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VT101

SERIES POCKET SERVICE GUIDE

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SERVICE GUIDE

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INTRODUCTION

PURPOSE
This pocket service guide describes the following topics for the VT101 series video terminals.

Troubleshooting to the field replaceable unit (FRU)
FRU removal and replacement
Video monitor alignment
Terminal controller board configurations
Options
Operator reference material

Notes, Cautions, and Warnings
Notes, Cautions, and Warnings appear throughout the pocket service guide. Their definitions are 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.

All Notes, Cautions, and Warnings appear in red.

PRODUCT INTRODUCTION

All VT101 series video terminals use the same FRUs. The FRUs differ only by the terminal controller board. The VT101 has the fewest parts on its controller board and has the same capabilities as a VT100 with no options.

The VT102 has modem control and half-duplex functions. The VT102 has the capabilities of a VT100 with the advanced video option and printer port.

The VT131 has all the VT102 functions, plus editing and block-mode transmission. This gives the VT131 the same capabilities as a VT132 with communication features.

All board configurations for VT101 series video terminals are illustrated in Chapter 4.

TOOLS REQUIRED

The following tools are required to service the VT101 series video terminals.

Tools	Part Number
VOM (volt ohmmeter)	29-13510-00
Slotted screwdriver, 1/4 inch	29-10983-00
Slotted screwdriver, 5/16 inch	29-10960-00
Phillips screwdriver, no. 2	29-11005-00
Tuning wand	29-23189-00
Video alignment tool	29-23190-00
Keycap puller	74-16355-00
Nut driver, 1/4 inch (optional)	29-10664-00
Nut driver, 5/16 inch (optional)	29-10673-00
Driver handle	29-10562-00
Scribe	None
CRT alignment template	94-03220-03
Character alignment template	94-03270-03
Safety goggles	29-16141-00
Gloves	29-16146-00

1 TROUBLESHOOTING AND TESTING THE VT101 SERIES VIDEO TERMINAL

1.1 GENERAL

This chapter contains the information needed to trouble-shoot and perform the self-test functions on VT101 series video terminals.

1.2 TROUBLESHOOTING AND TESTING

The VT101 series video terminals have a series of internal self-tests used to isolate failures to the field replaceable unit (FRU). Table 1-1 lists these tests in the recommended order of use. If a test indicates a failure, adjust or replace the FRU indicated by the test. When you adjust or replace an FRU, perform all the tests in Table 1-1 to ensure proper operation of the terminal.

1.3 TROUBLESHOOTING THE OPTION

All procedures for troubleshooting the option are in Chapter 5.

1.4 POWER-UP SELF-TEST

The power-up self-test checks the terminal internal memory, the SET-UP feature memory, and the keyboard for proper operation. A successful power-up self-test ends when all keyboard indicators turn on for an instant, the keyboard generates a bell tone, and the blinking cursor appears in the left corner of the screen. Either the ON LINE or OFF LINE indicator remains on at the end of the test.

Any power-up self-test failure is indicated by one or more of the above conditions not occurring, or an error character displayed on the screen under the blinking cursor.

Table 1-1   Self-Test Chart

Test	Prerequisites	Sequence
Power-Up (Par. 1.4)	None	Turn terminal power on.
Data Loopback (Par. 1.5)	• Off line • SET-UP in ANSI (S2-3 = 1) • Comm. S6 is on (VT102 and VT131 only) • Loopback	Once: **ESC [2 ; 2 y** Continuously: **ESC [2 ; 10 y**
EIA Loopback (Par. 1.6)	• Off line • SET-UP in ANSI (S2-3 = 1) • Comm. switches set (VT102 and VT131 only) • Loopback	Once: **ESC [2 ; 4 y** Continuously: **ESC [2 ; 12 y**
Printer Loopback (Par. 1.7)	• Off line • SET-UP in ANSI (S2-3 = 1) • Loopback	Once: **ESC [2 ; 16 y** Continuously: **ESC [2 ; 24 y**
Video Adjust (Par. 1.8)	• 80 characters per line • Off line • SET-UP in ANSI (S2-3 = 1) • SET-UP is dark background (S1-3 = 0)	**ESC # 8**
Printer Test (Par. 1.9)	• Off line • SET-UP in ANSI (S2-3 = 1)	1. **ESC # 8** 2. **SHIFT** and **ENTER**

Perform the following steps to run the power-up self-test.

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

    • Turn the terminal power on.

    • Type one of the following sequences to perform the power-up self-test.

      The terminal should be off-line with the ANSI/VT52 SET-UP feature set to ANSI (switch 2-3 = 1).

      ESC [2 ; 1 y   (Performs test once.)

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

    NOTE
    The continuously running test ends only if an error is found or if power is turned off. The keyboard does not generate a bell tone during a continuously running test.

    • Enter SET-UP and press the 0 key (reset).

    NOTE
    A disconnect occurs when the reset command is used.

2. Enter SET-UP and go into SET-UP A, SET-UP B, and SET-UP C (VT131 only). In SET-UP, the terminal exercises all its display functions. If the terminal enters SET-UP, most terminal functions are operating. If you are unable to enter SET-UP, replace the terminal controller board (Paragraph 2.6). If you are unable to enter SET-UP C (VT131 only) replace the VT131 ROM (Paragraph 2.18).

If the power-up self-test finds an error, the terminal screen or keyboard displays an error code (Paragraph 1.11). Figure 1-1 allows you to quickly identify power-up problems; it also directs you to the proper trouble-shooting procedure, enabling you to correct the problem (for example, adjustment, removal and replacement, etc.).

SYMPTOM
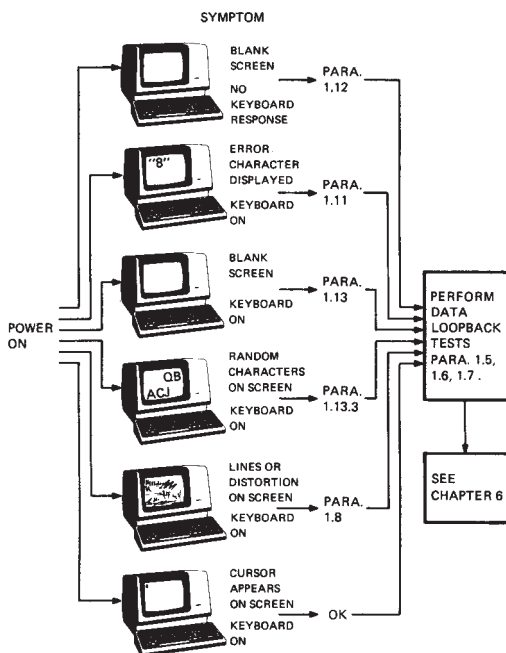
Figure 1-1   Power-Up Troubleshooting Diagram

1.5   DATA LOOPBACK SELF-TEST

In the data loopback self-test, the terminal transmit and receive lines connect to each other using an EIA loopback connector. The terminal transmits a predefined set of characters on its transmit line and receives the characters on its receive line. It then compares the output characters to the input characters and displays an error code if the characters do not match. A successful test ends with the terminal on-line and the cursor in the upper left corner of the screen.

NOTE
The power-up self-test must run before the data loopback self-test.

PRINTER
CONNECTOR

EIA CONNECTOR

POWER SWITCH

KEYBOARD
CABLE

LOOPBACK
CONNECTOR

CONNECTORS

FROM PIN	TO PIN	TO PIN
2	3	15
4	5	8
20	6	22
19	12	17

MA-7868D

Figure 1-2   Loopback Connectors

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

1. Install the EIA data loopback connector (Figure 1-2).

   NOTE
   You must disconnect the 20 mA current loop interface option from the terminal controller board before performing the loopback test. Chapter 5 covers the 20 mA loopback test.

   You can order the loopback connector used for all loopback tests from DIGITAL (PN 12-15336-00).

2. Check that communication switch 6 on the VT102 or VT131 terminal controller board is set to ON.

    NOTE
    Switch 6 is usually off only when transmitting on a secondary channel.

    If not set to ON, use the following procedures to set Switch 6.

    a. Remove the terminal access cover (Paragraph 2.3).

    b. Use a small screwdriver or ball-point pen to set the communication switches (Figure 1-3).

    c. Plug the keyboard cable into the back of the terminal (Figure 1-2).

3. Type one of the following sequences to perform the data loopback self-test.

    The terminal should be off-line with the ANSI/VT52 SET-UP feature set to ANSI (switch 2-3 = 1).

    ESC [2 ; 2 y   (Performs the test once.)

    ESC [2 ; 10 y   (Performs the test continuously.)

    NOTE
    The continuously running test ends only if an error is found or if power is turned off. The keyboard does not generate a bell tone during a continuously running test.

4. When the test ends, set switch 6 to its original position and replace the terminal access cover.

If the data loopback self-test finds an error, the terminal screen displays an error code. See Self-Test Error Codes (Paragraph 1.11), for the FRU to replace.

INTERNAL COMMUNICATION SWITCHES

MA-7256C
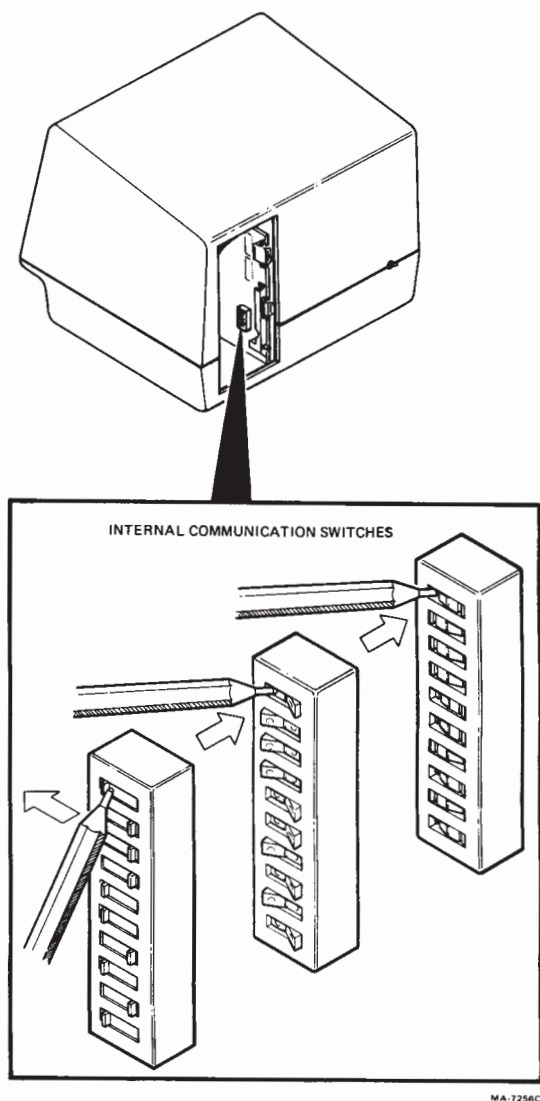
Figure 1-3   Communication Switch Location

1.6   EIA CONTROL LINES LOOPBACK SELF-TEST (VT102 AND VT131)

This procedure tests data terminal ready, request to send, carrier detect, data set ready, and clear to send. A successful test ends with the terminal ON LINE and the cursor in the upper left corner of the screen.

NOTE
The power-up self-test must run before the EIA control lines loopback self-test.

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

1. Install the EIA data loopback connector (Figure 1-2).

   NOTE
   You must disconnect the 20 mA current loop interface option from the terminal controller board before performing the loopback test. Chapter 5 covers the 20 mA loopback test.

   You can order the loopback connector used for all loopback tests from DIGITAL (PN 12-15336-00).

2. Make sure the communication switches on the terminal controller board are set as follows.

Closed (ON)	S 1, 2, 4, 6, 8, 9
Either position	S 3, 5, 7, 10

   If the internal communication switches are not set as described above, use the following procedure to set the switches.

   NOTE
   Record the switch positions before selecting the switches, so you can reset them when the test ends.

   a. Remove the terminal access cover (Paragraph 2.3).

   b. Use a small screwdriver or ball-point pen to set the communication switches (Figure 1-3).

   c. Plug the keyboard cable into the back of the terminal.

3. Type one of the following sequences to perform the EIA loopback self-test.

The terminal should be off-line with the ANSI/VT52 SET-UP feature set to ANSI (switch 2-3 = 1).

ESC [2 ; 4 y   (Performs the test once.)

ESC [2 ; 12 y   (Performs the test continuously.)

NOTE
The continuously running test ends only if an error is found or if power is turned off. The keyboard does not generate a bell tone during a continuously running test.

4. When finished testing, set the communication switches to their original positions and replace the terminal access cover.

If the EIA loopback self-test finds an error, the terminal screen displays an error code. See Self-Test Error Codes (Paragraph 1.11) for the FRU to replace.

1.7   PRINTER LOOPBACK SELF-TEST (VT102 AND VT131)

In the printer loopback self-test, the printer port transmit and receive lines connect to each other using the EIA loopback connector. The terminal transmits a predefined set of characters on its transmit line and receives the characters on its receive line. It then compares the output characters with the input characters and displays an error code if they do not match. A successful test ends with the terminal off-line and the cursor in the upper left corner of the screen.

NOTE
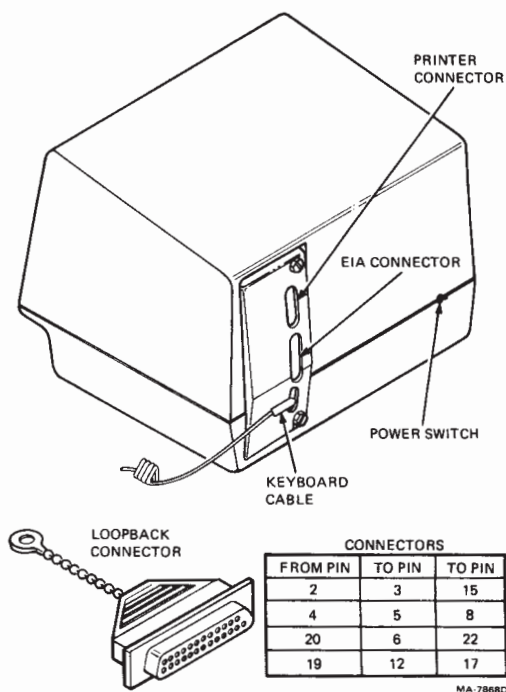**The power-up self-test must run before the printer loopback self-test.**

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

1. Install the EIA data loopback connector on the printer port connector (Figure 1-2).

NOTE
You must disconnect the 20 mA current loop interface option from the terminal controller

board before performing the loopback test. Chapter 5 covers the 20 mA loopback test.

You can order the loopback connector used for all loopback tests from DIGITAL (PN 12-15336-00).

2. Type one of the following sequences to perform the printer loopback self-test.

The terminal should be off-line with the ANSI/VT52 SET-UP feature set to ANSI (switch 2-3 = 1).

ESC [2 ; 16 y   (Performs the test once.)

ESC [2 ; 24 y   (Performs the test continuously.)

NOTE
The continuously running test ends only if an error is found or if power is turned off. The keyboard does not generate a bell tone during a continuously running test.

If the printer loopback self-test finds an error, the terminal screen displays an error code. See Self-Test Error Codes (Paragraph 1.11) for the FRU to replace.

1.8   VIDEO ADJUST TEST
The video adjust test provides a screen full of uppercase Es for the display height, width, and linearity adjustments. The test pattern is internal to the terminal and is not sent to the computer.
Perform the following steps to run the test.

1. Select the following features.

- 80 columns per line
- Terminal off-line
- ANSI/VT52 SET-UP feature set to ANSI (switch 2-3 = 1)
- Screen feature set to dark background (switch 1-3 = 0)
- Screen brightness set to normal intensity

2. Type the following sequence.
ESC # 8

3. Examine the characters at the four corners and at the center of the screen. The individual dots in the vertical segment of the E should be visible in each character. All characters should be normal in appearance (not short, tall, bowed in or out, slanted, etc.).

   Refer to Chapter 3 for a complete description of all monitor adjustments used with this test pattern.

4. To clear the test pattern, enter SET-UP and press the **0** (reset) key.

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

1. Perform the power-up self-test (Paragraph 1.4). If the terminal passes the self-test, go to step 2.

2. Perform the printer loopback self-test (Paragraph 1.7). If the terminal passes the loopback test, go to step 3.

   NOTE
   If the video terminal passes the above tests, it is running correctly; the problem is not a malfunction in the video terminal.

3. Test the printer. (Consult your printer PSG for the proper procedure.) If the printer is operational, go to step 4.

4. Check the SET-UP features in both the video terminal and the printer to ensure they are compatible. You must set the following features correctly in order for the printer to run.

   - Baud rate (both terminals)
   - Data bits per character (both terminals)
   - Parity (both terminals)
   - Printer on-line (data terminal ready set to ON – printer only)
   - XON/XOFF to XON (preferred – printer only)
   - Full duplex (printer only)

5. Check that you are using the proper cable between the video terminal and the printer (Appendix B). Make sure the connectors are securely fastened at both ends of the cable.

6. Type the following sequence.

   The terminal should be off-line with the ANSI/VT52 feature set to ANSI (switch 2-3 = 1).

   ESC #8

   Your video screen should display the test pattern of uppercase Es.

7. Hold down the **SHIFT** key and press the **ENTER** (print) key. The video display should print, indicating the printer is operating properly.

1.10   KEYBOARD PROBLEMS

The following paragraphs describe how to correct keyboard problems.

1.10.1   Unable to Type a Particular Alphanumeric Character

1. Replace the keyboard (Paragraph 2.14).

1.10.2   Keyboard Does Not Generate Bell Tone

1. Check that the keyboard is plugged in. (The screen should display "4" error character if unplugged at power up.)

2. Test speaker by putting the terminal off-line. Hold down the **CTRL** key and press the **G** key.

3. If the keyboard does not generate the bell tone, replace the keyboard speaker (Paragraph 2.16).

   NOTE
   If after replacing the keyboard speaker the keyboard still does not sound the bell tone, replace the keyboard (Paragraph 2.14).

1.11   SELF-TEST ERROR CODES

If an error character appears under the blinking cursor at the upper left corner of the screen, refer to Table 1-2 for the VT101, or Table 1-3 for the VT102 and VT131. Note that the character displayed may indicate more than one error.

> **NOTE**
> If the screen displays the "2" error character, it may indicate a power supply problem. Perform the power supply voltage checks as outlined in Paragraph 1.12.6 to ensure the power supply is functioning properly before going to the tables in this chapter.

Table 1-2   VT101 Self-Test Error Codes

Error Code Character	Replace Terminal Controller Board	Keyboard	Incorrect Escape Sequence
2	X	–	–
4	–	X	–
6	X	X	–
8	X	–	–
:	X	–	–
>	X	X	–
<	X	X	–
@	–	–	X
B	–	–	X
D	–	–	X
F	–	–	X
H	–	–	X
J	–	–	X
L	–	–	X
N	–	–	X

Table 1-3   VT102 and VT131 Self-Test Error Codes

| Error Code Character | Replace | |
	Terminal Controller Board	Keyboard
2	X	–
4	–	X
6	X	X
8	X	–
:	X	–
>	X	X
<	X	X
@	X	–
B	X	–
D	X	X
F	X	X
H	X	–
J	X	–
L	X	X
N	X	X
P	X	–
R	X	–
T	X	–
V	X	–
X	X	–
Z	X	–
\	X	–
^	X	–
`	X	–
b	X	–
d	X	–
f	X	–
h	X	–
j	X	–
l	X	–
n	X	–

1.12   NO RESPONSE AT POWER-UP

The following list identifies the probable no-response defective devices and their related troubleshooting paragraph. You should troubleshoot these problems in the order listed.

Probable Defective Device	Paragraph
Wall socket	1.12.1
Power cord	1.12.2
Fuse	1.12.3
Power supply – ac	1.12.4
Transformer	1.12.5
Power supply – dc	1.12.6
Keyboard	1.12.7
Terminal controller board	1.12.8
Video monitor board	1.12.9
Flyback assembly and CRT	1.12.10

General Troubleshooting Notes

1. This guide assumes that only one FRU has failed. The symptoms displayed may represent a multiple failure; as a result, the symptoms may change as you replace FRUs. Always troubleshoot according to the current symptoms.

2. Spare parts can fail. Do not ignore the possibility of a failure just because the part has been replaced once.

3. You must turn off power before disconnecting or replacing any FRU.

   NOTE
   All voltage readings are based on a line voltage of 115 Vac. Your readings may vary according to any difference in your line voltage.

1.12.1   Terminal Not Plugged In, or No Power at Wall Socket

1. Turn the terminal power off.

2. If unplugged, plug in the power cord.

3. Check for power at the wall socket with your VOM (volt ohmmeter).
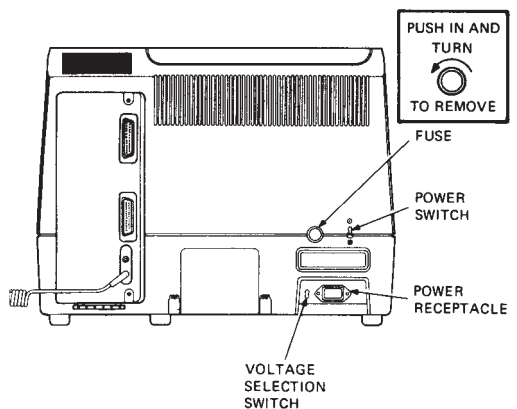
Figure 1-4   Fuse Removal

1.12.2   Power Cord Has Internal Short or Open

1. Turn the terminal power off.

2. Unplug power cord from the wall outlet and then from the rear of the terminal (Figure 1-4).

3. Use your VOM to check the power cord for continuity.

1.12.3   Fuse Is Blown

1. Turn the terminal power off.

2. Remove the fuse from rear of terminal (Figure 1-4).

3. Use your VOM to check the fuse.

4. Replace the fuse if it is bad. (See Table 2-1 for the correct replacement fuse.) Reinstall the fuse if it is good and perform the ac voltage check (Paragraph 1.12.4).

1.12.4   No AC Voltage to Power Supply

1. Turn the terminal power off.

2. Remove the top cover (Paragraph 2.5).

3. Disconnect the transformer primary cable from the power supply board (Figure 1-5).

4. Turn the terminal power on.
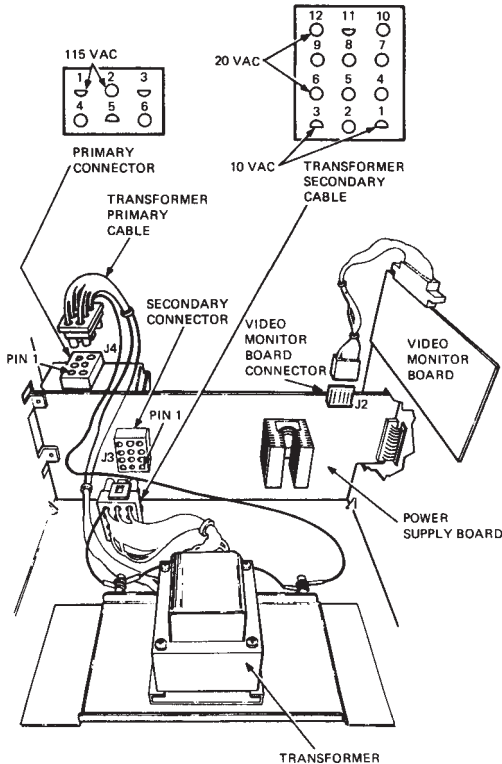
Figure 1-5   Transformer and Power Supply Board
Connections

5. Use your **VOM** to check the ac voltage across pins 1
    and 2 on the power supply board primary connector
    (Figure 1-5). You should obtain an ac voltage read-
    ing of about 115 Vac (U.S.) or the applicable wall
    outlet voltage. You can compare this voltage read-
    ing to the voltage at the wall outlet.

6. If the voltage is incorrect, replace the power supply
    board (Paragraph 2.8).

    If the voltage is correct, turn the terminal power off
    and connect the primary ac cable to the power sup-
    ply board.

7. Perform the secondary ac voltage check (Paragraph
    1.12.5).

1.12.5   No Secondary Voltage From Transformer

1. Turn the terminal power off and disconnect the transformer secondary cable from the power supply board (Figure 1-5).

2. Turn the terminal power on and check the ac voltage across pins 12 and 6 of the transformer secondary cable. You should obtain a voltage of 16 Vac.

3. Check the ac voltage across pins 3 and 1 of the transformer secondary cable. You should obtain a voltage reading of 10 Vac.

4. If the voltages in steps 2 and 3 are not present, replace the transformer (Paragraph 2.9).

   If the voltages are present, turn the terminal power off and connect the transformer secondary cable to the power supply board.

5. Perform the terminal controller board voltage checks (Paragraph 1.12.6).

1.12.6   Incorrect or No DC Voltage to Controller Board

Refer to Figure 1-6 during this procedure.
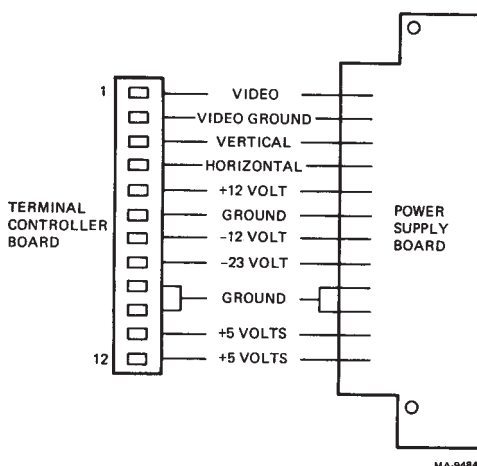
Figure 1-6   Voltage Test Points

1. Turn the terminal power on and check for the following voltages on the terminal controller board.

   - +12 Vdc at pin 5
   - −12 Vdc at pin 7
   - −23 Vdc at pin 8
   - +5 Vdc at pin 12

2. If all the voltages are present, then the power supply board is supplying the correct dc voltages.

   If the negative voltages are not present, replace the power supply board (Paragraph 2.8).

   If the positive voltages are not present, go to Paragraph 1.12.7.

1.12.7   Keyboard Voltage Check

1. Disconnect the keyboard cable from the rear of the terminal.

2. Turn the terminal power on and check for +12 Vdc at pin 5 of the terminal controller board connector.

3. If the +12 Vdc is present, replace the keyboard (Paragraph 2.14).

   If the +12 Vdc is not present, go to Paragraph 1.12.8.

1.12.8   Terminal Controller Board Voltage Checks

1. Remove the terminal controller board (Paragraph 2.6).

2. Turn the terminal power on and check for +12 Vdc at pin 5 on the power supply board connector (Figure 1-6).

3. If the +12 Vdc is present, replace the terminal controller board (Paragraph 2.6).

   If the +12 Vdc is not present, go to Paragraph 1.12.9.

1.12.9   Video Monitor Board Voltage Check

1. With the terminal controller board still removed, turn the terminal power off and disconnect the video monitor board cable from the top of the power supply board (Figure 1-5).

2. Turn the terminal power on and check for +12 Vdc at pin 5 on the power supply board connector (Figure 1-6).

3. If the +12 Vdc is not present, replace the power supply board (Paragraph 2.8).

    If the +12 Vdc is present, replace the video monitor board (Paragraph 2.10).

    NOTE
    If after replacing the video monitor board the +12 Vdc is still not present, go to Paragraph 1.12.10.

1.12.10   Flyback Assembly and/or CRT Cable Shorting or Bad

1. Turn the terminal power off and disconnect the 8-pin flyback transformer and vertical choke cable from the video monitor board (Figure 1-7).

2. Turn the terminal power on and check for +12 Vdc at pin 5 on the power supply board connector (Figure 1-6).

3. If the +12 Vdc is present, replace the flyback assembly (Paragraph 2.11).

    If the +12 Vdc is not present, turn the terminal power off and reconnect the 8-pin flyback transformer and vertical choke cable.

4. Disconnect the 4-pin yoke cable from the video monitor board (Figure 1-7).

5. Disconnect the circular cable connector from the neck of the CRT by pulling the connector straight out (Figure 1-7).

6. Turn the terminal power on and check for +12 Vdc at pin 5 on the terminal controller board connector (Figure 1-6).

7. If the +12 Vdc is not present, replace the video monitor board (Paragraph 2.10).

    If the voltage is present, replace the CRT assembly (Paragraph 2.12).
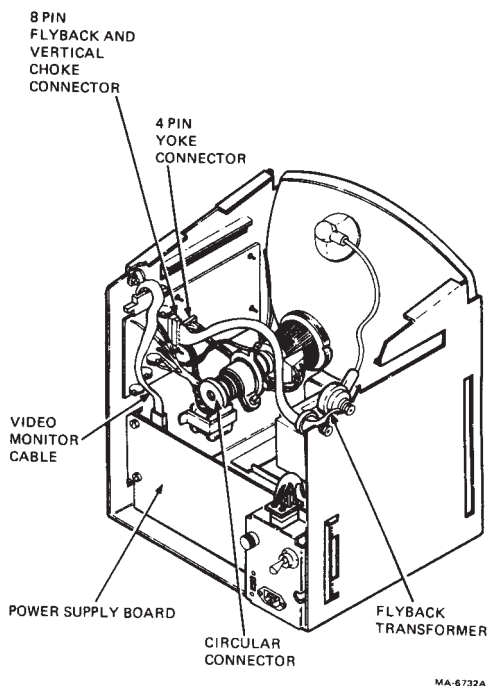
Figure 1-7   Terminal Part Locations

1.13   INCORRECT RESPONSE AT POWER-UP

The following paragraphs describe how to troubleshoot various incorrect responses at power-up.

1.13.1   Cursor Does Not Appear in Upper Left Corner of Screen

1. The screen brightness may be too low. Enter SET-UP and adjust the screen brightness by pressing the brightness key (▲).

2. Video monitor board is bad; see Paragraph 1.12.9.

3. CRT or flyback is bad; see Paragraph 1.12.10.

1.13.2   Random LEDs Flash, Cursor Does Not Appear on Screen

1. Check the position of the voltage switch.

2. If the voltage switch is set correctly, go to Para-graph 1.12.4.

   If the voltage switch is not set correctly, turn the terminal power off and use a small screwdriver to set the voltage switch to the correct voltage (Figure 1-4).

3. If a problem still exists, it may be an error in the power-up self-test indicating a bad ROM. Replace the terminal controller board (Paragraph 2.6).

1.13.3   Random Characters Appear on Screen

1. Replace the terminal controller board (Paragraph 2.6).

1.13.4   Cursor Appears on Screen but Terminal is Inoperable

1. Press the **SET-UP** key.

2. If the terminal cannot enter SET-UP, replace the terminal controller board (Paragraph 2.6).

   If the terminal enters SET-UP, then

   a. Remove the top cover (Paragraph 2.5).

   b. Go to Paragraph 1.12.6.

2 FRU REMOVAL AND REPLACEMENT

2.1 GENERAL
This chapter explains the removal and replacement of the FRUs in the VT101 series video terminals. Paragraph 2.19 provides the recommended spares list.

2.2 REMOVAL AND REPLACEMENT PROCEDURES
Figure 2-1 shows all the FRU removal procedures in this chapter and the sequence you must perform them in. For example, Figure 2-1 shows that to remove the monitor board, you must remove the top cover first.
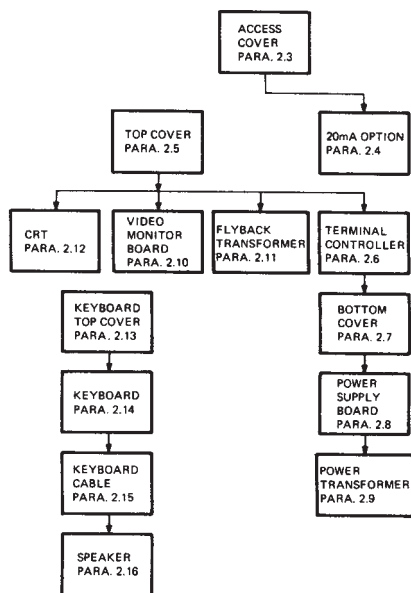
Figure 2-1 FRU Removal Sequence
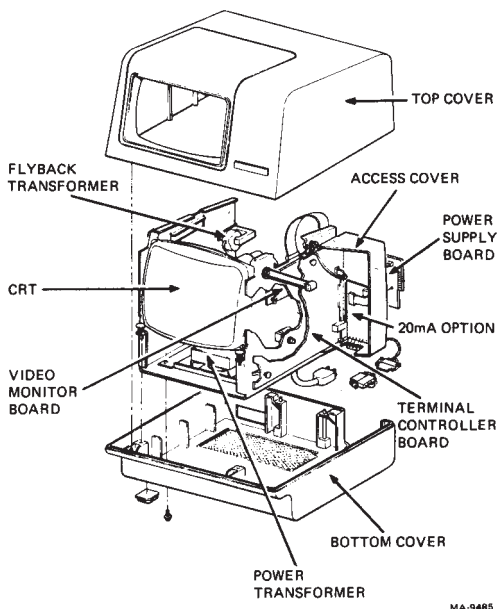
Figure 2-2   Terminal FRUs

Figure 2-2 shows an exploded view of the terminal with the FRU locations.

2.3   ACCESS COVER

Perform the following steps to remove the terminal access cover. Refer to Figure 2-3.

1. Turn the terminal power off.

2. Unplug the power cord.

3. Unplug the keyboard from the terminal.

4. Unplug the connector from the composite video output jack.

5. Disconnect the communication and printer cables.

PRINTER
CONNECTOR

POWER
SWITCH

ACCESS COVER
CAPTIVE SCREWS

EIA CONNECTOR

KEYBOARD
CABLE
CONNECTOR

MA-6675L
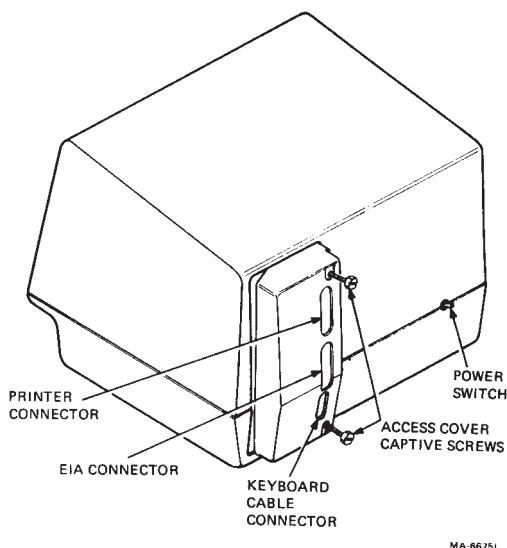
Figure 2-3   Captive Screws on Access Cover

6. Loosen the two captive screws holding the access cover. Begin removing the cover by pulling straight back (Figure 2-4). When the access cover is loose, hold it straight and move it to the left in order to avoid the studs on the inside chassis. Pull the access cover straight out. If the 20 mA current loop option is installed, remove the connector from the terminal controller board (J5) as shown in Figure 2-5.

To install the access cover, perform steps 1–6 in reverse.

CAUTION
Do not overtighten the captive screws; you may damage the access cover.
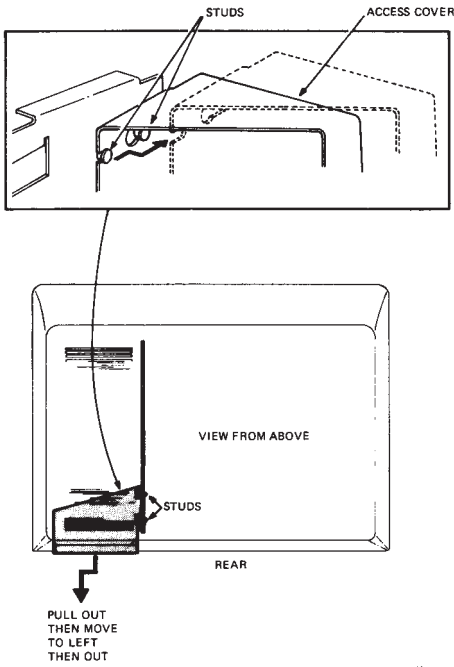
Figure 2-4   Access Cover Removal
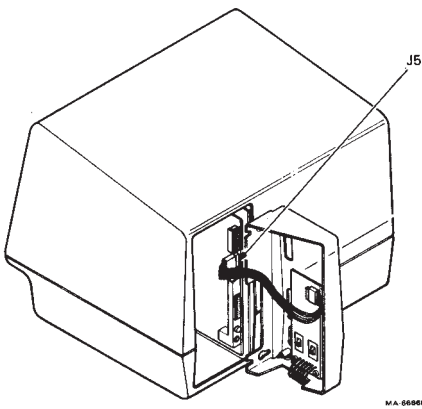
Figure 2-5   20 mA Disconnect

2.4   20 mA CURRENT LOOP OPTION BOARD

Perform the following steps to remove the 20 mA current loop option board.

1. Remove the access cover (Paragraph 2.3).

2. Remove the two slotted hex head screws holding the Mate-N-Lok connector to the bottom of the access cover (Figure 2-6).

3. Remove the three Phillips head screws holding the 20 mA board to the access cover. Remove the board (Figure 2-6).

To install the 20 mA current loop option board, perform steps 1–3 in reverse.
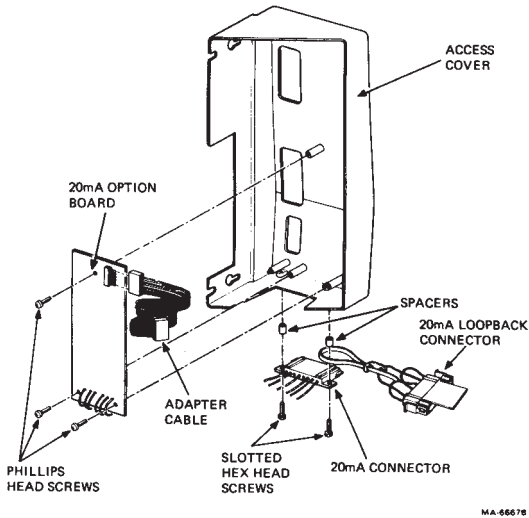
Figure 2-6   20 mA Current Loop Option Removal

2.5 TOP COVER

Perform the following steps to remove the terminal top cover.

1. Turn the terminal power off.

2. Use the scribe to release the two front pop fasteners located under the front lip of the terminal monitor (Figure 2-7).

3. Use the scribe to release the two rear pop fasteners located on the lower rear edge of the bottom cover (Figure 2-7).

4. Remove the top cover by lifting straight up.

    WARNING
    This procedure exposes you to the CRT anode which may contain a stored high voltage. Use caution while the top cover is removed from the terminal.

To install the top cover, perform steps 1–4 in reverse.
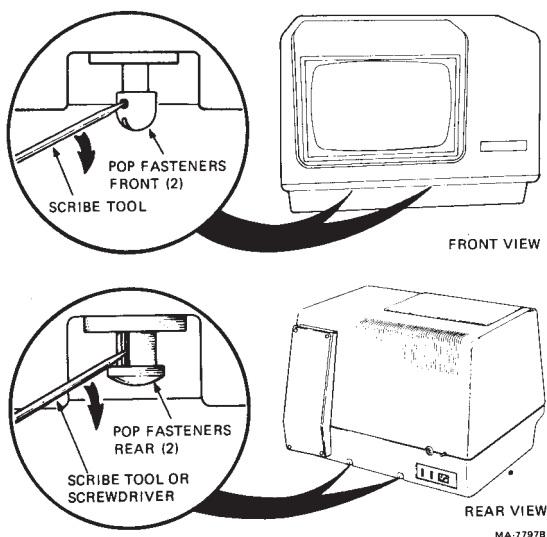
Figure 2-7   Top Cover Removal

2.6   TERMINAL CONTROLLER BOARD

Perform the following steps to remove the terminal controller board.

1. Remove the access cover (Paragraph 2.3).

2. Remove the top cover (Paragraph 2.5).

3. Disconnect the grounding wire from the terminal controller board (Figure 2-8).

4. Loosen the knurled captive screw on the terminal controller board until it becomes loose on its spring (Figure 2-8).

5. Pull the four pop fasteners until they release (Figure 2-8).
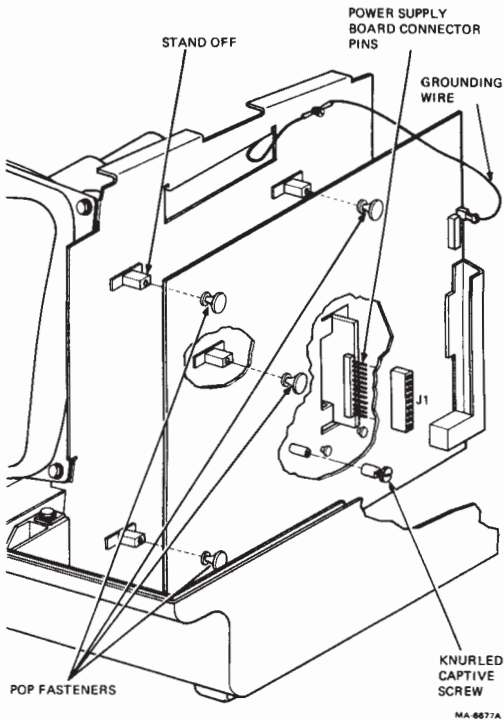
Figure 2-8   Terminal Controller Board Removal

6. Hold the board at its bottom and top; pull it straight out away from its mounting. Do not rotate the board in any direction. Pull the board away from its mounting until the long connector pins on the power supply board disconnect.

Perform the following steps to install the terminal controller board. Refer to Figure 2-8.

NOTE
If the new terminal controller board is for a VT131, refer to Paragraph 2.18 for the proper ROM removal and replacement procedures before installing the new board.

1. Align the terminal controller board connector with the power supply board pins. Position the pop fasteners in front of the standoffs to help align the connector.

2. Check that the pins on the power supply board align with the terminal controller board connector. Press the board straight onto its mounting.

3. Press in the four pop fasteners and tighten the captive screw.

4. Connect the grounding wire to the terminal controller board.

5. Install the top cover and access cover.

2.7   BOTTOM COVER
Perform the following steps to remove the terminal bottom cover.

1. Remove the access cover (Paragraph 2.3).

2. Remove the top cover (Paragraph 2.5).

3. Unplug the power cord from the terminal.

4. Turn the terminal upside down (Figure 2-9). Remove the four shipping screws (if installed) securing the bottom cover to the chassis. Discard the screws.

5. Return the terminal to its upright position.

6. Release the two front pop fasteners holding the frame to the base by pulling the plunger up (Figure 2-10).

7. Release the one rear pop fastener holding the power supply receptacle box to the base by pulling the plunger up (Figure 2-10).
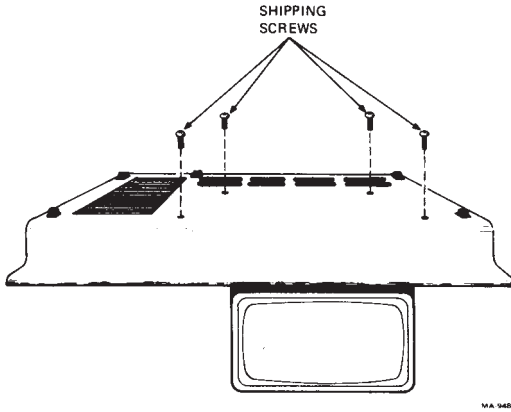
Figure 2-9   Shipping Screws
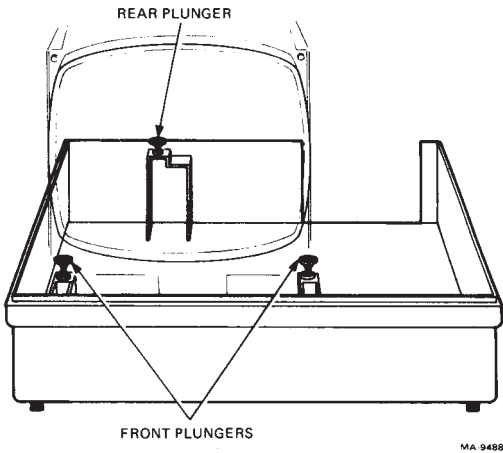
Figure 2-10   Bottom Cover Removal

8. Grasp the top of the metal frame at the hand-hold cutouts and lift the frame up and out of the terminal bottom cover.

To install the bottom cover, perform steps 1–8 in reverse.

2.8   POWER SUPPLY BOARD

Perform the following steps to remove the power supply board.

1. Remove the terminal controller board (Paragraph 2.6).

2. Remove the bottom cover (Paragraph 2.7).

3. Disconnect the transformer primary connector cable from the top of the power supply receptacle box (Figure 2-11).
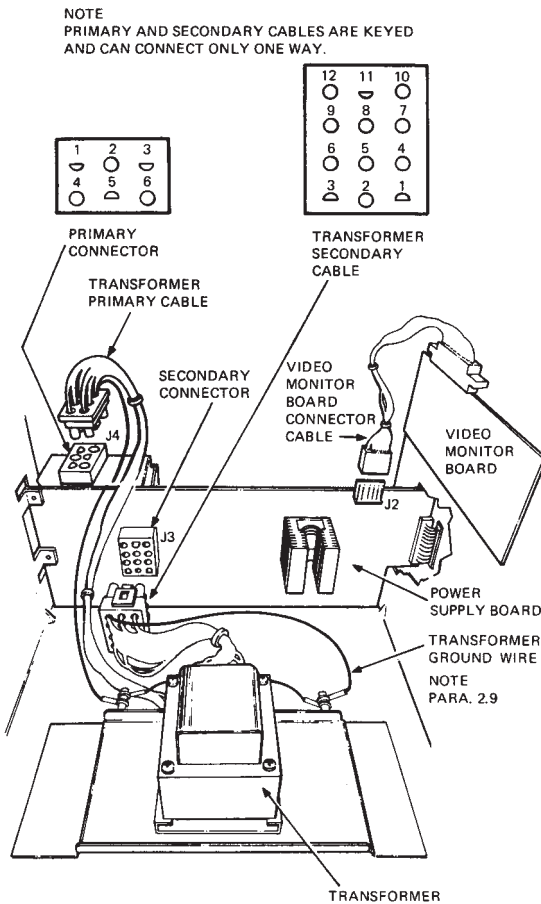
Figure 2-11   Power Supply Board Connections

4. Disconnect the transformer secondary connector cable from the power supply board (Figure 2-11).

5. Disconnect the video monitor board connector cable from the power supply board (Figure 2-11).

6. Remove the four screws holding the power supply board to the chassis (Figure 2-12).

7. Pull the power supply receptacle box out, swinging the board out as shown in the inset in Figure 2-12.

To install the power supply, perform steps 1–9 in reverse.

NOTE

TERMINAL CONTROLLER BOARD MUST BE REMOVED
BEFORE REMOVING POWER SUPPLY BOARD.
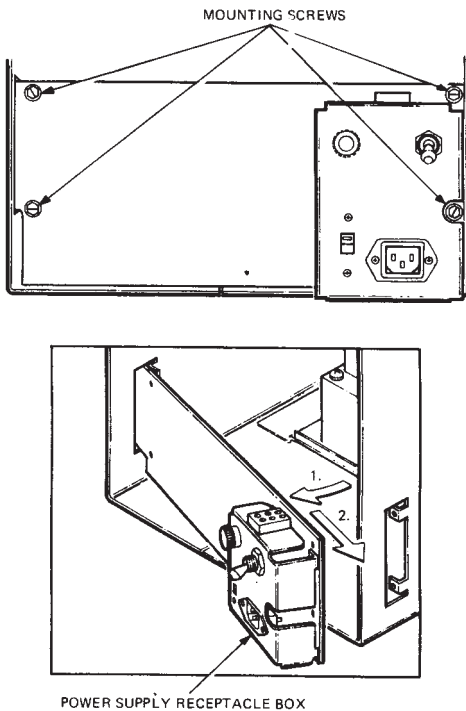
Figure 2-12   Power Supply Board Removal

2.9   POWER SUPPLY TRANSFORMER

Perform the following steps to remove the power transformer.

1. Remove the power supply board (Paragraph 2.8).

2. Remove the nut holding the chassis ground strap and the transformer ground wire to the chassis (Figure 2-11).

   NOTE
   Not all transformers have a grounding wire attached to the transformer cable.

3. Turn the chassis on its back end so the CRT screen is facing up (Figure 2-13). Remove the lower two screws from the transformer mounting bracket. Remove the upper two screws.

   WARNING
   While removing the upper two screws from the transformer mounting bracket, you must hold and support the transformer to prevent it from sliding into the CRT.

4. Remove the transformer and mounting bracket from the bottom of the chassis.

   CAUTION
   Once you remove the power supply transformer, the bottom of the chassis separates. Return the terminal to its upright position to prevent the chassis from binding and causing possible damage to the CRT.

To install the power supply transformer, perform steps 1–4 in reverse.
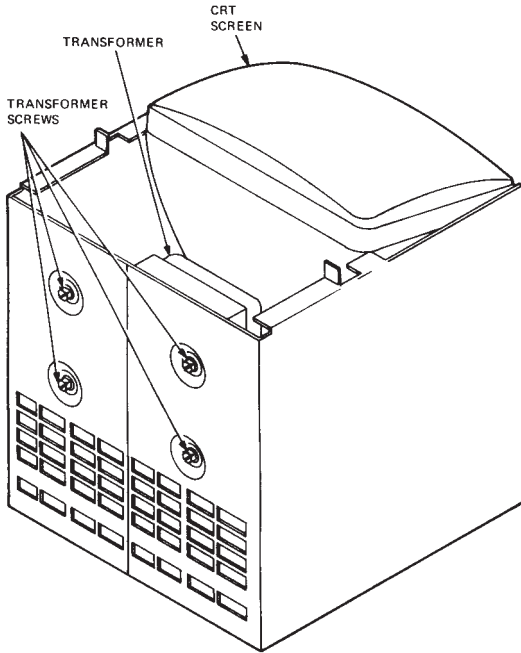
Figure 2-13   Power Supply Transformer Removal

2.10   VIDEO MONITOR BOARD

Perform the following steps to remove the video monitor board.

1. Remove the access cover (Paragraph 2.3).

2. Remove the top cover (Paragraph 2.5).

   Refer to Figure 2-14 for the following steps.

3. Remove the circular connector from the base of the CRT.

4. Disconnect the ground wire from the CRT yoke ground lug.
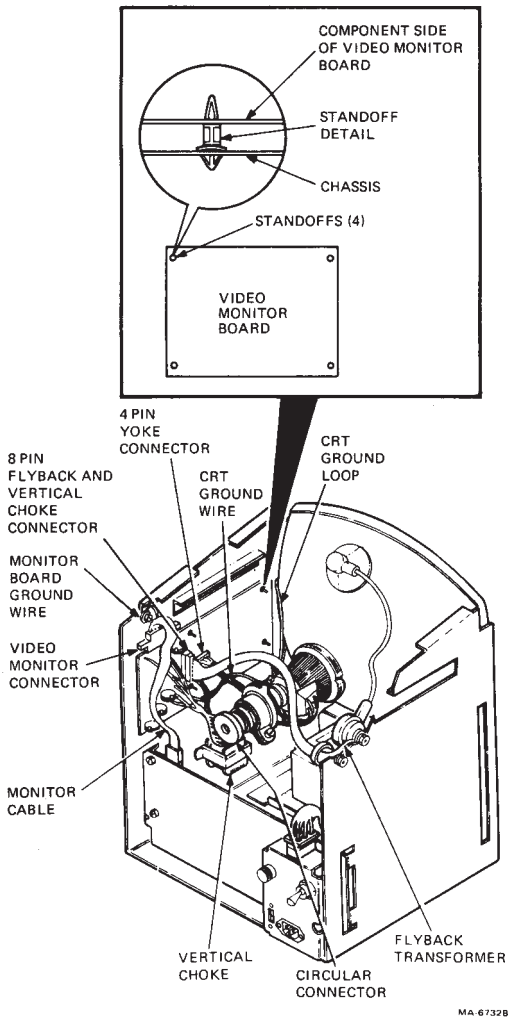
Figure 2-14   Video Monitor Board Connections

5. Disconnect the 8-pin flyback transformer and vertical choke connector from the video monitor board.

6. Disconnect the 4-pin yoke connector from the video monitor board.

7. Disconnect the video monitor connector from the top edge of the video monitor board.

8. Release the four standoffs by pressing in the standoff locking tabs and pulling the board out. (See Figure 2-14 insert.)

To install the video monitor board, perform steps 1–8 in reverse.

CAUTION
Be careful when reconnecting the monitor board connectors. You may damage the monitor board if the connectors are not aligned correctly.

2.11 FLYBACK TRANSFORMER AND VERTICAL CHOKE

Perform the following steps to remove the flyback transformer and vertical choke. The vertical choke is wired to the same connector as the flyback transformer, so you must replace both parts together.

1. Remove the terminal controller board (Paragraph 2.6).

2. Disconnect the 8-pin flyback transformer and vertical choke connector from the video monitor board (Figure 2-14).

3. Discharge the high voltage on the CRT anode by using the following procedure.

WARNING
This procedure exposes you to the CRT anode which may contain a stored high voltage. All grounds must be intact or the CRT will not discharge (Figure 2-14). These grounds are

● **CRT wire ground loop in contact with the conductive coating on the outside of the tube**

● **Ground wire connecting the loop mounting bracket to the video monitor board**

● **Ground wire connecting the video monitor board connector to the chassis.**

a. Firmly place the plug (short) end of a VOM test lead against the metal chassis. (A corner hole next to the CRT is a good location.)

b. Use the probe (long) end of the lead to push up under the rubber anode cap; push in until you can feel the probe touching the anode connector (Figure 2-15).

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

c. Hold the probe in contact with the connector for about 3 seconds, then remove the probe.

4. Disconnect the heavy red CRT anode wire from the CRT, as shown in Figure 2-16.
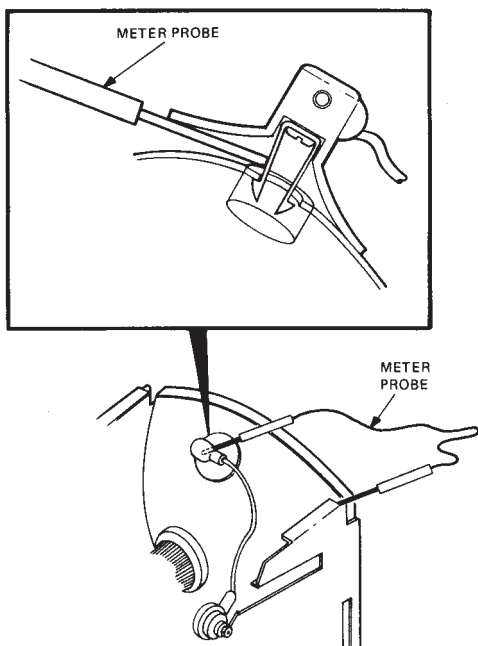
Figure 2-15   Discharging the CRT Anode
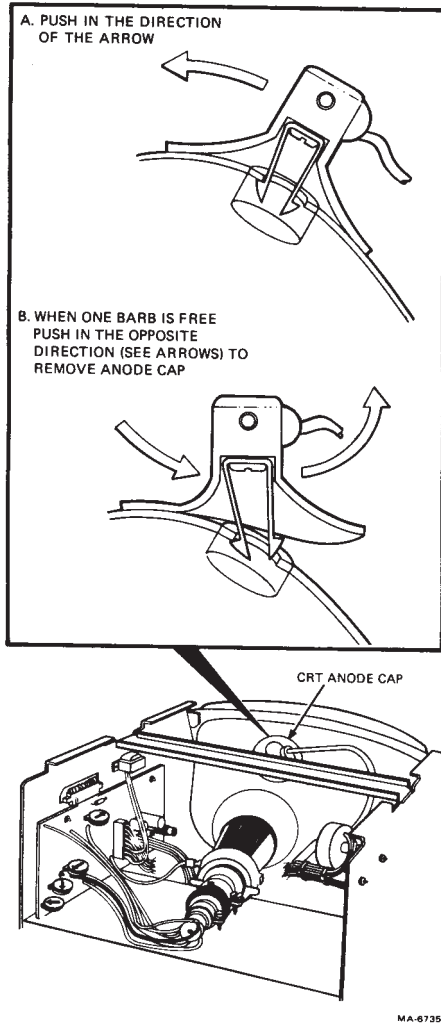
Figure 2-16   Removing the CRT Anode Cap

5. Remove the screw and washer securing the vertical choke to the monitor chassis (Figure 2-17). Remove the vertical choke.

6. Remove the two nuts holding the flyback transformer to the monitor chassis (Figure 2-14). Carefully remove the flyback transformer with the nylon insulation washers.

    CAUTION
    The flyback transformer ferrite material is brittle. Be careful when handling the transformer.

To install the flyback transformer and vertical choke, perform steps 1–6 in reverse.

    CAUTION
    Be careful when reconnecting the flyback transformer cable. You may damage the monitor board if you do not align the connector correctly.
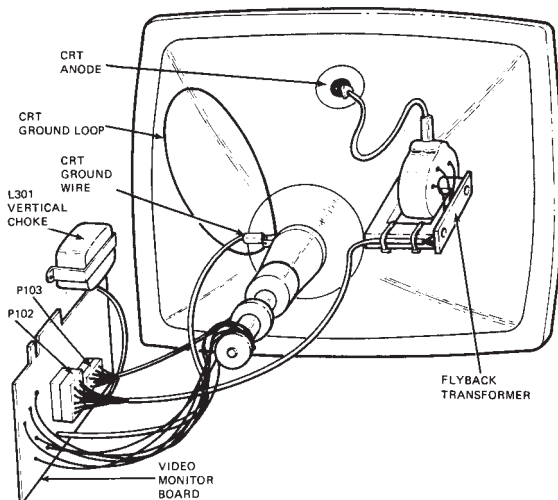
Figure 2-17   Vertical Choke Removal

2.12 CRT

Perform the following steps to remove the CRT (cathode ray tube). **Make sure the power supply transformer is installed with the chassis in the bottom cover.** This holds the two halves of the chassis together when the CRT is removed.

1. Make sure only field service personnel are in the area during replacement.

2. Any service person replacing a CRT must wear as a minimum, safety glasses with side guards or goggles and gloves. The part numbers are

       Goggles   29-16141
       Gloves   29-16146

3. Before servicing the CRT or its associated circuits, you must discharge the anode.

4. Remove the top cover (Paragraph 2.5).

5. Discharge the high voltage on the CRT anode by using the following procedure.

   WARNING
   This procedure exposes you to the CRT anode which may contain a stored high voltage. All grounds must be intact or the CRT will not discharge (Figure 2-14). These grounds are

   - **CRT wire ground loop in contact with the conductive coating on the outside of the tube**

   - **Ground wire connecting the loop mounting bracket to the video monitor board**

   - **Ground wire connecting the video monitor board connector to the chassis.**

   a. Firmly place the plug (short) end of a VOM test lead against the metal chassis (a corner hole next to the CRT is a good location).

   b. Use the probe (long) end of the lead to push up under the rubber anode cap; push in until you can feel the probe touching the anode connector (Figure 2-15).

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

    c. Hold the probe in contact with the connector for about 3 seconds, then remove the probe.

6. Disconnect the heavy red CRT anode wire from the CRT, as shown in Figure 2-16.

   Refer to Figure 2-14 for the following steps.

7. Disconnect the circular connector from the CRT base.

8. Disconnect the ground wire from the yoke ground lug.

9. Disconnect the 4-pin yoke connector from the video monitor board.

10. While supporting the assembly from the bottom rear of the CRT, remove the top two and then the bottom two screws from the frame of the CRT.

11. Remove the CRT by pulling it straight out.

WARNING
Handle the tube by the sides adjacent to the face, never by the neck. Do not rest the tube on its neck.

To install the CRT, perform steps 1–8 in reverse.

NOTE
Refer to Paragraphs 2.12.1 and 2.12.2 for the proper CRT storage and disposal procedures.

2.12.1   CRT Storage
All CRTs must be stored in a closed shipping container or correctly mounted in the product. Never store a CRT without a protective cover.

2.12.2   CRT Disposal
Use the regional disposal procedure to properly dispose of the CRT. If a regional disposal procedure does not exist in your area, perform the following steps to safely dispose of the CRT. Any CRT which is to be discarded and not returned for repair **must be destroyed**.

WARNING
Use extreme caution when performing this procedure.

1. Make sure only field service personnel are in the area during disposal.

2. Any service person disposing of a CRT must wear, as a minimum, safety glasses with side guards or goggles and gloves. The part numbers are

    Goggles   29-16141
    Gloves   29-16146

3. Place the CRT to be discarded in the box the replacement tube came in, so that the screen is facing the bottom.

4. Close and seal the container, leaving only the very end of the CRT neck exposed (Figure 2-18).
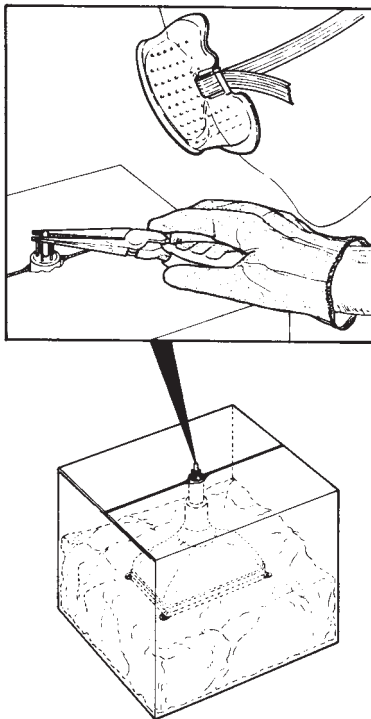
MA 9503

Figure 2-18   CRT Disposal

5. Slowly crush the CRT evacuation point with a pair
    of pliers or wire cutters. The evacuation point is lo-
    cated in the center of the CRT neck end (Figure 2-
    18). If the procedure is done correctly, you will hear
    a quick rush of air. This means that the CRT no
    longer has a vacuum and cannot implode.

6. Return the CRT to its proper position in the box
    and place the top piece of foam in position on the
    CRT. Seal the box.

2.13   KEYBOARD TOP COVER
Perform the following steps to remove the keyboard top
cover.

1. Turn the terminal off.

2. Unplug the keyboard from the terminal.

3. Turn the keyboard over so that the keycaps are fac-
    ing down.

4. Loosen the captive screws holding the keyboard to-
    gether (Figure 2-19).

KEYBOARD
TOP COVER

J2

KEYBOARD

KEYBOARD
BOTTOM COVER

SPEAKER

KEYBOARD
CABLE

CAPTIVE
SCREWS (2)

MA-7786A
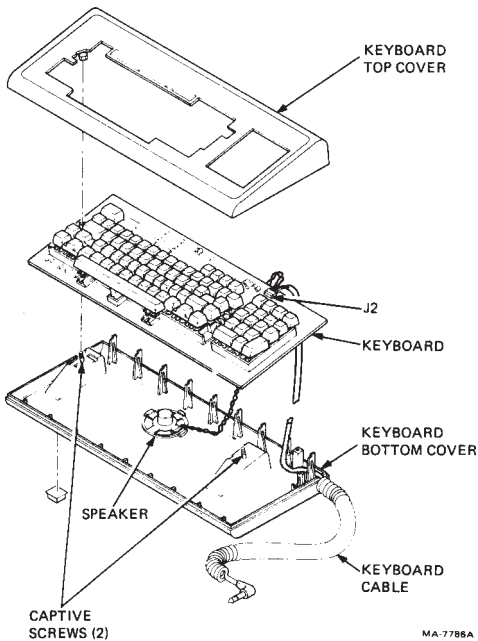
Figure 2-19   Keyboard Disassembly

5. Grasp the entire keyboard assembly and turn it right side up.

6. Remove the top cover by lifting it straight up.

To install the keyboard top cover, perform steps 1–6 in reverse.

2.14   KEYBOARD
Perform the following steps to remove the keyboard.

1. Remove the keyboard top cover (Paragraph 2.13).

2. Disconnect the keyboard cable (J2) from the keyboard (Figure 2-19).

3. Remove the keyboard.

To install the keyboard, perform steps 1–3 in reverse.

2.15   KEYBOARD CABLE
Perform the following steps to remove the keyboard cable.

1. Remove the keyboard top cover (Paragraph 2.13).

2. Remove the keyboard (Paragraph 2.14).

3. Disconnect the keyboard cable from the speaker (Figure 2-19).

4. Remove the keyboard cable.

To install the keyboard cable, perform steps 1–4 in reverse.

2.16   KEYBOARD SPEAKER
Perform the following steps to remove the keyboard speaker.

1. Remove the keyboard top cover (Paragraph 2.13).

2. Remove the keyboard (Paragraph 2.14).

3. Disconnect the keyboard cable from the speaker (Figure 2-19).

4. Remove the speaker by sliding it towards the front edge of the keyboard cover.

To install the keyboard speaker, perform steps 1–4 in reverse.

2.17   KEYCAPS

The only tool normally needed to remove and install key-caps is a keycap puller. In some cases a pair of long nose pliers may be needed.

1. Turn the terminal off.

    Refer to Figure 2-20 for the following steps.

2. Insert the keycap puller between the first cap to be replaced and the adjacent keycap.

3. Squeeze the puller legs around the keycap and slow-ly pull straight up to remove.

4. If the adapter does not come off with the keycap then carefully remove adapter with long nose pliers. Reinstall adapter in the keycap, making sure the pointed end faces front of cap.

NOTE
In some keyboards the adapter and the keycap are one molded part.
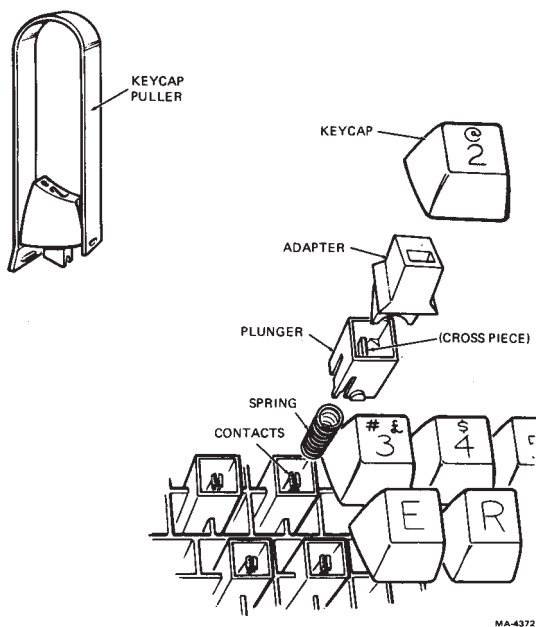
Figure 2-20   Keycap Removal

5. In a very few cases, the plunger might also come off. If so, take care to prevent the spring from flying out. Replace the plunger and spring as follows.

   CAUTION
   You must follow this procedure carefully to prevent damage to key contacts.

   a. Slide spring into plunger. Place spring and plunger in slot and over key contacts. Make sure crosspiece of plunger is vertical, not horizontal.

   b. Slowly push plunger down until crosspiece touches contacts. Release plunger and check that contacts are separated.

6. Locate proper replacement keycap. Gently press keycap straight down on plunger until it is fully seated.

7. Repeat steps 1–6 for each keycap to be replaced.

8. Store all unused keycaps in shipping bag for later use.

2.17.1   Test After Installation

1. Place terminal off-line.

2. Press each replacement keycap (lowercase and uppercase) and make sure the screen displays the proper character(s).

2.18   ROMS
When removing or replacing ROMs, refer to the appropriate terminal controller board configuration for the ROM location and part number (Chapter 4).

1. Place the terminal controller board component side up.

2. To remove the ROM, insert a screwdriver blade between the socket and the ROM. Carefully twist the screwdriver to separate the ROM from the socket. (If the ROM will be used in the new terminal controller board, go to step 4.)

3. Unpack the new ROM from its container, but do not remove the ROM from the conductive foam. Gently press the foam against the surface of the terminal controller board. Remove the ROM from the conductive foam by grasping the body of the ROM at the sides adjacent to the pins.

4. Refer to Figure 2-21 and check that the notches at the end of the ROM and the terminal controller board socket are positioned at the same end. Make sure all ROM pins are evenly spaced and straight before inserting the ROM in the new terminal controller board socket.
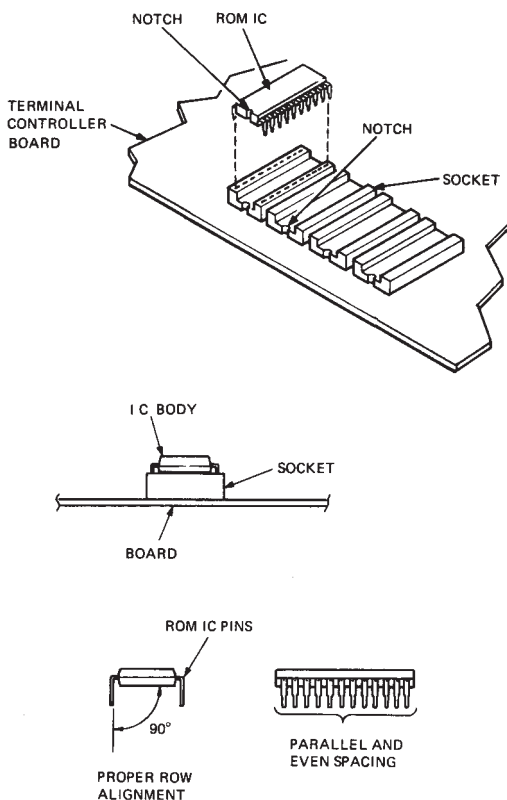
Figure 2-21   ROM Removal

5. Using even pressure, press the surface of the ROM until it is fully seated into the socket. If excessive resistance occurs, remove the ROM and check for proper pin alignment.

6. After inserting the ROM, check that all ROM pins are properly seated in the socket.

NOTE
ROM part numbers are subject to change. Check Tech Tips, Speed Bulletins, and Terminal Information Bulletins for any part number changes.

2.19   RECOMMENDED SPARES LIST

Table 2-1 provides the recommended spares list for the VT101, VT102, VT102W (Word Processor) and VT131. All spares that apply to a specific terminal are noted in the description column.

Table 2-1   Recommended Spares List

Qty	Description	Part Number
1	EIA cable (null modem)	BC22A
1	EIA cable (M to F)	BC22B
1	EIA cable (null modem)	BC03M-25
1	EIA cable (M to F 10 ft)	BC05D-10
1	20 mA interface cable (15 ft)	BC05F-15
5	.75 A slow blow fuse (240 V)	12-11237-00
1	VT100 main keyboard keycap set (VT101 only)	12-14333-72
1	VT100 numeric keycap set (VT101 only)	12-14333-91
1	VT102 main keyboard keycap set	12-14333-WE
1	VT102 numeric keycap set	12-14333-WD
1	VT102W keycap set	12-17800-B6
1	VT131 main keyboard keycap set	12-14333-WE
1	VT131 numeric keyboard keycap set	12-14333-WH
5	Plunger, rear enclosure	12-14740-00
1	Speaker	12-15050-00
5	Snap-in grommet, rear enclosure	12-17630-00
5	Plunger (5/16 in), front enclosure	12-17631-00
5	Standoff, logic board	12-17894-00
1	VT101 controller board	54-14185-00
1	VT102 controller board (VT102, VT102W, and VT131 only)	54-14185-01
1	VT131 ROM	23-280E2-00*
1	Cable assembly, keyboard	70-14652-00
1	20 mA option	70-15273-00
1	VT101 keyboard/keycap assembly	70-15765-00
1	VT102 keyboard/keycap assembly	70-15765-10
1	VT102W keyboard/keycap assembly	70-15765-13
1	VT131 keyboard/keycap assembly	70-15765-11
1	VT101 transformer assembly	70-17148-00
1	VT101 monitor power cable	70-17189-0L
1	Video monitor board assembly	70-18349-01
1	Flyback and choke assembly	70-17363-00
1	CRT and yoke assembly	70-17364-00
1	VT101 power supply	70-17374-00
1	20 mA adapter cable	70-17391-0F

* For Field Service use only; customers order VT131 controller (PN 54-14185-02).

Table 2-1   Recommended Spares List (Cont)

Qty	Description	Part Number
5	1.25 A fuse (120 V)	90-00020-01
4	Feet, rubber back	90-09624-00
5	Plunger, chassis (5/16 in)	90-09964-00
5	Grommet, monitor chassis	90-09966-01
5	Grommet, logic mount	90-10055-01
5	Plunger, logic mount	90-10056-00
1	Power cord, 125 V, 10 A (U.S.)	17-00083-09
1	Power cord, 250 V, 6 A (U.S.)	17-00083-10
1	Australian cord set	17-00198-00
1	German cord set	17-00199-00
1	UK cord set	17-00209-00
1	Swiss cord set	17-00210-00
1	EIA loopback connector	12-15336-00
1	Safety goggles	29-16141-00
1	Gloves	29-16146-00
1	Tuning wand	29-23189-00
1	Video alignment tool	29-23190-00
1	20 mA loopback connector	70-15503-00
1	Keycap puller	74-16355-00
1	CRT alignment template	94-03220-03
1	Character alignment template	94-03270-03

3 VIDEO MONITOR ALIGNMENT

3.1 GENERAL

This chapter describes the alignment of the video monitor. You do not have to perform all the individual adjustments each time you align the monitor. However, you should always check each adjustment, since many of the adjustments affect each other.

You must perform all adjustments under the following conditions.

- Normal video (white characters on a dark background; SET-UP B, switch 1-3 = 0)
- 80 columns per line
- ANSI mode (SET-UP B, switch 2-3 = 1)
- Terminal off-line
- Out of SET-UP
- CRT alignment template attached to the screen
- Top cover removed
- Screen filled with capital Es (after the brightness adjustment). Type **ESC # 8**.

3.2 ALIGNMENT TEMPLATE

Figure 3-1 shows the alignment dimensions used in this chapter. If the mylar adjustment templates (PN 94-03220-03 and PN 94-03270-03) are not available, use the dimensions in Figure 3-1 to draw an outline on a piece of paper. Paragraph 3.2.1 describes the procedure. Perform the adjustments with this paper template instead of the mylar templates.
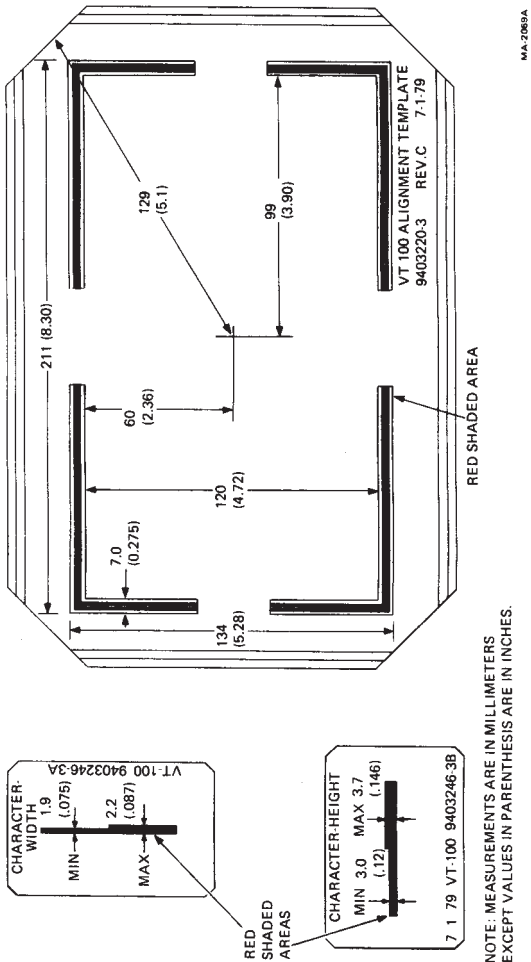
Figure 3-1   Video Alignment Template Dimensions

3.2.1 Making a Paper Template

To make a paper template, you need a pencil, ruler, triangle (or other tool to draw a right angle), and sharp knife. Refer to Figure 3-2 and perform the following steps.

1. Mark a dot in the center of a piece of stiff paper.

2. Measure the dimensions to the top and bottom, and mark with dots.

3. Draw the top and bottom lines (using the triangle if needed).

4. Mark off the left and right sides and draw those lines at a right angle to the top and bottom lines.

5. Measure the width of the "shaded area" and mark a dot at each of the four sides.

6. Draw a line through each dot to form a box around the box already drawn.

7. Mark an area in the middle of each side to leave as support; cut out the rest of the band of paper.

8. Measure from the center through each outer corner and cut the paper away, so you can center the paper template on the CRT between the marks at the bezel corners.
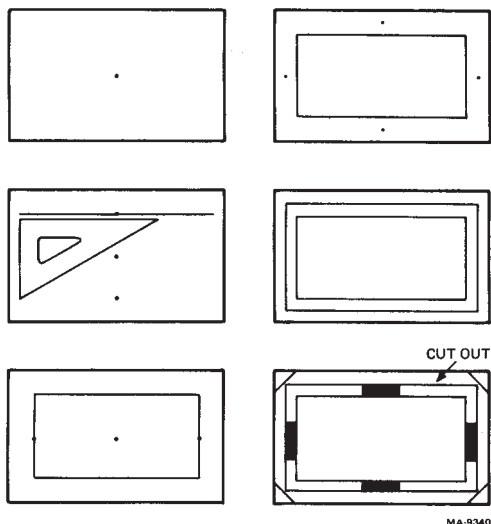
MA-9340

Figure 3-2   Paper Alignment Template

3.2.2 Attaching the Template

The CRT alignment template (PN 94-03220-03) stays attached to the screen during all adjustment procedures. (If you are using the paper template, you may have to remove it for the brightness and linearity adjustment.) Perform the following steps to attach the template to the CRT.

1. Use the bezel around the screen as a guide to mark the four edges of the screen with a water-soluble marker (felt-tip pen).

2. Remove the terminal top cover (Paragraph 2.4).

3. Tape the CRT alignment template to the screen, aligning it with the marks you made in step 1.

3.2.3 Brightness

Perform the following steps to adjust the brightness control on the video monitor board.

1. Allow the terminal to warm up for at least 5 minutes.

2. Increase the screen brightness to the maximum level with the ↑ (up arrow) key in SET-UP.

3. Adjust the brightness, using R109 (Figure 3-3), until the display raster is visible. Then back off on the adjustment until the raster disappears.

4. Restore the screen brightness to normal intensity with the ↓ (down arrow) key in SET-UP.
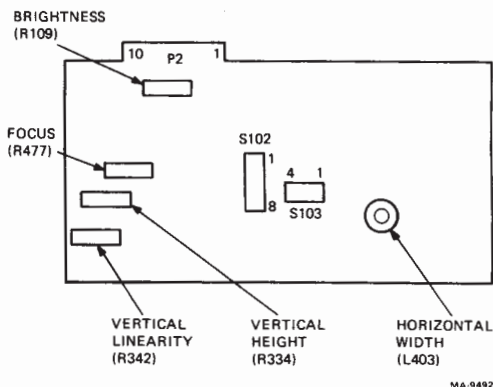
Figure 3-3   Video Monitor Board Adjustments

3.2.4 Yoke Rotation
Perform the following steps to check and adjust the yoke.

1. Check that all four sides of the screen display are parallel to the shaded area of the alignment template.

   NOTE
   If the yoke is adjusted correctly, do not perform the following steps; go to Paragraph 3.2.5.

2. Loosen the yoke collar clamp screw (Figure 3-4). Turn the yoke until the four sides of the screen display are parallel to the edges of the shaded area of the alignment template.

3. Check that the yoke is pushed all the way forward toward the face of the CRT. Tighten the yoke collar clamp screw while holding the yoke in place.

4. Go to Paragraph 3.2.5.
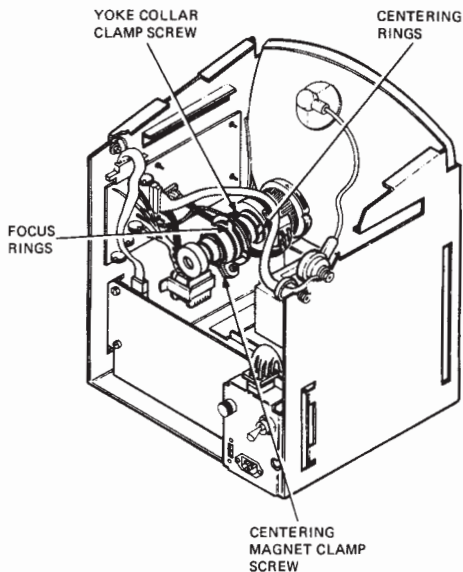
Figure 3-4   Yoke Adjustments

3.2.5   Vertical Height

Perform the following steps to check and adjust the height of the screen display.

1. Check that the top and bottom lines of the display are covered by the shaded area of the adjustment template.

   NOTE
   If the vertical height is correct, do not perform the following steps; go to Paragraph 3.2.6.

2. Adjust the vertical height, using R334 (Figure 3-3).

3. Check for uniform character height and adjust the vertical linearity (Paragraph 3.2.8) if necessary.

4. Go to Paragraph 3.2.6.

3.2.6   Horizontal Width

Perform the following steps to check and adjust the width of the screen display.

1. Check that the first and last columns of the display are covered by the shaded area of the adjustment template.

   NOTE
   If the horizontal width is correct, do not perform the following steps; go to Paragraph 3.2.7.

2. Adjust the horizontal width coil L403 (Figure 3-5) with a monitor alignment tool (PN 29-23190-00) and shaft extender (PN 29-23189-00). L403 is adjusted by placing the alignment tool through the hole in the terminal controller board, through the chassis and video board, and into position on the coil.

3. Go to Paragraph 3.2.7.

HOLE FOR MONITOR ALIGNMENT TOOL

MA-66778
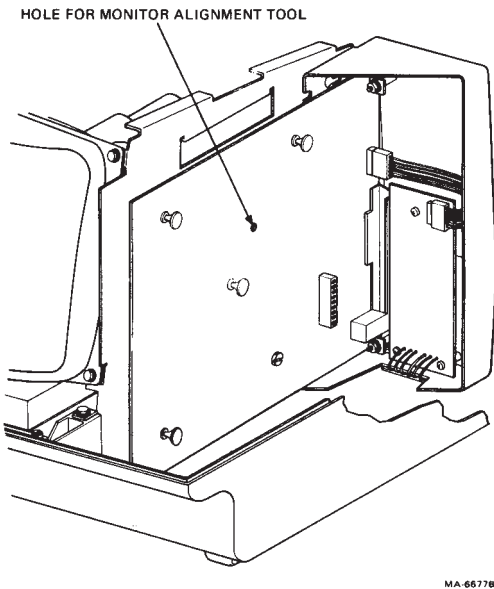
Figure 3-5   Horizontal Width Coil Adjustment

3.2.7   Centering

Perform the following steps to check and adjust the centering of the display.

1. Check that the display falls within the shaded area on the alignment template. If the display is too large or too small, perform the appropriate width or height adjustment.

   NOTE
   If the centering is correct, do not perform the following steps; go to Paragraph 3.2.8.

2. Center the display by rotating the two frontmost centering ring tabs (toward CRT face) located on the neck of the CRT (Figure 3-4) with respect to the tube and each other.

3. Go to Paragraph 3.2.8.

3.2.8   Vertical Linearity

Perform the following steps to check and adjust for uniform character height.

1. Check that the height of the characters located near the four corners and the center of the display fall between the minimum and maximum units of the character height template (PN 94-03270-03).

   NOTE
   If the vertical linearity is correct do not perform the following steps; go to Paragraph 3.2.9.

2. Adjust the vertical linearity, using R342 (Figure 3-3).

3. Check the height of the screen display and adjust the vertical height (Paragraph 3.2.5) if necessary.

4. Go to Paragraph 3.2.9.

3.2.9   Focus

Perform the following steps to check and adjust the focus.

1. Examine the characters at the four corners and in the center of the screen. The individual dots in the vertical segment of the E should be visible in each character.

   NOTE
   In some cases, the operator may want the focus misadjusted to suit personal preference. If the focus is adjusted correctly, do not perform the following steps.

2. Adjust the focus, using R477 (Figure 3-3), for the best overall character presentation.

3. Adjust the focus rings (located the furthest from the yoke) for the best focus at all four corners (Figure 3-4). Readjust R477 if needed.

4. Remove the CRT alignment template, clean the felt-tip pen marks from the screen, and replace the terminal top cover if no further adjustments are required.

4 BOARD CONFIGURATIONS

4.1 GENERAL

This chapter contains the information necessary to correctly configure the terminal controller boards to match the boards you are replacing.

4.2 TERMINAL CONTROLLER BOARDS

The following paragraphs indicate the various terminal controller board configurations.

4.2.1 VT101 Configuration

The VT101 can use a substitute main character set ROM (Figure 4-1). This character set **replaces** the US/UK special character set of the terminal when you remove jumper W6 on the terminal controller board. When replacing the terminal controller board, check to see if a substitute main character set is installed and jumper W6 is removed.

When installing a substitute main character ROM, remove jumper W6 and insert the ROM in socket E4 (Paragraph 2.18).

4.2.2 VT102 Configuration

The VT102 can use a substitute main character set ROM (replaces US/UK special character set) or an alternate character set (Figure 4-2). The alternate character set can be used in **addition** to the US/UK special character set of the terminal. When replacing the terminal controller board, check to see if a character set ROM is installed and if jumper W6 is in or out.

When installing an alternate character set ROM, do not remove jumper W6. Just insert the ROM in socket E4 (Paragraph 2.18).

When installing a substitute main character set ROM, remove jumper W6 and insert the ROM in socket E4 (Paragraph 2.18).

The VT102 also has a communication switch pack on the terminal controller board. When replacing the terminal controller board, check to see that the communication switches are set to the same positions as the old terminal controller board switch pack.

Figure 4-1   VT101 Terminal Controller Board

Figure 4-2   VT102 Terminal Controller Board

4.2.3   VT131 Configuration

The VT131 works the same way as the VT102 and uses the same terminal controller board, but with an additional terminal control ROM added (Figure 4-3). When replacing the terminal controller board in a VT131, you must remove ROM 0 from the faulty board. ROM 0 is then installed into socket 0 on the new terminal controller board (Paragraph 2.18).

NOTE
You must remove ROM 0 (PN 23-280E2) from all VT131 terminal controller boards being returned for repair.

Figure 4-3   VT131 Terminal Controller Board

4.3   COMMUNICATION SWITCH PACK (VT102 AND VT131 ONLY)

The communication switch pack on the VT102 and VT131 terminal controller boards are shown with the standard factory configuration (Figures 4-2 and 4-3). Figure 4-4 shows the switch positions and their relation to the modem pin numbers and signals.

NOTE
All U.S. configurations have the same switch settings. The VT102 and VT131 are shipped with the settings shown in Figure 4-4. Usually U.S. users are not required to change these settings before operation. However, switch 10 must be closed when using the speed select feature of any two-speed modem (such as the Bell 212A).
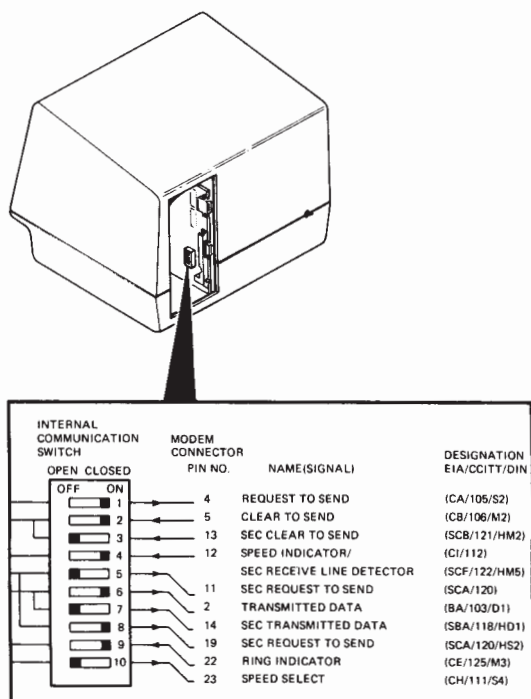

INTERNAL COMMUNICATION SWITCH OPEN CLOSED	MODEM CONNECTOR PIN NO.	NAME(SIGNAL)	DESIGNATION EIA/CCITT/DIN
1	4	REQUEST TO SEND	(CA/105/S2)
2	5	CLEAR TO SEND	(CB/106/M2)
3	13	SEC CLEAR TO SEND	(SCB/121/HM2)
4	12	SPEED INDICATOR/	(CI/112)
5		SEC RECEIVE LINE DETECTOR	(SCF/122/HM5)
6	11	SEC REQUEST TO SEND	(SCA/120)
7	2	TRANSMITTED DATA	(BA/103/D1)
8	14	SEC TRANSMITTED DATA	(SBA/118/HD1)
9	19	SEC REQUEST TO SEND	(SCA/120/HS2)
10	22	RING INDICATOR	(CE/125/M3)
	23	SPEED SELECT	(CH/111/S4)

MA 7256D

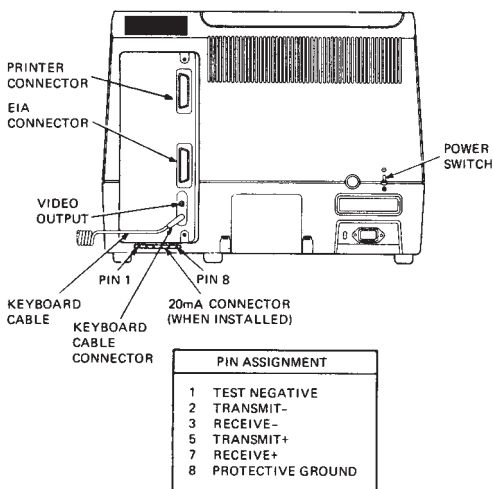Figure 4-4   Communication Switch Selection

5 OPTIONS

5.1 GENERAL

The 20 mA current loop option is an interface that connects the terminal directly to a computer. Figure 5-1 shows the 20 mA current loop connector and pin assignments.

> **NOTE**
> **When you use this option with VT102 or VT131 terminals, you must select the modem control SET-UP feature for full duplex with no modem control (data leads only) operation (FDX A). The communication switches are not used with the 20 mA current loop option installed.**

PIN ASSIGNMENT	
1	TEST NEGATIVE
2	TRANSMIT-
3	RECEIVE-
5	TRANSMIT+
7	RECEIVE+
8	PROTECTIVE GROUND

MA-6675M

Figure 5-1   20 mA Current Loop Connector

64

5.2 20 mA CURRENT LOOP OPTION INSTALLATION

Perform the following steps to install the 20 mA current loop option.

1. Remove the access cover (Paragraph 2.3).

2. Install the 20 mA current loop option board on the access cover with the three Phillips head screws provided (Figure 5-2).

3. Install the 20 mA connector to the bottom of the access cover with the two spacers and hex head screws provided (Figure 5-2).

Figure 5-2   20 mA Current Loop Option Installation

4. Set the TRANS (transmit) and REC (receive)
   switches to the proper configuration (Figure 5-3).
   The switches determine if the transmitter and re-
   ceiver of the 20 mA board are in either active or
   normal (passive) operation. Usually the terminal is
   connected using normal (passive) operation. Passive
   operation means the terminal does not supply the 20
   mA current used when communicating. Active op-
   eration means the terminal supplies the 20 mA cur-
   rent used when communicating.

   NOTE
   **You must set these switches for NORMAL
   (passive) operation to perform the data loop-
   back test.**

5. Connect either end of the cable supplied with the
   option to the 20 mA board. Place the access cover
   next to the opening in the back of the terminal; con-
   nect the other end of the cable to the connector (J5)
   on the terminal controller board (Figure 5-3).

   NOTE
   **VT101 series terminals use either 20 mA or
   Electronic Industry Association (EIA) commu-
   nications. If EIA is used on a terminal with a 20
   mA option, the short cable connecting the 20
   mA board to the terminal controller board must
   be disconnected from connector J5 on the ter-
   minal controller board.**

   If you are performing the 20 mA checkout, refer to
   Paragraph 5.3, step 2.

   If you are not performing the 20 mA checkout, go
   to step 6.

6. Reinstall the access cover.

7. Connect the 20 mA communications line to the
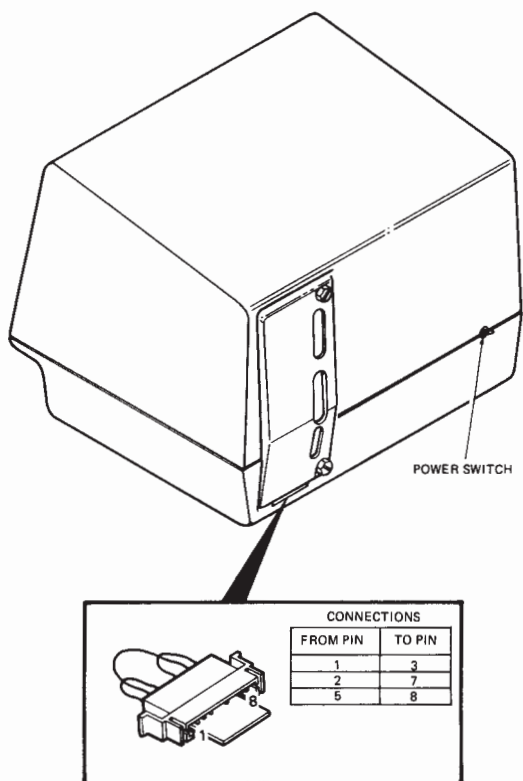   Mate-N-Lok connector located on the bottom of the
   access cover.
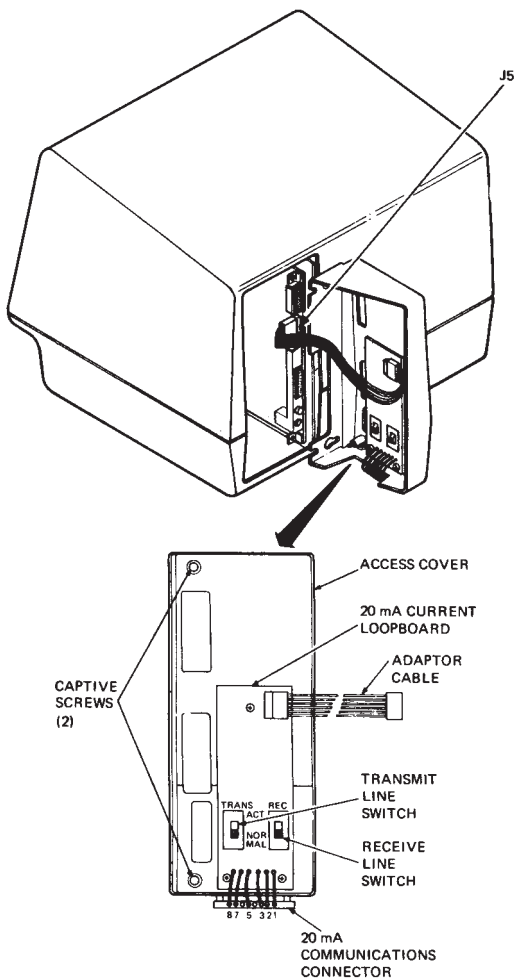
Figure 5-3   Switch Settings and Connections

5.3   20 mA CURRENT LOOP OPTION CHECKOUT

Perform the following steps to check out the operation of the 20 mA current loop option.

1. Remove the access cover containing the 20 mA current loopback board (Paragraph 2.3).

2. Set both the REC and TRANS switches to the NORMAL position (Figure 5-3).

3. Reinstall the access cover.

4. Connect the 20 mA loopback connector (PN 70-15503-00) to the Mate-N-Lok connector mounted on the bottom of the access cover (Figure 5-4).

CONNECTIONS	
FROM PIN	TO PIN
1	3
2	7
5	8

POWER SWITCH

MA-7967B

Figure 5-4   20 mA Loopback Connector

5. Turn the power switch on (Figure 5-1). The terminal performs the power-up self-test.

6. Enter SET-UP and select

   • OFF LINE

   • ANSI/VT52 SET-UP feature set to ANSI (SET-UP B, switch 2−3 = 1)

   • Modem control SET-UP feature set to FDX A (VT102 and VT131 only)

7. Type one of the following sequences to perform the data loopback

   ESC [2 ; 2 y   (Performs test once.)

   ESC [2 ; 10 y   (Performs test continuously.)

   NOTE
   The continuously running test ends only if an error is found or power is turned off.

   When the test runs, the screen clears and displays the message "WAIT" in the upper left corner. A successful test ends with the cursor in the upper left corner of the screen and the ON LINE or OFF LINE indicator on.

8. The screen displays the number 8 to indicate a loopback error. If an error is detected, check the 20 mA connectors and switch settings; then repeat step 7. If the option does not check out correctly, replace the option.

9. Once the test ends, return the 20 mA board switches to their original positions if necessary. Remove the 20 mA loopback connector and reconnect the communication, printer, and video output cables to the terminal.

6 OPERATOR REFERENCE MATERIAL

6.1 GENERAL

This chapter contains SET-UP summaries for the VT101 series video terminals.

6.2 SET-UP

SET-UP allows the keyboard to perform the following functions.

- Enable and disable terminal features
- Enter and store a 20-character answerback message
- Save selected features in a nonvolatile memory
- Temporarily change terminal features, and then recall the original settings

SET-UP is divided into three displays: SET-UP A, SET-UP B, and SET-UP C (VT131 only). Refer to the terminal's user guide for selection information.

6.2.1 SET-UP A

To enter SET-UP A, press the **SET-UP** key. The screen will display a presentation similar to Figure 6-1. The bottom line consists of a ruler that numbers each character position (80 or 132 characters per line) available on a line. The location of each tab is shown by a T above the ruler. SET-UP A is the same in all VT101 series video terminals.

6.2.2 SET-UP B (VT101)

You can only enter SET-UP B from SET-UP A, by pressing the **5** key on the main keyboard. The SET-UP B display for the VT101 is similar to Figure 6-2. Figure 6-3 summarizes the SET-UP B features in the VT101.
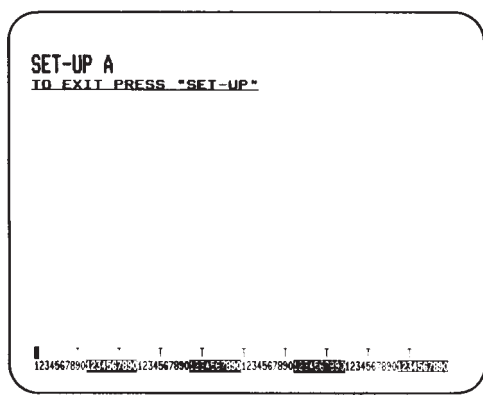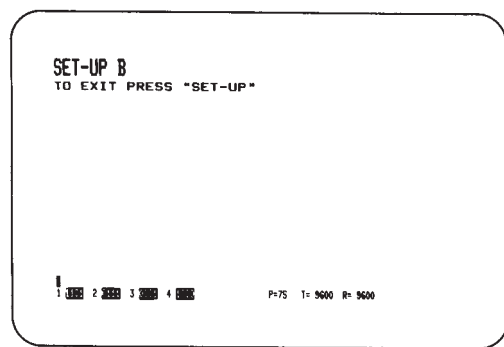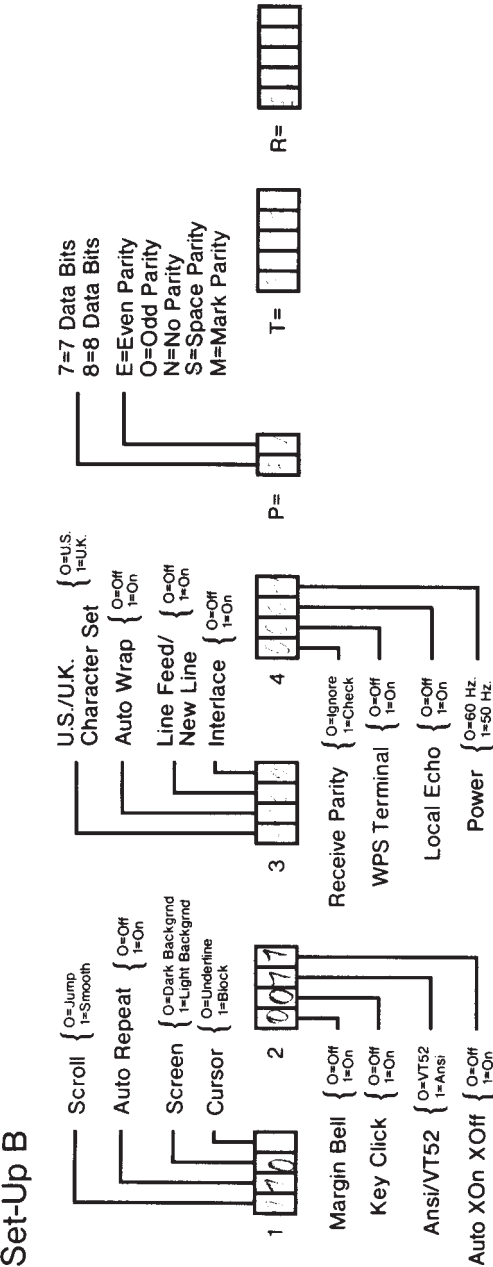
Figure 6-1   SET-UP A

Figure 6-2   SET-UP B (VT101)

Figure 6-3   SET-UP B Summary (VT101)

6.2.3   SET-UP B (VT102 and VT131)

The SET-UP B display for the VT102 and VT131 is similar to Figure 6-4. Figure 6-5 summarizes the SET-UP B features in the VT102 and VT131. The SET-UP B displays are the same for both the VT102 and VT131.

6.2.4   SET-UP C (VT131 only)

You can only enter SET-UP C from SET-UP B, by pressing the **5** key on the main keyboard.

NOTE
If unable to enter SET-UP C, replace the VT131 ROM (Paragraph 2.18). See Chapter 4 for board configuration.

The SET-UP C display for the VT131 is similar to Figure 6-6. Figure 6-7 summarizes the SET-UP C features in the VT131.
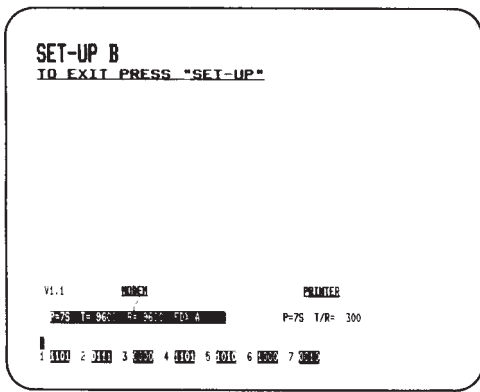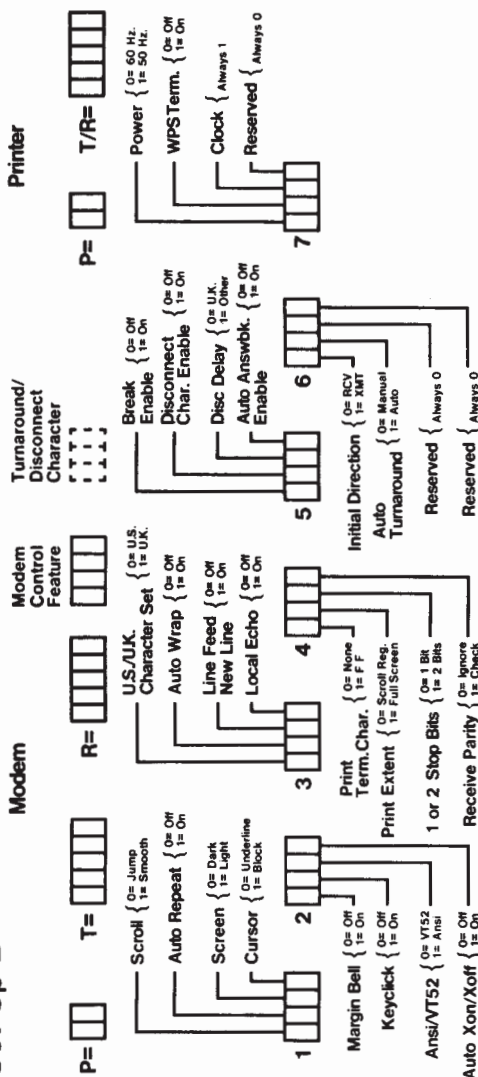

Figure 6-4   SET-UP B (VT102 and VT131)

Figure 6-5   SET-UP B Summary (VT102 and VT131)
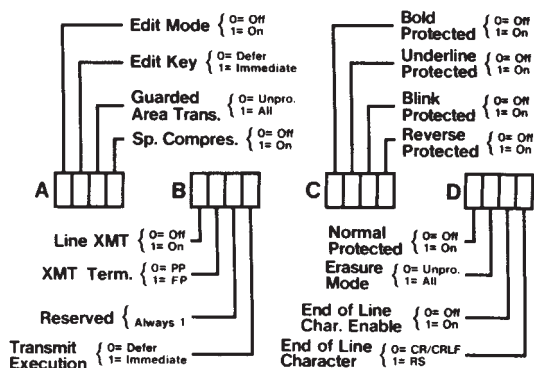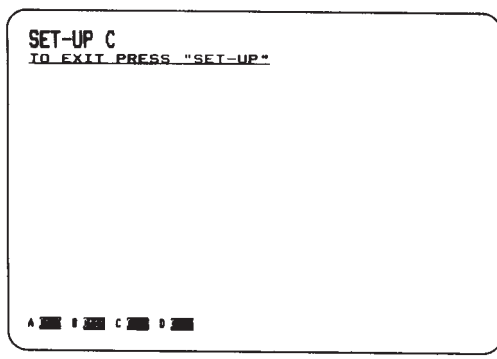
Figure 6-6   SET-UP C (VT131)

Set-Up C

MA-9500

Figure 6-7   SET-UP C Summary (VT131)

APPENDIX A
RELATED DOCUMENTATION

The following is a list of related documentation associated with the VT101 series video terminals.

VT101 Series Technical Manual   EK-VT101-TM

Describes the VT101 video terminal to a detailed block level. Provides troubleshooting information for the terminal technician. This manual does not contain detailed schematic drawings. The VT101 Family Field Maintenance Print Set has detailed schematic drawings. It is ordered separately.

VT101 User Guide   EK-VT101-UG
VT102 User Guide   EK-VT102-UG
VT131 User Guide   EK-VT131-UG

Describe the installation, operation, and programming of the VT101 series video terminals. These documents are shipped with their respective terminals.

VT101 Programming Reference Card   EK-VT101-RC
VT102 Programming Reference Card   EK-VT102-RC
VT131 Programming Reference Card   EK-VT131-RC

Provide a summary of the VT101 series escape and control sequences on a pocket size reference card.

VT101 Video Terminal IPB   EK-VT101-IP
VT102 Video Terminal IPB   EK-VT102-IP
VT131 Video Terminal IPB   EK-VT131-IP

Provide a detailed parts breakdown of the VT101 series field replaceable units. These documents do not contain part numbers for components on the printed circuit boards. However, components are listed in the VT101 Family Field Maintenance Print Set. It is ordered separately.

VT101 Family Field Maintenance   MP-01066
Print Set

Provides a complete set of electrical and mechanical schematic diagrams for the VT101 series terminal.

APPENDIX B
CABLE INFORMATION

Figure B-1 shows the cable connections for the VT101 series video terminals. Table B-1 lists the available interface cables.
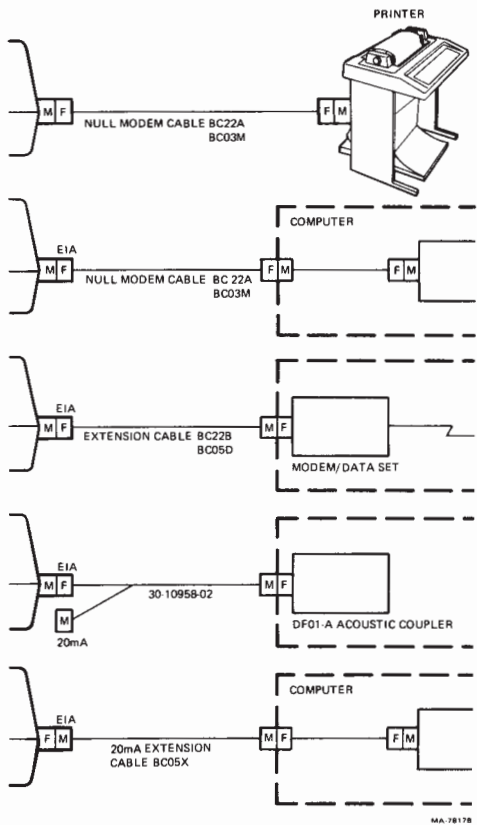

Figure B-1   Cable Summary

Table B-1   Interface Cables

Part No.	Connector Types	Function
BC22A-10 (10 ft)	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT1xx and computer or printer (6-conductor cable).
BC22A-25 (25 ft)	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT1xx and computer or printer (6-conductor cable).
BC22B-10 (10 ft)	RS-232 (male) to RS-232 (female)	Extension; connects VT1xx to a modem (14-conductor cable).
BC22B-25 (25 ft)	RS-232 (male) to RS-232 (female)	Extension; connects VT1xx to a modem (14-conductor cable).
BC03M-xx (variable length)	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT1xx and computer or printer.
BC05D-xx (variable length)	RS-232 (male) to RS-232 (female)	Extension; connects VT1xx to a modem.
BC05F-xx (variable length)	Mate-N-Lok (male) to Mate-N-Lok (male)	20 mA: direct connection between VT1xx with 20 mA option installed and a computer.
BC05X-xx (variable length)	Mate-N-Lok (female) to Mate-N-Lok (male)	20 mA extension cable.
30-10958-02 (EIA: 18 in 20 mA: 8 ft)	RS-232 (male) to RS-232 (female) and 20 mA (male)	Connects acoustic coupler and VT1xx EIA or 20 mA.

APPENDIX C
PHYSICAL FUNCTIONAL
DIAGRAM

C.1 PHYSICAL FUNCTIONAL DIAGRAM BOARD PINS AND SIGNALS

NOTE
All voltage readings are based on a line voltage of 115 Vac. Your readings may vary according to any difference in your line voltage.

VIDEO MONITOR BOARD

S102 (Flyback Assembly Cable Connector)
Pin 1   Grid supply
    2   Focus
    3   Horizontal drive
    4   +12 Vdc
    5   Boost
    7   Ground

S103 (CRT Yoke Cable Connector)
Pin 1   Vertical
    2   Horizontal
    3   Horizontal
    4   Vertical

POWER SUPPLY BOARD

J2 (Video Monitor Board Connector)
Pin 1   +12 return
    2   Ground
    3   Direct drive video
    4   +12 Vdc
    5   Vertical drive
    6   Horizontal drive
    7   Video ground

P3 (Secondary Cable Connector)

Pin	1-2	20 Vac
	1-3	10 Vac
	2-3	10 Vac
	6-9	32 Vac
	6-12	16 Vac
	9-12	16 Vac
	7-10	18 Vac
	8-11	30 Vac
	5	Ground

J4 (Primary Cable Connector)

Pin	1	Primary
	2	Primary
	3	Primary
	4	Primary
	5	Primary

TERMINAL CONTROLLER BOARD

J1 (Controller to Power Supply Board Connector)

Pin	1	Direct drive video
	2	Video ground
	3	Vertical drive
	4	Horizontal drive
	5	+12 Vdc
	6	Return (ground)
	7	−12 Vdc
	8	−23 Vdc
	9	Return (ground)
	10	Return (ground)
	11	+5 Vdc
	12	+5 Vdc

J4 (Printer Connector – VT102 and VT131)

Pin	1	Protective ground
	2	Transmitted data
	3	Received data
	6	Data set ready
	7	Signal ground
	20	Data terminal ready

J2 (EIA Connector)
Pin   1   Protective ground
      2   Transmitted data
      3   Received data
      4   Request to send
      5   Clear to send (not VT101)
      6   Data set ready (ignored in VT101)
      7   Signal ground
      8   Carrier detect
      11   Secondary request to send
      12   Speed indicator (FDX B) or secondary
           receive line signal detect (HDX A)
      13   Secondary clear to send (not VT101)
      14   Secondary transmit data (not VT101)
      19   Secondary request to send (not VT101)
      20   Data terminal ready
      22   Ring indicator (not VT101)
      23   Speed select

KEYBOARD

J2 (Keyboard)
Pin   1   Speaker
      2   Speaker
      3   +12 Vdc
      4   Ground
      5   Data

20 mA BOARD (Option)

J5 (20 mA Board)
Pin   1   Protective ground
      2   Transmit
      3   +12 Vdc
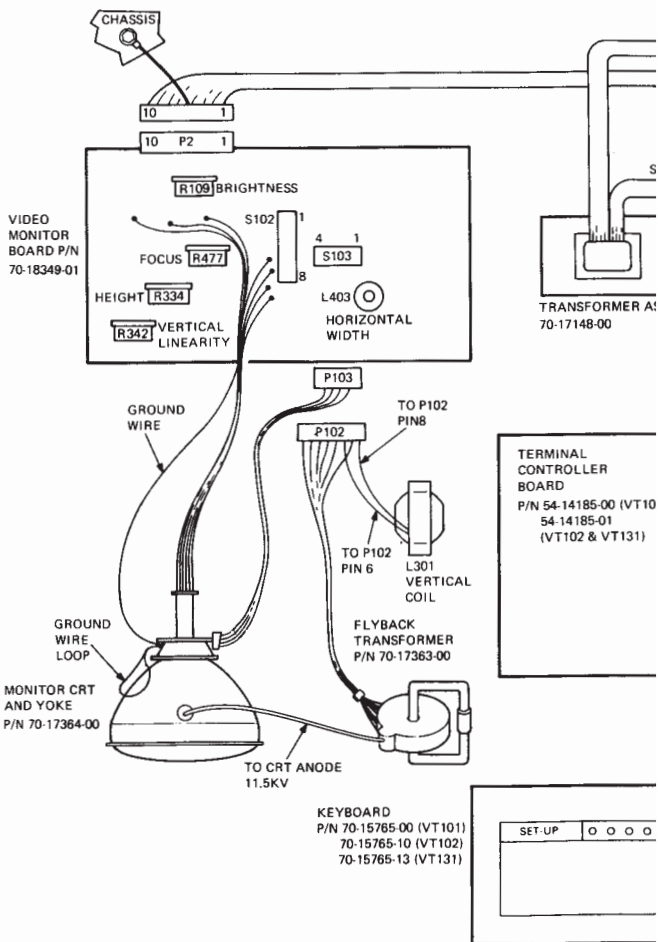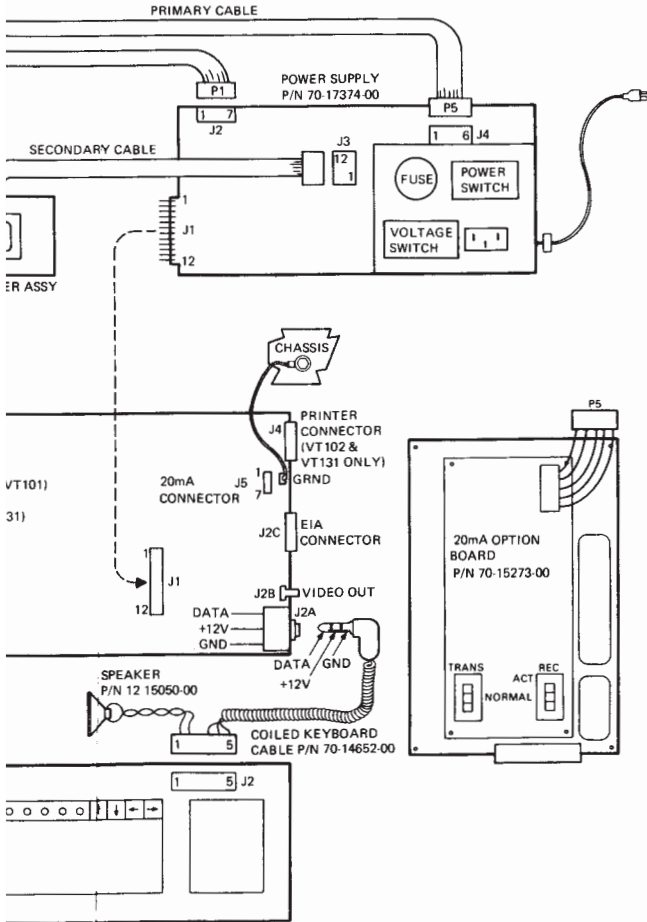   4   Receive
      5   Signal ground
      6   +5 Vdc
      7   −12 Vdc

Figure C-1 Physical Functional Diagram

MA-9501

digital