VT 220

Pocket Service Guide

CONTENTS

INTRODUCTION

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INTRODUCTION

ABOUT THIS GUIDE
This pocket service guide describes the following topics on servicing the VT220 video terminal.

Testing and troubleshooting the field replaceable units (FRUs)
FRU removal and replacement
Video monitor alignment
Set-up reference material
Related documentation
Cable information
Physical/functional diagram

WARNINGS, CAUTIONS, AND NOTES
Warnings. cautions. and notes appear throughout this pocket service guide. They are defined as follows.

WARNING   Contains information essential to the
               safety of personnel.

CAUTION   Contains information essential to the
               safety of the equipment and software.

NOTE   Contains an important message alerting
               you to information you should be
               aware of.

Information you type at the keyboard appears in **bold** type.
Information that appears on the screen appears in this type.

THE VT220

The VT220 is a general-purpose video terminal for text.
The VT220 is compatible with the VT102. An optional
VT22X modem mounts under the terminal.

The VT220 supports different language versions of the
LK201 corporate keyboard and works in three operating
states, selected from the keyboard: set-up, on-line, and
local.

The antiglare, 12-inch (305 mm) monochrome monitor
can display 24 rows of text in an 80- or 132-column
format. The monitor tilt mechanism lets the user adjust
the screen for optimum viewing comfort.

The VT220 has three standard interface connectors:
two asynchronous serial ports and one 20 mA port. You
can use the EIA host port or 20 mA host port to connect
the terminal to a host computer. The EIA host port is a
25-pin (EIA RS232C) male connector that connects the
terminal to the VT22X modem option. The 20 mA host
port is an 8-pin 20 mA female connector. The third inter-
face connector is the printer port. This port is a 9-pin
(EIA RS232C) male connector used to connect the termi-
nal to a printer. The VT220 terminal operates only on full-
duplex, asynchronous communication lines.

HOW TO IDENTIFY VT220 MODELS

The VT220 comes in two basic variations.

- Models A. B. and C
- Models D. E. and F

Both variations operate the same. The differences are internal.

To identify the model you are servicing. check the model number on the rear of the terminal (Figure 1-1).

> **NOTE**
> If the letter C (or any successive letter. such as
> D) appears in the serial number. the terminal is
> a VT220 D. E. or F model.

> **Examples:**
> TA629C0001. TA641D0001. TA712E0001

Chapter 2 describes the removal and replacement procedures for VT220 models A. B. and C. Some of these procedures are the same for models D. E. and F.

Chapter 3 describes the removal and replacement procedures that are different for models D. E. and F.

Testing and troubleshooting procedures (Chapter 1) and monitor alignment procedures (Chapter 4) are the same for all VT220 models.
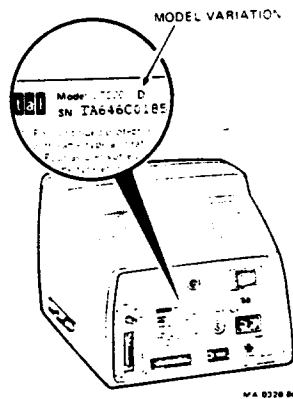
Figure 1-1   Identifying the VT220 Model

TOOLS REQUIRED
You need the following tools to service the VT220.

Tool	Part Number
Slotted screwdriver. 1/4 inch	29-10983-00
Phillips screwdriver, no. 2	29-11005-00
Tuning wand	29-23189-00
Video alignment tool	29-23190-00
Digital screen cleaner	49-01607-01
Diagonal cutters	29-10206-00
Anode discharge tool	29-24717-00
Scribe	None
Ruler	29-25342-00
Video alignment template	29-24371-00

1 TESTING AND TROUBLESHOOTING

1.1 GENERAL

This chapter contains the information needed to perform the self-test functions and troubleshoot the VT220 video terminal.

1.2 TESTING AND TROUBLESHOOTING

There are a series of internal self-tests to help you isolate failures to the field replaceable units (FRUs). (See Appendix B.) Table 1-1 lists the self-tests.

If a test finds a faulty FRU, adjust or replace the faulty unit. Then repeat all of the tests listed in Table 1-1 to ensure that the terminal operates correctly.

1.3 POWER-UP SELF-TEST

This test checks the terminal's internal memory, the keyboard, and the video circuitry. The test also makes a partial check of the communication and printer ports to see if they are operating correctly.

A successful power-up self-test ends when the following occur.

1. The keyboard LED indicators (Figure 1-1) are off.

2. The keyboard generates a bell tone.

3. A VT220 OK message enclosed by a rectangle appears on the screen (Figure 1-1). This message disappears from the screen (1) the moment any character except XON is received by your terminal, (2) if you press the Set-Up key, or (3) if you let 30 minutes elapse.
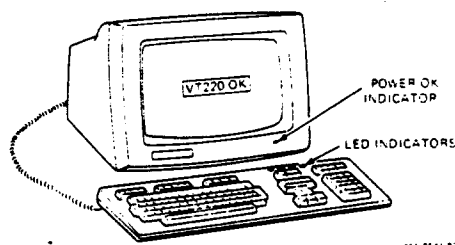
Figure 1-1   Indication of Successful Power-Up Self-Test

1

Table 1-1   Self-Test Chart

Self-Tests	Prerequisites	Sequence*
Power-up (Para. 1.3)	None	Turn terminal power on.

Power-up (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 (Para. 1.4)	● Set-up
	  – Local
	  – VT100
	● EIA loopback connector
		Once:
		ESC [4 ; 2 y
		Continuously:
		ESC [4 ; 2 ; 9 y

Printer port external loopback (Para. 1.5)	● Set-up
	  – Local
	  – VT100
	● Printer port loopback connector
		Once:
		ESC [4 : 3 y
		Continuously:
		ESC [4 : 3 ; 9 y

EIA port control lines loopback (Para. 1.6)	● Set-up
	  – Local
	  – VT100
	● EIA loopback connector
		Once:
		ESC [4 ; 6 y
		Continuously:
		ESC [4 : 6 : 9 y

20 mA port loopback (Para. 1.7)	● Set-up
	  – Local
	  – VT100
	● 20 mA loopback connector
		Once:
		ESC [4 : 7 y
		Continuously:
		ESC [4 : 7 : 9 y

Screen alignment (Para. 1.8)	–	ESC * 8
Execute all above tests except 20 mA port loopback test and screen alignment.	See individual tests.	ESC [4 : 0 y

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

If an error occurs, check your monitor first. Your screen will display VT220 and an error message. Table 1-2 defines the error message. (See Paragraph 1.11.)

If an error occurs that makes it impossible for you to continue operating your monitor, the keyboard LED indicators will display an error code. Table 1-3 defines thee error codes. (See Paragraph 1.11.)

If other problems occur, see Paragraph 1.12. Table 1-4 lists common symptoms and their probable causes, and suggests corrective actions.

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

1. Turn the power to the VT220 on. (The power-up self-test runs automatically each time the terminal is turned on.)

2. Type one of the following sequences to run the power-up self-test. (Read the following note first.)

   NOTE
   If you are already operating your terminal, enter set-up. Then put your terminal in local and in VT100 mode.

   ESC [4 ; 1 y (Performs test once.)

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

   NOTE
   The continuously running test ends only if an error occurs or you turn off the power. The keyboard does not generate a bell tone during a continuously running test.

When you run the power-up self-test, the following occurs.

• All keyboard LED indicators blink on and off intermittently.

• A bell tone sounds if the test is completed successfully.

• A VT220 OK message appears on the screen.

1.4   EIA PORT DATA LINES
LOOPBACK SELF-TEST

For this test, you connect the terminal's transmit and
receive lines together with a data loopback connector
(Figure 1-2). The terminal sends a predefined set of char-
acters on its transmit line and receives them on its receive
line. Then the terminal compares the output characters to
the input characters. If the characters do not match, an
error message appears on the screen. (See Paragraph
1.10.)

A successful test ends when the following occur.

1. The keyboard LED indicators are off.

2. The keyboard generates a bell tone.

3. A VT220 OK message appears on the screen.

Run the EIA data lines loopback self-test as follows.

1. Enter set-up and put your terminal in local and in
   VT100 mode. Then exit set-up.

2. Connect the data loopback connector
   (PN 12-15336-00) to the host port (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 you turn off the power. The
   keyboard does not generate a bell tone during a
   continuously running test.

If the EIA port data lines loopback self-test finds an
error, your screen displays the following message. (See
Paragraph 1.11.)

VT220 EIA Port Data Error - 2
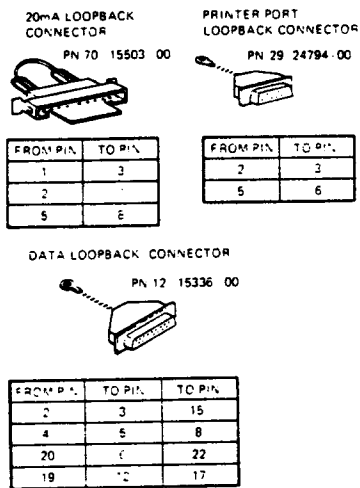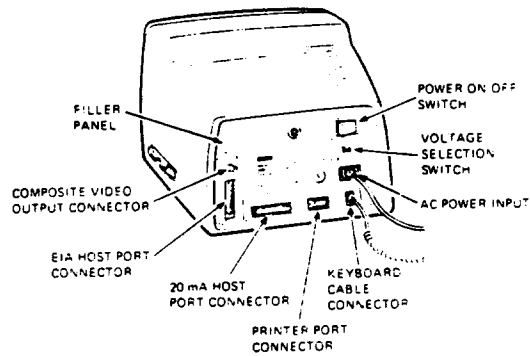
Figure 1-2   VT220 Rear Connector Panel

1.5   PRINTER PORT EXTERNAL
LOOPBACK SELF-TEST

For this test, you connect the printer port transmit and
receive lines together with the printer port loopback con-
nector (Figure 1-2). The terminal sends a predefined set of
characters on its transmit line and receives them on its
receive line. Then the terminal compares the input charac-
ters with the output characters. If the characters do not
match, an error message appears on the screen. (See Para-
graph 1.11.)

A successful test ends when the following occur.

1. The keyboard LED indicators are off.

2. The keyboard generates a bell tone.

3. A VT220 OK message appears on the screen.

Run the printer port loopback self-test as follows.

1. Enter set-up and put your terminal in local and in the
   VT100 mode. Then exit set-up.

2. Connect the printer port loopback connector (PN
   29-24794-00) to the printer port (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 you turn off the power. The
   keyboard does not generate a bell tone during a
   continuously running test.**

If the printer port loopback self-test finds an error, your
screen displays the following message. (See Paragraph
1.11.)

VT220 Printer Port Error - 6

1.6   EIA PORT CONTROL LINES
LOOPBACK SELF-TEST

This test checks data terminal ready, request to send, carrier detect. data set ready, and clear to send.

A successful test ends when the following occur.

1. The keyboard LED indicators are off.

2. The keyboard generates a bell tone.

3. A VT220 OK message appears on the screen.

Run the EIA port control lines loopback self-test as follows.

1. Enter set-up and put your terminal in local and in VT100 mode. Then exit set-up.

2. Install an EIA loopback connector (PN 12-15336-00) to the EIA host port (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 you turn off the power. The keyboard does not generate a bell tone during a continuously running test.

If the EIA port control lines loopback self-test finds an error. your screen displays the following message. (See Paragraph 1.11.)

VT220 EIA Port Controls Error - 3

1.7   20 mA PORT LOOPBACK SELF-TEST

For this test, you connect the terminal's transmit and receive lines together with a 20 mA data loopback connector (Figure 1-2). The terminal sends a predefined set of characters on its transmit line and receives them on its receive line. Then the terminal compares the output characters to the input characters. If the characters do not match, an error message appears on the screen. (See Paragraph 1.11.)

A successful test ends when the following occur.

1. The keyboard LED indicators are off.

2. The keyboard generates a bell tone.

3. A ⁻?20 OK message appears on the screen.

Run the 20 mA port loopback self-test as follows.

1. Enter set-up and put your terminal in local and in VT100 mode. Then exit set-up.

2. Connect the 20 mA loopback connector (PN 70-15503-00) to the 20 mA port (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 you turn off the power. The keyboard does not generate a bell tone during a continuously running test.

If the 20 mA port loopback self-test finds an error, your screen displays the following message. (See Paragraph 1.11.)

VT220 20 mA Port Error - 5

1.8 SCREEN ALIGNMENT TEST

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

Run the screen alignment self-test as follows.

1. Enter set-up and select the following.

   a. 80 columns per line

   b. VT100 mode

   c. Local

   d. Reverse video

   Then exit set-up.

2. Type ESC # 8. (Your screen will display all capital E's in reverse video.)

3. See 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.

1.9 VT22X MODEM OPTION PROBLEMS

The VT22X modem (Figure 1-3) has a test indicator (labled TEST) and two test pushbuttons (labeled ANALOG LOOP and REMOTE LOOP).
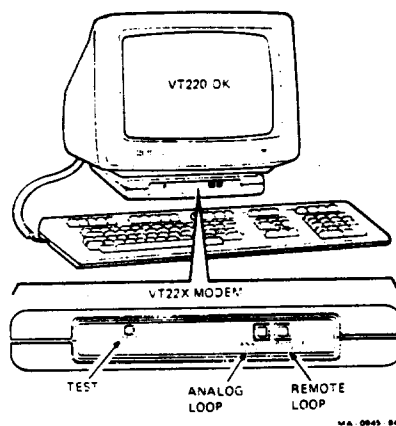
Figure 1-3 VT22X Modem

If there are problems with VT22X modem communication, perform the following steps.

> **NOTE**
> **The VT22X modem does not have autodial, and does not interpret pushbutton telephone codes (DTMF codes). Do not troubleshoot failures of these nonfunctions.**

1. Perform the analog loop test in Paragraph 1.9.1. If this test fails, perform step 2. If the test is successful, perform step 3.

2. If the analog loop test fails, perform the EIA host port loopback test in Paragraph 1.4. If this loopback test fails, follow directions in Paragraph 1.4 to further isolate the VT220 terminal fault. If this loopback test is successful, replace either the cable connecting the VT22X modem to the VT220 terminal, or the VT22X modem to isolate the FRU at fault.

3. If the analog loop test is successful, perform the remote loop test in Paragraph 1.9.2 for both modems in a faulty communication link. You must run separate remote loop tests, one test for each modem, to test the remote communications in both directions.

1.9.1   Analog Loop Test

The analog loop test verifies the operation of the VT22X modem communication link through the VT220 terminal, the cable connecting the VT220 terminal to the VT22X modem option, and the transmit and receive circuits in the VT22X modem option.

> **NOTE**
> **Before you run the analog loop test, make sure the terminal is on-line and**
>
> `EIA Port, Modem Control`
>
> **is selected in the Communications Set-Up screen.**

1. Press the **ANALOG LOOP** pushbutton in.

2. Verify that the **TEST** indicator is on and the modem is connected in a loop.

NOTE
To verify the connection, enter set-up and check the status line (the bottom line of the Set-Up Directory screen). If the connection was made, the right side of the status line will read

Modem: DSR, Connected

3. Type a message on the keyboard. The data you type is looped back by the modem and displayed on the terminal (Figure 1-4). This lets you compare the received data with the transmitted data for accuracy.

4. If the test fails, go to the EIA host port loopback test in Paragraph 1.4. This test helps you isolate a fault to either the VT220 terminal, or to the connecting cable and VT22X modem. If the analog loop test is successful, go to the remote loop test in Paragraph 1.9.2 to further isolate the fault.
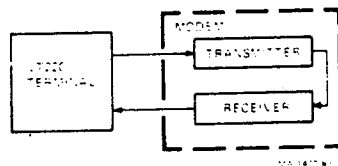

Figure 1-4   Analog Loop Test

1.9.2   Remote Loop Test

This test lets you test the communication link with a remote modem. You must run the analog loop test (Paragraph 1.9.1) successfully before you run this test.

Perform the remote loop test for both modems in a communications link. Each remote loop test is run individually. You cannot run these tests at the same time.

After you make a connection with a remote modem (another VT22X, a Digital DF03, or an AT&T 212A with the Response to Digital Loop option enabled). pressing the **REMOTE LOOP** pushbutton on the *local* VT22X modem sends a signal that places the *remote* modem in a loopback state. The TEST indicator on the local modem will turn on. At this point, any data typed on the local VT220 keyboard is sent to the remote modem and looped back (Figure 1-5). Then you can check the data for accuracy. Run the remote loop test as follows.

1. Verify that the **ANALOG LOOP** pushbutton and the **REMOTE LOOP** pushbutton are out.

2. Verify that the TEST indicator is off.

3. Put the VT22X modem in talk mode.

   NOTE
   To verify that the VT22X modem is in talk mode, enter set-up and check the status line (the bottom line of the Set-Up Directory screen). The right side of the status line should read

   Modem: No DSR, Talk

   If it reads

   Modem: No DSR, Data

   take these steps. Hold the Ctrl key and press Data/Talk to put the VT22X modem in talk mode. Then exit set-up.
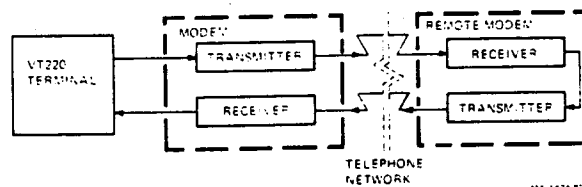
Figure 1-5   Remote Loop Test

4. Pick up the telephone and listen for the dial tone. Then dial the location you want to communicate with.

NOTE
The right side of the status line must read

`Modem: No DSR, Talk`

before the dial tone on your telephone can be heard.

If a person answers your call, have the modem at the remote site set to receive data. The modem then generates an answer tone.

5. When you hear the answer tone, press **Data/Talk** to put the VT22X modem in data mode. Then hang up the telephone.
6. Wait for the connection. Then press the **REMOTE LOOP** pushbutton in.

NOTE
To verify the connection, enter set-up and check the status line (the bottom line of the Set-Up Directory screen). If the connection was made, the right side of the status line will read

`Modem: DSR, Connected`

After the connection is made, exit set-up.

7. Verify that the TEST indicator is on.
8. Type a message on your keyboard. The data you type is sent to the remote modem. Then the data is looped back from the remote modem and displayed on your terminal (Figure 1-5). You can compare the received data with the transmitted data for accuracy.

To test the remote side of the link, put the local VT22X modem in data mode and have the remote end perform steps 1 through 8.

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 (Paragraph 1.3). If the terminal passes the self-test, go to step 2.

2. Perform the printer port external loopback self-test (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. (See your printer pocket service guide for the correct procedure.) If your printer is operating, go to step 4.

4. Check the following set-up features to make sure that your VT220 terminal and printer are compatible.
   - Baud rate (VT220 and printer)
   - Data bits per character (VT220 and printer)
   - Parity (VT220 and printer)
   - Printer Ready must appear on the VT220 set-up status line.
   - Printer must be set to Full Duplex in set-up.

5. Check for the correct cable between your terminal and the printer (Appendix C). Make sure the connectors are securely fastened at both ends of the cable.

6. Put your terminal in local and in VT100 mode. Then exit set-up. Type the following sequence.

   ESC # 8

   Your video screen should display a test pattern of uppercase E's.

7. Press the **Print Screen** key. The video display should print out if the printer is operating correctly.

1.11 SELF-TEST ERROR CODES

If your screen displays an error message, refer to Table 1-2. Each error message includes the FRU you must replace to correct the problem.

If a video problem occurs, refer to Table 1-3 for error codes shown by the LED indicators (Figure 1-1). The LED indicators always display the error code for the test currently running. This test must run successfully before your VT220 terminal clears the error readout.

Refer to Table 1-4 for other troubleshooting procedures.

Table 1-2   VT220 Monitor Display Error Codes

Error Message	Corrective Action
VT220 NVR Error - 1	1. Enter set-up. 2. Check default values. 3. Power down, then power up. 4. If error continues, replace terminal controller board.
VT220 EIA Port Data Error - 2	Replace terminal controller board.
VT220 EIA Port Controls Error - 3	Replace terminal controller board.
VT220 Keyboard Error - 4	1. Check to see if keyboard is plugged in. 2. Replace keyboard. 3. Replace terminal controller board. 4. Replace power supply/monitor board.
VT220 20 mA Port Error - 5	1. Replace terminal controller board. 2. Replace power supply/monitor board.
VT220 Printer Port Error - 6	1. Replace terminal controller board. 2. Replace power supply/monitor board.

NOTE
Keyboard LED indicators flash repeatedly: on for one second, off for one-third of a second, in the following patterns.

Table 1-3   VT220 LED Error Codes

L1 Hold	L2 Lock	L3 Compose	L4 Wait	Replace
○	○	○	○	Controller (Para. 2.3)
○	○	○	●	
○	○	●	○	
○	○	●	●	
●	○	○	○	
●	○	○	●	
●	○	●	○	
●	○	●	●	
●	●	○	○	
●	●	○	●	
●	●	●	○	
●	●	●	●	
x	x	x	x	Keyboard (Para. 2.7)

●	=	on
○	=	off
x	=	varying LED display that repeats one of the above patterns

1.12   TROUBLESHOOTING GENERAL PROBLEMS

Table 1-4 lists some common problem symptoms and their probable causes, and suggests corrective actions.

Table 1-4   VT220 Troubleshooting Chart

Symptom	Probable Cause	Corrective Action
No VT220 OK display, power OK indicator off, no bell tone.	Not plugged in, or no power at wall outlet.	Plug in VT220, or try another wall outlet.
	Power fuse	Replace fuse.
	AC power cord	Check for opens/ shorts.
	Power supply	Replace power supply/ monitor board.
No VT220 OK display, power OK indicator on, no bell tone.	Terminal controller board	Replace terminal controller board.
No VT220 OK display, power OK indicator on, bell tone present.	Brightness set too low.	Adjust contrast and brightness controls.
	Terminal controller board	Replace terminal controller board.
	Monitor board	Replace power supply/ monitor board.
	Flyback transformer	Replace flyback transformer.
	CRT and yoke	Replace the VT200 terminal.
VT220 OK display present, power OK indicator on, bell tone present VT220 cannot communicate with host.	VT220 to host port connection loose.	Check to see if host plugged in.
	Host port circuits faulty	Run EIA or 20 mA loopback test.
	Terminal controller to power supply/ monitor board connection.	Check terminal controller to power supply/monitor board connector.
Random characters appear on screen.	Terminal controller board	Replace terminal controller board.

Table 1-4   VT220 Troubleshooting Chart (Cont)

Symptom	Probable Cause	Corrective Action
Horizontal or vertical line appears on screen.	Monitor connectors	Check and reconnect.
	Monitor circuit	Replace power supply/ monitor board.
	CRT and yoke	Replace the VT220 terminal.
Screen display distorted.	Monitor is out of alignment.	Align monitor.
	Monitor circuit	Replace power supply/monitor board.
	Terminal controller board	Replace terminal controller board.
	CRT and yoke	Replace the VT220 terminal.
Screen display jittery.	Flyback transformer	Replace flyback transformer.
No bell tone.	Keyboard speaker faulty.	Replace keyboard.
Different characters appear on screen than were typed in local.	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 while on-line with host. (Terminal works in local.)	Transmit and receive speeds are set wrong.	Set speeds to match host.
	Bits per character is set wrong.	Set bits to match host.
	Parity is set wrong.	Set parity to match host.
	Stop bits is set wrong.	Set to match host.

Table 1-4   VT220 Troubleshooting Chart (Cont)

Symptom	Probable Cause	Corrective Action
Terminal display does not scroll. Hold Screen indicator on.	Hold screen mode enabled.	Press the Hold Screen key to disable.
Terminal appears locked, does not respond to data from host.	–	Clear terminal with Clear Comm field in set-up.
		Turn ac power off. then on again.
Screen goes blank after successful power-up. then is inactive for one-half hour. Power OK indicator 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.	Select VT100 mode in set-up.

# 2 REMOVING AND REPLACING FRUs (MODELS A, B, AND C)

2.1 GENERAL

This chapter shows you how to remove and replace FRUs for VT220 models A, B, and C. Some procedures also apply to models D, E, and F. Chapter 3 lists the procedures that are different for models D, E, and F.

The following procedures apply to all VT220 terminals.

Access cover	Para. 2.2
Keyboard*	Para. 2.7
VT2XX modem	Para. 2.8

To identify the model you are servicing, check the model number on the rear of the terminal (Figure 2-1).

Paragraph 2.9 provides the recommended spares list for models A, B, and C.
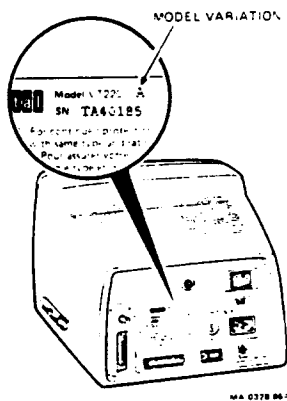
Figure 2-1   Identifying the VT220 Model

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* See note at Paragraph 3.7.

2.2 ACCESS COVER (ALL MODELS)
Remove the terminal access cover as follows.

1. Turn the power to the terminal off.

2. Disconnect the power cord from the wall outlet. Remove the power cord from the terminal's power cord connector.

3. Disconnect the keyboard cable connector and the connector from the video output jack, if applicable.

4. Disconnect all other cables from the rear panel of your terminal, including the following.

   - EIA host port cable
   - 20 mA host port cable
   - printer port cable

NOTE
Before you go to step 5, 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.

You must clean the face of the CRT after you service the monitor. Use the cleaning solution supplied with the monitor or use isopropyl alcohol.

5. With a scribe, remove the plastic cap on the rear panel of the access cover.
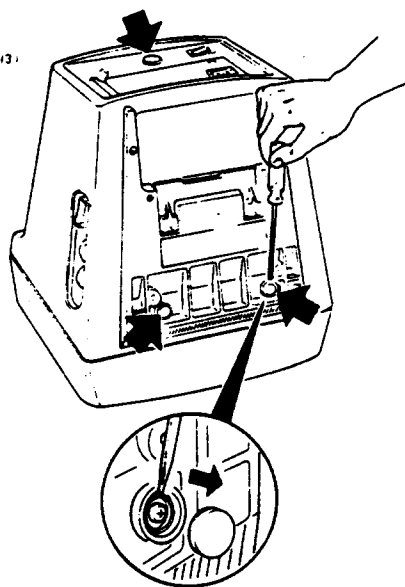
6. With a phillips screwdriver, remove the screw and washer that were exposed when you removed the cap. This screw helps hold the access cover to the terminal's chassis.

7. With the scribe, remove the two caps on the bottom side of the access cover.

8. Remove the screws and washers that were exposed when you removed these caps.
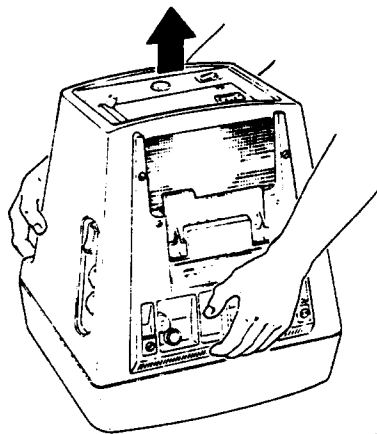
REMOVE THE PHILLIPS SCREWS (3)
AND WASHERS (3)
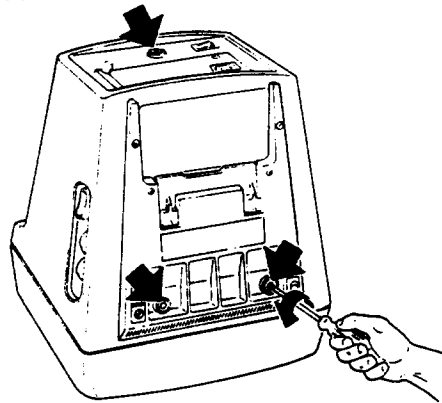
WARNING
The next step exposes you to the CRT anode, which may contain a stored high voltage. Use caution while the access cover is off the terminal.

9. Remove the access cover by sliding it straight up.

MA 0641 83

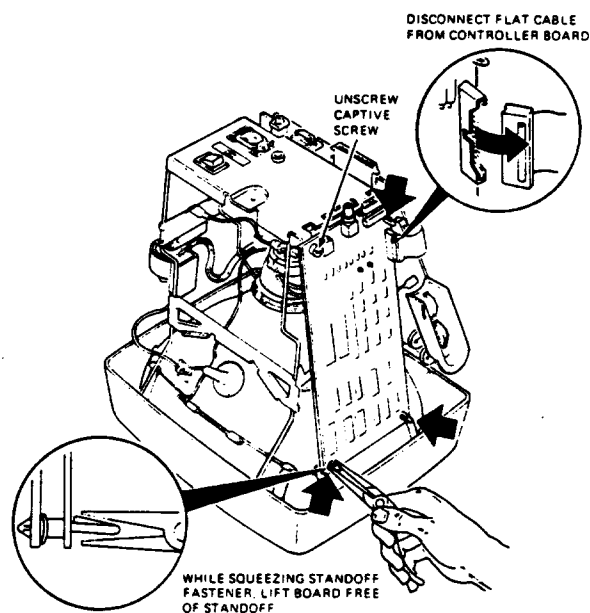To install the access cover, reverse steps 1 through 9.

CAUTION
During installation, the access cover may require careful positioning to align the screw holes.

2.3 TERMINAL CONTROLLER BOARD
Remove the terminal controller board as follows.

1. Remove the access cover (Paragraph 2.2).

2. Disconnect the flat cable going to the power supply/monitor board.

3. Loosen the knurled captive grounding screw on the terminal controller board until it is held only by its retaining spring.

4. Free the controller board from the three standoff fasteners by simultaneously lifting the board and squeezing each standoff fastener with needlenose pliers.

DISCONNECT FLAT CABLE
FROM CONTROLLER BOARD

UNSCREW
CAPTIVE
SCREW

WHILE SQUEEZING STANDOFF
FASTENER, LIFT BOARD FREE
OF STANDOFF

MA 0048 83

To install the terminal controller board, reverse steps 1 through 4.

NOTE
When.replacing the terminal controller board, you should also replace the three standoffs used to mount the board to the chassis. New standoffs come with each controller board.

2.4 POWER SUPPLY/MONITOR BOARD

Remove the power supply/monitor board as follows.

WARNING
This procedure exposes you to the high voltage of the CRT and the power supply. Use caution while the access cover is off the terminal.

1. Remove the access cover (Paragraph 2.2).

2. Disconnect the 26-pin flat cable connector from the terminal controller board.

3. Disconnect the following cables in order from the power supply/monitor board.

   a. The 2-wire cable that runs to the power OK indicator on the front bezel

26 PIN
FLAT CABLE
CONNECTOR

POWER OK
INDICATOR
2 WIRE CABLE
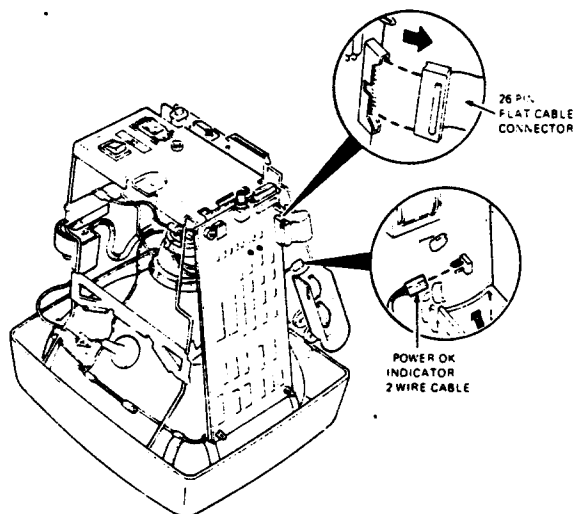
b. The 6-wire input cable that runs to the rear chassis panel

c. The 7-wire cable that runs to the flyback transformer

6 WIRE
INPUT CABLE

7 WIRE
FLYBACK TRANSFORMER
CABLE

MA 0850-83
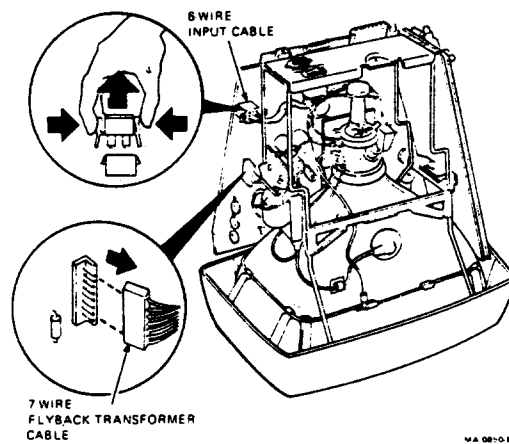
4. Remove the white ground wire from the tab on the CRT ground loop clamp. This wire runs to the round CRT connector.

5. Remove the round CRT connector from the base of the CRT.

CRT CONNECTOR

GROUND WIRE

CRT GROUND
LOOP CLAMP

MA 0051 53
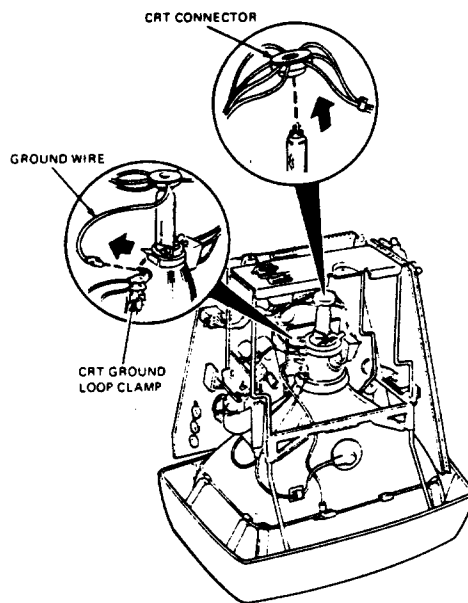
6. Remove the four phillips screws on the power supply/monitor board that hold the board to the chassis.

INSULATING
PAPER

DO NOT
REMOVE
THIS SCREW

MA 0057 83
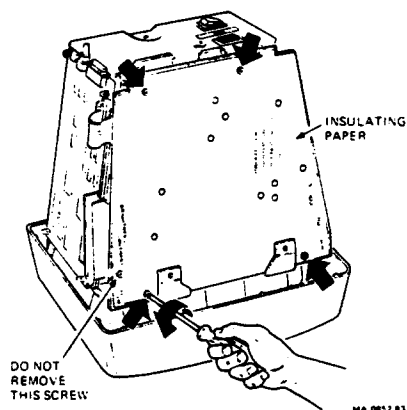
7. Cautiously move the power supply/monitor board away from the chassis so you can see the remaining connectors.

8. Untwist the white plastic clamp that holds the CRT round connector cable to the chassis.

9. Disconnect the 4-wire cable that runs to the yoke of the CRT to free the power supply/monitor board.
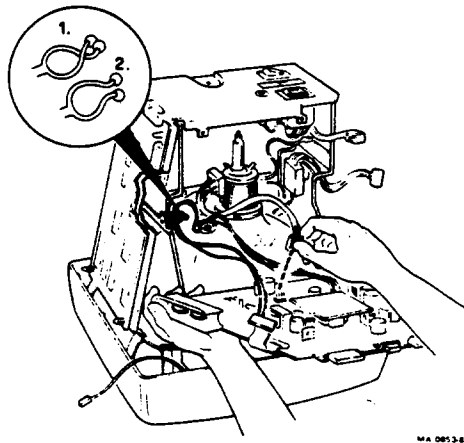
To install the power supply/monitor board, reverse steps 1 through 11.

NOTE
Make sure you can reach the CRT round connector cable to install it after you secure the power supply/monitor board to the chassis with screws. When replacing the CRT round connector, make sure it is seated firmly on the neck of the CRT.

CAUTION
To protect the components on the power supply/monitor board from short circuiting, make sure you reinstall the insulating paper.

2.5 FLYBACK TRANSFORMER
Remove the flyback transformer as follows.

1. Remove the access cover (Paragraph 2.2).

    WARNING
    The following step exposes you to the CRT anode, which may contain a stored high voltage.

2. Discharge the CRT anode by performing the following steps.

    a. Attach the clip end of the anode discharge tool (PN 29-24717-00) to the metal chassis.

    b. Push the probe end under the soft plastic anode connector cap until you feel the probe touching the anode connector.

    CAUTION
    Do not scratch the glass of the CRT when discharging the anode.

    c. Hold the probe against the anode connector for at least 3 seconds, then remove the probe.
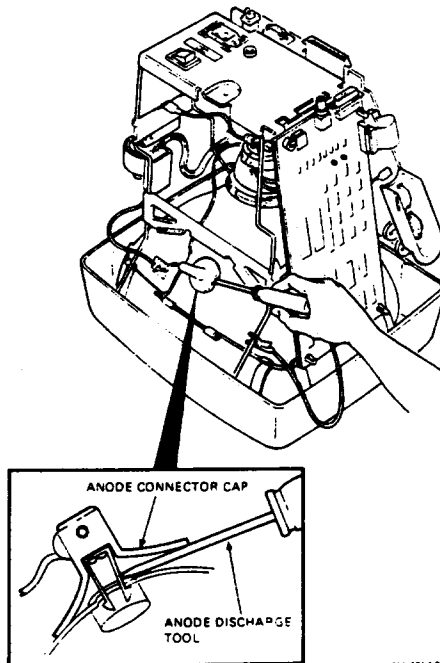
3. Cut the tie wrap that holds the CRT anode wire to the CRT.

TIE WRAP
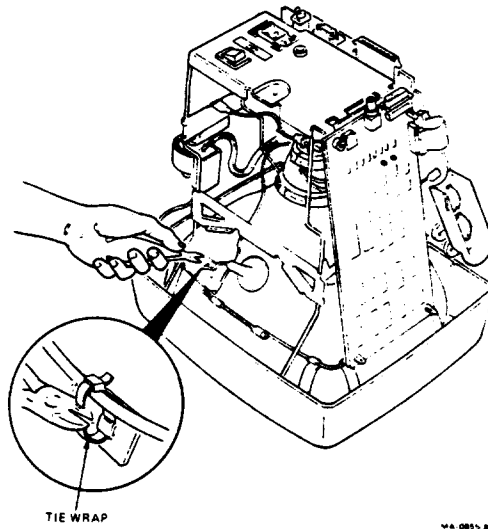
4. Remove the CRT anode connector from the CRT.

A. PUSH IN THE DIRECTION
   OF THE ARROW

B. WHEN ONE BARB IS FREE
   PUSH IN THE OPPOSITE
   DIRECTION (SEE ARROWS) TO
   REMOVE ANODE CAP
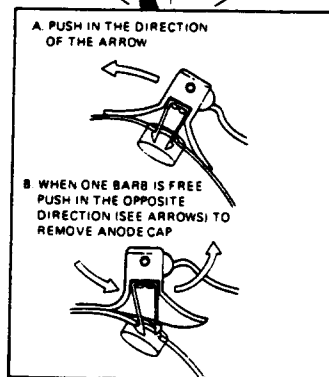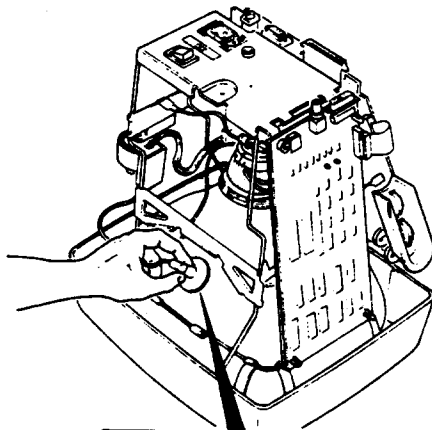
MA-0856-83

5. Disconnect the 7-wire connector from the power sup-
ply/monitor board.
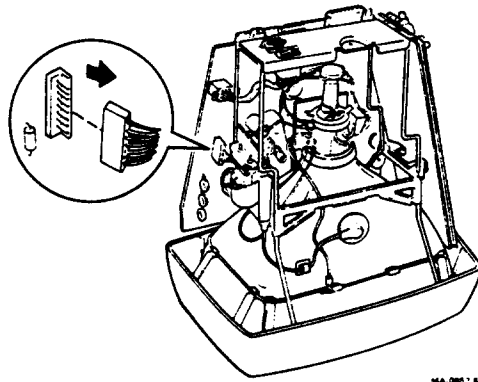
6. Use a 1/4-inch nut driver to remove the two nuts and
two washers that hold the flyback transformer to the
chassis. Remove the flyback transformer.
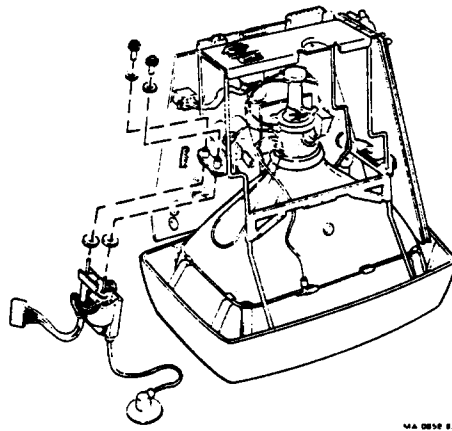
   To install the flyback transformer, reverse steps 1
through 6.

CAUTION
**Do not forget to replace the tie wrap that holds
the anode wire to the CRT.**

2.6 CRT ASSEMBLY

If you cannot repair the VT220 monitor with the video alignment and adjustment procedures (Chapter 4) replace the complete VT220 terminal (whole option swap). Do not try to remove or repair any part of the CRT assembly in the field.

Remove the terminal as follows.

1. Set the power switch to 0 (off position) before disconnecting cables from the rear panel of your terminal.
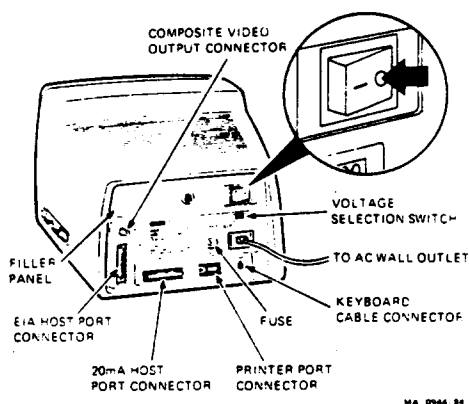
2. Disconnect the following cables from the rear panel of your terminal. if applicable.

- AC power cord
- EIA host port cable
- 20 mA host port cable
- composite video output cable
- video monitor cable
- printer cable
- keyboard cable

To install your new VT220 terminal, reverse steps 1 and 2.

2.7   KEYBOARD (ALL MODELS)*

If the keyboard is faulty, replace the entire keyboard (whole option swap). Remove the keyboard as follows.

1. Disconnect the keyboard cable from the cable connector on the rear panel of your VT220.

2. Remove the keyboard cable from the keyboard.
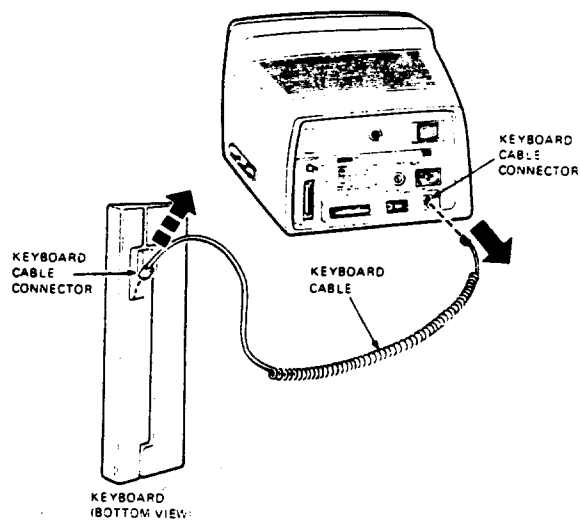
Perform the following steps to install the new keyboard.

Install the Legend Strip

1. Open the clear plastic window.
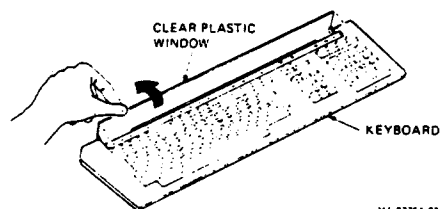
---

* See note at Paragraph 3.7.

2. Remove the legend strip from the defective keyboard.

3. Insert the old legend strip directly over the one already on the new keyboard.

LEGEND STRIP

KEYBOARD

MA 0777A 83
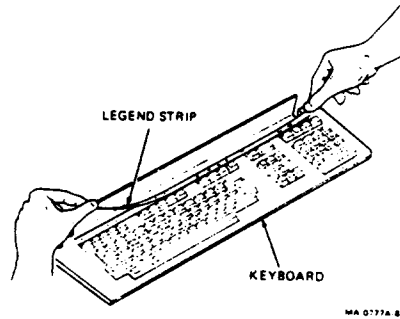
4. Close the clear plastic window.

Install the Keyboard Standoffs

KEYBOARD
(BOTTOM VIEW)

MA 0778A 83
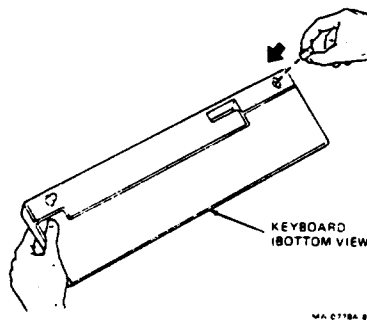
Connect the Keyboard to the Video Terminal

1. Turn the terminal power switch off.
2. Insert the longer end of the keyboard cable into the connector on the bottom of the keyboard.
3. Press the cable into the long groove if routing to the left.
4. Press the cable into the short groove if routing to the right.
5. Insert the keyboard cable into the connector on the rear of the terminal.
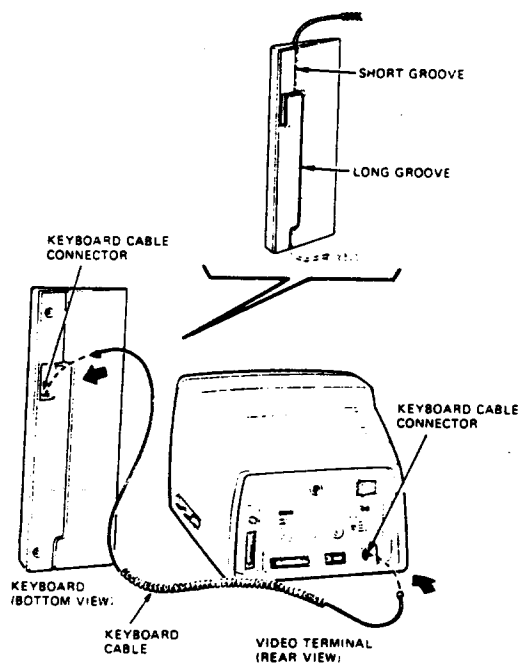
2.8 VT22X MODEM OPTION (ALL MODELS)

The VT22X modem consists of three FRUs: the VT22X modem, the EIA cable with shorting plug, and the telephone cable.

2.8.1 Installing the VT22X Modem

Install a VT22X modem as follows.

1. Turn the terminal switch power off.

2. Disconnect these cables (if connected).

   - power cable
   - keyboard cable
   - EIA communications

   - 20 mA port cable
   - printer port cable
   - video output cable

3. Lay the terminal on a flat surface (bottom side up).
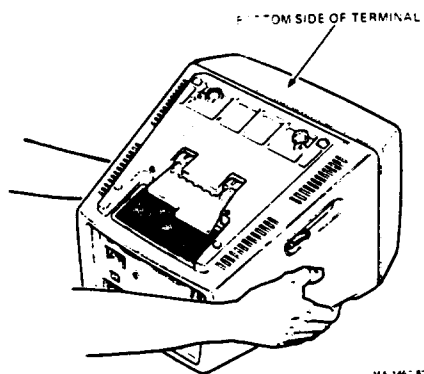
4. Identify the modem mounting holes.
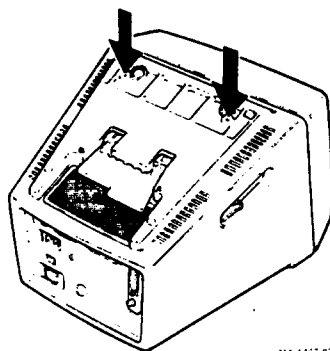
5. Align the mounting holes in the modem and terminal.
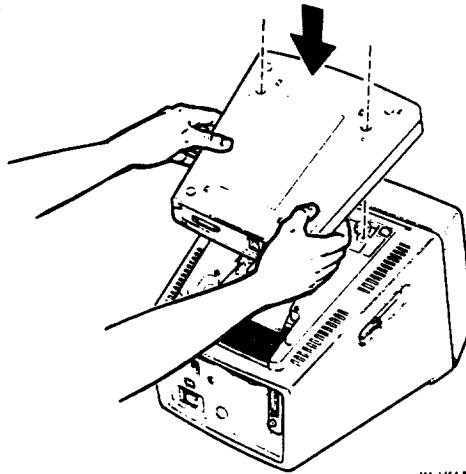
6. Attach the modem to the terminal with the screw-driver and screws provided.
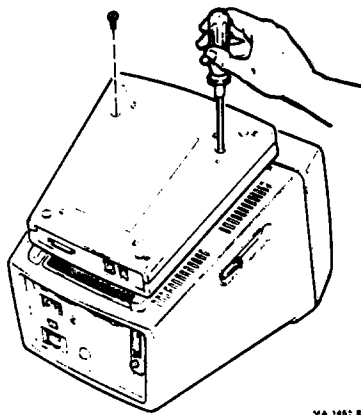
To remove the modem, perform steps 1 through 3.
Then remove the screws holding the modem to the
terminal.

2.8.2   Installing the VT22X Modem Cabling

Install the EIA cable with shorting plug (PN 70-21475-01) and the telephone cable (PN 17-00089-01) as follows.

1. Turn the terminal and modem upright as shown.
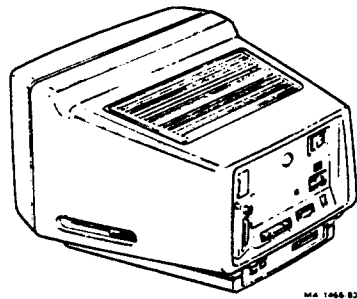
2. Locate the EIA cable and shorting plug.
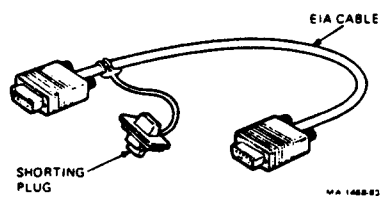
3. Identify the connectors on the rear panel of the modem and terminal.

FILLER PANEL

EIA CONNECTOR

TELEPHONE JACK   TELEPHONE CABLE JACK

EIA CONNECTOR
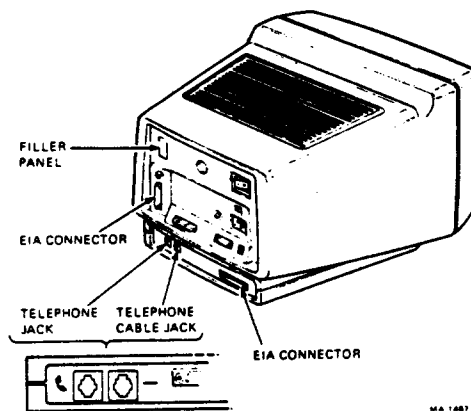
MA 1467 83

4. Remove the filler panel on the terminal.

FILLER PANEL

NOTE
PANEL IS FIRMLY IN PLACE.
A SMALL-BLADED SCREWDRIVER
MAY BE REQUIRED TO PRY IT OFF.

MA-1466-83
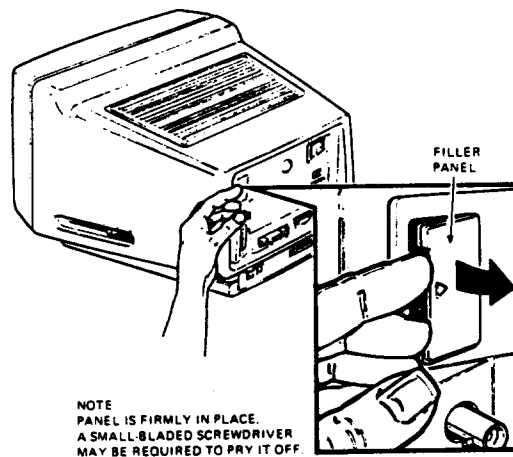
5. Connect the EIA cable and shorting plug as shown.
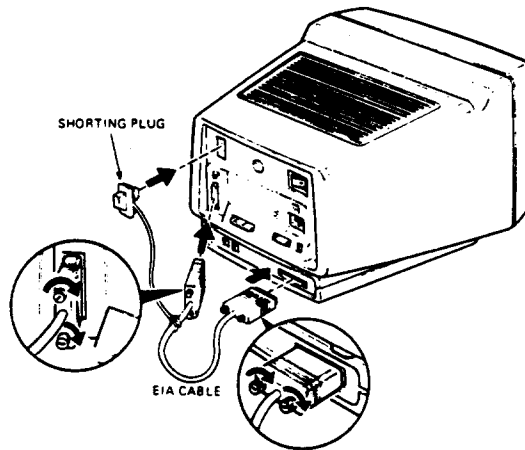
6. Connect the telephone to the modem.
7. Connect the telephone cable to the modem and RJ11C wall jack.
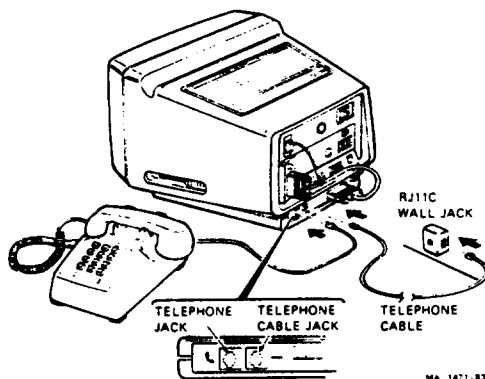
To remove the EIA cable, reverse step 5. To remove the telephone cable, reverse step 7.

2.9 RECOMMENDED SPARES LIST
(MODELS A, B, AND C)

Table 2-1 lists the recommended spares for VT220 models A, B, and C. Refer to Table 3-1 for models D, E, and F.

Table 2-1   Recommended Spares List (Models A, B, and C)

Description	Part Number
Terminal controller	70-20814-02
Power supply/monitor board	70-20624-01
Flyback transformer	70-20772-01
CRT/bezel/yoke (white)	70-20622-04
(green)	70-20622-05
(amber)	70-20622-06
VT22X modem (with EIA cable and telephone cable)	70-21205-01
EIA cable with shorting plug (modem cable)	70-21475-01
Telephone cable	17-00089-01
EIA loopback connector	12-15336-00
20 mA loopback connector	70-15503-00
Printer port loopback	29-24794-00
United States keyboard	LK201-AA
French Canadian keyboard	LK201-AC
Danish keyboard	LK201-AD*
British keyboard	LK201-AE*
Finnish keyboard	LK201-AF
Austrian/German keyboard	LK201-AG
Dutch keyboard	LK201-AH
Italian keyboard	LK201-AI
Swiss (French) keyboard	LK201-AK
Swiss (German) keyboard	LK201-AL
Swedish keyboard	LK201-AM
Norwegian keyboard	LK201-AN
French/Belgium keyboard	LK201-AP
Spanish keyboard	LK201-AS
Australian keyboard	LK201-AZ
Keycap removal tool	74-27314-01
Video alignment tool	29-23190-00
Tuning wand	29-23189-00
Fuse (U.S.), 2 amps	90-07215-00
Fuse carrier (U.S.)	12-21126-03
Fuse holder	12-21126-01
Fuse (European), 2 amps	12-19285-03
Fuse carrier (European)	12-21126-04
Tie wraps	90-09996-00

* Do not use with VT220 models D, E, and F.
  See Table 3-1.

3 REMOVING AND REPLACING FRUs (MODELS D, E, AND F)

3.1 GENERAL

This chapter shows you how to remove and replace FRUs for VT220 models D, E, and F. Some of the procedures are the same as for models A, B, and C. Chapter 2 contains the procedures that are the same.

Access cover	Para. 2.2
Keyboard*	Para. 2.7
VT2XX modem	Para. 2.8

To identify the model you are servicing, check the model number on the rear of the terminal (Figure 3-1). For models A, B, and C, refer to Chapter 2.

Paragraph 3.9 provides the recommended spares list for models D, E, and F.

Figure 3-1   Identifying the VT220 Model

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* See note at Paragraph 3.7.

3.2   ACCESS COVER
Refer to Paragraph 2.2.

3.3   TERMINAL CONTROLLER BOARD
Remove the terminal controller board as follows.

1. Remove the access cover (Paragraph 2.2).
2. Disconnect the flat cable that goes to the power supply/monitor board.
3. Loosen the four phillips screws from the terminal controller board.
4. Lift the board to release it from the slotted brackets and remove.
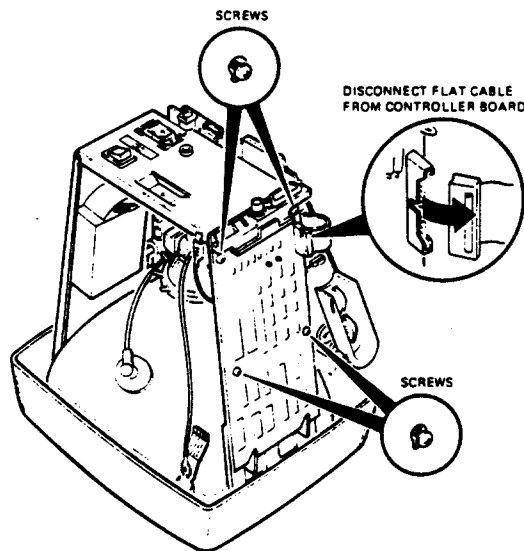
To install the terminal controller board, reverse steps 1 through 4.

3.4 POWER SUPPLY/MONITOR BOARD
Remove the power supply/monitor board as follows.

WARNING
This procedure exposes you to the high voltage
of the CRT and the power supply.

1. Remove the access cover (Paragraph 2.2).

WARNING
The following step exposes you to the CRT
anode, which may contain a stored high voltage.

2. Discharge the CRT anode by performing the following steps.

    a. Attach the clip end of the anode discharge tool
       (PN 29-24717-00) to the metal chassis.
    b. Push the probe end under the soft plastic anode
       connector cap, until you feel the probe touching
       the anode connector.

CAUTION
Do not scratch the glass of the CRT when discharging the anode.

    c. Hold the probe against the anode connector for at
       least 3 seconds, then remove the probe.

ANODE CONNECTOR CAP

ANODE DISCHARGE TOOL

MA-0297-86

3. Remove the anode from the CRT.

A. PUSH IN THE DIRECTION OF THE ARROW

B. WHEN ONE BARB IS FREE PUSH IN THE OPPOSITE DIRECTION (SEE ARROWS) TO REMOVE ANODE CAP

MA-0298-86
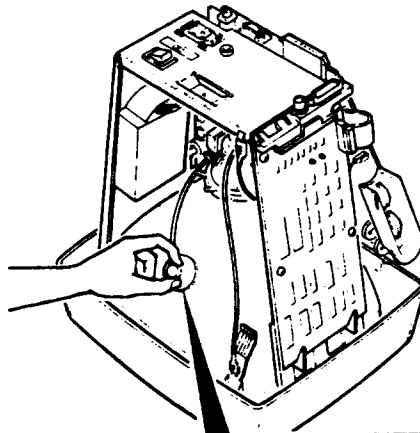
4. Disconnect the CRT connector from the CRT neck. Push the connector so that it rests between the power supply/monitor board and the CRT neck.

5. Disconnect the ground wire from the ground clip on the CRT. This wire runs to the CRT connector.

   Disconnect the white ground wire from the chassis. This wire runs to the power supply/monitor board.
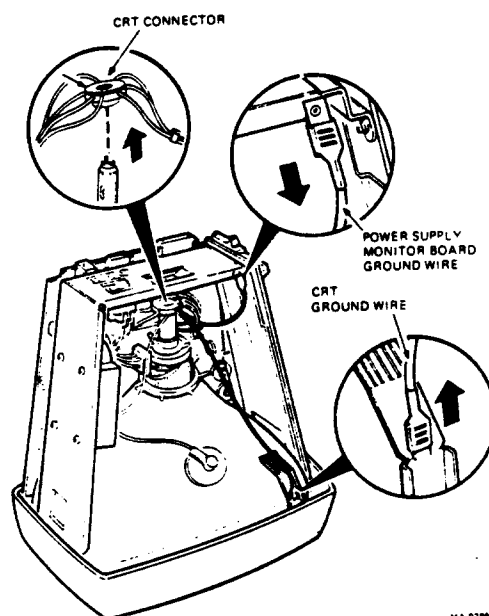
6. Disconnect the 26-pin flat cable connector from the terminal controller board.

7. Disconnect the 2-wire cable that runs to the power OK indicator on the front bezel (J7).

8. Use a phillips screwdriver to loosen the two screws from the top of the board. The screws are in keyholes.

SCREWS (2)

26-PIN
FLAT CABLE
CONNECTOR

POWER OK
INDICATOR
2-WIRE CABLE

VA-0300-86
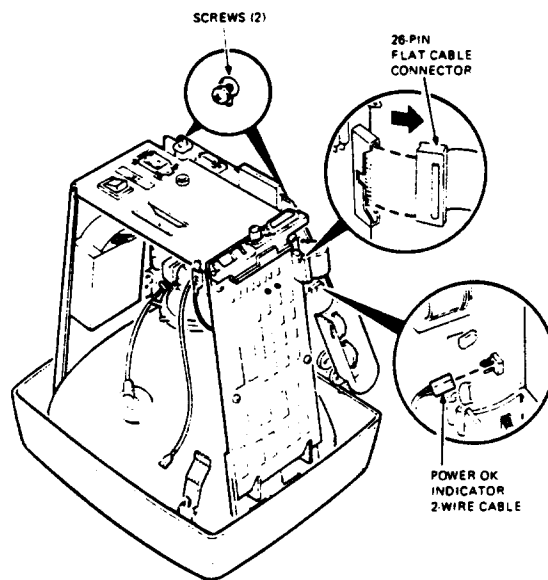
9. Pull the board up and forward to disconnect the following cables.

    a. The 2-wire cable that runs to the transformer

    b. The 4-wire cable that runs from J1 to the deflection yoke (J1)
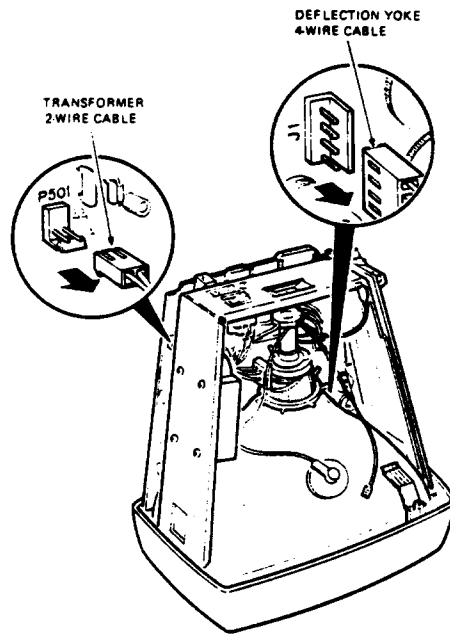
To install the power supply/monitor board, reverse steps 1 through 9.

3.5 TRANSFORMER
Remove the transformer as follows.

1. Remove the access cover (Paragraph 2.2).
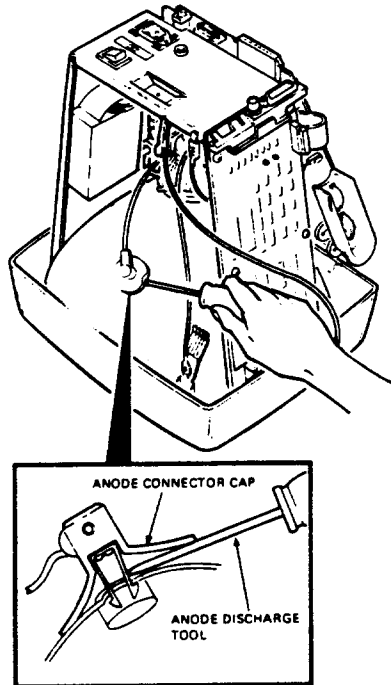
   WARNING
   The following step exposes you to the CRT anode, which may contain a stored high voltage.

2. Discharge the CRT anode by performing the following steps.

   a. Attach the clip end of the anode discharge tool (PN 29-24717-00) to the metal chassis.

   b. Push the probe end under the soft plastic anode connector cap, until you feel the probe touching the anode connector.

   CAUTION
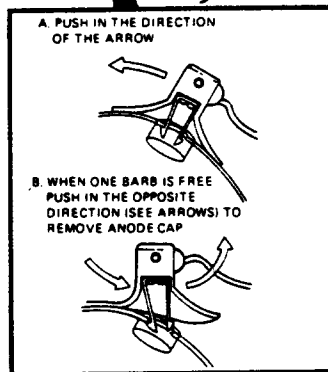   **Do not scratch the glass of the CRT when discharging the anode.**

   c. Hold the probe against the anode connector for at least 3 seconds, then remove the probe.

ANODE CONNECTOR CAP

ANODE DISCHARGE TOOL

MA-0791.86
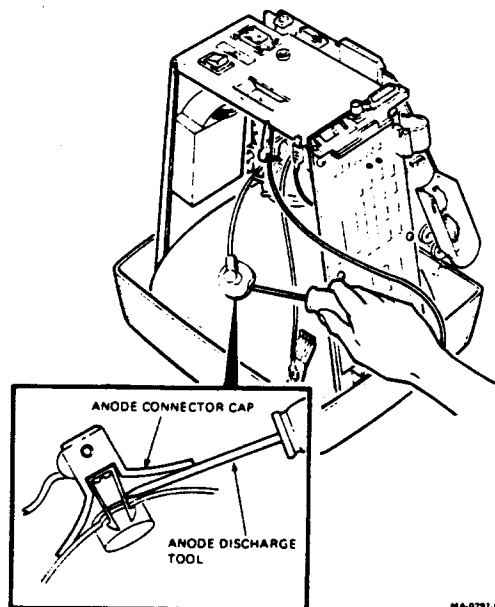
3. Disconnect the 2-wire cable from the power supply/monitor board.

4. Turn the terminal so the transformer is on your left. Use a flat blade screwdriver to pry off the right rear plug from the power 1/0 switch. (This transformer wire branches between the voltage select switch and the power 1/0 switch.)

2-WIRE CABLE ON POWER SUPPLY MONITOR BOARD

RIGHT REAR WIRE ON POWER 1 0 SWITCH
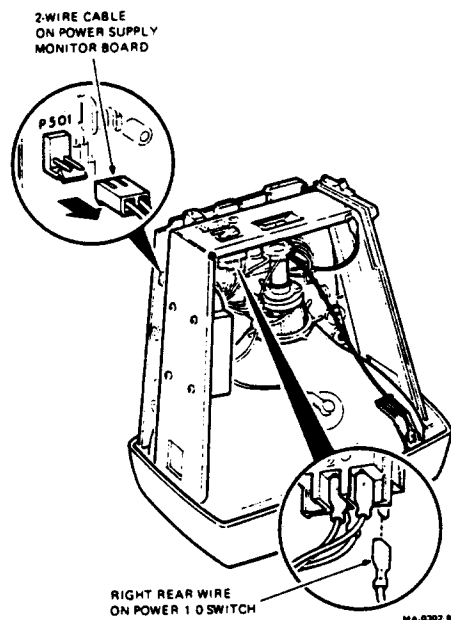
5. Pry off the four connectors from the back of the voltage select switch.

6. Disconnect the transformer wire from the side of the fuse.

4-WIRE CABLE
ON VOLTAGE-SELECT
SWITCH

FUSE HOLDER
AND WIRES

MA-0303-86
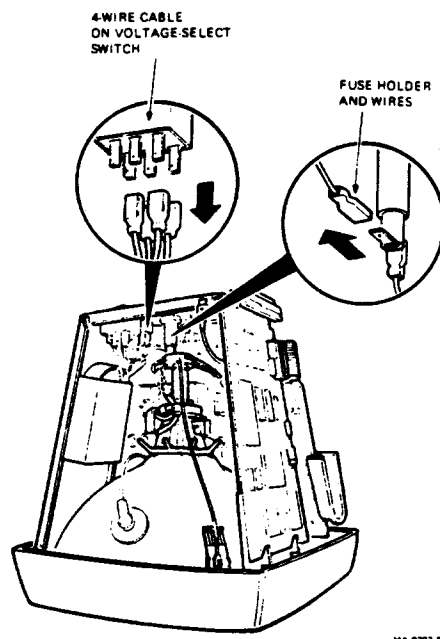
WARNING
Be careful not to drop the transformer on the CRT neck, or to hit the CRT as you remove the transformer.

7. Remove the four screws that hold the transformer to the chassis.

   Hold on to the transformer to prevent it from dropping to the table as you release it.

To install the transformer, reverse steps 1 through 7.

3.6   CRT/BEZEL ASSEMBLY

The CRT/bezel assembly is one FRU. Do not try to remove or repair any part of this assembly in the field. To replace the assembly, remove and save the following FRUs.

1. Remove the access cover (Paragraph 2.2).

2. Remove the terminal controller board (Paragraph 3.3).

3. Remove the power supply/monitor board (Paragraph 3.4).

4. Remove the transformer (Paragraph 3.5).

To install a new CRT/bezel assembly, reverse steps 1 through 4. Place a piece of paper on a flat working surface. Carefully place the new monitor face down on the paper. The paper prevents scratches to the monitor bezel.

3.7   KEYBOARD

Refer to Paragraph 2.7.

> **NOTE**
> There are two versions of United Kingdom, Danish, and Norwegian keyboards. You must use the correct version of the United Kingdom and Danish keyboards. See Tables 2-1 and 3-1 for part numbers.

3.8   VT22X MODEM OPTION

Refer to Paragraph 2.8.

3.9   RECOMMENDED SPARES LIST (MODELS D, E, and F)

Table 3-1 lists the recommended spares for VT220 models D, E, and F. Refer to Table 2-1 for models A, B, and C.

Table 3-1   Recommended Spares List (Models D, E, and F)

Item	Part Number
Terminal controller	70-23363-01
Power supply/monitor board	70-23361-01
Transformer	70-23362-01
CRT/bezel/yoke (white)	70-23360-01
(green)	70-23360-02
(amber)	70-23360-03
VT22X modem (with EIA cable and telephone cable)	70-21205-01
EIA cable with shorting plug (modem cable)	70-21475-01
Telephone cable	17-00089-01
EIA loopback connector	12-15336-00
20 mA loopback connector	70-15503-00
Printer port loopback	29-24794-00
United States keyboard	LK201-AA
French Canadian keyboard	LK201-AC
Danish keyboard	LK201-ED*
British keyboard	LK201-EE*
Finnish keyboard	LK201-AF
Austrian/German keyboard	LK201-AG
Dutch keyboard	LK201-AH
Italian keyboard	LK201-AI
Swiss (French) keyboard	LK201-AK
Swiss (German) keyboard	LK201-AL
Swedish keyboard	LK201-AM
Norwegian keyboard	LK201-EN
French/Belgium keyboard	LK201-AP
Spanish keyboard	LK201-AS
Australian keyboard	LK201-AZ
Video alignment tool	29-23190-00
Tuning wand	29-23189-00
Fuse (U.S.), 2 amps	90-07215-00
Fuse carrier (U.S.)	12-21126-03
Fuse holder	12-21126-01
Fuse (European), 2 amps	12-19285-03
Fuse carrier (European)	12-21126-04
Tie wraps	90-09996-00

* Do not use with VT220 models A, B, and C.
  See Table 2-1.

4 VIDEO MONITOR ALIGNMENT

4.1 GENERAL

This chapter shows you how to align the VT220 monitor. You do not have to make every adjustment each time you align your monitor. However, you should check all adjustments, because many adjustments affect the other settings. If you find a correct setting, you can skip that adjustment and go on to check the next setting.

You must make all adjustments under the following conditions.

Enter set-up and select the following.

- Reverse video mode (black characters on a white background)
- 80 columns per line
- VT100 mode
- Local

Use a flexible metric ruler for determining alignment adjustments. Make sure all adjustments are made under the above conditions.

4.2 MONITOR ADJUSTMENTS

Figure 4-1 shows the locations for most of the adjustments.

VH (R303)

VL (R307)

HH (R203)

PH (R211)

FO (R221)
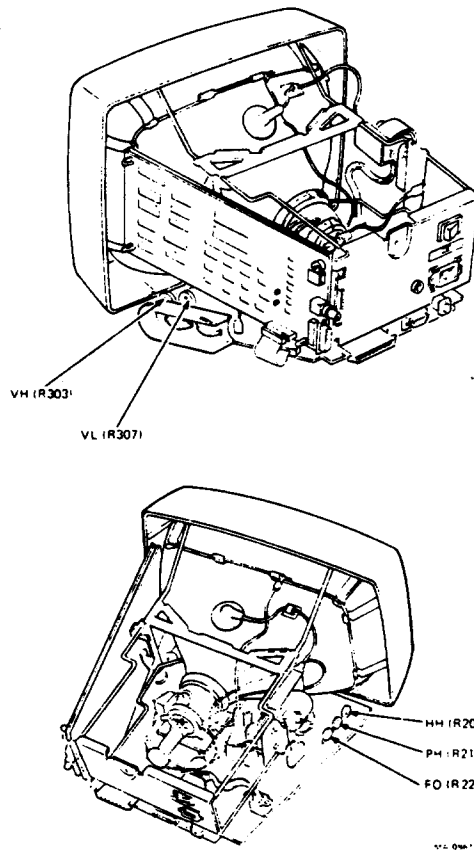
Figure 4-1a   Video Adjustment Locations
(Models A, B. and C)

4.2.1   Initial Preparations

Before you perform adjustments. complete the following
steps.

1. Remove the access cover (Paragraph 2.2).

2. Place your terminal as shown in Figure 4-1. Make
   sure your monitor is on a nonconductive surface.

3. Reconnect the keyboard cable and power cord.

4. Turn the power switch on.

VH (R303)

VL (R307)

HH (R203)

PH (R211)

FO (R221)
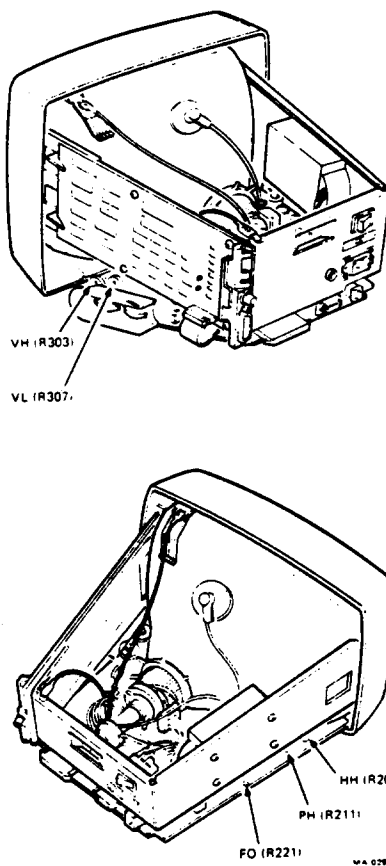
Figure 4-1b   Video Adjustment Locations
(Models D, E, and F)

5. After VT220 OK appears on your screen, type ESC #
   8. Your screen will display all capital E's. This is your
   alignment pattern.

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

4.2.2 Character Quality

This section covers brightness, contrast, vertical linearity, and focus adjustments.

4.2.2.1 Brightness – Adjust the brightness as follows.

1. Let the terminal warm up for at least five minutes.
2. Increase the brightness and the contrast controls to maximum (Figure 4-2).
3. Decrease the brightness until the white diagonal lines (raster) just disappear.
4. Go to Paragraph 4.2.2.2.

4.2.2.2 Contrast – Set the contrast control for the desired screen intensity.
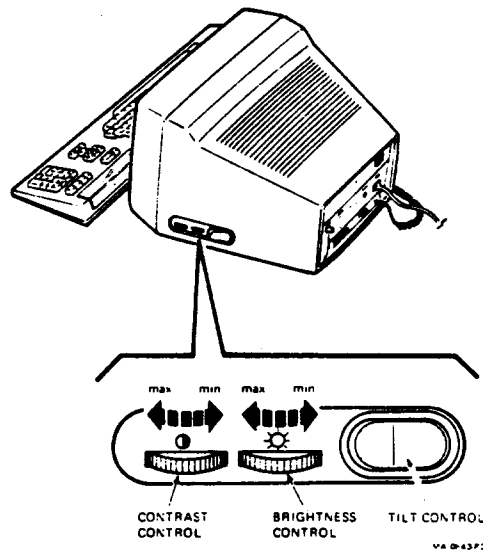
Figure 4-2   Brightness, Contrast, and Tilt Controls

4.2.2.3 Vertical Linearity – Check and adjust the vertical linearity as follows.

1. Check character heights at the four corners and center of the screen. All characters should be the same height (3.7 ± 0.4 mm).

2. If necessary, adjust the vertical linearity (VL) control (Figure 4-1) until all characters are the same height.

3. Go to Paragraph 4.2.2.4.

4.2.2.4 Focus – Check and adjust the focus as follows.

1. Check the characters at the four corners and center of the screen. You should be able to see the individual dots in the vertical segments of each E.

NOTE
Make sure the screen is clean. This condition can appear to affect the focus.

In some cases, 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 (Figure 4-1) for the best overall character presentation, if necessary.

3. Go to Paragraph 4.2.3.

4.2.3 Horizontal Hold (Display Instability Adjustment)
Check and adjust the horizontal hold as follows.

1. Examine the screen for tearing or any other signs of horizontal instability.

2. If necessary, adjust the horizontal hold (HH) control (Figure 4-1) to stabilize the display.

3. Go to Paragraph 4.2.4.

NOTE
There is no vertical hold adjustment.

4.2.4   Display Centering

This section covers horizontal and vertical centering adjustments.

4.2.4.1   Horizontal Centering – Check and adjust the horizontal centering as follows. Use your flexible ruler.

1. Measure the distance between the center of the left edge of the alignment pattern of E's on the screen and the monitor bezel. Make a note of the result.

2. Measure the distance between the center of the right edge of the alignment pattern of E's and the monitor bezel. Make a note of the result.

3. Compare the measurements in steps 1 and 2. If the difference between the two measurements is greater than 6 mm. adjust the horizontal centering control (PH in Figure 4-1).

4. Perform steps 1 and 2 again to verify the adjustment.

> **NOTE**
> If the PH control adjusts the horizontal centering correctly, go to Paragraph 4.2.5.

5. Go to Paragraph 4.2.4.2.

4.2.4.2   Vertical Centering – Check and adjust the vertical centering as follows. Use your flexible ruler.

1. Measure the distance between the center character in the top row of E's and the monitor bezel. Make a note of the result.

2. Measure the distance between the center character in the bottom row of E's and the monitor bezel. Make a note of the result.

3. If the distance is less than 3 mm in either case, center the screen display by rotating the centering rings on the neck of the CRT. Use the ring tabs to rotate these rings (Figure 4-3).

4. Repeat Paragraph 4.2.4.1 to bring the horizontal centering control (PH) within range.
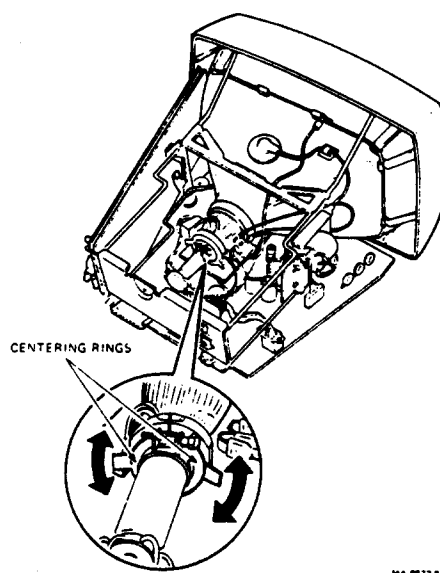
Figure 4-3   Centering Adjustments

4.2.5 Display Size
This section covers horizontal width and vertical height adjustments.

4.2.5.1 Horizontal Width – Check and adjust the horizontal width as follows.

Use your flexible ruler to measure the width of one row in the alignment pattern of E's. If the row does not measure 203.2 mm, adjust the horizontal width (HW) control (L201 in Figure 4-4) with the tuning wand tool (PN 29-23189-00). Go to Paragraph 4.2.5.2.
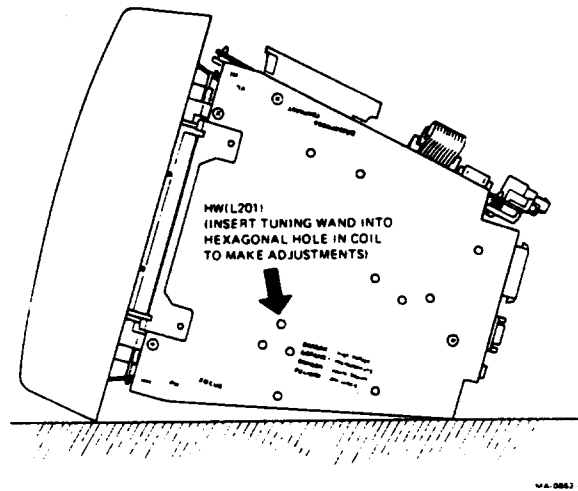
Figure 4-4   Horizontal Width Adjustment

4.2.5.2   Vertical Height – Check and adjust the vertical height as follows.

1. Use your flexible ruler to measure the height of one column in the alignment pattern of E's. If the column does not measure 127 mm, adjust the vertical height (VH) control (Figure 4-1).

2. Readjust the vertical linearity, if necessary (Paragraph 4.2.2.3).

5 SET-UP REFERENCE MATERIAL

Refer to the *VT220 Owner's Manual* for the set-up summaries for the VT220 video terminal.

5.1 USING SET-UP

You enter set-up by pressing the **Set-Up** key (F3) on the top row of the VT220 keyboard. You move to different fields in each set-up menu by using the arrow keys. The field you are in is highlighted in reverse video.

You use the **Enter** key to select any of the following.

* A set-up menu – Move to the field selecting the menu. Then press **Enter**, and the new menu will appear on the screen.
* An action field – Move to the desired field. Then press **Enter**, and the terminal will perform the action.
* A parameter field – These fields have more than one value. Move to the desired field. Then use **Enter** to step through the values for the field. When the desired value is displayed, move to a new field (or exit set-up) to select that value.

You exit set-up by pressing the **Set-Up** key.

5.2 SAVING OR RECALLING SET-UP VALUES

You can save values selected in set-up, or recall the last saved values, as follows.

1. Move to the **Set-Up Directory** screen.
2. Move to the **Save** or **Recall** field.
3. Press **Enter**.

Save stores the current values of most set-up features in all set-up screens. The terminal uses these values until you change them. **Recall** changes the current values to the last saved values.

A VT220 DOCUMENTATION

The following documents on the VT220 are available from Digital.

VT220 Owner's Manual   EK-VT220-UG

This manual provides the user with the information needed to operate and service the VT220 terminal. The manual includes an overview of the VT220's physical and functional structure. Specific operational features such as set-up procedures, controls and indicators, communication interfaces, and test functions are also described.

Installation Guide   EK-VT220-IN

This guide provides the user with the information needed to unpack, assemble, and bring the VT220 terminal to operating status.

VT220 Programmer Reference Manual EK-VT220-RM

This manual provides the programmer with the information needed to use the communication and character processing features of the VT220 video terminal.

VT220 Programmer Pocket Guide   EK-VT220-HR

This guide provides the programmer with a summary of the information needed to program the VT220 video terminal.

VT220 Pocket Service Guide   EK-VT220-PS

This guide provides service personnel with the information needed to test, troubleshoot, and repair the VT220 video terminal.

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VT220 Technical Manual   ·   EK-VT220-TM

This manual provides the user with a technical description
to isolate and repair VT220 problems that go beyond the
FRU replacement level of repair. This manual is for models
A, B, and C. An addendum to the manual covers models D,
E, and F. The manual includes an overview of both
hardware and software components, and detailed de-
scriptions of communication components and subsystems
to the major circuit level.

VT220 Video Terminal IPB   EK-VT220-IP

This document is a detailed parts breakdown of the
VT220 field replaceable units. This document does not
contain part numbers for components on the printed cir-
cuit boards. However, these components are listed in the
VT220 Field Maintenance Print Set, ordered separately.

VT220 Field Maintenance Print Set   MP-01732-01

This document provides the user with a complete set of
electrical and mechanical schematic diagrams for the
VT220 terminal.

VT220 Modem User Guide   EK-VT22M-UG

This guide describes how to install, operate, and test the
VT22X modem.

B FRU EXPLODED VIEW DRAWING
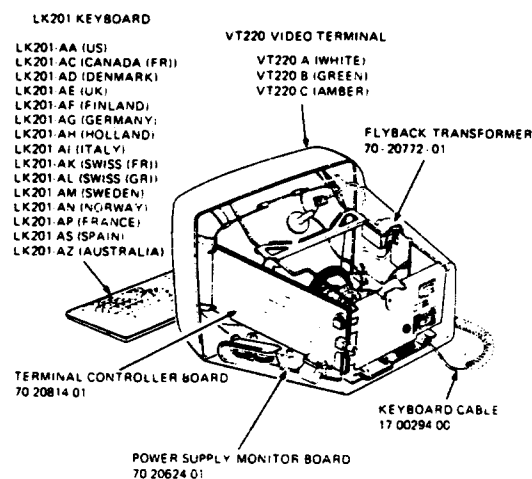
LK201 KEYBOARD

LK201-AA (US)
LK201-AC (CANADA (FR))
LK201-AD (DENMARK)
LK201-AE (UK)
LK201-AF (FINLAND)
LK201-AG (GERMANY)
LK201-AH (HOLLAND)
LK201-AI (ITALY)
LK201-AK (SWISS (FR))
LK201-AL (SWISS (GR))
LK201-AM (SWEDEN)
LK201-AN (NORWAY)
LK201-AP (FRANCE)
LK201-AS (SPAIN)
LK201-AZ (AUSTRALIA)

VT220 VIDEO TERMINAL

VT220 A (WHITE)
VT220 B (GREEN)
VT220 C (AMBER)

FLYBACK TRANSFORMER
70-20772-01

TERMINAL CONTROLLER BOARD
70-20814-01

KEYBOARD CABLE
17-00294-00

POWER SUPPLY MONITOR BOARD
70-20624-01

NOTE
THE MODEM OPTION (VT22X), EIA CABLE
WITH SHORTING PLUG (70-21475-01), AND
TELEPHONE CABLE (17-00089-01) ARE NOT SHOWN.

VT220-FRU-01
MA-0047-84

Figure B-1   VT220 FRUs. Models A, B, and C
(Exploded View)

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LK201 KEYBOARD

LK201 AA (US)
LK201-AC (CANADA (FR))
LK201-ED (DENMARK)
LK201-EE (UK)
LK201-AF (FINLAND)
LK201-AG (GERMANY)
LK201-AH (HOLLAND)
LK201-AI (ITALY)
LK201-AK (SWISS (FR))
LK201-AL (SWISS (GR))
LK201-AM (SWEDEN)
LK201-EN (NORWAY)
LK201-AP (FRANCE)
LK201-AS (SPAIN)
LK201-AZ (AUSTRALIA)

VT220 VIDEO TERMINAL

VT220-D (WHITE)
VT220-E (GREEN)
VT220-F (AMBER)

TRANSFORMER
70-23362-01

TERMINAL CONTROLLER BOARD
70-23363-01

KEYBOARD CABLE
17-00294-00

POWER SUPPLY MONITOR BOARD
70-23361-01

NOTE
THE MODEM OPTION (VT22X), EIA CABLE
WITH SHORTING PLUG (70-21475-01), AND
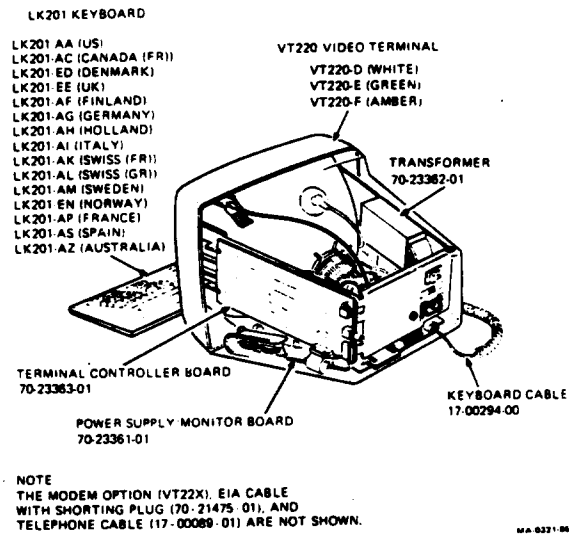TELEPHONE CABLE (17-00089-01) ARE NOT SHOWN.

MA-0321-86

Figure B-2   VT220 FRUs, Models D, E, and F
(Exploded View)

C CABLE INFORMATION

Figure C-1 shows the cable connections for the VT220.
Table C-1 lists the interface cables, and Table C-2 lists the
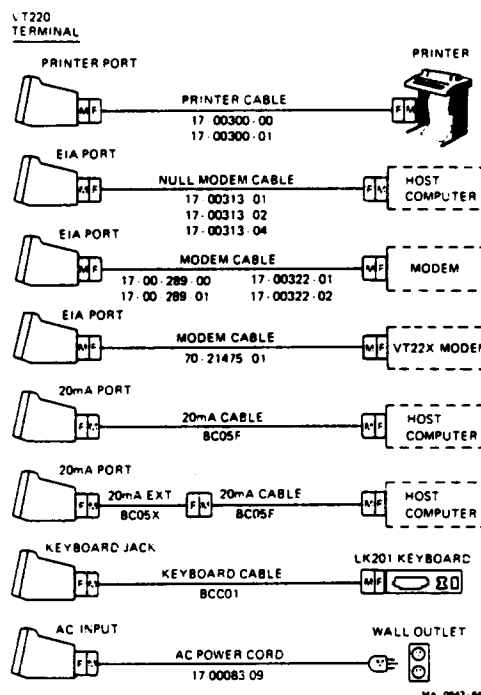modem control selections.

Figure C-1   Cable Summary

Table C-1   Interface Cables

Part Number	Length	Connector
Printer Cable (VT220 to printer)		
17-00300-00	3 m (10 ft)	9-pin F RS232
17-00300-01	7.6 m (25 ft)	to 25-pin F RS232
Null Modem Cable (VT220 to host)		
17-00313-01	3 m (10 ft)	25-pin F RS232
17-00313-02	7.6 m (25 ft)	to 25-pin F RS232
17-00313-04	15.2 m (50 ft)	
Modem Cable (VT220 to host)		
17-00289-00	3 m (10 ft)	25-pin F RS232
17-00289-01	7.6 m (25 ft)	to 25-pin M RS232
Modem Cable (VT220 to modem)		
17-00322-01	3 m (10 ft)	25-pin F RS232
17-00322-02	7.6 m (25 ft)	to 25-pin M RS232
Modem Cable (VT200 to VT22X modem)		
70-21475-01	–	25-pin F RS232
		to 25-pin M RS232
20 mA Cable (VT220 to host)		
BC05F-15	4.5 m (15 ft)	8-pin M to 8-pin M
BC05F-50	15.2 m (50 ft)	
20 mA Extension (VT220 to 20 mA cable)		
BC05X-15	4.5 m (15 ft)	8-pin to 8-pin
BC05X-50	15.2 m (50 ft)	
Keyboard Cable (VT220 to keyboard)		
17-00294-00	1.8 m (6 ft)	Telephone jack
AC Power Cable		
17-00083-09	–	Output to ac input

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
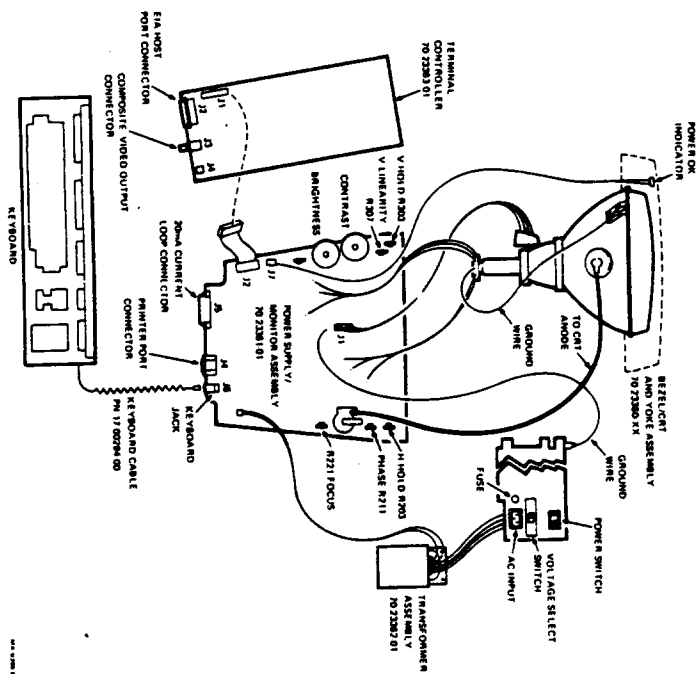
Figure D-2 Physical/Functional Diagram
(Models D, E, and F)

POWER SUPPLY/MONITOR BOARD

J1 CRT Yoke Cable Connector

Pin 1 Vertical (Yellow)
2 Horizontal (Red)
3 Horizontal (Green)
4 Vertical (Brown)

J2 Power Supply/Monitor Board to
J1 Controller Connector

Pin 1 Test/status
2 −20 mA transmit −
3 +20 mA transmit +
4 Keyboard transmit data
5 Printer transmit data
6 Printer data set ready
7 +5 Vdc
8 +5 Vdc
9 Ground
10 Ground
11 Video
12 Horizontal
13 Video ground
14 Video ground
15 Vertical
16 Ground
17 Ground
18 +5 Vdc
19 +5 Vdc
20 +12 Vdc
21 −12 Vdc
22 + Printer receive data
23 Keyboard receive data
24 20 mA receive +
25 20 mA receive −
26 Production reset

J4 Printer Port Connector

Pin 1 Protective ground
2 Printer transmit data
3 Printer receive data
4 Request to send
5 Data terminal ready
6 Printer data set ready
7 Signal ground
8 Not used
9 Not used

J5 20 mA Current Loop Connector

Pin 1 Not used
2 Transmit −
3 Receive −
4 Not used
5 Transmit +
6 Not used
7 Receive +
8 Protective ground

J6 Keyboard Connector

Pin 1 Keyboard receive
2 Ground
3 +12 Vdc
4 +5 transmit

TERMINAL CONTROLLER BOARD

J2 (EIA Connector)

Pin 1 (AA)Protective ground
2 (BA)Transmitted data
3 (BB) Received data
4 (CA)Request to send
5 (CB)Clear to send
6 (CC)Data set ready
7 (AB)Signal ground (common ground)
8 (CF)Received line signal detector
9 − +12 Vdc
10 − −12 Vdc
11 − Not used
12 (CI) Speed mode indicate
13 − +5 Vdc
14 − Data/talk
15 − Not used
16 − Not used
17 − Not used
18 − Not used
19 − Not used
20 (CD)Data terminal ready
21 − Not used
22 − Not used
23 (CH)Data rate select
24 − Not used
25 − Not used

D PHYSICAL/FUNCTIONAL DIAGRAM

Figures D-1 and D-2 are physical/functional diagrams showing how VT220 components work together. Figure D-1 is for models A, B, and C. Figure D-2 is for models D, E, and F.

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.
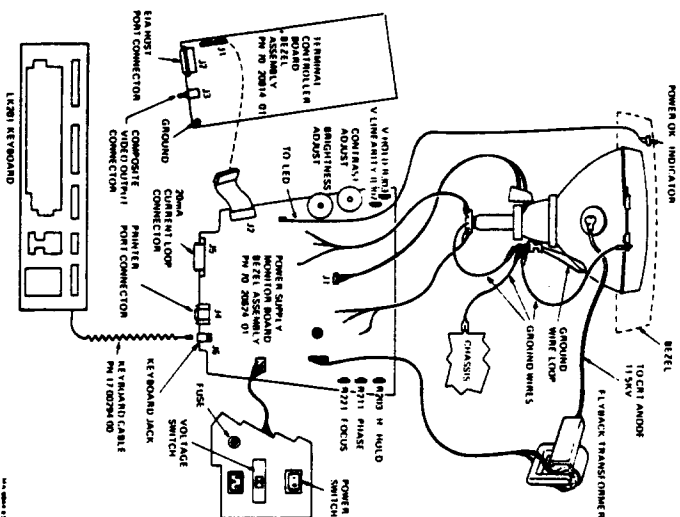

Figure D-1 Physical/Functional Diagram
(Models A, B, and C)

POWER SUPPLY/MONITOR BOARD

J1 CRT Yoke Cable Connector

Pin
1 Vertical (Yellow)
2 Horizontal (Red)
3 Horizontal (Green)
4 Vertical (Brown)

J2 Power Supply/Monitor Board to J1 Controller Connector

Pin
1 Test/status
2 −20 mA transmit −
3 +20 mA transmit +
4 +20 mA transmit +
5 Printer transmit data
6 Printer data set ready
7 +5 Vdc
8 +5 Vdc
9 Ground
10 Ground
11 Video
12 Horizontal
13 Video ground
14 Video ground
15 Vertical
16 Ground
17 Ground
18 +5 Vdc
19 +5 Vdc
20 +12 Vdc
21 −12 Vdc
22 + Printer receive data
23 Keyboard receive data
24 20 mA receive +
25 20 mA receive −
26 Production reset

J4 Printer Port Connector

Pin
1 Protective ground
2 Printer transmit data
3 Printer receive data
4 Request to send
5 Data terminal ready
6 Printer data set ready
7 Signal ground
8 Not used
9 Not used

J5 20 mA Current Loop Connector

Pin
1 Not used
2 Transmit −
3 Receive −
4 Not used
5 Transmit +
6 Not used
7 Receive +
8 Protective ground

J6 Keyboard Connector

Pin
1 Keyboard receive
2 Ground
3 +12 Vdc
4 +5 transmit

TERMINAL CONTROLLER BOARD

J2 (EIA Connector)

Pin
1 (AA)Protective ground
2 (BA) Transmitted data
3 (BB) Received data
4 — Request to send
5 (CB) Clear to send
6 (CC) Data set ready
7 (AB)Signal ground (common ground)
8 (CF) Received line signal detector
9 — +12 Vdc
10 — −12 Vdc
11 — Not used
12 (CI) Speed mode indicate
13 — +5 Vdc
14 — Data/talk
15 — Not used
16 — Not used
17 — Not used
18 (LL) Local loopback test
19 — Not used
20 (CD) Data terminal ready
21 — Not used
22 — Not used
23 (CH)Data rate select
24 — Not used
25 (TM)Test mode indicate

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