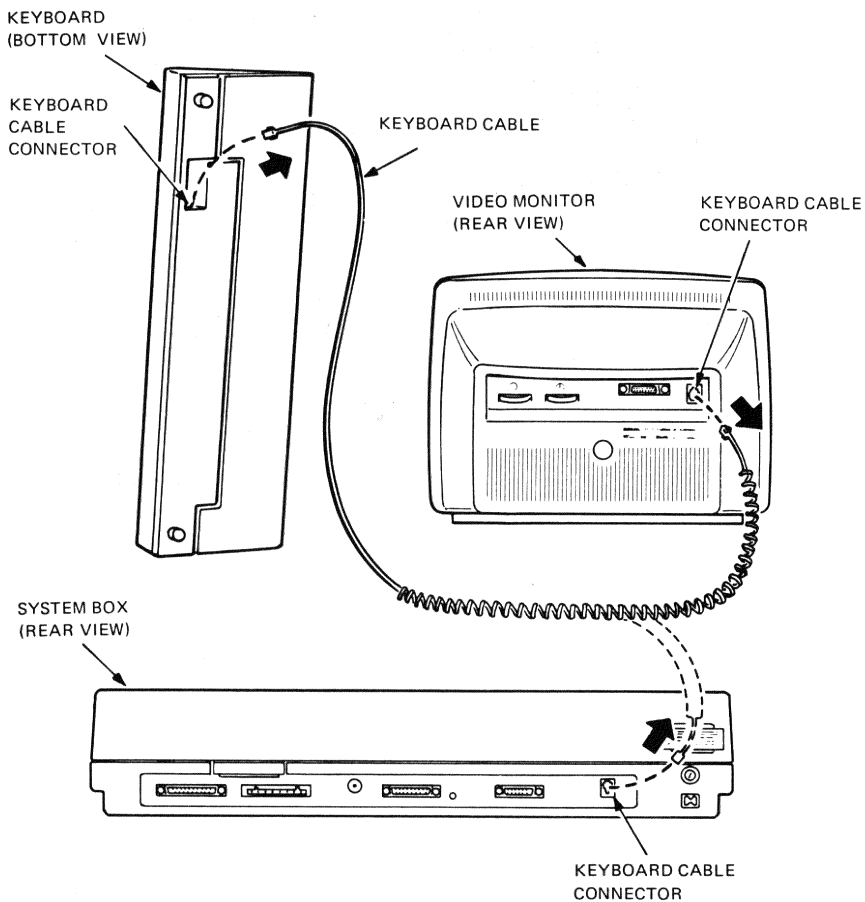


MA-1241-83(P)

## 2.8 KEYBOARD

If the keyboard is faulty, exchange the entire keyboard (whole option swap). Perform the following steps to remove the keyboard. (See following illustration.)

1. Turn power to video monitor off.
2. Disconnect the keyboard cable from the cable connector on the rear panel of your video monitor or from your system box, whichever applies.
3. Remove the keyboard cable from the keyboard.

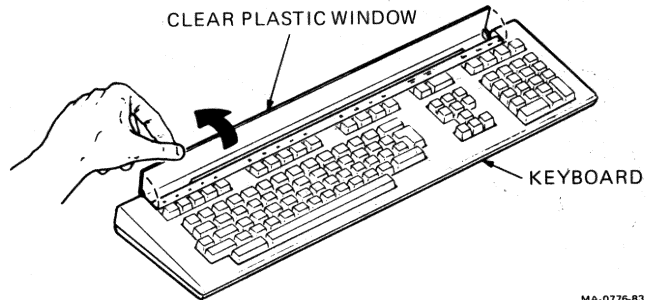


MA-0787-83

Perform the following steps to install the replacement keyboard. (See following illustrations.)

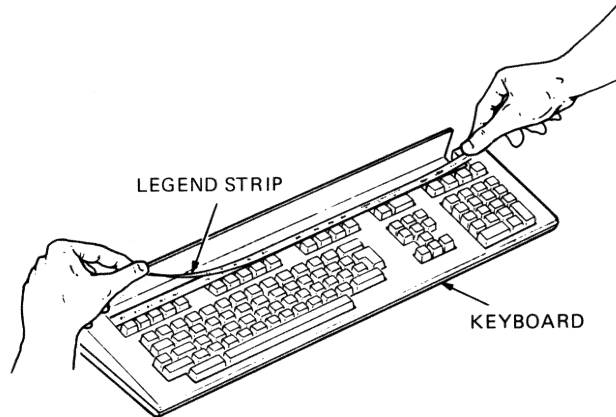
1. Install legend strip.

- a. Open clear plastic window.



MA-0776-83

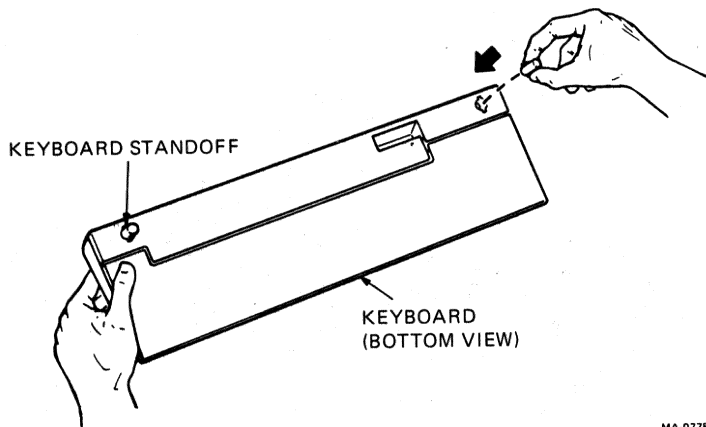
- b. Remove legend strip from defective keyboard.  
c. Insert old legend strip directly over the one presently on the replacement keyboard.



MA-0777-83

- d. Close clear plastic window.

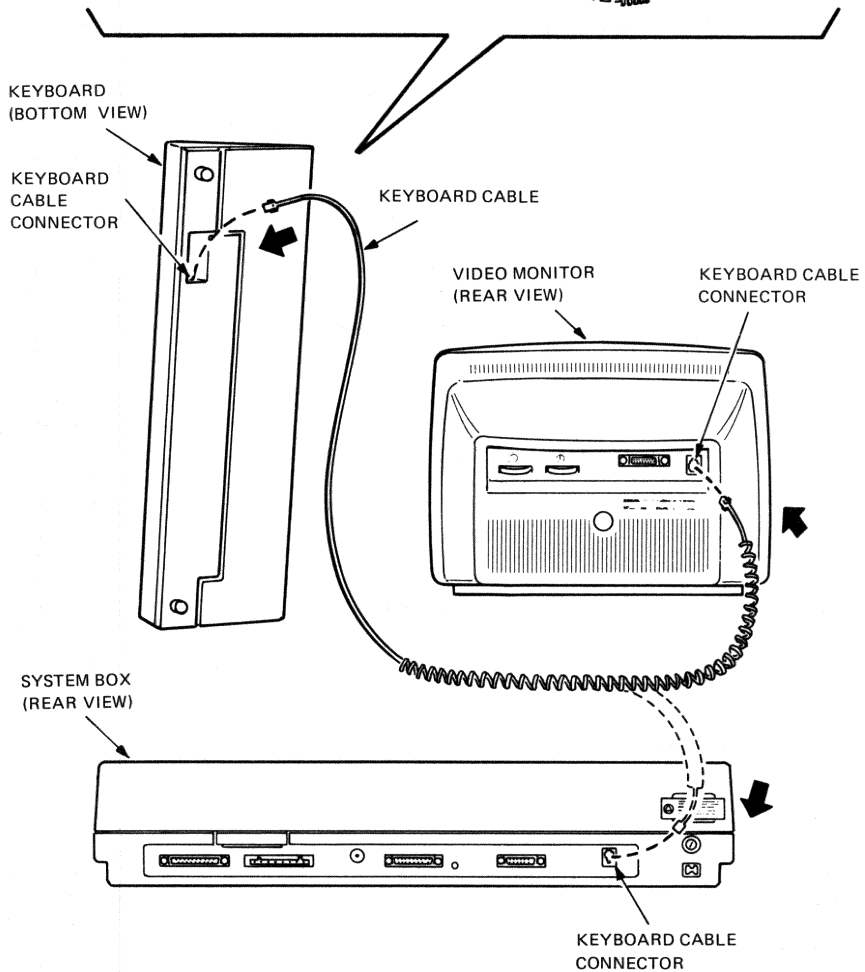
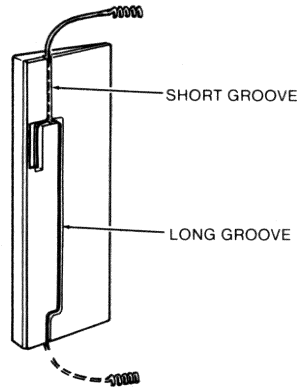
2. Install keyboard standoffs.



MA-0778-83

3. Connect keyboard to video monitor or to system box.

- 1 Insert keyboard cable into connector on bottom of keyboard.
- 2 Press cable into short groove of keyboard if routing to the left.
- 3 Press cable into long groove of keyboard if routing to the right.
- 4 Insert keyboard cable into connector on rear of monitor or on rear of system box.



MA-0787-83

4. Turn on power to video monitor.

### 2.9 RECOMMENDED SPARES LIST

The recommended spares list for the VT240 is given in Table 2-1.

Table 2-1 Recommended Spares List

Description	Part Number	
System Box	VS240-A	
Power Supply Chassis	70-19499-00	
Terminal Controller	54-15495-01	
Video Monitor Cable (VR201)	BCC02	
Video Monitor Cable (VR241 color monitor)	BCC03	
Monitor Assembly (White)	VR201-A	
Monitor Assembly (Green)	VR201-B	
Monitor Assembly (Amber)	VR201-C	
Keyboard	United States/Canada	LK201-AA
Keyboard	Belgium	LA201-AB
Keyboard	Canada (French)	LK201-AC
Keyboard	Denmark	LK201-AD
Keyboard	United Kingdom	LK201-AE
Keyboard	Finland	LK201-AF
Keyboard	Germany	LK201-AG
Keyboard	Holland	LK201-AH
Keyboard	Italy	LK201-AI
Keyboard	Swiss (French)	LK201-AK
Keyboard	Swiss (German)	LK201-AL
Keyboard	Sweden	LK201-AM
Keyboard	Norway	LK201-AN
Keyboard	France	LK201-AP
Keyboard	Spain	LK201-AS
Keyboard	Australia	LK201-AZ
Integral Modem	54-15643-01	
EIA Loopback Connector	12-15336-00	
20 mA Loopback Connector	70-15503-00	
Printer Port Loopback Connector	29-24795-00	
Video Alignment Tool	29-23190-00	
Tuning Wand	29-23189-00	
Fuse (U.S.) 3AG	2 Ampere rating	90-07215-00
Fuse Carrier (U.S.)		12-21126-03
Fuse Holder		12-21126-01
Fuse (European)		12-19284-00
Fuse Carrier (European)		12-21126-04

3  
VIDEO MONITOR  
ALIGNMENT

3.1 GENERAL

The alignment procedure for the VT240 video monitor is described in this chapter. Refer to Appendix E if you have a color monitor. It will not be necessary to make all of the adjustments each time you align your monitor. However, many of the adjustments affect the other settings; therefore, all the adjustments should be checked. Then if a check discloses a correct setting that adjustment can be omitted and you can go on to check the next setting.

Unless directed otherwise, all the adjustments must be made under the following conditions.

Enter SET-UP and put terminal in

- Normal video (light text, dark screen)
- 80 columns per line
- VT100 mode
- Local

Use the Video Alignment Template (PN 29-24371) for determining alignment adjustments. Make certain that all adjustments are made under the conditions stated above.

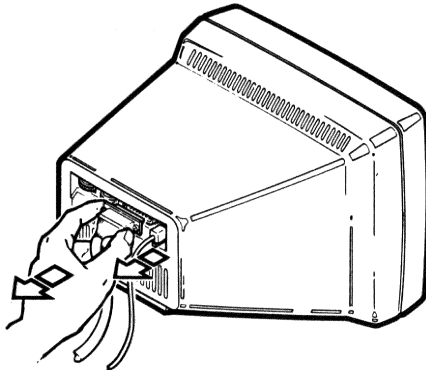
3.2 REMOVING THE ACCESS COVER

**WARNING**

This procedure exposes you to the CRT anode, which may contain a stored high voltage. Use caution while the access cover is off of the terminal.

Perform the following steps to remove the access cover.

1. Turn the power switch on the system box to "0" (off position).
2. Disconnect both the video and keyboard cables from the rear of your monitor.



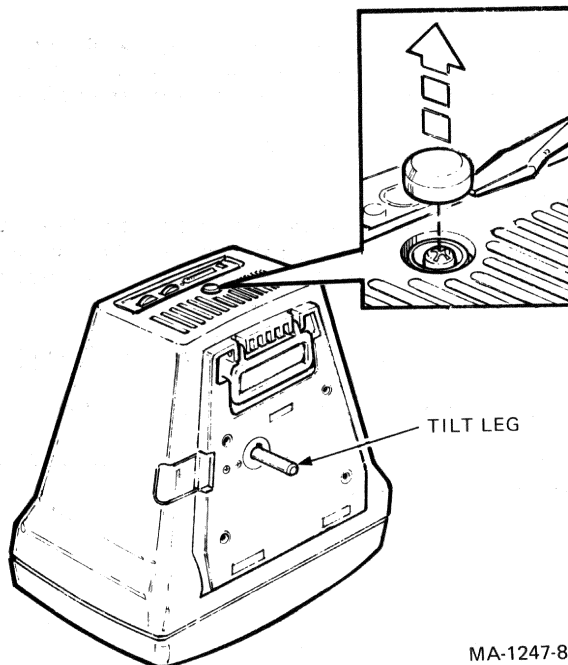
MA-0009A82

**NOTE**

Before proceeding with step 3, place a piece of paper on a flat work surface to avoid scratching the monitor bezel. Carefully place the monitor face down on this paper.

The face of the CRT must be cleaned when you have finished servicing the monitor. Use the cleaning solution supplied with the monitor or use isopropyl alcohol.

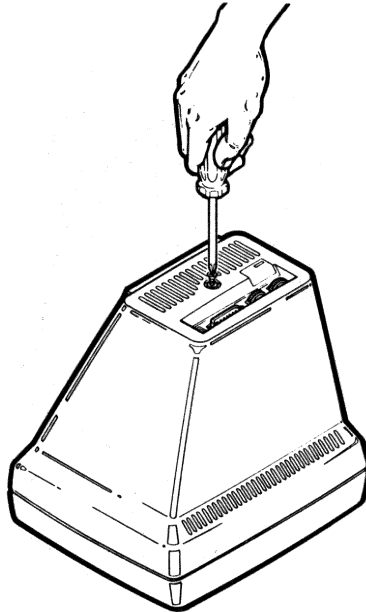
3. Completely extend the tilt leg mechanism. (See illustration below.) Then carefully place the monitor face down as described in the above note.



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4. With a small-bladed screwdriver, remove the round plastic cap on the rear panel of the access cover.
5. With a Phillips type screwdriver, remove the screw and washer that were exposed when you removed the cap. This screw secures the access cover to the monitor's chassis.

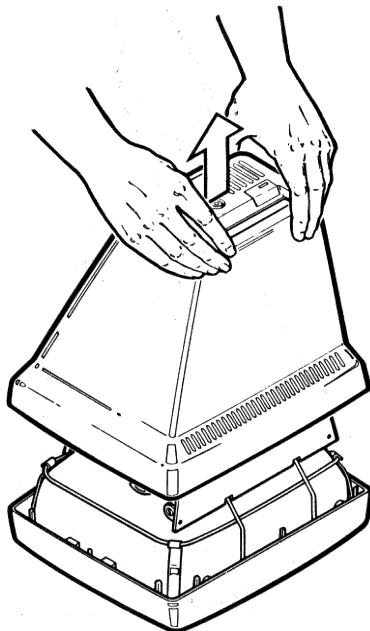


MA-0009C82

6. Remove the cover by sliding it straight up.

**CAUTION**

When replacing the monitor cover, make sure the tilt mechanism foot is fully extended.



MA-0009D82

7. To replace the access cover, perform steps 1--6 in reverse.

### 3.3 MONITOR ADJUSTMENTS

#### 3.3.1 Initial Conditions

1. Position your terminal as shown in Figure 3-1. Make certain that your monitor is on a nonconductive surface.

The locations of the components where most of the adjustments will be made are shown in Figure 3-1.

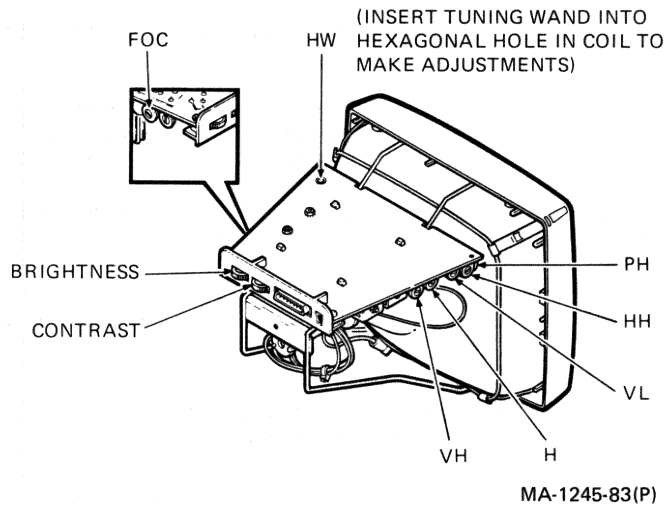


Figure 3-1 Video Adjustment Locations

2. Reconnect the video and keyboard cables.
3. Turn the power switch to "1" (on position).
4. After "VT240 OK" appears on your screen and the conditions detailed in Paragraph 3.1 are satisfied, type ESC #8. (Your screen will display all capital Es.) This will be your alignment pattern.

NOTE

Your alignment pattern may not be distinct. Commence with the following alignment procedures to correct the problem.

### 3.3.2 Character Quality

3.3.2.1 Brightness -- Perform the following steps to adjust the brightness.

1. Permit the terminal to warm up for at least 5 minutes.
2. Increase both the brightness and contrast to maximum. (See Figure 3-1 for the locations of the brightness and contrast controls.)
3. Decrease the brightness until the white diagonal lines (raster) just disappear.
4. Go to Paragraph 3.3.2.2.

3.3.2.2 CONTRAST -- Set the contrast control (See Figure 3-1.) for the desired intensity of display relative to the background.

3.3.2.3 Vertical Linearity -- Perform the following steps to check and adjust the vertical linearity (VL).

1. Check the height of the characters at the four corners of the screen display. All of the characters should be the same height.
2. If necessary, adjust the vertical linearity (VL) control (See Figure 3-1.) until all of the characters are the same height.
3. Go to Paragraph 3.3.2.4.

3.3.2.4 Focus -- Perform the following steps to check and adjust the focus (FO).

1. Check the characters at the four corners and at the center of the screen display. The individual dots in the vertical segments of each E should be readily distinguishable.

NOTE

Make certain that the screen is clean.

In some instances, the operator may want the focus adjusted to suit personal preference. If the focus is adjusted as desired, go to step 3.

2. Adjust the focus (FO) control (See Figure 3-1.) for the best overall character presentation, if necessary.
3. Go to Paragraph 3.3.3.

### 3.3.3 Display Instability

3.3.3.1 Vertical Hold -- Perform the following steps to adjust the vertical hold (VH).

1. Examine the monitor display for rolling or any other sign of vertical instability.
2. If necessary, adjust the vertical hold (VH) control (See Figure 3-1.) to stabilize the screen display.
3. Go to Paragraph 3.3.3.2.

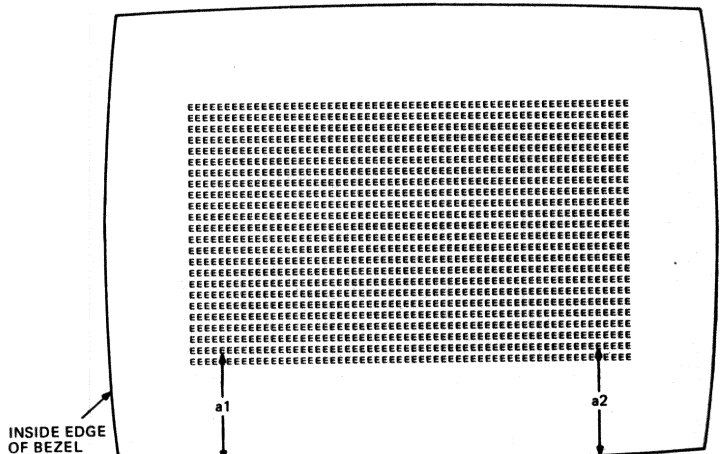
3.3.3.2 Horizontal Hold -- Perform the following steps to adjust the horizontal hold (HH).

1. Examine the monitor display for tearing or any other signs of horizontal instability.
2. If necessary, adjust the horizontal hold (HH) control (See Figure 3-1.) to stabilize the display.
3. Go to Paragraph 3.3.4.

### 3.3.4 Display Centering Adjustments

3.3.4.1 Yoke Rotation -- Perform the following steps to check the display rotation.

1. Use the scale on the alignment template (PN 29-24371-00) to make the following measurements (See Figure 3-2).



MA-1308-838

Figure 3-2 Rotation Measurements

Find point a1 (five columns of Es from the left and one row of Es from the bottom of the alignment pattern). Measure the distance from this point to the monitor bezel. Find point a2 (five columns of Es from the right and one row of Es from the bottom of the alignment pattern). Measure the distance from this point to the monitor bezel. Compare both measurements. The difference between measurements should not be greater than  $\pm 2$  mm.

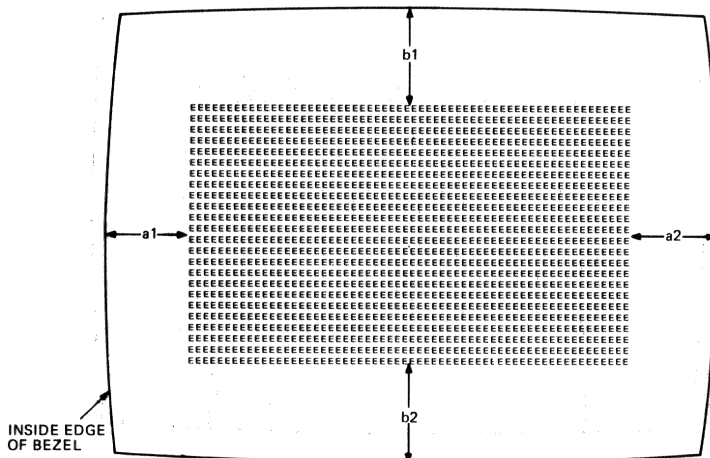
**NOTE**

If the yoke is adjusted correctly, do not go to step 2. Go to Paragraph 3.3.4.2.

2. If the display rotation is out of tolerance, replace the entire video monitor (whole option swap).
3. Go to Paragraph 3.3.4.2.

**3.3.4.2 Horizontal Centering --** Perform the following steps to check and adjust the horizontal centering (PH).

1. Use your alignment template to make the following measurements (See Figure 3-3).
2. Measure the distance a1 between the center of the left edge of the alignment pattern of Es and the monitor bezel.
3. Measure the distance a2 between the center of the right edge of the alignment pattern of Es and the monitor bezel.



MA-1308-83C

Figure 3-3 Vertical Centering Measurements

4. Compare the measurements taken in steps 2 and 3. If the difference between the two measurements is greater than 6 mm, adjust the horizontal centering control (PH). (See Figure 3-1.)
5. Perform steps 2 and 3 again to verify the adjustment.

**NOTE**

If the PH control adjusts the horizontal centering correctly, go to Paragraph 3.3.4.3.

6. If necessary, check and adjust the display size. (See Paragraph 3.3.5.)

**3.3.4.3 Vertical Centering --** Perform the following steps to determine vertical centering dimensions.

1. Use the scale on the alignment template to make the following measurements (See Figure 3-3).
2. Measure the distance b1 from the top center of the alignment to the monitor bezel. Also measure the distance b2 from the bottom center of the alignment pattern to the monitor bezel.
3. Compare the two measurements you made in step 2. The distance from the top edge of the alignment pattern to the bezel must be greater than the distance from the bottom edge of the alignment pattern to the bezel. This difference must be within the range of 2 mm to 14 mm. If the difference is not within the range specified, go to step 4. Otherwise go to Paragraph 3.3.5.

**NOTE**

The electrical center of the screen is not the same as the apparent physical center. When the monitor has been adjusted correctly, the screen display will be offset toward the bottom of the screen.

4. If your measurement is out of tolerance, replace the entire video monitor (whole option swap). The vertical centering cannot be adjusted.
5. Go to Paragraph 3.3.5.

### 3.3.5 Aspect Ratio

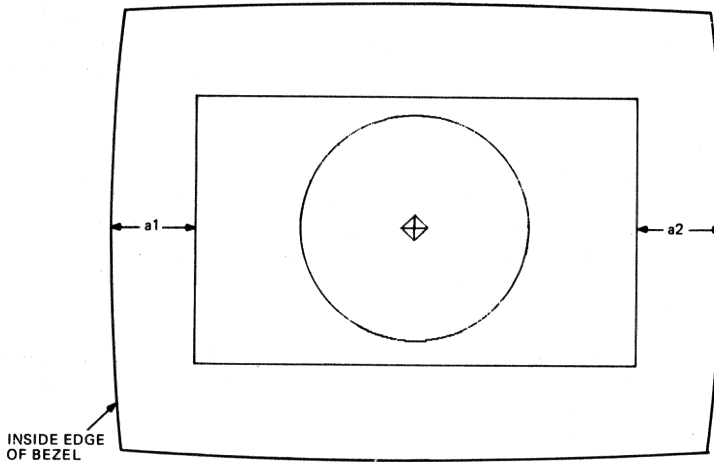
1. Enter Setup. Clear display, and put terminal in reverse video (dark text, light screen).
2. Put terminal in Local mode and in VT100 mode.
3. Exit Set-Up.
4. Type the following escape sequence to invoke the graphics alignment pattern:

```
ESC Pp  
P [390,240]  
C [200]
```

#### NOTE

Do not type spaces or carriage returns.  
The spaces shown were included only for clarity.

5. Observe circle for ovalness or flattening. If the circle appears abnormal, perform steps 6 through 9.
6. Use your alignment template to make the following measurements. (See Figure 3-4.) Measure the distance  $a_1$  from the center of the left edge of the alignment pattern to the monitor bezel. Also measure the distance  $a_2$  from the center of the right edge of the alignment pattern to the monitor bezel.



MA-1309-83A

Figure 3-4 Aspect Ratio Measurements



7. Subtract the sum ( $a_1+a_2$ ) from 242 mm (the width of the monitor screen) to arrive at the width of the video display.

Example:

$a_1 = 21$  mm       $a_2 = 20$  mm       $a_1+a_2 = 41$  mm

Video display width =  $242 - 41$  mm =  $201$  mm

8. The video display width must be within the range of 200 to 210 mm. If necessary, adjust HW (the horizontal width control) until the video display width is within the range specified. (See Figure 3-1.)
9. Adjust H (the height control) as necessary to improve the appearance of the circle.
10. Type ESC \ to exit the ReGIS Graphics mode.



4

SET-UP REFERENCE MATERIAL

Refer to the VT240 Owner's Manual (EK-VT240-UG) for the SET-UP summaries for the VT240 terminal.

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APPENDIX A  
VT240 DOCUMENTATION

All related documentation pertaining to the VT240 terminal is included in the following list.

VT240 Owner's Manual EK-VT240-UG

This manual provides the user with the information needed to operate and service the VT240 terminal. The manual includes an overview of the VT240's physical and functional structure. Specific operational features such as SET-UP procedures, controls and indicators information, communication interfaces, and test functions are also described.

Installation Guide EK-VT240-IN

This guide provides the user with the information needed to unpack, assemble, and bring the VT240 terminal to operating status.

VT240 Programmer's Reference Manual EK-VT240-RM

This manual provides the programmer with all the information needed to use the communication and character processing features of the VT240 series terminal.

VT240 Programmer's Reference Card EK-VT240-RC

This card provides the programmer with a summary of the information needed to program the VT240 series terminal. Essentially, it is a list of the escape and control sequences on a pocket size reference card.

VT240 Pocket Service Guide EK-VT240-PS

This guide provides service personnel with the information needed to test, troubleshoot, and repair the VT240 series terminal.

This manual provides the user with a technical description with which to isolate and repair VT240 problems that go beyond the FRU replacement level of repair. The manual includes an overview of both hardware and software components, and detailed descriptions of communications components and subsystems to the major circuit level.

## VT240 Terminal IPB

EK-VT240-IP

This document is a detailed parts breakdown of the VT240 terminal's field replaceable units. This document does not contain part numbers for components on the printed circuit boards. However, these components are listed in the VT240 Field Maintenance Print Set, which is ordered separately.

## VT240 Field Maintenance Print Set

The following documents provide the user with a complete set of electrical and mechanical schematic diagrams for the VT240 terminal.

- |                              |             |
|------------------------------|-------------|
| - For the system box (VS240) | MP-01597    |
| - For the monitor (VR201)    | MP-01410-00 |
| - For the keyboard (LK201)   | MP-01395-00 |

**APPENDIX B**  
**FRU EXPLODED VIEW DRAWINGS**

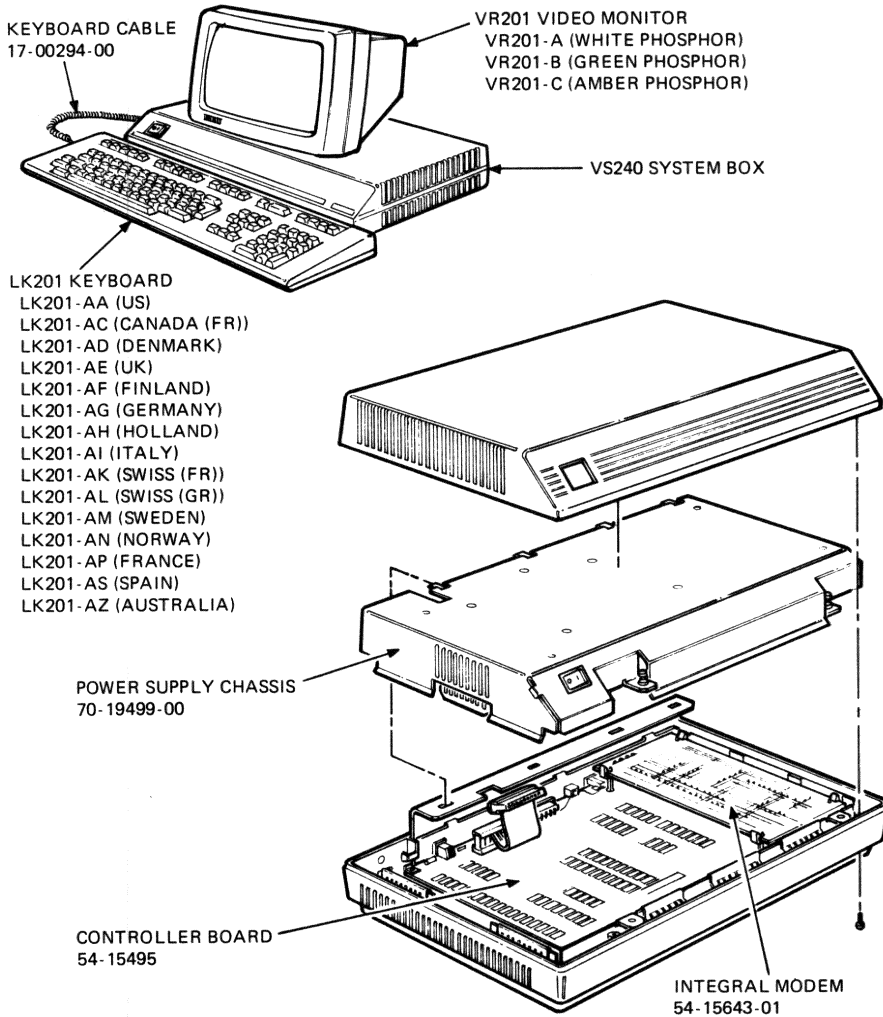


Figure B-1 VT240 FRUs (Exploded View)

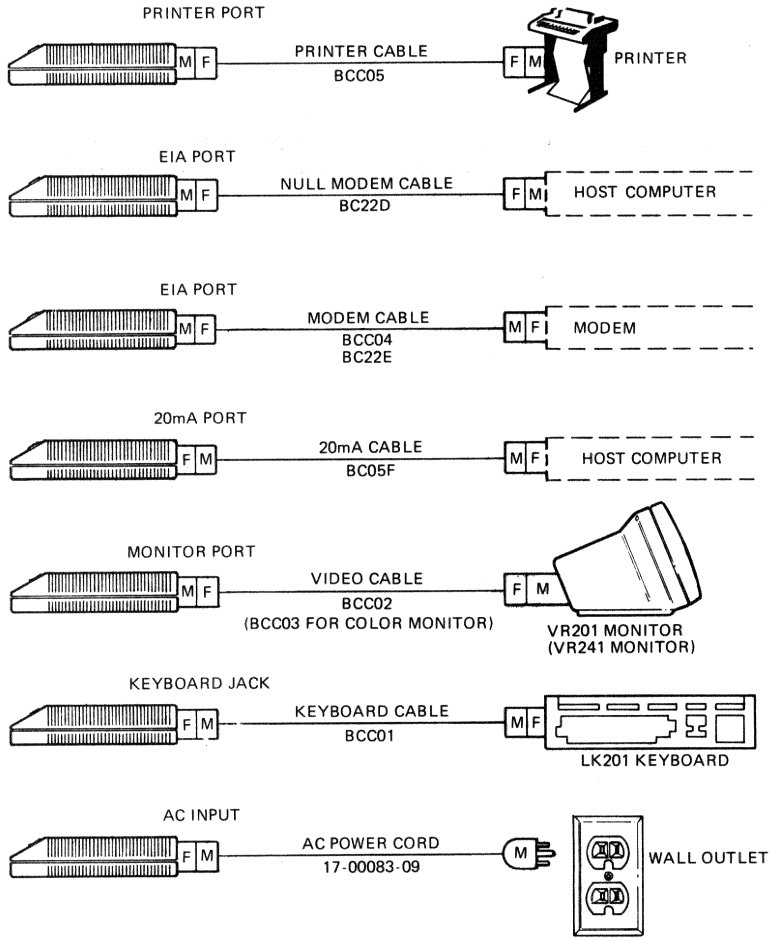




APPENDIX C  
CABLE INFORMATION

In Figure C-1 are shown the cable connections for the VT240 terminal. The available interface cables are listed in Table C-1 and the modem control selections in Table C-2.

VT240 TERMINAL



MA-1246-83 (P)

Figure C-1 Cable Summary

**Table C-1      Interface Cables**

Cable	Number	Connector	Function
BCC05-10	17-00300-00	9 pin F RS232	VT240 and Printer
BCC05-25	17-00300-01	to 25 pin F RS232	(Printer Cable)
BC22D-10	17-00313-01	25 pin F RS232	Null Modem Cable,
BC22D-25	17-00313-02	to 25 pin F RS232	VT240 to Host
BC22D-50	17-00313-04		
BCC04-10	17-00289-00	25 pin F RS232	Modem Cable,
BCC04-25	17-00289-01	to 25 pin M RS232	VT240 to Modem
BC05F-15	17-XXXXX-XX	8 pin M	20 mA Cable, VT240 to Host
BCC02-06	17-00283-00		Video Cable (VT240 Monitor to system box)
BCC03-06	17-00284-00	15 pin F RS232 to 3 coaxial connectors and a keyboard jack	VR241 Cable (VR241 Monitor to system box)
BCC01-06	17-00294-00	Telephone Jack	Keyboard Cable, VT240 to keyboard
N/A	17-00083-09		(U.S. 125 V) AC Power Cable
N/A	17-00083-10		(U.S. 250 V) AC Power Cable
N/A	17-00198-00		Australian AC Power Cable
N/A	17-00199-00		German AC Power Cable
N/A	17-00209-00		United Kingdom AC Power Cable
N/A	17-00210-00		Swiss AC Power Cable
N/A	17-00311-01		Danish AC Power Cable

Table C-2 Modem Control Selections

Selection	Description	Usual Application
EIA Data leads only	Full duplex no EIA modem control (data leads only)	Full duplex communication with a null modem (direct) connection to the computer or with a modem that does not use modem control signals.
EIA modem control	Full duplex with EIA modem control	Full duplex communication with a modem that uses modem control signals, or with a port on the host computer supporting modem controls.

APPENDIX D  
PHYSICAL FUNCTIONAL DIAGRAM

See Figure D-1 for a physical functional diagram showing the interrelationships among components.

NOTE

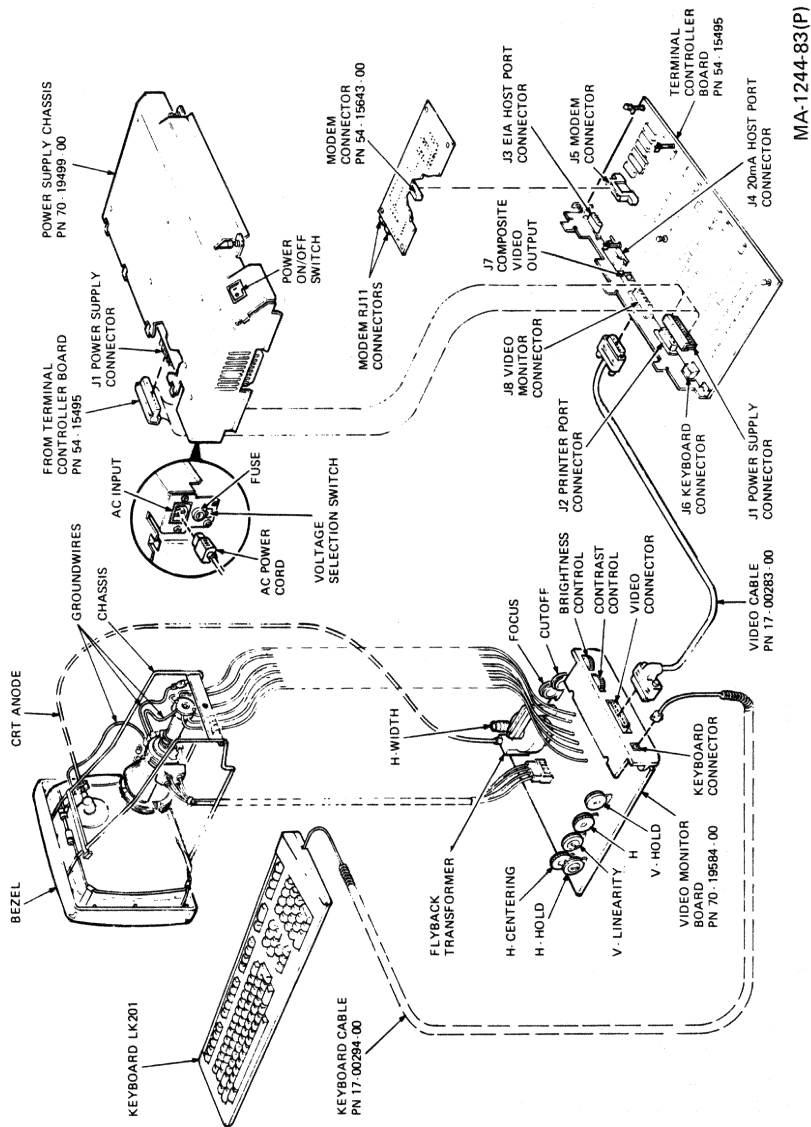
All voltage readings are based on a line voltage of 115 Vac. Your readings may differ in accordance with any variations in your line voltage.

J1 (Power Supply Connector)

Pin	1	N.C.
	2	N.C.
	3	N.C.
	4	-12 Volts
	5	-12 Volts
	6	Ground
	7	Ground
	8	Ground
	9	Ground
	10	Ground
	11	+12 Volts
	12	+12 Volts
	13	+12 Volts
	14	+12 Volts
	15	Ground
	16	+5 Volts
	17	+5 Volts
	18	+5 Volts

J2 (Printer Port Connector)

Pin	1	N.C.
	2	Transmitted Data
	3	Received Data
	4	Ready to Send
	5	Data Terminal Ready
	6	Data Set Ready
	7	Signal Ground
	8	Signal Ground
	9	N.C.



MA-1244-83(P)

Figure D-1 Physical Functional Diagram

J3 (EIA Host Port Connector)

Pin	1	N.C.
	2	Transmitted Data
	3	Received Data
	4	Request to Send
	5	Clear to Send
	6	Data Set Ready
	7	Signal Ground
	8	Received Line Signal Detector
	9	N.C.
	10	N.C.
	11	N.C.
	12	Speed Indicator
	13	N.C.
	14	N.C.
	15	N.C.
	16	N.C.
	17	N.C.
	18	N.C.
	19	N.C.
	20	Data Terminal Ready
	21	N.C.
	22	N.C.
	23	Speed Select
	24	N.C.
	25	N.C.

J4 (20 mA Host Port Connector)

Pin	1	N.C.
	2	Transmit-
	3	Receive-
	4	N.C.
	5	Transmit+
	6	N.C.
	7	Receive+
	8	Ground

J5 (Modem Connector)

Pin	1	+12 Volts
	2	Mode Select
	3	Data Set Ready
	4	Received Data
	5	Speed Indicator
	6	Transmitted Data
	7	Speed Select
	8	Ground
	9	Data Available
	10	Off Hook Drive
	11	Modem 9-bit character/10-bit character
	12	Modem Present
	13	Talk/Data
	14	Modem A/B

- 15 N.C.
- 16 Domestic/Europe
- 17 Dial Tone Detect
- 18 N.C.
- 19 -12 Volts
- 20 Coupler Cut Through
- 21 Switch Hook
- 22 Off Hook Modem
- 23 N.C.
- 24 Analog Test
- 25 Remote Data Loop

J6 (Keyboard Connector)

- Pin 1 Transmitted Data
- 2 +12 Volts
- 3 Signal Ground
- 4 Received Data

J7 (Composite Video Output Connector)

- Pin 1 Video Output
- 2 Signal Ground

J8 (Video Monitor Connector)

- Pin 1 Ground
- 2 Ground
- 3 Ground
- 4 Ground
- 5 Ground
- 6 Ground
- 7 +12 Volts
- 8 +12 Volts
- 9 Blue Output
- 10 Green Output
- 11 Red Output
- 12 Monochrome Output
- 13 Monitor Present
- 14 Keyboard Transmit
- 15 Keyboard Receive



**APPENDIX E**  
**VT240 COLOR VIDEO MONITOR, MODEL VR241-A**

**INTRODUCTION**

**PURPOSE**

This appendix provides the following information on servicing the VR241-A Color Video Monitor.

Troubleshooting  
Quality checks and adjustment procedures  
Operational and physical descriptions

This information applies to VT240 host system units that have the following standard test patterns. (See Table E-1.) These test patterns are listed below:

DISPLAY ALIGNMENT PATTERN (See Figure E-1.)  
COLOR BAR PATTERN (See Figure E-2.)  
RED SCREEN  
BLUE SCREEN  
GREEN SCREEN

**Notes, Cautions, Warnings**

Notes, Cautions, and Warnings appear throughout this appendix.

Notes contain general information you should be aware of.  
Cautions contain information to prevent damage to the equipment.  
Warnings contain information to prevent personal injury.

**Tools Required**

You need the following tools to service the VR241-A Color Video Monitor.

Tool	Part Number
Phillips screwdriver	none
Video alignment template	29-24371-00
VR241 adjustment tool	29-24746-00
Hex core alignment tool	29-23190-00

**Table E-1 Test Pattern Summary for Color Monitors**

Unless directed otherwise, to invoke any of the test patterns, observe the following prerequisites:

- Enter Set-Up
- Put monitor in
  - Local
  - VT100 mode
  - 80 columns per line
  - Color display
  - Normal video (light text, dark screen).
- Exit Set-Up

Test Pattern	Sequence (See Note)	Prerequisite Exception
1. Display (Screen of white Es) Alignment Pattern	ESC # 8	- monochrome display
2. Graphics Alignment Pattern C [200]	ESC Pp P [390,240]	- monochrome display - reverse video (dark text, light screen)
3. Color Bar Pattern	ESC [4;4y	
4. Red Screen Pattern	ESC [4;1ly	
5. Green Screen Pattern	ESC [4;12y	
6. Blue Screen Pattern	ESC [4;10y	
7. White Screen Pattern	ESC [4; 13y	

**NOTE:**

Do not type spaces between parameters of escape sequences. The parameters are spaced as shown for clarity only.

**NOTE:**

Test patterns 3 through 7 force a RESET of the terminal Set-Up features back to the saved defaults. The prerequisites must be Set-Up before invoking each self-test.

**NOTE:**

IT IS IMPERATIVE THAT THE EIA PORT NOT BE CONNECTED TO A HOST WHEN INVOKING THE VT240 SELF-TESTS AND ALIGNMENT PATTERNS.

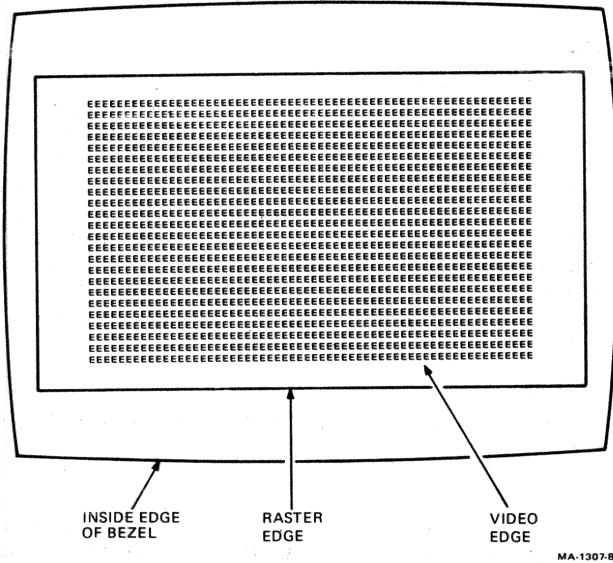


Figure E-1 Screen of Es Alignment Pattern

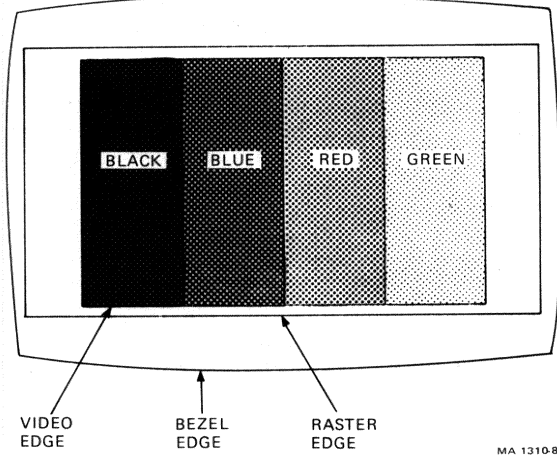


Figure E-2 Color Bar Pattern

## E.1.0 TROUBLESHOOTING THE VR241-A COLOR MONITOR

### E.1.1 GENERAL

This chapter provides information to troubleshoot the four types of problems that may affect your VR241-A color monitor: no video, distorted video, color problems, and/or alignment problems. Refer to the section that most closely describes your monitor's problem, match the symptom, then take the corrective action suggested.

The corrective procedures in this appendix assume that only one assembly has failed or only one problem exists. The symptoms that your monitor displays may indicate more than one failure or problem because some of the circuits of your monitor may interact with the other circuits. Therefore, you should troubleshoot to the most obvious symptom.

### E.1.2 NO VIDEO

Use Table E-2 when the monitor will not display a picture sent by the host system unit.

#### NOTE

Make sure the color monitor has warmed up for at least 15 minutes before you use Table E-2.

### E.1.3 DISTORTED VIDEO

Use Table E-3 to find the appropriate corrective action when your monitor display is distorted. Typical display distortions include rolling, flickering, blooming, and displays that do not disappear at minimum contrast and brightness control settings.

#### NOTE

Make sure the color monitor warms up for at least 15 minutes before you use Table E-3.

### E.1.4 COLOR PROBLEMS

Use Table E-4 to find the corrective action when your monitor distorts the color of the picture sent by the host system unit.

#### NOTE

Make sure the color monitor warms up for at least 15 minutes before you use Table E-4.

Table E-2 No Video Troubleshooting Procedures

Symptom	Conditions	Corrective Action
Screen is black, there is no video or raster, and the green "power OK" indicator is off.	One end of the power cord is disconnected.	Reconnect power cord.
	Power switch is turned off.	Turn the VR241-A power switch to "1" (on position).
	There is no power at the wall outlet.	Make sure there is power at the outlet.
	Monitor's fuse has blown.	Replace fuse.
Screen is black, there is no video or raster, but green "power OK" indicator is on.	You performed all of the steps above but the problem has not been corrected.	Replace monitor.
	Brightness and contrast controls are set to minimum.	Turn brightness and contrast controls to maximum.
	Service switch is set to SERVICE position.	Set switch to NORMAL position.
There is a raster but no video.	Monitor is faulty.	Replace monitor.
	Signal cable is disconnected.	Connect signal cable between monitor and host system unit.
	Host is not on.	Turn host system unit to "1" (on position).
	Contrast is set to minimum.	Turn contrast control to maximum to see video.
	Signal cable is faulty.	Replace signal cable.
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
	Color monitor is faulty.	Replace color monitor.
Only a horizontal line appears on the screen.	Service switch is set to SERVICE position.	Set switch to NORMAL position.
	Color monitor is faulty.	Replace color monitor.

**Table E-3 Distorted Video Troubleshooting Procedures**

<b>Symptom</b>	<b>Conditions</b>	<b>Corrective Action</b>
Video rolls vertically and horizontally.	Video cable is connected incorrectly or an external video sync is required from the host system unit.	Check video cable at color monitor and at host system unit, or add an external sync cable if required by your host system unit.
	Synchronization switch is set to the wrong position.	Check the switch settings on monitor, and match monitor to host system type. (See Paragraph E.4.7 for correct setting.)
	Signal cable is faulty.	Replace signal cable.
	Monitor is out of adjustment.	Perform color monitor synchronization procedure. (See Paragraph E.2.3.)
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
Video rolls vertically.	Color monitor is faulty.	Replace color monitor.
	Monitor sync is out of adjustment.	Perform color monitor synchronization procedure. (See Paragraph E.2.3.)
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
	Color monitor is faulty.	Replace color monitor.

Table E-3 Distorted Video Troubleshooting Procedures (Cont)

Symptom	Conditions	Corrective Action
Video rolls horizontally.	Monitor sync is out of adjustment.	Perform color monitor synchronization procedure. (See Paragraph E.2.3.)
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
	Color monitor is faulty.	Replace color monitor.
Video shows blooming at high intensity levels.	Impedance switch is set incorrectly for your system configuration.	Check monitor's impedance switch setting for your system configuration. (See Paragraph E.4.7 for correct setting.)
	White balance is out of adjustment.	Perform white balance procedure. (See Paragraph E.2.15.)
	Color monitor is faulty.	Replace color monitor.
Raster and/or video will not disappear when brightness and contrast controls are at minimum.	Monitor's white balance is out of adjustment.	Perform white balance check/adjustment procedure. (See Paragraph E.2.15.)
	Color monitor is faulty.	Replace color monitor.

**Table E-4 Color Troubleshooting Procedures**

Symptom	Conditions	Corrective Action
Wrong color is displayed and color bars are in wrong position.	Video cables are connected incorrectly.	Check video cables at color monitor and at host system unit.
	Color monitor is faulty.	Replace color monitor.
Wrong color is displayed but color bars are correctly positioned.	Host system unit software is faulty.	Have customer verify software.
Color bar pattern is missing a color.	Signal cable is faulty.	Replace signal cable.
	White balance is not normal.	Perform color monitor white balance check/adjustment procedure. (See Paragraph E.2.15.)
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
	Color monitor is faulty.	Replace color monitor.
Convergence or color purity is not normal.	Monitor needs degaussing.	Turn monitor to "0" (off position) for 10 minutes then turn it to "1" (on position) to activate the internal degaussing circuits.
	Monitor is located near strong magnetic field.	Move monitor to an area free of strong magnetic fields.
	Color monitor is faulty.	Replace color monitor.



**Table E-4 Color Troubleshooting Procedures (Cont)**

Symptom	Conditions	Corrective Action
White balancing is not normal.	Impedance switch is set incorrectly for your system's configuration.	Check the monitor's impedance switch setting for system configuration. (See Paragraph E.4.7 for proper settings.)
	Video cables are connected incorrectly.	Check video cables at color monitor and at host system unit.
	Monitor's white balance is out of adjustment.	Perform color monitor white balance check/adjustment procedure. (See Paragraph E.2.15.)
	Host system unit is faulty.	Refer to host system unit's pocket service guide.
	Color monitor is faulty.	Replace color monitor.

**E.1.5 ALIGNMENT PROBLEMS**

Use Table E-5 to find the appropriate corrective action when the display on your monitor, sent by the host system unit, is misaligned.

**E.1.6 TERMINAL HOST PRESETS**

Refer to Table E-1 for Set-Up presets and exceptions.

**NOTE**

Make sure the color monitor warms up for at least 15 minutes before you use Table E-5.

**NOTE**

Make sure the color monitor warms up for at least 15 minutes before you use Table E-5.

**CAUTION**

Magnetic fields affect the performance of the color monitor. Do not operate your monitor near electromechanical devices such as printers, or near large magnetized objects such as filing cabinets or steel beams in walls.

Table E-5 Troubleshooting Alignment Problems

Symptom	Conditions	Corrective Action
Video is rotated.	Monitor is out of rotational adjustment.	Replace color monitor.
<p><b>CAUTION</b> Do not attempt to adjust the yoke.</p>		
Video unstable or is jittery after new display.	Monitor is out of sync adjustment.	Perform color monitor synchronization procedure. (See Paragraph E.2.3.)
	Color monitor is faulty.	Replace color monitor.
Video is not centered.	Monitor is out of centering adjustment.	Perform appropriate color monitor centering procedures. (See Paragraphs E.2.4, E.2.5, and E.2.6.)
	Color monitor is faulty.	Replace color monitor.
Video is not rectangular.	Monitor is out of rectangular adjustment.	Perform color monitor rectangular check/adjustment procedure. (See Paragraph E.2.8.)
	Color monitor is faulty.	Replace color monitor.
Video has incorrect aspect ratio.	Monitor is out of aspect ratio alignment.	Perform color monitor aspect ratio check/adjustment procedure. (See Paragraph E.2.9.)
	Color monitor is faulty.	Replace color monitor.
Video is not linear.	Monitor is out of linear adjustment.	Perform appropriate color monitor linear check/adjustment procedures. (See Paragraphs E.2.10 and E.2.11.)
	Color monitor is faulty.	Replace color monitor.
Video is not focused.	Monitor is out of focus adjustment.	Perform color monitor focusing check/adjustment procedure. (See Paragraph E.2.12.)
	Color monitor is faulty.	Replace color monitor.

## E.2.0 QUALITY CHECK/ADJUSTMENT PROCEDURES

### E.2.1 GENERAL

This chapter describes how to check and adjust the quality of the video display. If the video display is acceptable as is, the adjustments for that check need not be made. Instead, go to the next check/adjustment.

These quality checks/adjustment procedures are to be performed in the order shown because some of them interact and depend on the correctness of the preceding ones.

These procedures are to be performed only when your monitor exhibits a display. If your monitor will not exhibit a display, use the troubleshooting procedures described in Chapter E.1.

A summary of adjustment and operating function locations is given in Chapter E.4.

If an adjustment is necessary, perform the preadjustment procedure once then continue with the quality checks/adjustment procedures. Then, observe the following precautions after all quality checks/adjustment procedures have been completed.

- Make certain that brightness and contrast controls turn freely.
- Make certain the ground cable is connected to rear lower left tab. (See Figure E-3).
- When reinstalling cabinet cover, be sure the white plastic shield around the brightness and contrast controls is tucked inside the cover.

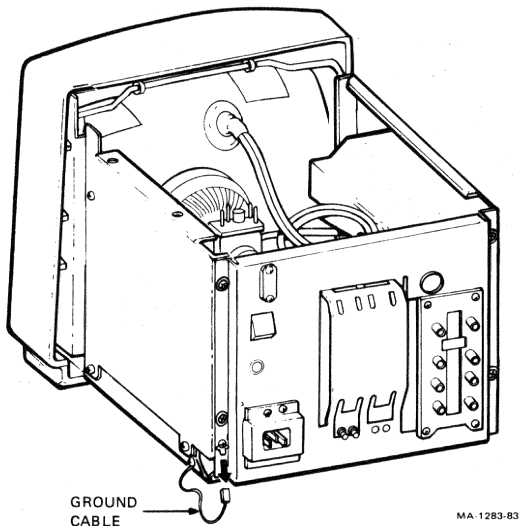


Figure E-3 VR241-A Monitor Ground Cable

### E.2.2 PREADJUSTMENT

Perform this procedure only if an adjustment is needed.

1. Turn power to "0" (off position) and wait 30 seconds before continuing.

#### WARNING

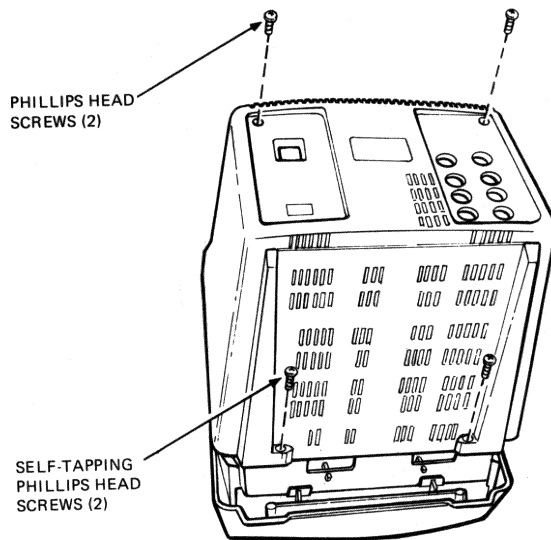
Static charges on the CRT can cause shock injury. Static charges take at least 30 seconds to dissipate after the monitor has been turned off.

2. Disconnect power cables.
3. Disconnect video cables.
4. Remove tilt swivel if installed.
5. Carefully set monitor face down.

#### CAUTION

Do not scratch the bezel or screen. Place monitor on a nonabrasive surface such as a large desk pad or soft cloth.

6. Remove four screws that hold cover. (See Figure E-4.)
7. Pull cover straight up and set it aside.
8. Carefully set monitor back on its base.
9. Reconnect all cables.
10. Turn monitor on and allow it to warm up for 15 minutes.
11. Unless directed otherwise, set brightness control so that raster just disappears and contrast control is at desired display intensity relative to background.



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Figure E-4 Monitor Cover Removal

### E.2.3 VIDEO SYNCHRONIZATION

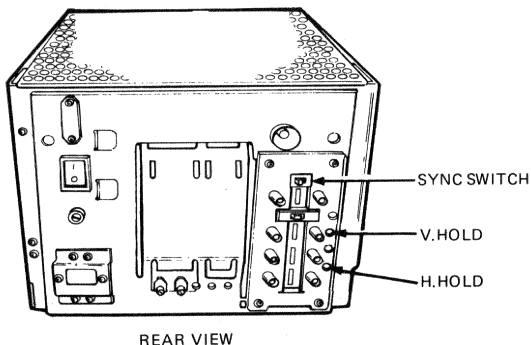
Perform the following steps to check, and if necessary, adjust the video synchronization.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Set contrast and brightness controls for desired viewing comfort.
3. Display any test pattern.
4. Slide synchronization switch back and forth.
5. Observe the display. The picture should lock in quickly with no tearing of the top lines.

#### NOTE

If display is normal, continue to the vertical centering check/adjustment procedure. (See Paragraph E.2.4.) If display is not normal, be sure preadjustment procedure was completed and continue to step 6.

- 6a. Restore terminal presets as described in Paragraph E.1.6.
- 6b. Display the alignment pattern, which is a screen of all Es. Invoke this display by typing:  
ESC # 8
7. Slide the synchronization input selector switch so that the screen rolls, which means no synchronization input signal is being applied. (See Figure E-5.)
8. Adjust horizontal hold (H. HOLD) control so picture has almost stopped rolling horizontally.
9. Turn vertical hold (V. HOLD) control so picture rolls vertically one way. Then back up V. HOLD so picture rolls the opposite way. Now set control to center of this vertical synchronization holding range.
10. Slide synchronization input selector switch so test pattern locks in and stops rolling, which means that the synchronization input signal is being applied.



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Figure E-5 Video Sync Adjustments

#### E.2.4 VERTICAL CENTERING

Perform the following steps to check, and if necessary, adjust the vertical centering.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display alignment pattern, which is a screen full of Es. Invoke this display by typing:  
ESC # 8 (See Figure E-6.)
3. Measure the distance  $b_1$  from the center of the top edge of the alignment pattern to the monitor bezel.

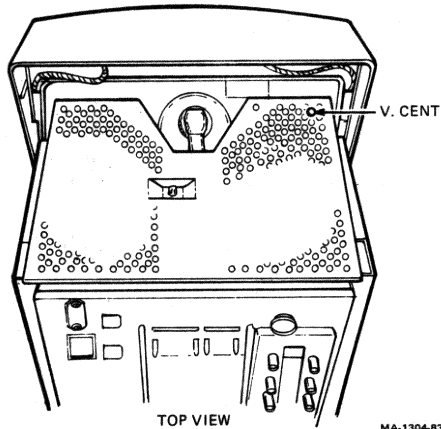
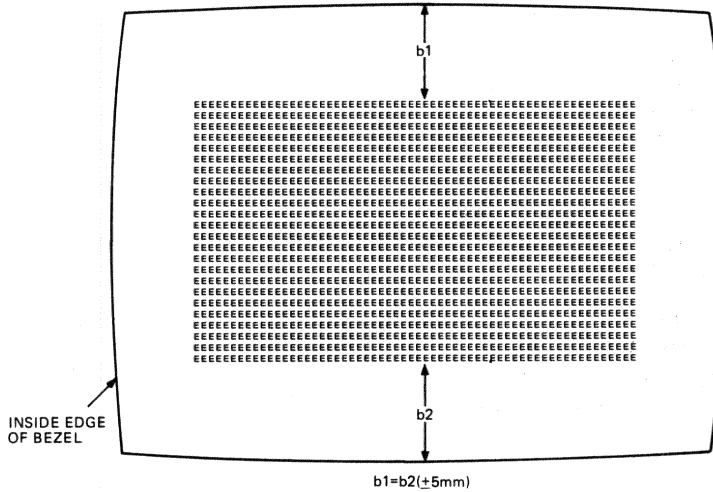


Figure E-6 Vertical Centering Adjustments

4. Measure the distance b2 from the center of the bottom edge of the alignment pattern to the monitor bezel.
5. Check that measurements are equal or within 5 mm of each other.

**NOTE**

If measurements are within limitations, continue to the horizontal centering check/adjustment procedure. (See Paragraph E.2.5.) If measurements are not within limitations, be sure preadjustment procedure was completed, then continue to step 6.

6. Turn vertical centering (V. CENT) adjustment until distance from top center of alignment pattern to bezel and distance from bottom center of alignment pattern to bezel are within 5 mm of each other.

**E.2.5 HORIZONTAL CENTERING**

Perform the following steps to check, and if necessary, adjust the horizontal centering.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display the alignment pattern, which is a screen full of Es. Invoke this display by typing:  
ESC # 8 (See Figure E-7.)

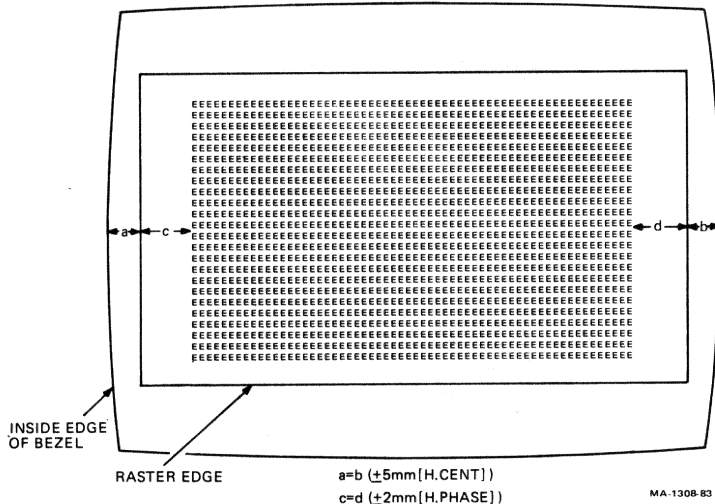


Figure E-7 Horizontal Centering Check/Adjustments



3. Turn contrast and brightness controls so raster is visible. (See Figure E-15.)
4. Measure distance a from left center of raster edge to bezel.
5. Measure distance b from right center of raster edge to bezel.
6. Check that measurements are equal to or within 5 mm of each other.

**NOTE**

If measurements are within limitations, continue to the horizontal phase check/adjustment procedure. (See Paragraph E.2.6.) If measurements are not within limitations, be sure preadjustment procedure was completed and continue to step 7.

7. Turn horizontal centering (H. CENT) control until distance a from left center of raster to bezel and distance b from right center of raster to bezel are within 5 mm of each other. (See Figure E-7.)

**E.2.6 HORIZONTAL PHASE**

Perform the following steps to check, and if necessary, adjust the horizontal phase.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display alignment pattern, which is a screen full of Es. Invoke this display by typing:  
ESC # 8 (See Figures E-7 and E-8.)

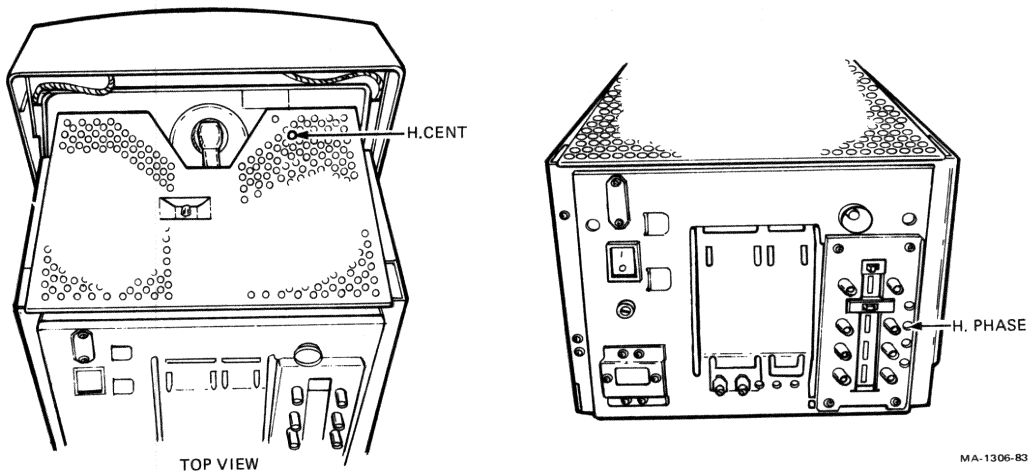


Figure E-8 Horizontal Phase Check/Adjustments

3. Turn contrast and brightness controls so raster is visible. (See Figure E-15.)
4. Measure distance c from left center of raster edge to left center of E pattern.
5. Measure distance d from right center of raster edge to right center of E pattern.
6. Check that measurements are equal or within 2 mm of each other.

NOTE

If measurements are within limitations, continue to the rotational check procedure, (see paragraph E.2.7). If measurements are not within limitations, be sure preadjustment procedure was completed and continue to step 7.

7. Adjust brightness and contrast controls so that E alignment pattern and raster are visible.
8. Turn horizontal phase (H. PHASE) control until distance from right center of E alignment pattern to right center of raster and distance from left center of alignment pattern to left center of raster are within 2 mm of each other.

NOTE

When you attempt this adjustment, some host system units cause raster distortion (discoloration of right raster edge). If this distortion occurs, adjust H.PHASE control so no raster distortion is visible, then center the video display to the bezel by adjusting H.CENT control.

### E.2.7 ROTATION

Perform the following steps to check the rotation.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display the alignment pattern, which is a screen full of Es. Invoke this display by typing:  
ESC # 8 (See Figure E-9.)
3. Use the scale on the alignment template to make the following measurements (See Figure E-9.) Find point a1 (five columns of Es from the left and one row of Es from the bottom of the alignment pattern). Measure the distance from this point to the monitor bezel.
4. Find point a2 (five columns of Es from the right and one row of Es from the bottom of the alignment pattern). Measure the distance from this point to the monitor bezel.
5. Check that measurements are equal or within 3 mm of each other.

#### NOTE

Rotation is not adjustable. Replace the monitor if measurements are not within limitations. Continue with the next procedure if rotation is normal.

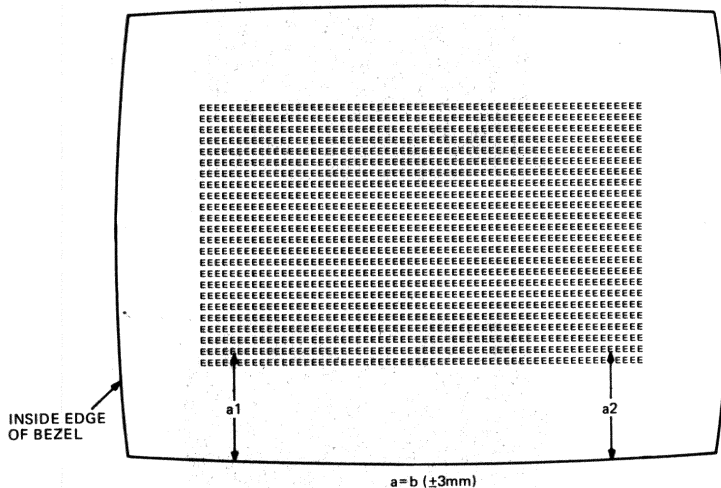


Figure E-9 Rotational Check

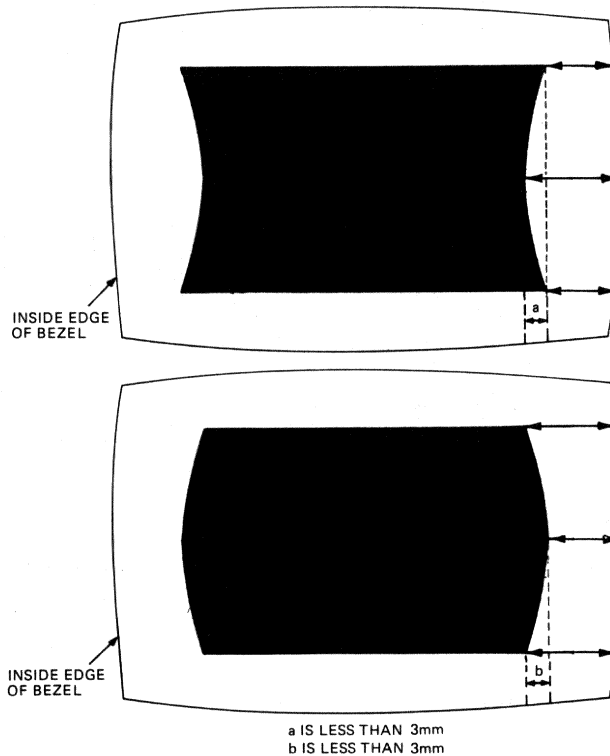
### E.2.8 RECTANGULARITY

Perform the following steps to check the rectangularity.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display an all red screen pattern. Invoke this display by typing:  
ESC [ 4 ; 11 y (See Figure E-10.)
3. Measure from lower right corner, from right middle edge, and from upper right corner of pattern to bezel.
4. Measure from lower left corner, from left middle edge, and from upper left corner of pattern to bezel.
5. Check that the maximum difference between all three measurements is less than 3 mm. (See Figure E-10.)

#### NOTE

If rectangularity is within limitations, continue to the aspect ratio check/adjustment procedure. (See Paragraph E.2.9.) If not within limitations, be sure preadjustment procedure was completed and continue to step 6.



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Figure E-10 Rectangularity Check

6. Turn SIDE PIN control (Figure E-11) so that left and right sides of display appear to be vertical without any bowing when viewed straight on. The maximum bowing in or out must be less than 3 mm.

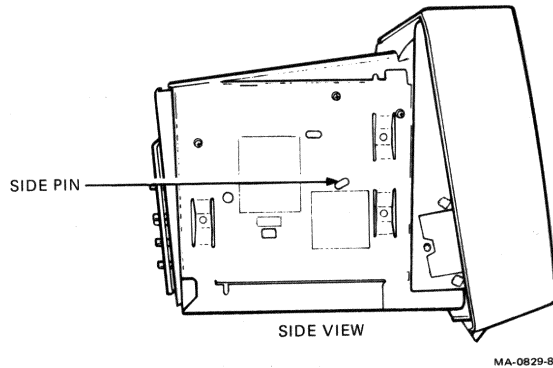


Figure E-11 Rectangularity Adjustment

### E.2.9 ASPECT RATIO

Perform the following steps to check, and if necessary, adjust the aspect ratio.

1. Set terminal host presets as follows:
  - Enter Set-Up
  - Put terminal in
    - Local
    - Clear Display
    - Reverse Video (dark text, light screen)
    - Monochrome Display.
  - Exit Set-Up
2. Type:
  - ESC Pp
  - P [390,240]
  - C [200]
3. Observe circle for ovalness or flattening. (See Figure E-12.)

If the circle appears abnormal, perform steps 4 through 7.

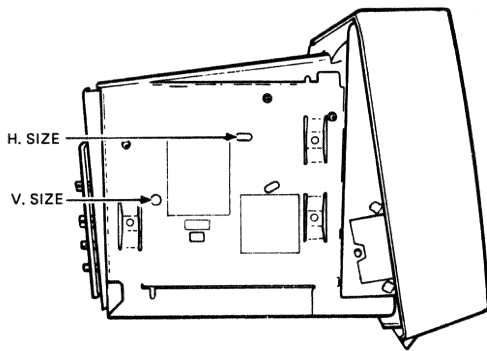
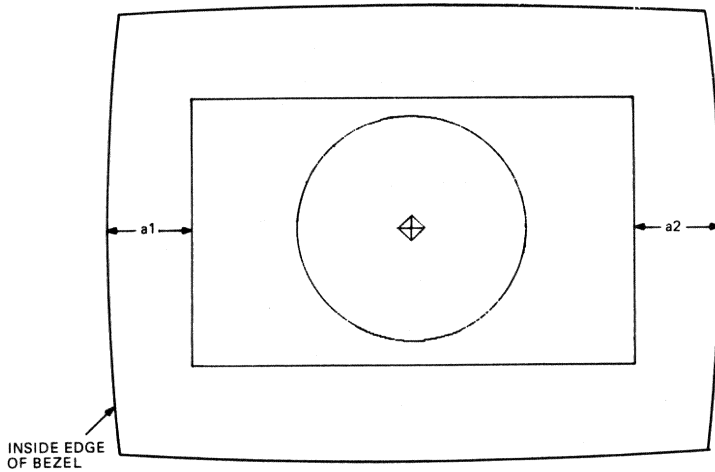


Figure E-12 Aspect Ratio Check/Adjustment

If the circle appears abnormal, perform steps 4 through 7.

4. Use your alignment template to make the following measurements. (See Figure E-12.) Measure the distance  $a_1$  from the center of the left edge of the alignment pattern to the monitor bezel. Also measure the distance  $a_2$  from the center of the right edge of the alignment pattern to the monitor bezel.
5. Subtract the sum ( $a_1+a_2$ ) from 293 mm (the width of the monitor screen) to arrive at the width of the video display.

Example:

$a_1 = 26$  mm       $a_2 = 25$  mm       $a_1+a_2 = 51$  mm

Video display width =  $293 - 51$  mm = 242 mm

6. The video display width must be within the range of 235 mm to 245 mm. If necessary, adjust H SIZE (the horizontal size control) until the video display width is within the range specified. (See Figure E-12.)

**CAUTION**

Do not adjust H SIZE control to the extent that the coil core falls out.

7. Adjust V SIZE (the vertical size control) as necessary to improve the appearance of the circle.
8. Type:  
ESC \ (to get out of the ReGIS Graphics mode)

### E.2.10 VERTICAL LINEARITY

Perform the following steps to check, and if necessary, adjust the vertical linearity.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display the alignment pattern, which is a screen full of Es (no reverse video). To invoke this display, type:  
ESC # 8. (See Figure E-1.)
3. Visually check the Es from top row to bottom row for uniform height.
4. Adjust vertical linearity (V. LIN) control to correct if necessary. (See Figure E-13.)

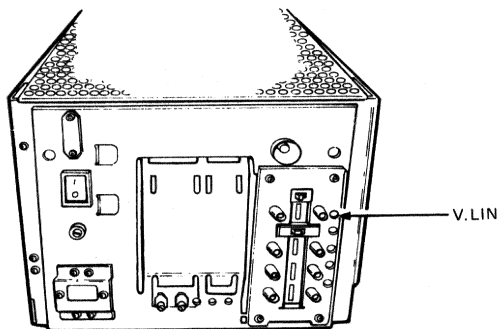
### E.2.11 HORIZONTAL LINEARITY

Perform the following steps to check the horizontal linearity.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display the alignment pattern, which is a screen full of Es (no reverse video). To invoke this display, type:  
ESC # 8. (See Figure E-1.)
3. Visually check Es from left to right in center row for uniform width.

#### NOTE

Horizontal linearity is not adjustable.  
Replace monitor if Es are not of uniform width. Continue with next check if normal.



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Figure E-13 Vertical Linearity Adjustment



### E.2.12 FOCUS

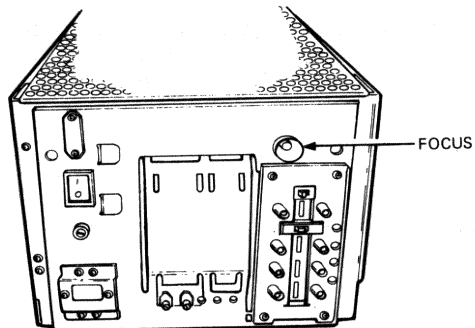
Perform the following steps to check, and if necessary, adjust the focus.

1. Ensure Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display alignment pattern, which is a screen full of Es (no reverse video). To invoke this display, type:  
ESC # 8. (See Figure E-1.)
3. Check that Es are clearly defined over entire screen.

#### NOTE

If E pattern is uniformly clear over entire screen, continue purity check. (See Paragraph E.2.13.) If focus is satisfactory, be sure preadjustment procedure was completed and continue to step 4.

4. Turn FOCUS control (See Figure E-14.) until the Es are uniformly sharp over entire screen.



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Figure E-14 Focus Adjustment

### E.2.13 COLOR PURITY

Perform the following steps to check color purity.

1. Ensure that Terminal Host Presets are as detailed in Paragraph E.1.6.
2. Display full screen red test pattern by typing:  
ESC [ 4 ; 11 y
3. Check that screen is evenly red over entire screen without any other colors present.

#### NOTE

If a color does not appear normal, turn monitor off for ten minutes then turn it on and recheck the color after monitor has warmed up for 5 minutes.

Make certain there are no strong magnetic fields near the monitor, such as motors, printers, magnetized filing cabinets or structural beams. If so, relocate either monitor or offending device.

Color purity is not adjustable. Replace monitor if normal color is unobtainable. Continue to next procedure if normal.

### E.2.14 CONVERGENCE

Perform the following steps to check convergence.

1. Set terminal host presets as follows:
  - Enter Set-Up
  - Put terminal in
    - Local
    - Clear Display
    - Reset Terminal
    - Normal Video (light text, dark screen)
    - Monochrome Display
    - VT100 Mode.
  - Exit Set-Up

2. Display a full screen of white Es by typing ESC # 8.
3. View center of pattern of Es at arm's length. There should not be any color fringing.

**NOTE**

Some color fringing is to be expected at outer edges of display. This fringing should not be objectionable at a normal viewing distance.

If E characters are poorly converged, turn monitor off for ten minutes then turn it on and recheck the E character display for fringing after your monitor has warmed up for 5 minutes.

Make sure there are no strong magnetic fields near the monitor, such as motors, printers or magnetized filing cabinets. If so relocate either monitor or the offending device.

Convergence is not adjustable. Replace monitor if a normal display cannot be obtained. Continue to next procedure if display acceptable.

### E.2.15 WHITE BALANCE

Perform the following steps to check, or if necessary, adjust the white balance.

1. Ensure Terminal Host Presets are as detailed in Paragraph E.1.6.

#### NOTE

If you are color blind, do not attempt to perform the following procedure.

2. Display solid white test pattern by typing:  
ESC [ 4 ; 13 y
3. Vary contrast control between maximum and minimum. (See Figure E-15.)
4. Check that white screen goes from white through shades of gray to black.
5. Set brightness control to maximum.
6. Set contrast control to minimum.
7. Check that raster is white.

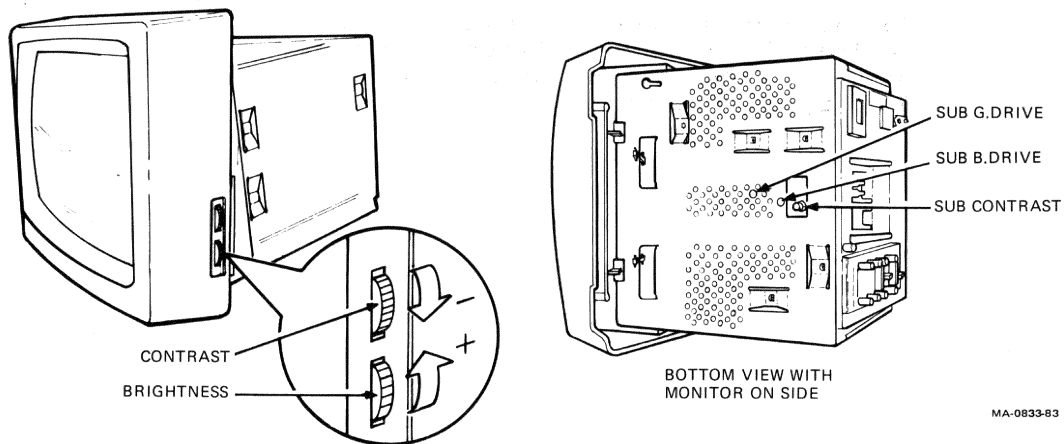


Figure E-15 Presets (part 1)

- 8a. Restore terminal presets as described in Paragraph E.1.6.
- 8b. Display color bar test pattern by typing:  
ESC [ 4 ; 4 y
9. Vary contrast control between maximum and minimum.
10. Check that all colors fade evenly and no one color drops out before any others do at usable intensity levels.
11. With brightness and contrast controls at minimum check that the entire screen is black (no display or raster is visible).

**NOTE**

If your monitor passed white balance procedure, reassemble monitor if necessary. (Perform preadjustment procedure, Paragraph E.2.2 in reverse.) If you experienced difficulty be sure preadjustment procedure was completed and proceed to Paragraph E.2.15.1.

**E.2.15.1 White Balance Presets**

Perform the following steps to preset the white balance.

1. Turn BRIGHTNESS control to maximum. (See Figure E-15.)
2. Turn CONTRAST control to minimum.
3. Set monitor on its side with BRIGHTNESS and CONTRAST controls facing up.

**NOTE**

The display may show signs of color impurity or poor convergence. Turn off monitor for ten minutes, then turn it on again and wait 5 minutes for monitor to warm up.

Perform the remaining procedures with the monitor on its side. Only move the monitor to access the service switch (see Figure E-16), then place it back on its side.

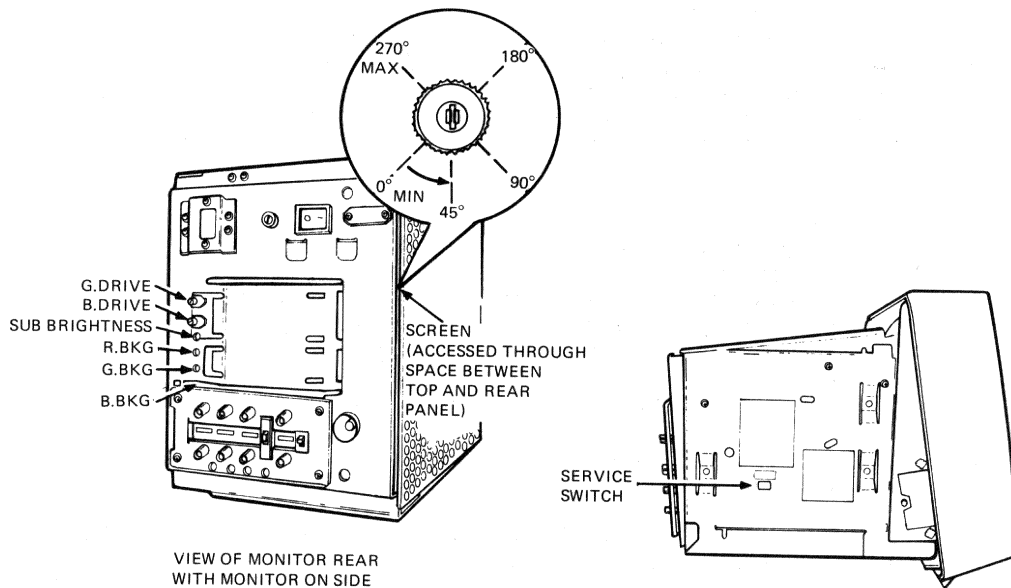


Figure E-16 Presets (part 2)

4. Turn SUB-CONTRAST control to midrange.
5. Turn sub-green drive (SUB-G DRIVE) and sub-blue drive (SUB-B DRIVE) controls fully clockwise.
6. Turn green drive (G. DRIVE) and blue drive (B. DRIVE) controls fully counterclockwise. (See Figure E-15.)
7. Turn SUB-BRIGHTNESS control fully counterclockwise.
8. Turn red background (R. BKG), green background (G. BKG), and blue background (B. BKG) controls fully counterclockwise.
9. Turn SCREEN control fully clockwise, then back control off 45 degrees.
10. Set service switch to SERVICE position.
11. Disconnect video signal cables.
12. Slide impedance switch to 75-ohm position.

**NOTE**

The screen should be totally black. Continue to white balance cutoff procedure, (Paragraph E.2.15.2).

### E.2.15.2 White Balance Cutoff

Perform the following steps to adjust the white balance cutoff.

1. Turn R. BKG control clockwise (See Figure E-17.) until a red line just appears on the screen. Then turn control counterclockwise until the line just disappears.
2. Turn G. BKG control clockwise until a green line just appears on the screen. Then back control counterclockwise until the line just disappears.
3. Turn B. BKG control clockwise until a blue line just appears on the screen. Then turn control counterclockwise until the line just disappears.
4. Set service switch to NORMAL position.

#### NOTE

The screen should show a red raster.  
Continue to white balance white raster  
procedures (Paragraph E.2.15.3).

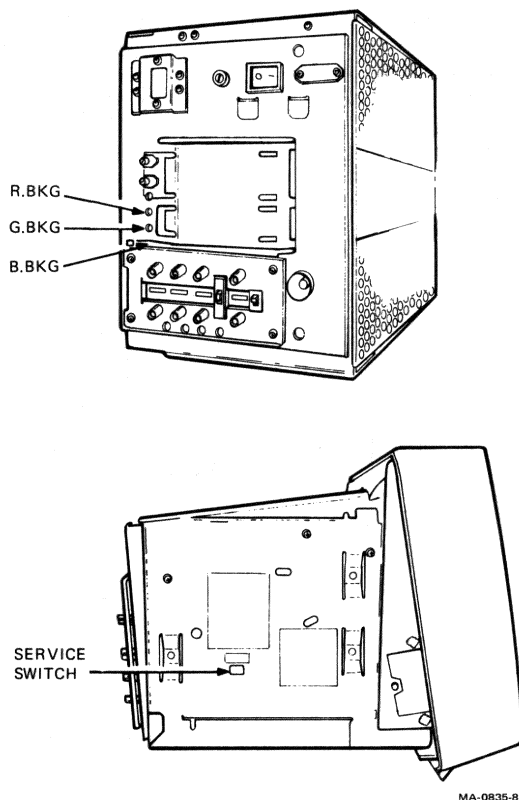


Figure E-17 Cutoff Adjustment

### E.2.15.3 White Balance White Raster

Perform the following steps to adjust the white balance white raster.

#### NOTE

Read steps 1 through 3 before starting.

1. Adjust BRIGHTNESS control to display a dim red raster.

#### NOTE

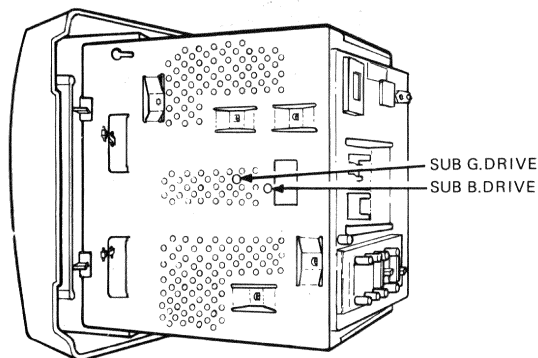
If you set the red raster as dim as you can work with, steps 2 through 4 will be easier to perform.

2. Turn SUB-G DRIVE control (See Figure E-18.) just until no red is visible in the center of the screen.

#### NOTE

You will start with a red screen; it will turn yellow, then green. You must stop increasing green just as the center of the screen goes from a yellow tint to a green tint. If you do this correctly, the screen will have a green tint but not brilliant green. The level of green is critical.

3. Turn SUB-B DRIVE control (See Figure E-18.) just until center of the raster turns gray.



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Figure E-18 White Raster Adjustment (part 1)



**NOTE**

You should be able to get gray easily by adding blue. If you cannot get gray, it is because you have either too little or too much green.

A red or purple tint means there is too little green.

A blue or green tint means there is too much green.

4. Slowly turn BRIGHTNESS control from maximum to minimum and make sure the raster goes from white to gray. (See Figure E-19.) Readjust SUB-G DRIVE and SUB-B DRIVE controls as necessary to obtain a white and gray raster at all BRIGHTNESS levels.

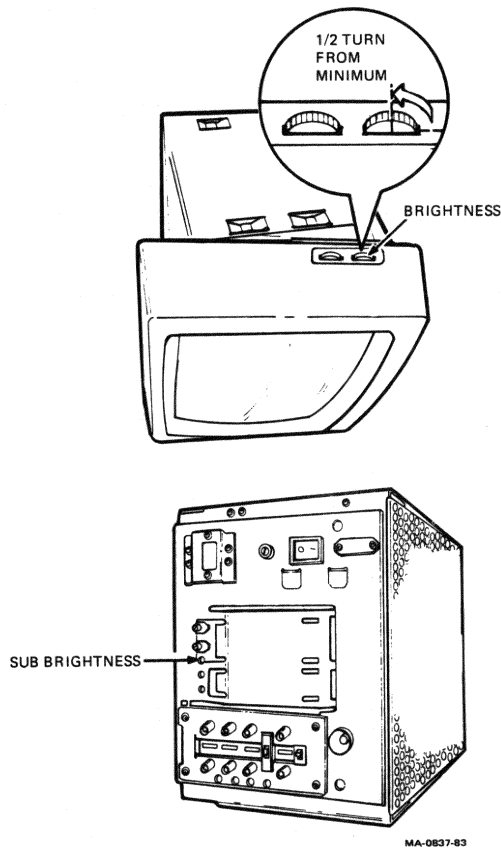


Figure E-19 White Raster Adjustment (part 2)

5. Turn BRIGHTNESS control to minimum, then turn it 1/2 turn toward maximum.
6. Make sure CONTRAST control is set to minimum.

**NOTE**

The screen should be totally black.

7. Turn SUB-BRIGHTNESS control (Figure E-19) clockwise until raster appears.
8. Adjust SUB-BRIGHTNESS control counterclockwise until the entire screen goes black.
9. Continue to white balance white video procedures (Paragraph E.2.15.4).

**E.2.15.4 White Balance White Video**

Perform the following steps to adjust the white balance white video.

**NOTE**

Read steps 1 through 6 before starting.

1. Reconnect video signal cables.
2. Turn BRIGHTNESS control to full minimum.
3. Turn CONTRAST control so that video is dim.

**NOTE**

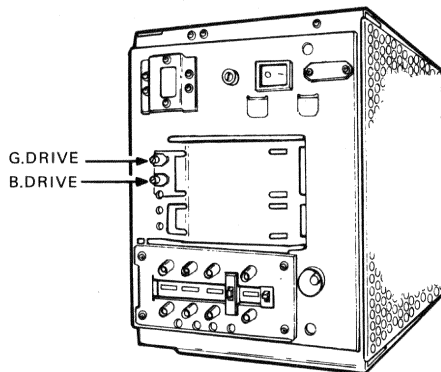
If you set the video as dim as you can work with, steps 5 through 7 will be easier to perform.

- 4a. Restore terminal presets as described in Paragraph E.1.6.
- 4b. Display solid white test pattern by typing:  
ESC [ 4 ; 13 y.

**NOTE**

The screen should display red video.

5. Turn G. DRIVE control (See Figure E-20) just until no red is visible in the center of the screen.



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Figure E-20 White Video Adjustment

NOTE

Step 5 is critical. Like step 2 in Paragraph E.2.15.3, you will start with a red screen; it will turn yellow, then green. You must stop increasing green just as the screen center goes from a yellow tint to a green tint. If you do this correctly, the screen will have a green tint but not a brilliant green.

6. Turn B. DRIVE control just until the raster turns gray in the center of the screen.

NOTE

You should be able to get gray easily by adding blue. If you cannot get gray, it is because you have either too little or too much green.

A red or purple tint means you have too little green.

A blue or green tint means you have too much green.

7. Slowly turn CONTRAST control from maximum to minimum and make sure the video turns from white to gray. Readjust B. DRIVE and G. DRIVE controls as necessary to get white and gray at all contrast levels in the center of the screen.
- 8a. Restore terminal presets as described in Paragraph E.1.6.
- 8b. Display color bar test pattern by typing ESC [ 4 ; 4 y.
9. Check the color bars for proper color.
10. Slowly turn CONTRAST control from maximum to minimum and make sure no color drops out before the others (all colors should fade equally).

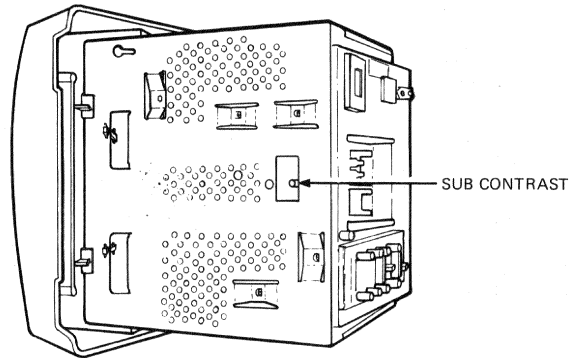
NOTE

If green drops out, G. DRIVE is set too low. If blue drops out, B. DRIVE is set too low. If red drops out, G. DRIVE and B. DRIVE controls are set too high or R. BKG is set too low. (Check G. DRIVE and B. DRIVE first.) If the R. BKG is misadjusted, perform the entire white balance adjustment procedure again. (See Para. E.2.15.1.)

### E.2.15.5 Sub Contrast Adjustment and Final Checks

Perform the following steps to adjust the sub-contrast and make final checks.

1. Set terminal host presets as follows:
  - Enter Set-Up
  - Put terminal in
    - Local
    - Clear Display
    - Reset Terminal
    - Normal Video (light text, dark screen)
    - Monochrome Display
    - VT100 Mode.
  - Exit Set-Up
2. Display a full screen of white Es by typing ESC # 8.
3. Turn BRIGHTNESS control until raster just disappears.
4. Turn CONTRAST control to maximum.
5. Adjust SUB-CONTRAST control (Figure E-21) to maximum intensity without distortion or blooming of display.



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Figure E-21 Sub-Control Adjustment

6. Select the white screen test pattern by typing:  
ESC [ 4 ; 13 y.
7. With contrast control at minimum, slowly turn BRIGHTNESS control from maximum to minimum while you check for white to gray BACKGROUND RASTER.

**NOTE**

If you cannot get correct background raster at this point, either you did not perform the cutoff procedure or white raster procedure correctly, or the monitor is faulty. Perform the entire white balance procedure again (Paragraphs E.2.15.1 through E.2.15.3.).

8. With brightness control set for raster extinction, slowly turn CONTRAST control from maximum to minimum while you check for white to gray VIDEO.

**NOTE**

If you cannot get correct video at this point, either you did not perform the white video procedure correctly, or the monitor is faulty. Perform the white video procedure again (Paragraph E.2.15.4.).

**E.3.0 RECOMMENDED SPARES LIST**

The following is a list of replaceable parts and accessories recommended for maintaining the VR241-A Color Video Monitor.

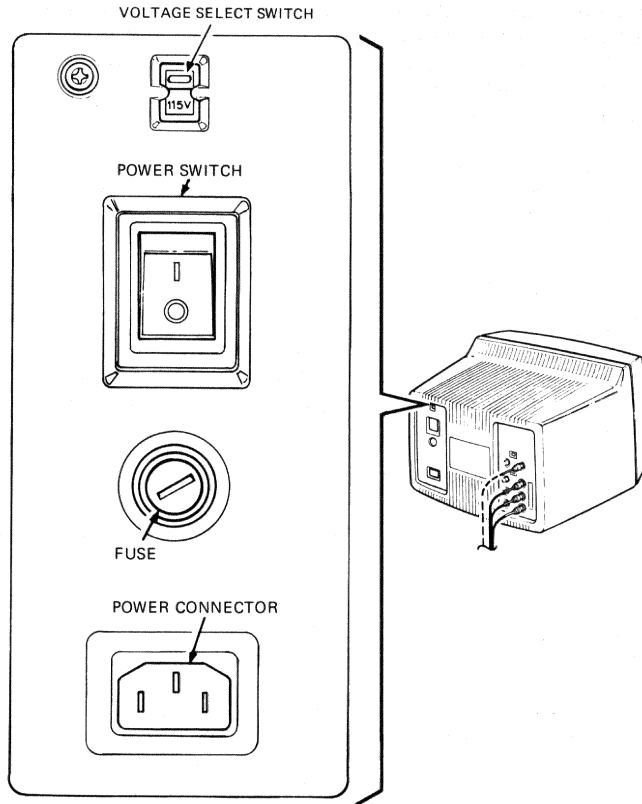
Description	PN
Color monitor (whole option)	VR241-A
Screen cleaner (1 oz)	29-24791-00
VR241 Adjustment Tool	29-24746-00
Alignment tool (yellow)	29-10144-00
Hex-core alignment tool (white)	29-23190-00
Fuses (2.5 amp)	90-08387-00
RGB signal cable	17-00284-00

#### E.4.0 PHYSICAL/FUNCTIONAL DESCRIPTION

This chapter describes how to find and operate the external controls and how to find the alignment points.

#### E.4.1 VOLTAGE SELECTION SWITCH

The voltage selection switch (Figure E-22) is on the back of the color monitor. The switch has two positions: 115 V and 230 V.



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Figure E-22 Power Controls

#### E.4.2 POWER SWITCH

The power switch (Figure E-22) is on the back of the color monitor. Pressing the 1 turns on the color monitor. Pressing the 0 turns off the color monitor.

#### E.4.3 FUSE

The fuse (Figure E-22) is on the back of the color monitor. It is a 2.5 A, 250 V fuse, set in 1/4 inch by 1-1/4 inch fuse carrier for the United States. A 2.5 A, 250 V set in a 5 mm by 20 mm fuse carrier is also packed with the VR241-A for use outside the United States.

#### CAUTION

Do not use the 5 mm by 20 mm fuse and fuse carrier in the United States.

#### E.4.4 POWER INDICATOR

The color monitor has one indicator for power (Figure E-23). When this indicator light is on:

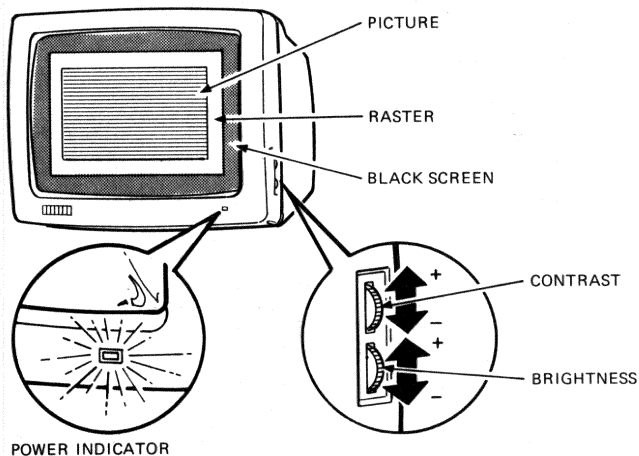
- AC power is applied.
- Power switch is ON.
- Fuse is good.
- Power is being applied to monitor circuits.

#### E.4.5 CONTRAST -- PICTURE INTENSITY ADJUSTMENT

This control (Figure E-23) allows you to adjust the picture's intensity for viewing preference.

#### E.4.6 BRIGHTNESS -- BACKGROUND INTENSITY ADJUSTMENT

This control (Figure E-23) allows you to adjust the raster to cutoff, which compensates for room lighting.



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Figure E-23 Video Controls and Indicators

#### E.4.7 SYNCHRONIZATION AND IMPEDANCE SWITCH SETTINGS

The synchronization switch (Figure E-24) determines on which line the monitor receives the synchronization signal from the host system unit. The monitor can receive the signal on the green video line or on the external sync line. Hosts that provide three video signals to the color monitor (synchronization on green) should have the synchronization switch in the INT (internal) position. Hosts that provide four video signals to the color monitor (external synchronization) should have the synchronization switch in the EXT (external) position.

SET THE SYNCHRONIZATION AND IMPEDANCE SWITCHES ON COLOR MONITOR(S) TO MATCH ARRANGEMENT.

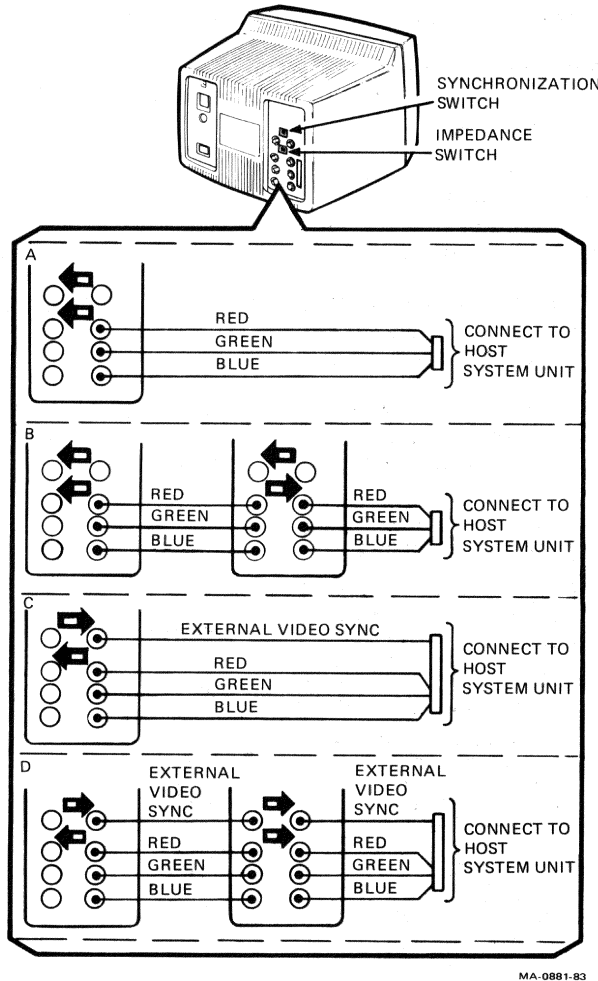


Figure E-24 Synchronization and Impedance Switch Settings



The impedance switch allows you to operate the color monitor correctly in either termination or loop-through modes.

- Termination mode is when your color monitor is the only monitor connected to the host, or your monitor is the last monitor in a string of monitors connected to a host. In the termination mode the impedance switch should be in the 75 ohm position.
- Loop-through mode is when your monitor is connected between a host and another monitor, but is not the last monitor connected. In loop-through mode the impedance switch should be in the HIGH position.

**E.4.8 ALIGNMENT ADJUSTMENT LOCATIONS AND CONTROL DEFINITIONS**  
 Figure E-25 shows the VR241-A alignment point locations. Table E-6 lists and defines the video alignment controls. Table E-7 lists and defines the white balance alignment controls.

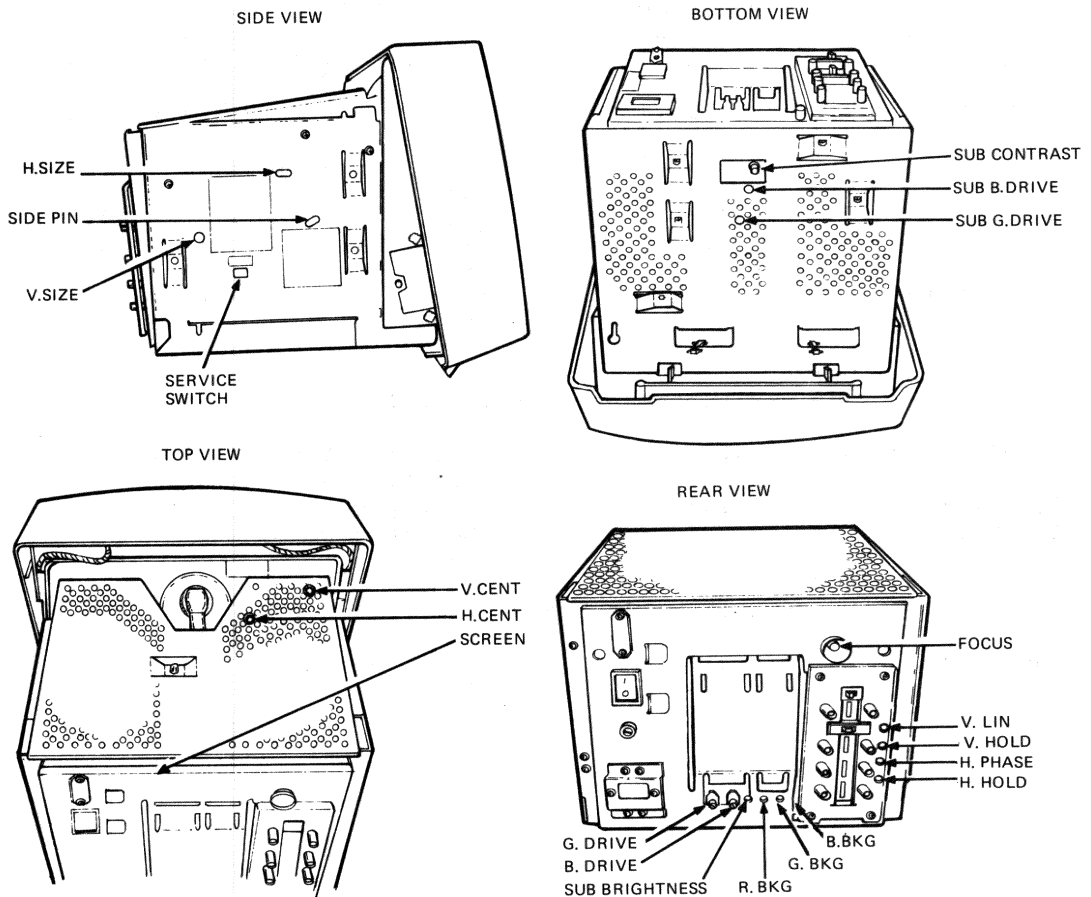


Figure E-25 Adjustment Locations

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Table E-6 Video Alignment Controls

Control	Paragraph	Definition
H. HOLD	E.2.3	Horizontal synchronization
V. HOLD	E.2.3	Vertical synchronization
V. CENT	E.2.4	Vertical video centering
H. CENT	E.2.5	Horizontal raster and video centering
H. PHASE	E.2.6	Horizontal video centering on raster
SIDE PIN	E.2.8	Rectangularity
H. SIZE	E.2.9	Aspect ratio horizontal size
V. SIZE	E.2.9	Aspect ratio vertical size
V. LIN	E.2.10	Vertical linearity
FOCUS	E.2.12	Video focus

Table E-7 White Balance Alignment Controls

Adjustment	Paragraph	Definition
SCREEN	E.2.15.1	Presets bias on CRT control grid 2 (G2)
SERVICE SWITCH	E.2.15.1	Selects service for cutoff adjustment
R. BKG	E.2.15.2	Sets cutoff point of red gun
G. BKG	E.2.15.2	Sets cutoff point of green gun
B. BKG	E.2.15.2	Sets cutoff point of blue gun
SUB-G DRIVE	E.2.15.3	Sets amount of green background raster
SUB-B DRIVE	E.2.15.3	Sets amount of blue background raster

NOTE

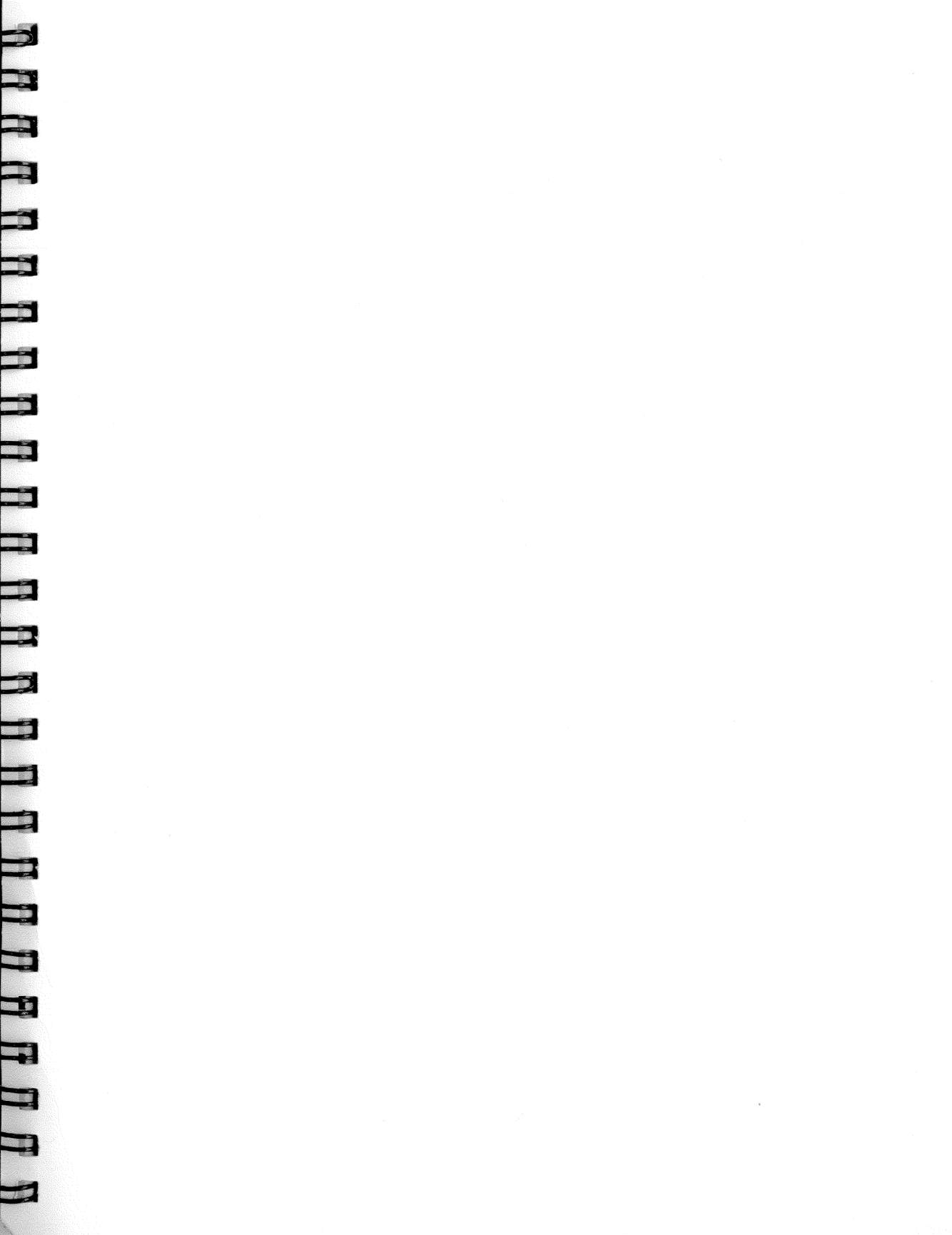
The red background raster is fixed.

SUB-BRIGHTNESS	E.2.15.3	Sets the range of user brightness control
G. DRIVE	E.2.15.4	Sets amount of green video
B. DRIVE	E.2.15.4	Sets amount of blue video

NOTE

The red video is fixed.

SUB-CONTRAST	E.2.15.5	Sets range of user contrast control
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EK-VT240-PS-001