

VT100 SERIES POCKET SERVICE GUIDE

DEC-100 1180-8AP

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INTRODUCTION

This pocket service guide describes how to troubleshoot any VT100-family video terminal to the field replaceable unit (FRU), replace the FRU, and perform any needed adjustments. The guide also provides installation procedures for the advanced video option, 20 mA current loop option, printer port option, and the graphics processor upgrade kit.

The following products are covered in this guide.

- VT100 Video Terminals
- VT100-WA through -WK Word Processing Terminals
- VT1XX-AA Current Loop Option
- VT1XX-AB Advanced Video Option
- VT1XX-AC Printer Port Option
- VT105 Graphics Terminal
- VT125 Graphics Terminal
- VT132 Editing Terminal
- VT1XX-CB, -CL Graphics Processor Upgrade Kits

1 TROUBLESHOOTING

1.1 INTRODUCTION

This chapter contains all the troubleshooting information for the VT100 series of terminals. All terminals in the series are based on the VT100. Therefore, the VT100 can always be isolated as a separate unit. This allows you to determine if the trouble lies within the VT100 hardware, or in the hardware added to make it a variation.

1.2 TROUBLESHOOTING THE BASIC VT100

The VT100 has internal self-tests that help isolate failures to a field replaceable unit (FRU). Chapter 3 describes the tests and how to run them. Tables 1-1 and 1-2 show the error codes that the tests provide, the detected failure, and the FRU that should be replaced.

Table 1-1 Keyboard LED Error Codes

Keyboard LEDs				Error Detected	Replaceable FRU
L1	L2	L3	L4		
Off	Off	Off	On	ROM 1	Terminal controller
Off	Off	On	Off	ROM 2	Terminal controller
Off	Off	On	On	ROM 3	Terminal controller
Off	On	Off	Off	ROM 4	Terminal controller
Off	On	Off	On	Main data RAM	Terminal controller

Table 1-2 VT100 Displayed Error Codes

Error Character Displayed	Check or Replace		
	Terminal Controller	Advanced Video	Keyboard
1	-	X	-
2	X	-	-
3	X	X	-
4	-	-	X
5	-	X	X
6	X	-	X
7	X	X	X
8	X	-	-
9	X	X	-
:	X	-	-
.	X	X	-
>	X	-	X
=	X	X	X
<	X	-	X
?	X	X	X
@	X	-	-
A	X	X	-
B	X	-	-
C	X	X	-
D	X	-	X
E	X	X	X
F	X	-	X
G	X	X	X
H	X	-	-
I	X	X	-
J	X	-	-
K	X	X	-
L	X	-	X
M	X	X	X
N	X	-	X
O	X	X	X

1.3 TROUBLESHOOTING BASIC VT100 VARIATIONS WITHOUT SELF-TEST

If the terminal appears to be faulty, perform the following procedure. If the problem is not solved by this procedure, refer to Table 1-3 for a list of typical problems.

1. Turn the power switch to the off position and check the following:
 - a. Power Cord – make sure the cord is connected securely at both the terminal and the wall outlet. Check the wall outlet with another device, such as a lamp, to make sure it is providing ac power.

- b. Voltage Selection Switch and Fuse – make sure the switch is in the correct position and the fuse is good.
 - c. Keyboard Coiled Cord – check that the cord is securely plugged into the keyboard connector at the back of the terminal.
2. Turn the power switch to the on position. the terminal performs the power-up test. [Refer to the power-up test description (Paragraph 3.1.2) for more information about the power up test.] If the terminal does not power up correctly, refer to Table 1-3.
3. If needed, perform the Computer Port Data Loopback Test. [Refer to the data and EIA loopback test descriptions (Paragraphs 3.1.3 and 3.1.4) for more information about the data loopback test.]

Table 1-3 lists the most common VT100 failures and the symptoms associated with these failures. To use the table select the symptom that matches the terminal failure.

Table 1-3 Basic VT100 Troubleshooting Procedure

Symptom	Probable Cause	Corrective Action
No response when power switch is set to ON position. CRT filament is not lit and LEDs are not on.	Not plugged in; no power at wall socket	Plug in VT100; use different wall socket if possible.
	Main power fuse	Replace fuse. (If fuse blows again there is a possible shorting problem. Use the appropriate troubleshooting methods.)
	Power supply	Replace power supply.
	AC line cord	Check for open or short and replace line cord.
	Power distribution harness	Replace harness.

Table I-3 Basic VT100 Troubleshooting Procedure (Cont)

Symptom	Probable Cause	Corrective Action
No response when the power switch is set to ON position. CRT filament is lit.	Terminal controller board	Replace board.
	Power distribution	Replace harness.
No audible tone when terminal is turned on. LEDs are lit.	Keyboard	Replace
	Keyboard cable	Replace
	Controller	Replace
	Speaker	Replace
No audible alarms and indicators when the terminal is turned on and none of the keyboard LEDs light.	Keyboard cable	Replace
	Keyboard is disconnected.	Connect
	Keyboard cable	Replace
	Keyboard	Replace
	Controller	Replace
Cursor does not appear on screen after terminal is powered up. CRT filament is on.	Connectors	Check and reconnect.
	Screen brightness is too low.	Adjust monitor brightness.
	Controller	Replace
	Monitor board	Replace
	Flyback transformer	Replace
	DC power harness	Replace
	CRT and yoke assembly	Replace

Table I-3 Basic VT100 Troubleshooting Procedure (Cont)

Symptom	Probable Cause	Corrective Action
Cursor does not appear on screen after terminal is powered up. CRT filament is not on. Keyboard is functional.	Monitor fuse open	Replace monitor board.
	Monitor board	Replace
	DC power harness	Replace
Random characters appear on screen.	CRT and yoke assembly	Replace
	Controller	Replace
Horizontal or vertical line appears on screen.	Monitor connectors	Check and reconnect.
	Monitor board	Replace
Screen display is distorted. Characters are narrow on left or right side of screen.	CRT and yoke assembly	Replace
	Monitor is misadjusted.	Adjust monitor.
	Monitor board	Replace
	Flyback transformer	Replace
Display presentation bows in or out.	CRT and yoke assembly	Replace
	Controller	Replace
	Yoke pin-cushion is misadjusted	Replace CRT and yoke assembly.
Display presentation is jumpy.	Interlace feature is on.	Turn feature off.
	Power feature is set incorrectly.	Set feature to correct line frequency.

Table 1-3 Basic VT100 Troubleshooting Procedure (Cont)

Symptom	Probable Cause	Corrective Action
Display presentation is jumpy.	Controller	Replace
	Power supply	Replace
	Monitor board	Replace
	Flyback transformer	Replace
Wrong character appears on screen when typed in LOCAL.	Graphics or alternate character set, or alternate keypad mode or cursor key mode is selected.	Clear condition with power up or reset.
	Keyboard	Replace
	Controller	Replace
Wrong character appears on screen when typed in ON-LINE mode with loopback installed. Terminal functional in LOCAL mode.	Graphics or alternate character or alternate keypad mode or cursor key mode is selected.	Clear condition with power up or reset.
	Transmit and receive speed not the same.	Change speed setting
	Controller	Replace
Wrong characters appear on screen when typed in ON-LINE mode and connected to computer. Terminal is functional with loopback connector.	Receive and/or transmit speed is set incorrectly.	Speed speeds to match computer.
	Bits per character feature is set incorrectly.	Set feature to match computer.
	Parity feature is set incorrectly to match computer.	Set parity and/or parity sense feature to match computer.
	Communications line	Check communications facilities.

Table 1-3 Basic VT100 Troubleshooting Procedure (Cont)

Symptom	Probable Cause	Corrective Action
Messages received are incomplete.	XON/XOFF feature is set incorrectly.	Set feature
	Computer does not recognize XON/XOFF sequence.	See Chapter 3 of <i>VT100 User Guide</i> .
Checkerboard character appears on screen instead of character typed (on-line with computer).	Controller	Replace
	Parity feature is set incorrectly.	Set parity and/or parity sense feature to match computer.
All characters are displayed as a white area (black with reverse screen).	Controller	Replace
	Communications facility problem	Check communications facility.
Only top or bottom half of characters are displayed on the screen.	Alternate character set selected and not available	Clear condition with power up or reset.
	Incorrect use of double height escape sequence	See Chapter 3 of <i>VT100 User Guide</i> .
SET-UP features do not work correctly (multiple alarms may sound on power up or recall).	Save operation was not performed.	Perform save operation.
	Controller	Replace
Terminal does not respond to escape sequences.	ANSI/VT52 feature is set incorrectly.	Set ANSI/VT52 feature to correct compatibility.

1.3.1 Using the Basic Terminal Troubleshooting Table

The symptoms displayed may represent a multiple failure and, as a result, the symptoms may change as FRUs are replaced. Always troubleshoot according to the current symptoms.

1. This table assumes that only one field replaceable unit (FRU) has failed.
2. Spare parts do fail. Do not ignore the possibility of a failure just because the module has been replaced once.
3. You must turn off power before disconnecting or replacing any of the FRUs.

1.4 TROUBLESHOOTING THE VT105

The troubleshooting procedure for the VT105 consists of the following two steps.

1. Isolate to the base VT100 configuration and troubleshoot the terminal.
2. Perform the internal VT105 waveform generator tests described in Paragraph 3.3.

To isolate to the base VT100, disconnect the graphics interface cable from J2 on the VT100 controller board. Now perform the troubleshooting procedures outlined for the basic VT100 (Paragraph 3.1).

To troubleshoot the VT105 graphics module, reconnect the graphics interface cable to J2 on the VT100 controller board. Perform the testing procedure outlined in Paragraph 3.2. If an error appears perform the test sequence again to verify that there is an error and then replace the VT105 graphics board.

1.5 TROUBLESHOOTING THE VT132

The troubleshooting procedure for the VT132 is the same as for the basic VT100. The only difference between the two machines is the advanced video option (AVO) board. On the VT132 the AVO board is standard and contains four ROMs. In addition the ROMs on the video controller board are different. To replace the terminal controller board, remove the ROMs from the new VT100 controller board and substitute the VT132 ROMs. To replace the advanced video option board, configure the new AVO board jumpers or switches for VT132 application, and plug in the VT132 ROMs. Chapter 7 contains information on board configuration.

1.6 TROUBLESHOOTING THE VT125

The VT125 is a VT100 terminal that has an intelligent graphics processor installed between the terminal and the communication connectors (Figure 1-1). A problem in the graphics components can also prevent the terminal from working as a text terminal. Any problem with the VT125 can be isolated to the VT100 components or the graphics components.

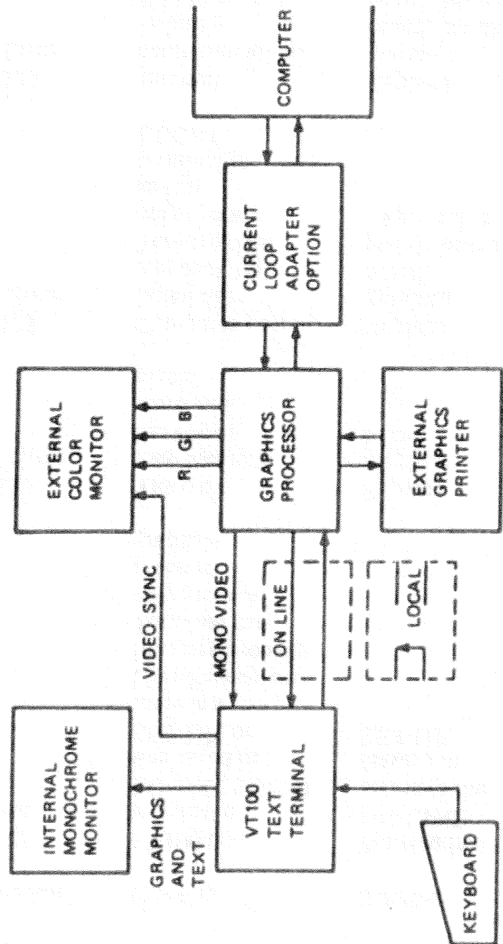
If any of the following conditions exist, remove the graphics components from the terminal by performing the appropriate procedures in Chapter 5.

- The VT125 cannot complete its power-up test
- Any of keyboard indicators L1 through L4 are lit at the end of power-up test
- The complete screen flashes

Once you have removed the graphics components, test and troubleshoot the terminal as a VT100. When the terminal passes its VT100 power-up and data loopback tests, reinstall the graphics components and perform the VT125 tests (Chapter 3).

1.6.1 VT125 Self-Test Error Codes

If a character appears under the blinking cursor at the top left corner of the screen, or a message appears in the center of the screen, check Table 1-4 for the meaning of the error code character or message. Note that a character displayed can indicate more than one error. To clear the error indication after the error is corrected, reset or power up the terminal.



MA 9436

Figure 1-1 VT125 General Block Diagram

Table 1-4 VT125 Displayed Error Codes

Character Displayed	Faults Detected		
	AVO	Memory	Keyboard
1	X	-	-
2	-	X*	-
3	X	X	-
4	-	-	X†
5	X	-	X
6	-	X	X
7	X	X	X

Message Displayed	Faults Detected
VT125 OK	None (normal power-up test results)
VT125 Offline	VT100 text terminal is LOCAL - LOCAL was saved in SET-UP, or there is a User Permanent Memory problem
VT125 BM Error	Video bit map memory one or more bad pixels
VT125 EC Error	Computer port
VT125 IC Error	Internal Communications
VT125 SC Error	Auxiliary port
VT125 VG Error	Vector generator

* Also, bell tones are generated - perform a save and recall in SET-UP

† Check that keyboard is properly connected.

The self-test code characters indicate the following three types of errors.

Advanced video option (AVO) if installed If the advanced video option fails, the terminal operates with the basic VT100 text capabilities.

User permanent SET-UP feature memory failure (Memory) If the user permanent SET-UP feature memory fails, the terminal operates using default SET-UP feature selections for each feature. (Refer to Chapter 2 for more information on the SET-UP feature memories.)

Keyboard missing or malfunction (Keyboard) If only the keyboard fails, the terminal ends the test ON-LINE so that it may operate as a receive-only terminal. The SET-UP feature selections cannot be changed.

There are several other problem indicators. The solutions are listed in the suggested order of FRU replacement.

Indication	Problem	Solution
VT125 Offline	VT100 text terminal is LOCAL. LOCAL was saved in SET-UP, or there is a User Permanent Memory problem. Terminal can only process received graphics.	Put terminal ON-LINE and save the feature in SET-UP.
VT125 BM Error	Video bit map memory has one or more bad pixels.	Replace graphics board.
VT125 EC Error	Computer port failed data loopback test. Terminal can only operate as text terminal in LOCAL.	Replace graphics board, paddle board, 24-pin cable.
VT125 IC Error	Internal communications failure – VT125 cannot communicate with VT100. Terminal can only process received graphics.	Replace graphics board, paddle board, 24-pin cable.

Indication	Problem	Solution
VT125 SC Error	Auxiliary port failed data loopback test. Terminal cannot send data to printer.	Replace graphics board, paddle board, 24-pin cable.
VT125 VG Error	Vector generator could not draw sample shape. Graphics probably does not work, but terminal may communicate normally.	Replace graphics board.

A box is drawn around the margin of the graphics screen area.* If any part of the box is missing or distorted, replace the graphics board.

If no graphics data is displayed, but the VT100 section of the terminal operates correctly, the 16-pin cable may be bad.

If an external color monitor has trouble displaying graphics information, but the internal monitor displays correctly, the ground wire from the chassis to the graphics processor board video connector bracket may be loose.

Table 1-4 shows the possible error characters that are displayed on the screen and the failure indicated by each character. Note that a character displayed can indicate more than one error.

*Not on all units

1.7 TROUBLESHOOTING THE OPTIONS

Troubleshoot the terminal options after the basic terminal is checked and found to be good. Perform the check-out procedure for the suspected faulty option as described in Chapter 6. If the option does not check out correctly, replace the option module.

1.8 RECOMMENDED SPARES LIST

Table 1-5 lists the recommended spares for the basic VT100 and all the terminal variations. This list includes spares for the advanced video option, the 20 mA current loop adapter option, and the printer port option.

NOTE

ROM part numbers are subject to change. Contact your local DIGITAL Field Service branch office for the latest part numbers.

Table 1-5 VT100 Recommended Spares

Qty	Description/ Part Number	V	V	V	V	V	V	V
		T	T	T	T	T	T	T
		1	1	1	1	1	1	1
		0	0	0	X	0	2	3
		0	0	0	X	5	5	2
			W	W				
			A	C	A			
					C			
			B	K				
1	Monitor PCB (Ball) 30-14590-02	x	x	-	-	-	-	-
1	Flyback Xfmr (Ball) 30-14590-01	x	x	-	-	-	-	-
1	Monitor PCB (Elston) 70-17362-00	x	x	x	-	x	x	x
1	Flyback assy (Elston) 70-17363-00	x	x	x	-	x	x	x
1	CRT and yoke assy 70-17364-00	x	x	x	-	x	x	x
1	Terminal controller PCB not FCC-complying 54-13009-00	x	x	x	-	x	x	x
1	Terminal controller PCB FCC-complying 54-13009-03	x	x	x	-	x	x	x
1	Advanced video PCB 54-13097-00	x	x	x	-	x	x	x
1	20 mA adapter assy 70-15273	x	x	x	-	x	x	x
1	20 mA internal cable 70-15506-0B	x	x	x	-	x	x	x
1	20 mA cable (15 ft) BC05F-15	x	x	x	-	x	x	x
1	EIA cable (M-F) (10 ft) BC05D-10	x	x	x	-	x	x	x
1	EIA cable (null modem) BC03M-10	x	x	x	-	x	x	x
1	LK keyboard 70-15765-00	x	-	-	-	x	x	x
1	Cable assy, keyboard 70-14652	x	x	x	-	x	x	x
1	Speaker 12-15050	x	x	x	-	x	x	x
1	LK07 keycap set 12-14333-72	x	x	x	-	x	x	x
1	LK08 keycap set 12-14333-91	x	x	x	-	x	x	x
1	Keycap removal tool 74-16355	x	x	x	-	x	x	x
1	Power supply assy 70-14979	x	x	x	-	x	x	x

Table I-5 VT100 Recommended Spares (Cont)

Qty	Description/ Part Number	V	V	V	V	V	V	V
		T	T	T	T	T	T	T
		I	I	I	I	I	I	I
		0	0	0	X	0	2	3
		0	0	0	X	5	5	2
			W	W				
			A	C	A			
					C			
		B	K					
1	Power switch 12-15232	x	x	x	-	x	x	x
1	Voltage select switch 12-16901-00	x	x	x	-	x	x	x
10	Fuse 3 amp 90-07217	x	x	x	-	x	x	x
1	Line cord, 115 V 17-0083-09	x	x	x	-	x	x	x
1	Line cord, 230 V 17-0083-10	x	x	x	-	x	x	x
1	DC power dist. cable 70-14978-01	x	x	x	-	x	-	x
1	DC power dist. cable 70-14978-03	x	x	x	-	x	x	x
2	Card guide 12-12405-00	x	x	x	-	x	x	x
5	Retainer ring* 90-10007	x	x	x	-	x	x	x
5	Support*, chassis 90-09747-01	x	x	x	-	x	x	x
5	Cable clamp* 90-10016-00	x	x	x	-	x	x	x
15	Plunger*, chassis mounting 90-09964	x	x	x	-	x	x	x
15	Grommet*, chassis 90-09966-01	x	x	x	-	x	x	x
5	Captive screw* 12-14811	x	x	x	-	x	x	x
15	Plunger*, base mounting 12-14740-00	x	x	x	-	x	x	x
15	Plunger*, base mounting 90-09965-00	x	x	x	-	x	x	x
5	Standoff*, AVO 90-09747-03	x	x	x	-	x	x	x
15	Grommet*, base 90-09966-02	x	x	x	-	x	x	x
5	Mounting screw* 12-14817	x	x	x	-	x	x	x
5	Feet* 90-09624-00	x	x	x	-	x	x	x
1	Fuse holder* 12-12893	x	x	x	-	x	x	x

Table I-5 VT100 Recommended Spares (Cont)

Qty	Description/ Part Number	V	V	V	V	V	V	V
		T	T	T	T	T	T	T
		I	I	I	I	I	I	I
		0	0	0	X	0	2	3
		0	0	0	X	5	5	2
			W	W				
			A	C	A			
					C			
		B	K					
5	Screw*, tap 6 X 1/2 hex 90-09680-04	x	x	x	-	x	x	x
5	Screw*, 6-32 X 5/16 90-09701-00	x	x	x	-	x	x	x
1	CRT mask, alignment 94-03220-03	x	x	x	-	x	x	x
1	CRT mask, char. alignment 94-03270-03	x	x	x	-	x	x	x
1	Shaft extender 29-23189-00	x	x	x	-	x	x	x
1	Alignment tool, monitor 29-23190-00	x	x	x	-	x	x	x
1	Kit, carrying case 29-23187	x	x	x	-	x	x	x
1	I.C. container 99-05812	x	x	x	x	x	x	x
1	Loopback connector, RS232C 12-15336	x	x	x	x	x	x	x
1	Loopback connector, 20 mA 70-15503-00	x	x	x	-	x	x	x
1	Word processor keyboard 70-15675-†	-	x	x	-	-	-	-
1	STP board 54-14260-00	-	-	-	x	-	-	-
1	Waveform generator module M7071	-	-	-	-	x	-	-
1	Cable 70-08612-0F	-	-	-	-	x	-	-

* These items are expendable.

† Use the following chart to determine the correct last two digits of the part number.

Terminal	Language	Part Number
VT100WA/WB	Word Processing	70-15765-03
VT100WC/WD	French Canadian	70-15765-05
VT100WE/WF	French	70-15765-06
VT100WG/WH	Dutch	70-15765-07
VT100WJ/WK	German	70-15765-08

Table 1-5 VT100 Recommended Spares (Cont)

Qty	Description/ Part Number	V	V	V	V	V	V	V
		T	T	T	T	T	T	T
		1	1	1	1	1	1	1
		0	0	0	X	0	2	3
		0	0	0	X	5	5	2
		W	W					
		A	C	A				
				C				
		B	K					
1	Mono graphics board 54-14277	-	-	-	-	-	-	x
1	STP paddle board 54-14275	-	-	-	-	-	-	x
1	24-pin flat cable 70-16165-1E	-	-	-	-	-	-	x
1	16-pin flat cable 70-18396-YA	-	-	-	-	-	-	x
1	Keycap, DELETE 12-14333-U3	-	-	-	-	-	-	x
1	Keycap, INSERT LINE/PF1 12-14333-U4	-	-	-	-	-	-	x
1	Keycap, DELETE LINE/PF2 12-14333-U5	-	-	-	-	-	-	x
1	Keycap, CHAR INSERT/PF3 12-14333-U6	-	-	-	-	-	-	x
1	Keycap, CLEAR/HOME 12-14333-WK	-	-	-	-	-	-	x
1	Keycap, BACK TAB/ 12-14333-U8	-	-	-	-	-	-	x
1	Keycap, DELETE CHAR/ 12-14333-U9	-	-	-	-	-	-	x
1	Keycap, PRINTER/ENTER 12-14333-W0	-	-	-	-	-	-	x
1	Keycap, (EDIT)/PF4 12-14333-W1	-	-	-	-	-	-	x
1	Keycap, PRINT/ENTER 12-14333-U0	-	-	-	x	-	-	-
1	ROM, basic video 23-061E2-00	x	x	-	-	x	x	-
1	ROM, basic video 23-032E2-00	x	x	-	-	x	x	-
1	ROM, basic video 23-033E2-00	x	x	-	-	x	x	-
1	ROM, basic video 23-034E2-00	x	x	-	-	x	x	-
1	ROM, AVO 23-069E2-00	-	x	-	-	-	-	-
1	ROM, basic video 23-180E2	-	-	-	-	-	-	x
1	ROM, basic video 23-181E2	-	-	-	-	-	-	x

Table 1-5 VT100 Recommended Spares (Cont)

Qty	Description/ Part Number	V	V	V	V	V	V	V
		T	T	T	T	T	T	T
		1	1	1	1	1	1	1
		0	0	0	X	0	2	3
		0	0	0	X	5	5	2
		W	W					
		A	C	A				
				C				
		B	K					
1	ROM, basic video 23-182E2	-	-	-	-	-	-	x
1	ROM, basic video 23-183E2	-	-	-	-	-	-	x
1	ROM, advanced video 23-236E2	-	-	-	-	-	-	x
1	ROM, advanced video 23-237E2	-	-	-	-	-	-	x
1	ROM, advanced video 23-238E2	-	-	-	-	-	-	x
1	ROM, advanced video 23-239E2	-	-	-	-	-	-	x
1	ROM, basic video 23-095E2	-	-	x	-	-	-	-
1	ROM, basic video 23-096E2	-	-	x	-	-	-	-
1	ROM, basic video 23-139E2	-	-	x	-	-	-	-
1	ROM, basic video 23-140E2	-	-	x	-	-	-	-
1	ROM, advanced video 23-186E2	-	-	-	x	-	-	-
1	ROM, advanced video 23-187E2	-	-	-	x	-	-	-
1	ROM, advanced video 23-152E2	-	-	x	-	-	-	-
1	ROM, char. gen (E9) 23-094E2	-	-	x	-	-	-	-
2	Fiber spacer* 90-09306-00	-	-	-	x	-	x	-
10	Jumpers* 90-09185-00	-	-	-	-	-	-	-

* These items are expendable.

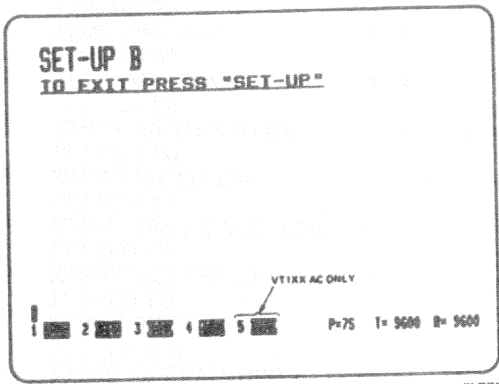


Figure 2-3 VT100-WC, -WK, VT132, VT1XX-AC, SET-UP B

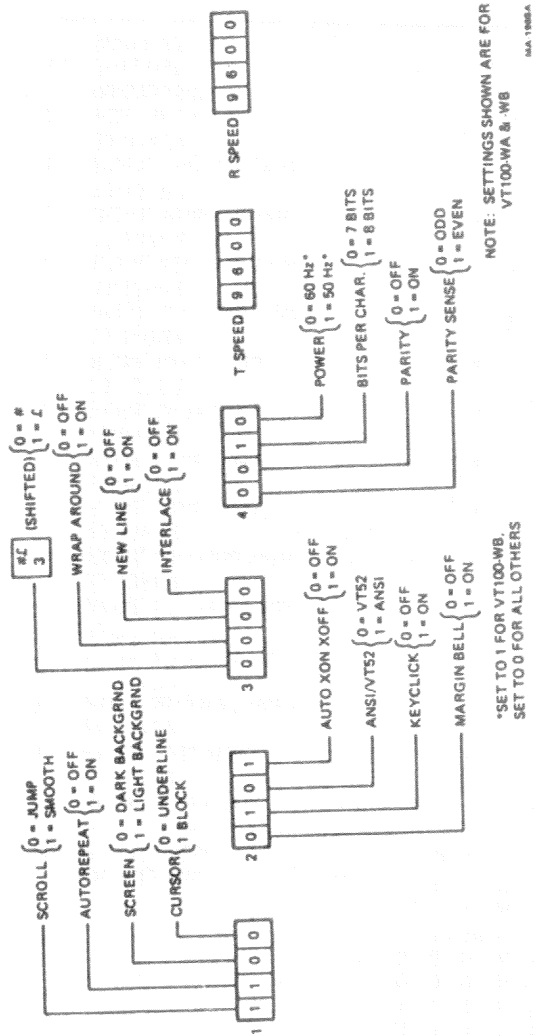


Figure 2-4 VT100-AA, -AB, -WA, -WB, SET-UP B Summary

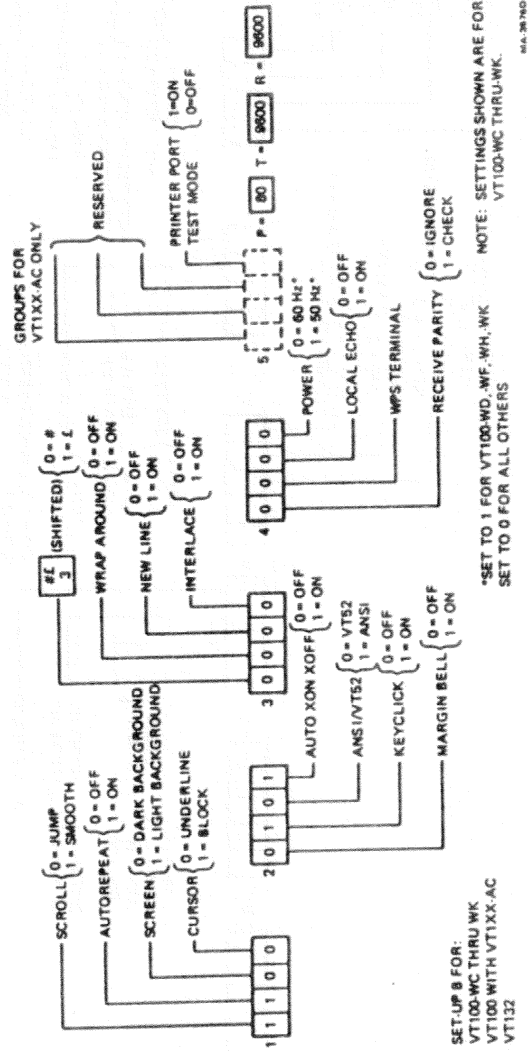


Figure 2-5 VT100-WC, -WK, VT132, VT1XX-AC, SET-UP B Summary

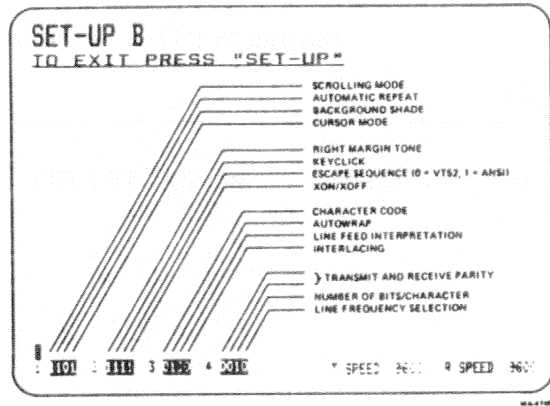


Figure 2-6 VT105 SET-UP B Settings

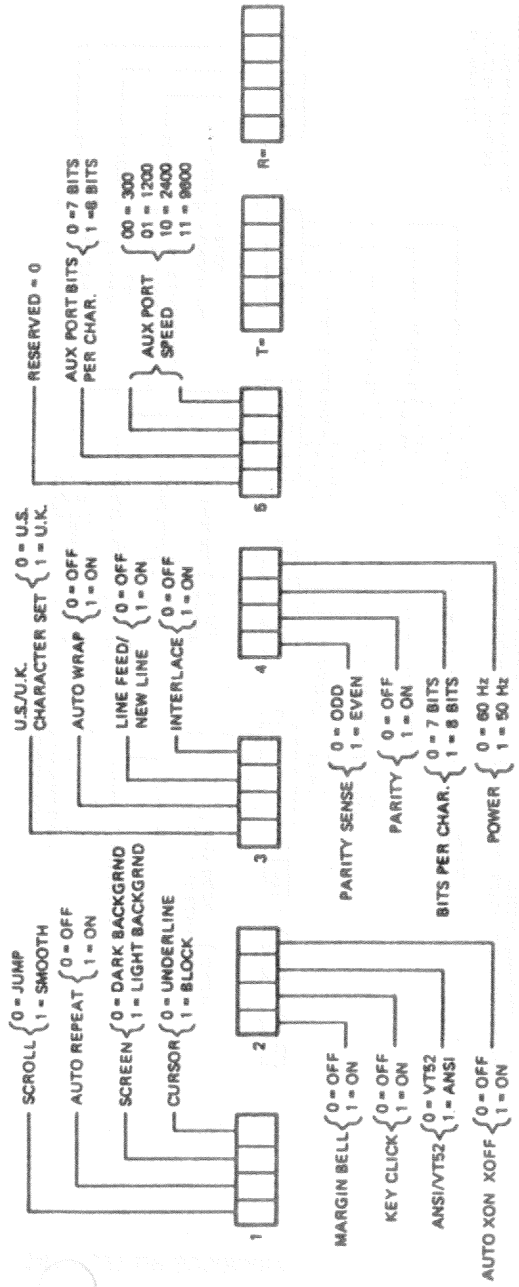


Figure 2-7 VT125 SET-UP B Summary

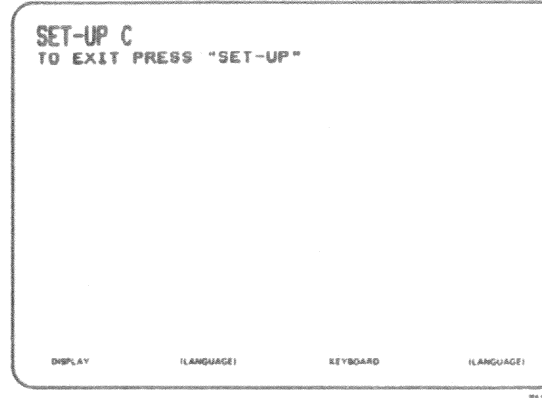


Figure 2-8 VT100-WC, -WK, SET-UP C

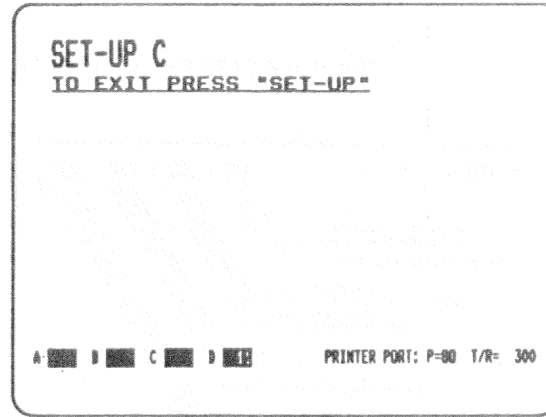


Figure 2-9 VT1XX-AC SET-UP C

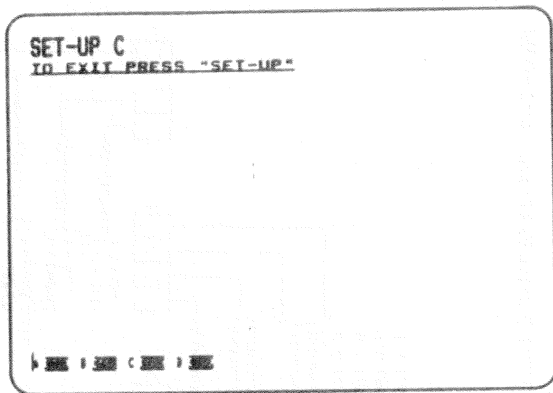


Figure 2-10 VT132 SET-UP C

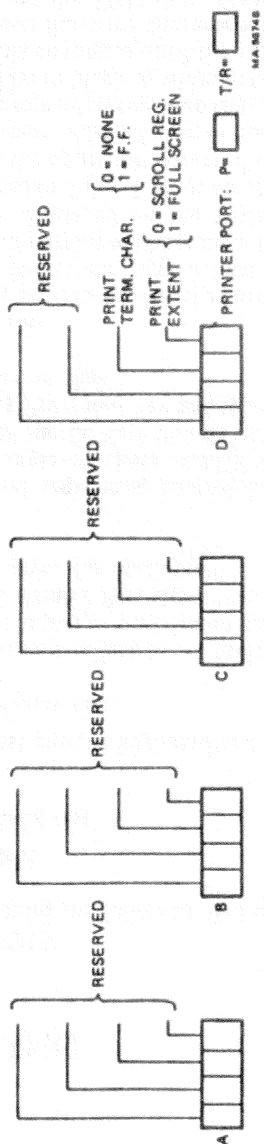
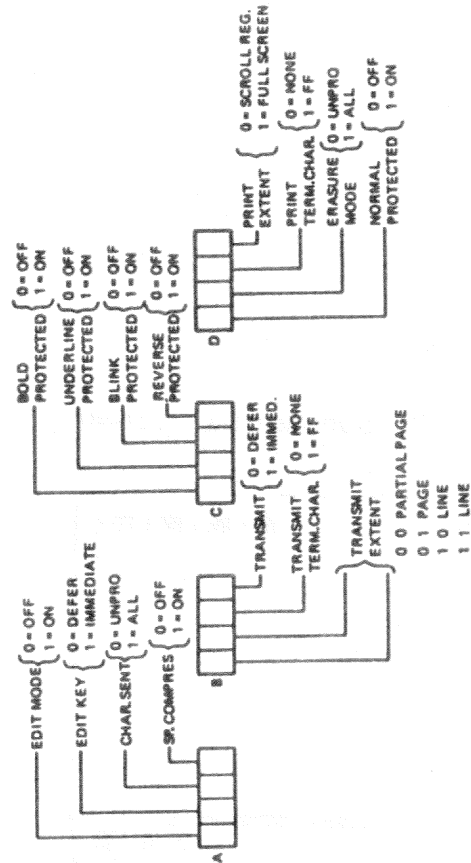


Figure 2-11 VT1XX-AC SET-UP C Summary



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Figure 2-12 VT132 SET-UP C Summary

3 TESTING

3.1 VT100 TESTS

The VT100 contains the following five self-tests.

- Power-up test
- Data loopback test
- EIA test
- Video adjust pattern keyboard test
- SET-UP display test.

Each test isolates a failure to the faulty module so you can repair the terminal in a minimum amount of time. If the VT1XX-AC Printer Port Option is installed, use the test procedures given for that option.

NOTE

In command sequences, control keys are labelled in angle brackets <KEY>. (Control keys are the special keys that do not display on the screen.) Press that key and type the rest of the sequence as shown.

3.1.1 Error Codes

If executing any self-test produces an error, the test stops automatically. The screen may not be blank, but may display a random pattern of characters. Error indications are error codes displayed on the keyboard LEDs (L1 through L4, listed in Table 1-1), or an error code character displayed in the upper left corner of the screen, under the blinking cursor. Also, if one or more errors occur while the test is repeating continuously, the entire screen flashes from white to black to white about once a second as an alarm. This continues until the terminal is reset.

Table 1-2 shows the error characters that may appear on the screen, and the FRU that should be checked or replaced.

3.1.2 Power-Up Test

The terminal automatically performs the following tests during power up.

1. Writes a 1 and a 0 in each bit location of RAM on the basic terminal controller board to verify that the RAM can store each bit.
2. Writes a 1 and a 0 in each bit location of RAM on the advanced video option (AVO) board to verify that the option RAM can store each bit. If the AVO board is not present, the terminal automatically skips this part of the test.
3. Reads the contents of the nonvolatile RAM (NVR), calculates a checksum, then compares the checksum to the checksum stored in the NVR.
4. Reads the contents of each ROM chip, calculates a checksum, then compares the checksum to the checksum stored in each ROM chip.
5. Turns on all keyboard LEDs, rings the keyboard bell for a quarter second, and looks for the end of scan character from the keyboard to determine if the keyboard is functioning properly.

Performing the Test

The power-up test may be started in any one of the following ways.

1. Turn terminal power on
or
2. Type the following sequence to perform the test once. The terminal must be in ANSI-compatible mode (in SET-UP B group 2 switch 3 = 1).
<ESC>[2;1y
or
3. Type the following sequence to perform the test continuously. The terminal must be in ANSI-compatible mode (in SET-UP B, group 2 switch 3 = 1).
<ESC>[2;9y
or
4. Enter SET-UP and press the 0 key (reset).

NOTE

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

Any error found by the power-up test is displayed on the terminal screen and/or on LEDs L1 through L4 on the keyboard. Tables 1-1 and 1-2 explain the error codes.

3.1.3 Data Loopback Test

In the data loopback test the VT100 transmit and receive lines are connected to each other via a special external connector. A predefined set of characters are then transmitted. The terminal receives the characters and compares them to the characters transmitted. If the characters do not match, an error is then flagged.

Performing the Test

Use the following procedures to perform the data loopback test.

1. Install the appropriate data loopback connector. Connector part number 12-15336 is for EIA communication (Figure 3-1) and connector part number 70-15503-00 is for 20 mA current loop communication (Figure 3-2).
2. Make sure the transmit and receive speeds are the same.
3. Place the terminal in ANSI-compatible mode (in SET-UP B group 2 switch 3 = 1).
4. Place the terminal ON-LINE.
5. Type the following sequence to perform the test.
<ESC>[2;2y
or
6. Type the following sequence to perform the test continuously.
<ESC>[2;10y.

NOTE

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

Any error displays an error code on the terminal screen. Table 1-2 explains the error codes.

3.1.4 EIA Test

The EIA test checks that the following signals can be set to a 1 or a 0: Data Terminal Ready, Request to Send, Clear To Send, Ring Indicator, and Speed Indicator.

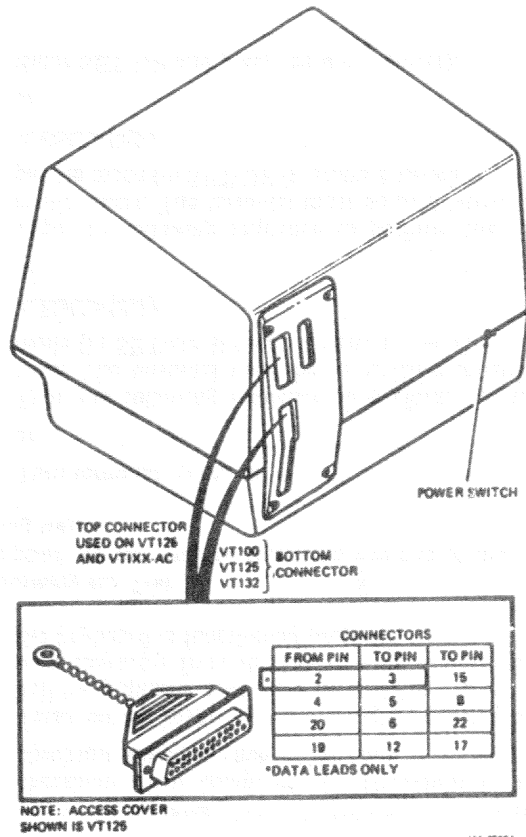


Figure 3-1 EIA Loopback Connector

Performing the Test

Use the following procedures to perform the EIA test.

1. Install the EIA data loopback connector, part number 12-15336.
2. Make sure the transmit and receive speeds are the same.
3. Place the terminal in ANSI-compatible mode (in SET-UP B group 2 switch 3 = 1).
4. Place the terminal ON-LINE.

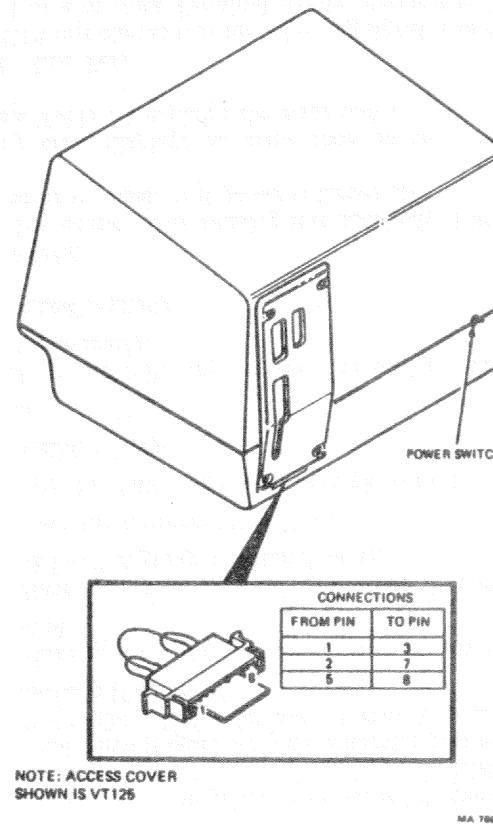


Figure 3-2 20 mA Loopback Connector

5. Type the following sequence to perform the test once.
`<ESC>[2;4y`
 or
6. Type the following sequence to perform the test continuously.
`<ESC>[2;12y.`

NOTE

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

Any error displays an error code on the terminal screen. Table 1-2 explains the error codes.

3.1.5 Keyboard Tests

The power-up test verifies the presence or absence of a keyboard. Individual keys may be tested by placing the terminal OFF-LINE, and enabling keyclick. All keys typed should produce a click except NO SCROLL, CAPS LOCK, SHIFT, BREAK, and CTRL. Typing the keys should cause the corresponding characters to be displayed on the screen. Typing <CTRL>G should cause the bell to sound. This checks both the bell circuitry and the CTRL key. Keys typed with CAPS LOCK and SHIFT verify the operation of those keys. After enabling XON/XOFF, and placing the terminal ON-LINE, the BREAK and NO SCROLL keys should produce a click when typed.

3.1.6 SET-UP SCREEN TEST

In SET-UP the terminal exercises all of its display functions. The functions available in the VT100 include double-height, double-width characters (SET-UP A), double-width, single-height characters (TO EXIT PRESS "SET-UP"), and reverse or underline attribute (selected by the cursor setting and displayed by the cursor and the tab ruler).

The functions available in the VT100 with advanced video option include, in addition to the base VT100 functions, 24 lines with 132 columns (test with the video adjust pattern, Paragraph 3.1.7), and more character attributes.

The following setup features can be checked with the keyboard controls.

Intensity (up and down arrow keys)
80/132 column
Tab setting and clearing
Transmit and receive speeds
Reset
Smooth/jump scroll
Autorepeat
Reverse screen
Margin bell
Keyclick
US/UK character set
Wraparound
ON-LINE/OFF-LINE control

Check smooth scrolling by filling the screen with Es (Paragraph 3.1.7) and pressing linefeed while OFF-LINE.

To perform the test, enter the two SET-UP displays and check that the details agree with those in the sample displays in Chapter 2. To test the advanced video option, check that the words SET-UP A blink in bold, the words TO EXIT PRESS "SET-UP" are underlined, and the tab ruler has alternating normal and reverse video sections, even if the cursor is selected to be underline.

3.1.7 Video Adjust Test

The video adjust test provides a screen full of Es for the display height, width, and linearity adjustments. The test pattern is internal to the terminal and is not sent to the host computer.

Performing the Test

Use the following procedure to display the test pattern.

1. Place the terminal in ANSI-compatible mode (in SET-UP B group 2 switch 3 = 1).
2. Place the terminal LOCAL.
3. Type the following sequence.
<ESC>#8.

3.2 VT1XX-AC TEST PROCEDURE

The VT1XX-AC Printer Port test procedure is in Paragraph 6.4.2.1.

3.3 VT105 WAVEFORM GENERATOR TEST PROCEDURE

The interactive graphic test feature of the VT105 is a series of displayable test patterns. These patterns verify that all features of the waveform generator are operating correctly. Perform these tests in the order shown.

NOTES

The VT105 has two graphic formats: rectangular and square. The tests described in this procedure are run in rectangular format. Tests may also be run in square format, but the test patterns are slightly different.

Do not use the SPACE BAR unless the word <SPACE> is spelled out.

Remember to use the SHIFT key for uppercase symbols; the CAPS LOCK key is only used for uppercase letters.

If at any time the wrong character is entered, initialize the registers and memories by typing the following sequence.

A<SPACE><SPACE> I0 I<SPACE>“

Then reenter the test data.

Graph 0 is brighter than graph 1.

3.3.1 Test Setup

1. Place the terminal LOCAL.
2. Turn on the auto repeat feature (in SET-UP B group 1 switch 2 = 1).
3. Type the following sequence.

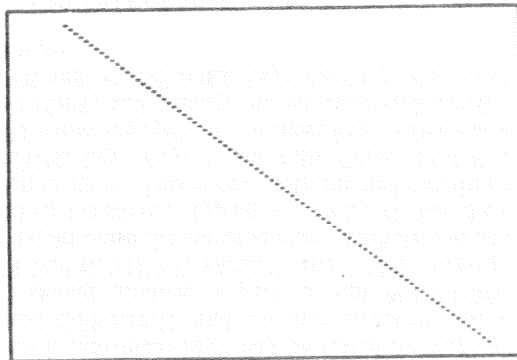
<ESC> I I<SPACE><SPACE>
I<SPACE>“

3.3.2 Test Graph 0, Histogram 0, and Graph 0 Markers

1. Type the following sequence.

Af

The graph test pattern in Figure 3-3 appears on the screen.



MA-4741

Figure 3-3 Graph Test Pattern

2. Type the following sequence.

A)

The histogram test pattern in Figure 3-4 appears on the screen.

3. Type the following sequence.

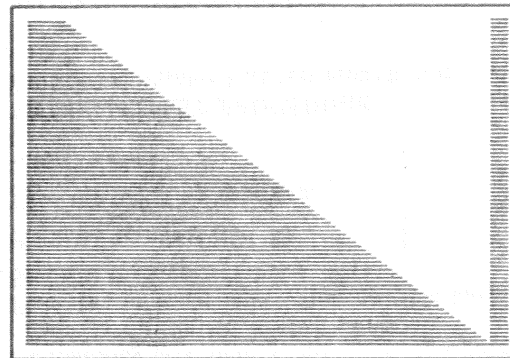
IS

The graph marker test pattern in Figure 3-5 appears on the screen.

4. Type the following sequence.

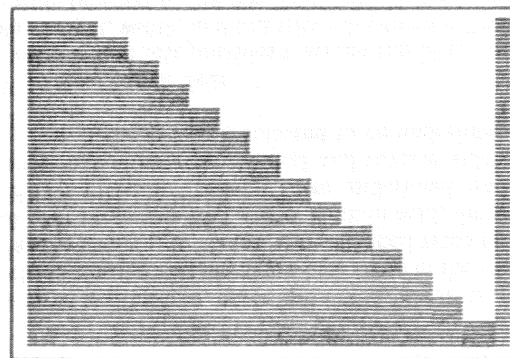
I<SPACE> A<SPACE>

The graph 0, histogram 0, and graph 0 markers are now disabled.



MA-4742

Figure 3-4 Histogram Test Pattern



MA-4743

Figure 3-5 Graph Marker Test Pattern

3.3.3 Test Graph 1, Histogram 1, and Graph 1 Markers

1. Type the following sequence.

A%

The graph test pattern in Figure 3-3 appears on the screen.

2. Type the following sequence.

A1

The histogram test pattern in Figure 3-4 appears on the screen.

3. Type the following sequence.

I(

The graph marker test pattern in Figure 3-5 appears on the screen.

4. Type the following sequence.

I<SPACE> A<SPACE>

The graph 1, histogram 1, and graph 1 markers are now disabled.

3.3.4 Test Horizontal Lines

1. Type the following sequence.

AI II

The horizontal line test pattern in Figure 3-6 appears on the screen. Note that the test pattern appears as vertical lines. This is the correct test pattern.

2. Type the following sequence.

I<SPACE>

The horizontal line test pattern is now disabled.

3.3.5 Test Vertical Lines

1. Type the following sequence.

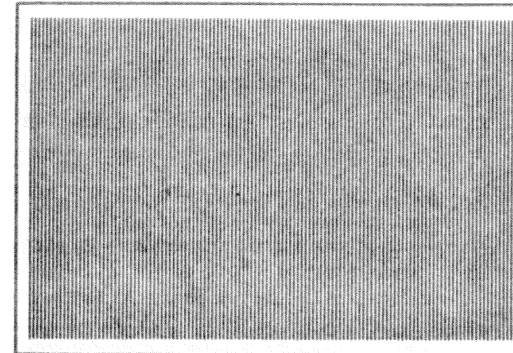
AI I"

The vertical line test pattern in Figure 3-7 appears on the screen. Note that the test pattern appears as horizontal lines. This is the correct test pattern.

2. Type the following sequence.

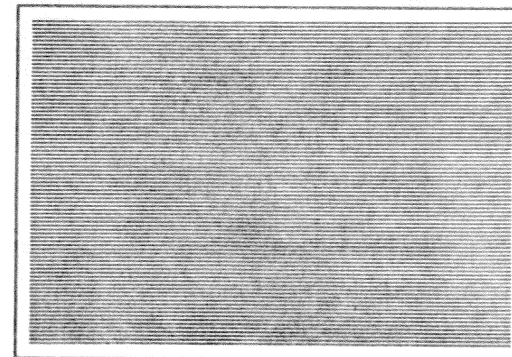
I<SPACE>

The vertical line test pattern is now disabled.



MA-4744

Figure 3-6 Horizontal Lines Test Pattern
(Looks Like Vertical Lines)



MA-4745

Figure 3-7 Vertical Lines Test Pattern
(Looks Like Horizontal Lines)

3.3.6 Test Shade Line 0 (Baseline 0)

1. Type the following sequence to enable graph 0 and shade line 0.

A#"

2. Type the following sequence.

@11 22 33 44 55 66 <SPACE> <SPACE>

The shade line in Figure 3-8 appears on the screen and shifts upward with each pair of numbers typed, and then returns to line 0 with the space characters.

3. Type the following sequence.

A<SPACE> <SPACE>

The shade line 0 test pattern is now disabled.

3.3.7 Test Shade Line 1 (Baseline 1)

1. Type the following sequence enabling graph 1 and shade line 1.

A%%

2. Type the following sequence.

@11 22 33 44 55 66 <SPACE> <SPACE>

The shade line in Figure 3-8 shifts upward with each pair of numbers typed, and then returns to line 0 with the space characters.

3. Type the following sequence.

A<SPACE> <SPACE>

The shade line 1 test pattern is now disabled.

3.3.8 Test Strip Chart 0

1. Type the following sequence.

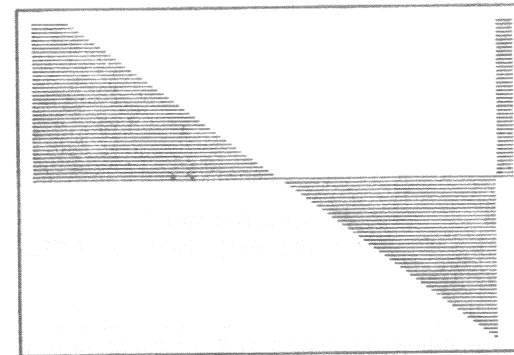
I<SPACE>" A+(

The histogram test pattern in Figure 3-4 appears on the screen.

2. Type the following sequence.

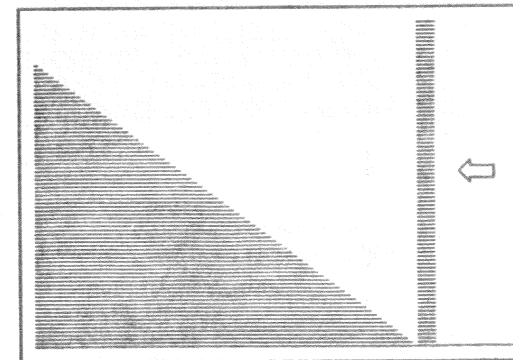
H?? B

3. Type any sequence of two numbers. This moves the graph to the left. The SPACE BAR enters a 0 as in Figure 3-9, 11 enters data at line 49, 22 enters data at line 82, etc. Hold down the number key if in auto repeat mode.



MA-4748

Figure 3-8 Shade Line (Baseline) Test Pattern (Shade Line Shifts Upward)



MA-4747

Figure 3-9 Strip Chart Test Pattern (Graph Should Shift Right to Left)

4. Type the following sequence.

A<SPACE> <SPACE>

The strip chart 0 test pattern is now disabled.

3.3.9 Test Strip Chart 1

1. Type the following sequence.

I<SPACE>" A5(

The histogram test pattern in Figure 3-4 appears on the screen.

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2. Type the following sequence.

H?? J

3. Type any sequence of two numbers. This moves the graph. The SPACE BAR enters a 0 as in Figure 3-9, 11 enters data at line 49, 22 enters data at line 82, etc. Hold down the number key if in auto repeat mode.

4. Type the following sequence.

A<SPACE> <SPACE>

The strip chart 1 test pattern is now disabled.

3.3.10 Exit Graphic Test Mode

1. Type the following sequence.

I0<SPACE> A<SPACE> <SPACE>
I<SPACE> <SPACE> <ESC>2

The terminal returns to the interactive mode of operation.

3.4 VT125 TESTS

The VT125 terminal has several self-tests available for checking terminal operation. Some of these are the self-tests of the VT100 terminal that the VT125 Graphics Processor resides in. The other tests are for the graphics processor itself. To perform the VT100 tests as described in Paragraph 3.1, disconnect the graphics components from the terminal controller.

The power-up test is performed each time the terminal is powered up. The other tests may be performed after the power-up test is completed. To perform the other tests the terminal must be disconnected from the communication line, have an external loopback connector installed, and be ON-LINE with the ANSI/VT52 SET-UP B feature selected to ANSI (SET-UP B switch 2-3 = 1). When the tests are completed, turn the power switch off, remove the loopback connector, and connect the communication cable.

NOTE

Continuously running tests end only if an error is found, or if power is turned off.

3.4.1 Loopback Connector Installation

Use the following procedure if the test needs a loopback connector installed on the terminal.

1. With the power switch off, disconnect the communication cable.
2. Install the loopback connector on the EIA connector. Refer to Figure 3-1. The EIA loopback connector part number is 12-15336.
3. If the 20 mA Current Loop Adapter Option is installed, use the loopback connector (PN 70-15503-00) that was included with the option; or, disconnect the current loop option cable from the terminal controller board (inside the access cover) and use the EIA loopback connector.

NOTE

Do not use the EIA loopback connector at the same time as the current loop connector.

3.4.2 VT125 Power-Up Test

A power-up test is built into the VT125 terminal to test terminal operation. The test checks general operation of the VT100 terminal, including the advanced video option if installed, the user permanent SET-UP feature memory and the keyboard, and general operation of the graphics processor (including the bit map memory).

To perform the power-up test, turn the terminal on, or if power is already on, enter SET-UP and press the 0(RESET) key. Install a loopback connector and follow this procedure if the test must be run continuously.

1. Turn the power switch on. The terminal performs the power-up test.
2. Type one of the following sequences to perform the test.

<ESC>[4;1y Performs the power-up test once.

<ESC>[4;1;9y Performs the power-up test continuously.

NOTE

This test can also be performed with the VT100 power-up test sequence (<ESC>[2;1y). The continually running test ends only if an error is found, or if power is turned off.

The test gives the following indications.

- Keyboard and screen flash on and off.
- All keyboard indicators turn on and off, and either the ON LINE or LOCAL indicator is turned on.
- The wait message is displayed on the screen and then erased.
- A bell tone is generated.
- A band of light appears at the top of the screen and is erased.
- Another bell tone is generated.
- A message appears to announce the result of the VT125 power-up test, and a box is drawn* around the margins of the graphics screen area.

NOTE

No messages appear on the screen until the terminal warms up.

- The text cursor is displayed in the upper left corner of the screen.

Any error found by the power-up test is displayed on the screen as a character, as a message, on keyboard indicators L1 through L4, or by several bell tones. Refer to Paragraph 3.1.1 for more information about error indications.

3.4.3 VT125 Computer Data Port Loopback Test

The computer port data loopback test checks that the VT125 terminal can transmit and receive characters over the computer data port. The transmit and receive lines must be connected to each other with an external loopback connector. The terminal transmit and receive speeds must be the same, and 300 baud or faster to perform this test.

To perform the data loopback test, use the following procedure.

1. Turn the power switch on. The terminal performs the power-up test.
2. Type one of the following sequences to perform the test.

on all units.

<ESC>[4;1;2y Performs the power-up test and the computer data port loopback test.

<ESC>[4;1;2;9y Performs the power-up test and the computer data port loopback test continuously until failure.

The test gives the following indications. (Refer to Paragraph 3.4.2 for power-up test indications.)

- Either the ON LINE or LOCAL indicator is turned on.
- The wait message is displayed on the screen and then erased.
- The cursor is displayed in the upper left corner of the screen.
- If the computer data port loopback test fails, the message "VT125 EC Error" is displayed on the internal monitor.

3.4.4 VT125 Auxillary Port Loopback Test

The auxiliary port data loopback test checks that the VT125 terminal can transmit and receive characters over the auxiliary data port. The transmit and receive lines must be connected to each other with an external loopback connector. The auxiliary port speed should be 300 baud or greater to perform this test.

To perform the auxiliary port data loopback test, use the following procedure.

1. Turn the power switch on. The terminal performs the power-up test.
2. Type one of the following sequences to perform the test.

<ESC>[4;1;3y Performs the power-up test and the auxiliary data port loopback test.

<ESC>[4;1;3;9y Performs the power-up test and the auxiliary data port loopback test continuously until failure.

The test gives the following indications. (Refer to Paragraph 3.4.2 for power-up test indications.)

- Either the ON LINE or LOCAL indicator is turned on.
- The wait message is displayed on the screen and then erased.
- The cursor is displayed in the upper left corner of the screen.
- If the test fails, the message "VT125 SC Error" is displayed.

3.4.5 VT125 Display Test

This test requires you to check the internal monitor screen and the color monitor screen (if present) for correct operation. The screen cycles through the four intensity levels of each of the three primaries and white to test the output memory. The computer data port must have the loopback connector installed.

To perform the display test, use the following procedure.

1. Turn the power switch on. The terminal performs the power-up test.
2. Type one of the following sequences to perform the test.

<ESC>[4;1;4y Performs the power-up test and the display test.

<ESC>[4;1;4;9y Performs the power-up test and the display test continuously until failure.

The test gives the indications listed in Table 3-1. (Refer to Paragraph 3.4.2 for power-up test indications.)

Table 3-1 Display Test Indications

Monochrome				
Step 1	Black	White	Light Grey	Dim Grey
Step 2	Dim Grey	Black	White	Light Grey
Step 3	Light Grey	Dim Grey	Black	White
Step 4	White	Light Grey	Dim Grey	Black
Step 5	White	Light Grey	Dim Grey	Black
Color				
Step 1	Black	Light Red	Black	Black
Step 2	Dim Blue	Dim Red	Dim Green	Dim Grey
Step 3	Light Blue	Light Red	Light Green	Light Grey
Step 4	Light Green	Light Red	Light Blue	Black
Step 5	Black	Black	Black	Black

3.4.6 VT125 Video Bit Map Memory Test

This test checks that every bit in both video bit map planes can be written to both one and zero. The computer data port must have the loopback connector installed.

To perform the video bit map memory test, use the following procedure.

1. Turn the power switch on. The terminal performs the power-up test.
2. Type one of the following sequences to perform the test.

`<ESC>[4;1;5y` Performs the power-up test and the video bit map memory test.

`<ESC>[4;1;5;9y` Performs the power-up test and the video bit map memory test continuously until failure.

The test gives the following indications. (Refer to Paragraph 3.4.2 for power-up test indications.)

- The screen fills with levels of intensity (or color) moving from top to bottom.
- If this test fails, the message "VT125 BM Error" is displayed.

4 VIDEO ALIGNMENT

4.1 GENERAL

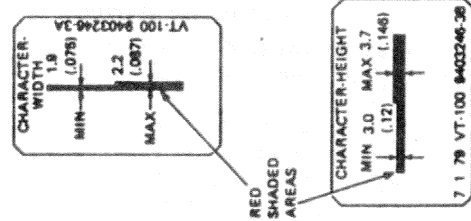
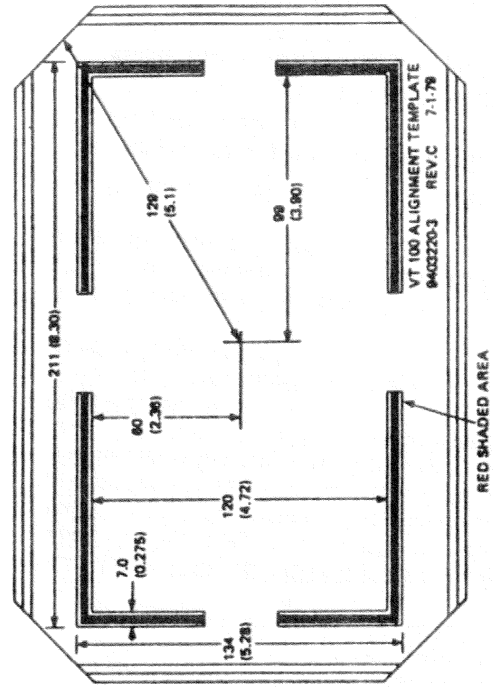
This chapter describes the alignment of both the Ball Brothers and Elston video monitors. Each adjustment should always be checked because many of the adjustments affect each other. However, if a check shows the correct indication, skip that adjustment and go to the next procedure.

All adjustments must be made under the following conditions.

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

4.2 ALIGNMENT TEMPLATE

Figure 4-1 shows the alignment dimensions used in this procedure. If the mylar adjustment templates (PN 94-03220-03 and PN 94-03270-03) are not available, use the dimensions in Figure 4-1 to help you make a template from a piece of paper. Paragraph 4.2.1 and Figure 4-2 describe the procedure. You can perform the adjustments with the paper template or the mylar template.



NOTE: MEASUREMENTS ARE IN MILLIMETERS EXCEPT VALUES IN PARENTHESIS ARE IN INCHES.

Figure 4-1 Video Alignment Template

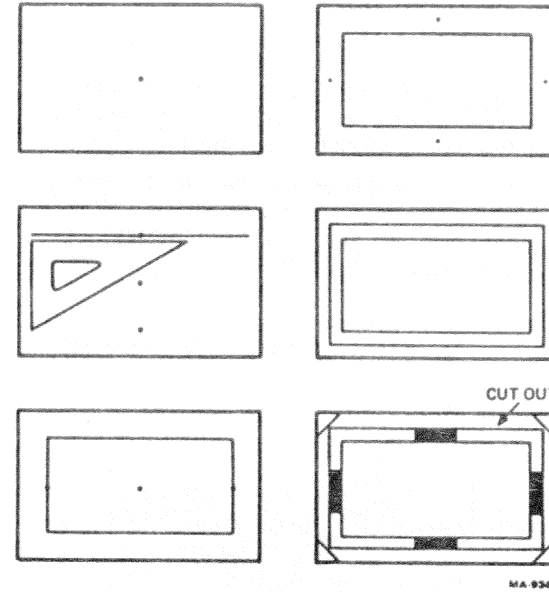


Figure 4-2 Paper Alignment Template

4.2.1 Making a Paper Template

You need a pencil, a ruler, a triangle (or anything that can help you draw a right angle), and a sharp knife.

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 "red shaded area" in Figure 4-1 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 for support, and 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.

4.2.2 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 brightness and linearity.) Attach the template to the CRT using the following procedure.

1. Using the bezel around the screen as a guide, mark the four edges of the screen with a water-soluble marker (felt-tip pen).
2. Remove the terminal top cover (Chapter 5, paragraph 5.14).
3. Tape the CRT alignment template to the screen with the four corners of the template all the same distance from the marks you made in step 1.

4.3 MONITOR ADJUSTMENTS (Ball Brothers)

The following paragraphs describe the alignment of the Ball Brothers video monitor. The monitor is easily identified by the placement of the flyback transformer. The transformer is located on the horizontal brace above the neck of the CRT. A small connector board is located on the CRT yoke assembly.

All adjustments must be made under the conditions listed in Paragraph 4.1.

4.3.1 Brightness Adjustment

Use the following procedure to adjust the brightness control on the monitor board.

1. Let the terminal warm up for at least five minutes.
2. Increase the brightness to the maximum level with the \uparrow key in SET-UP.
3. Adjust R117 (Figure 4-3) until the display raster is visible; then turn R117 in the opposite direction until the raster disappears.
4. Return the brightness to a medium level with the \downarrow key in SET-UP.

4.3.2 Yoke Adjustment

Use the following procedure to check and adjust the yoke.

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

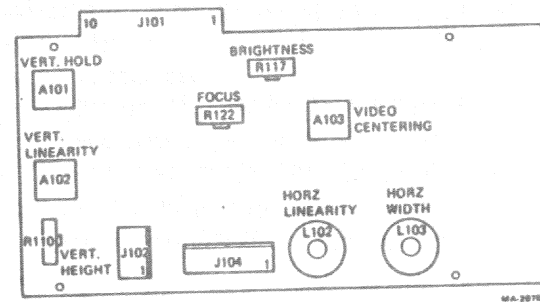


Figure 4-3 Ball Video Monitor Board Adjustment

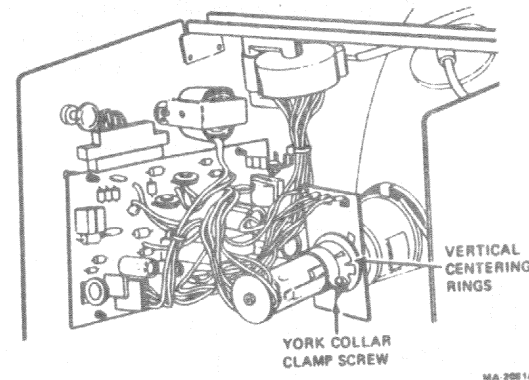


Figure 4-4 Ball Monitor CRT Adjustments

2. Loosen the yoke collar clamp screw (Figure 4-4), and turn the yoke until the four sides of the screen display are parallel to the edges of the red shaded areas 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.

4.3.3 Vertical Height Adjustment

Use the following procedure 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 red shaded area of the adjustment template.
2. Adjust the vertical height control R110.

4.3.4 Horizontal Width Adjustment

Use the following procedure to check and adjust the width.

1. Check that the first and last columns of the display are covered by the red shaded area of the adjustment template.
2. Adjust the horizontal width coil L103 with a monitor alignment tool (PN 29-23190-00).

4.3.5 Centering Adjustment

Use the following procedure to check and adjust the display centering.

1. Check that the screen display is centered in the red shaded area on the alignment template.
2. Set A103 fully counterclockwise.
3. Center the presentation by rotating the centering tabs on the yoke (Figure 4-4).

NOTE

A103 may be used to move the display presentation a small distance horizontally. If A103 is misadjusted, the left side of the screen display may be distorted.

4.3.6 Vertical Linearity Adjustment

Use the following procedure to check and adjust the character height over the complete screen.

1. Use the character height template (PN 94-03270-03) to check that the heights of the characters located near the four corners and the center of the display are between the minimum and maximum sections of the template.
2. Adjust the vertical linearity control A102.
3. Check and adjust the vertical height and vertical hold if needed.

4.3.7 Horizontal Linearity Adjustment

Use the following procedure to check and adjust the character width over the complete screen.

1. Use the character width template (PN 94-03270-03) to check that the widths of the characters located near the four corners and the center of the display are between the minimum and maximum sections of the template.
2. Adjust the horizontal linearity coil L102 with a monitor alignment tool (PN 29-23190-00).
3. Check and adjust the horizontal width if needed.

4.3.8 Vertical Hold Adjustment

Use the following procedure to check and adjust the vertical hold adjustment.

1. Set vertical hold control A101 fully counterclockwise. If the display is not stable (tearing or rolling), turn A101 clockwise until the display is stable. Note the position of the control and continue turning clockwise until the display is not stable. Then turn the control counterclockwise to the position halfway between the positions where the display is not stable.
2. Check and adjust the vertical height and vertical linearity if needed.

4.3.9 Focus Adjustment

Use the following procedure to check and adjust the focus of the screen display.

1. Increase the brightness to the maximum level with the ↑ key in SET-UP. Decrease the brightness eight steps by pressing the ↓ key eight times.
2. Look at the characters at the four corners and in the center of the screen. All the dots in the vertical segment of the E should be visible in each character.

NOTES

Some operators may want the focus misadjusted to suit personal preference.

If the focus is adjusted correctly, go to step 4.

3. Adjust R122 (Figure 4-3) for the best overall character display.
4. Remove the CRT alignment template, clean the marks from the screen, and replace the terminal top cover if no more adjustments are needed.

4.4 MONITOR ADJUSTMENTS (ELSTON AND DIGITAL)

The following paragraphs describe the alignment of the Elston video monitor. The monitor is easily identified by the placement of the flyback transformer. In the Elston monitor the transformer is located on the monitor sideplate opposite the monitor board. In addition, the connector card is not present on the Elston CRT yoke assembly.

All adjustments must be made under the conditions listed in Paragraph 4.1.

4.4.1 Brightness Adjustment

1. Increase the brightness to the maximum level with the ↑ key in SET-UP.
2. Adjust R109 (Figure 4-5) until the display raster is visible; then turn R109 in the opposite direction until the raster disappears.
3. Return the brightness to normal intensity with the ↓ key in SET-UP.

4.4.2 Yoke Adjustment

1. Check that all four sides of the screen display are parallel to the red shaded area of the alignment template.
2. Loosen the yoke collar clamp screw (Figure 4-6) and turn the yoke until the four sides of the screen display are parallel to the red 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 screen while holding the yoke in place.

4.4.3 Vertical Height Adjustment

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

Adjust the vertical height control R334.

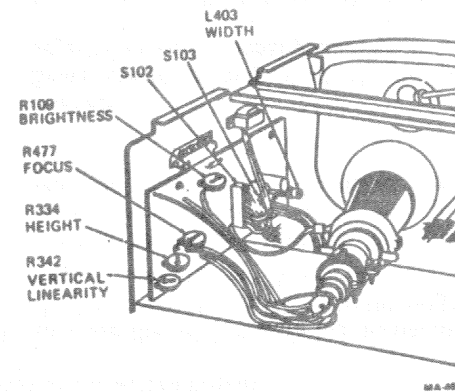


Figure 4-5 Elston/DIGITAL Video Monitor Board Adjustments

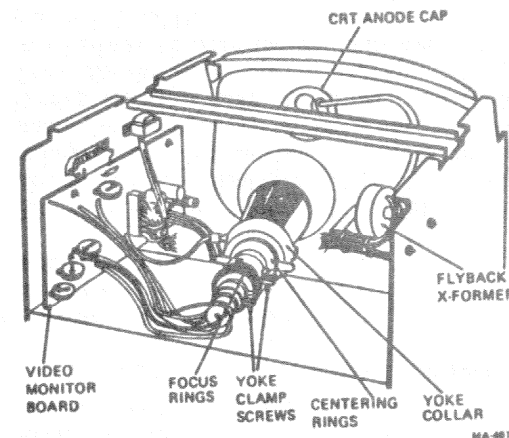


Figure 4-6 Elston/DIGITAL Monitor CRT Adjustments

5 MODULE REMOVAL AND REPLACEMENT

5.1 GENERAL

This chapter contains removal and replacement information for mechanical subassemblies of the VT100 series terminals. Unless otherwise noted, each procedure applies to all terminals in the series.

Figure 5-1 lists all removal procedures in this chapter and the sequence in which they are performed. For example, Figure 5-1 shows that to remove the dc power harness, you must perform the top cover, bottom cover, and power supply removal procedures first.

5.2 ACCESS COVER REMOVAL AND INSTALLATION

1. Remove power from the terminal by disconnecting the ac plug from the power outlet.
2. Unplug the keyboard.
3. Unplug the connectors from the composite video input/output jacks.
4. Disconnect the communications cable.
5. Disconnect the printer interface cable if installed.
6. With a screwdriver loosen the four captive screws holding the access cover (Figure 5-2).
7. If the 20 mA current loop option is installed, gently pull the access cover away from the terminal about two inches and then reach in and disconnect J5 from the terminal controller board.
8. Remove the access cover.
9. To install the access cover, perform steps 1 through 8 in reverse.

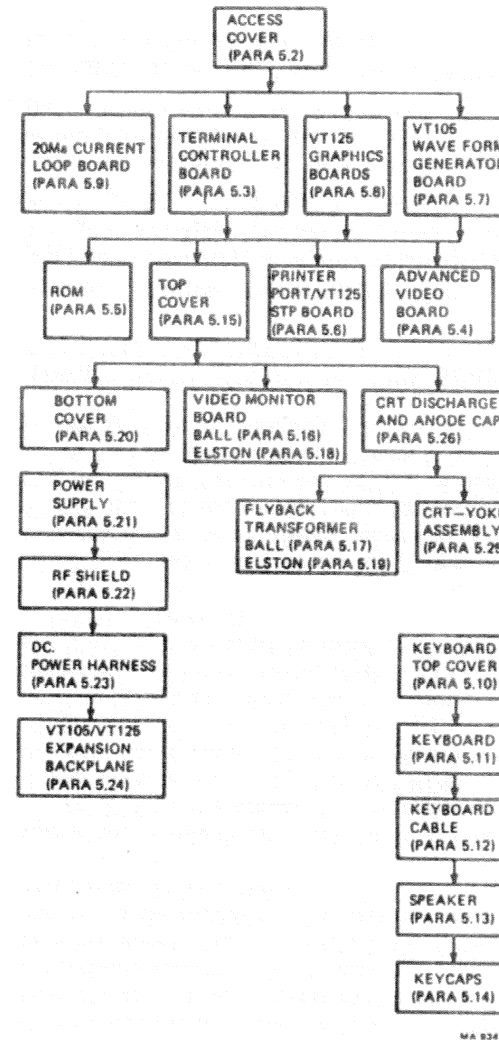


Figure 5-1 Removal Procedure Sequence

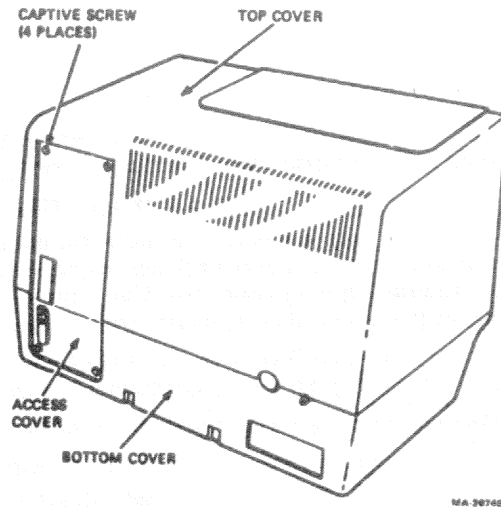


Figure 5-2 VT100 Rear View

5.3 TERMINAL CONTROLLER BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Pull the terminal controller board partially out of the card cage. Disconnect the ground wire, if present, from the metal bracket at the EIA connector.
 - a. If the terminal is a VT105, disconnect the graphic interface cable from the terminal controller board (Paragraph 5.7). After separating the boards, remove the terminal controller board.
 - b. If the terminal is a VT125, refer to Paragraph 5.8. After separating the boards, remove the terminal controller board from the card cage. Remove the screw holding the STP board to the terminal controller and remove the board.
3. Remove the advanced video board and/or the printer port/STP board if they are installed on the terminal controller board (Paragraph 5.4 and 5.6).

4. To install the terminal controller board, perform steps 1 through 3 in reverse. Be sure to reconnect any ground wires.

NOTES

Always replace an FCC-certified terminal controller board with another certified board. There is a key in the connector to prevent swapping. Do not use an FCC-certified board in a noncertified terminal. The VT125 must use a certified board. The noncertified board part number is 54-13009-00. The certified board part number is 54-13009-03.

Check the terminal controller board for the correct ROM configuration. On -W series and printer ports, you must move the old ROMs to the new board. Refer to Paragraph 5.5 for ROM procedures. Refer to Chapter 7 for ROM location information. Remember to reconfigure the terminal to the customer's original SET-UP selections (which should be listed on the keyboard SET-UP label).

The VT105 and VT125 cables are 16-pin cables connecting to an 18-pin connector. The VT105 fits into the top 16 connector sockets and the VT125 fits into the bottom 16 connector sockets. Do not misalign the cable in the connector. Refer to Paragraphs 5.7 and 5.8.

5.4 ADVANCED VIDEO OPTION (AVO) BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Remove the terminal controller board (Paragraph 5.3) and, if present, the graphics boards (VT105: Paragraph 5.7, VT125: Paragraph 5.8).
3. Grasp the advanced video board by its edges and gently but firmly lift the board straight up and off the terminal controller board (Figure 5-3).
4. To install the advanced video board (AVO), perform steps 1 through 4 in reverse.

NOTE

Check the AVO board for the correct ROMs, jumpers, and switch settings. Refer to Chapter 7 for this information.

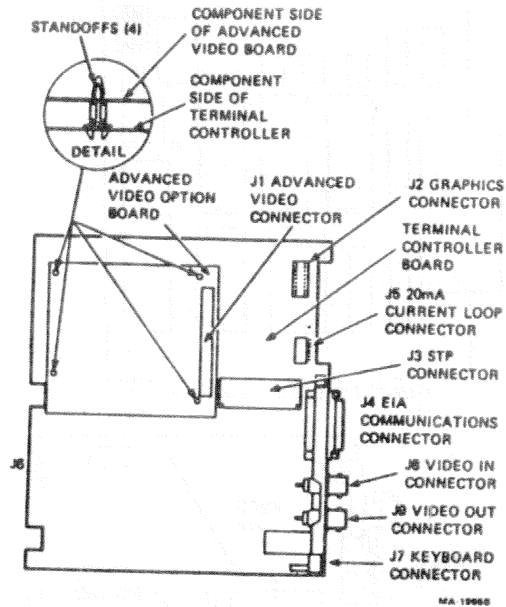


Figure 5-3 Terminal Controller with Advanced Video Board

5.5 ROM REMOVAL AND INSTALLATION

If a ROM is defective, or if the terminal is a variation with special ROMs, this procedure describes how to replace them. Refer to Chapter 7 for ROM positions and part numbers.

1. Remove the old ROM.
2. 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 to remove static charges. Then remove the ROM from the conductive foam.
3. Referring to Figure 5-4, align the ROM so the notch on the end of the ROM is on the same side as the notch on the board socket. Check that all ROM pins are evenly spaced and straight before trying to insert the ROM into the board socket.
4. Using even pressure, press the top of the ROM until it is completely seated into the socket. If you feel a lot of friction, remove the ROM and check for proper pin alignment.

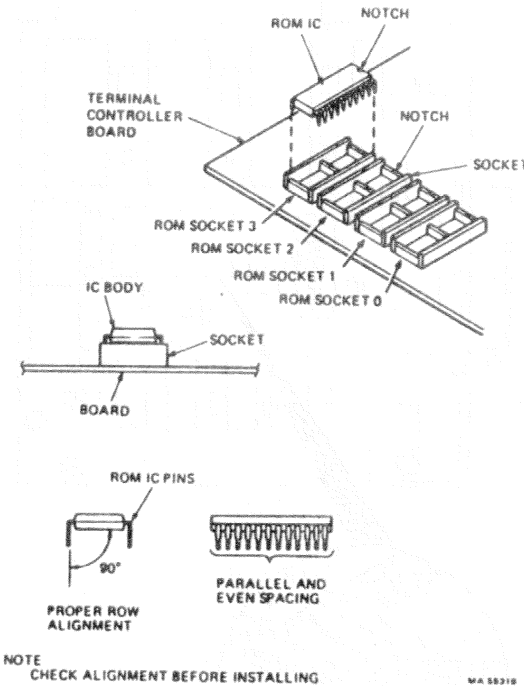


Figure 5-4 Terminal Controller Board ROM Installation

5. After the ROM is inserted, check to see that all ROM pins are properly seated into the socket.

5.6 PRINTER PORT/VT125 STP BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Remove the terminal controller board (Paragraph 5.3) and, if present, the graphics boards (VT105: Paragraph 5.7, VT125: Paragraph 5.8).
3. Remove the screw and washer holding the STP board to the terminal controller board (Figure 5-5).
4. Disconnect the STP board from the STP connector on the terminal controller board.
5. On a VT125, remove the 24-pin flat cable.
6. To install the printer port/STP board, perform steps 1 through 5 in reverse. For a VT125, refer to Figure 5-6 to install the 24-pin cable.

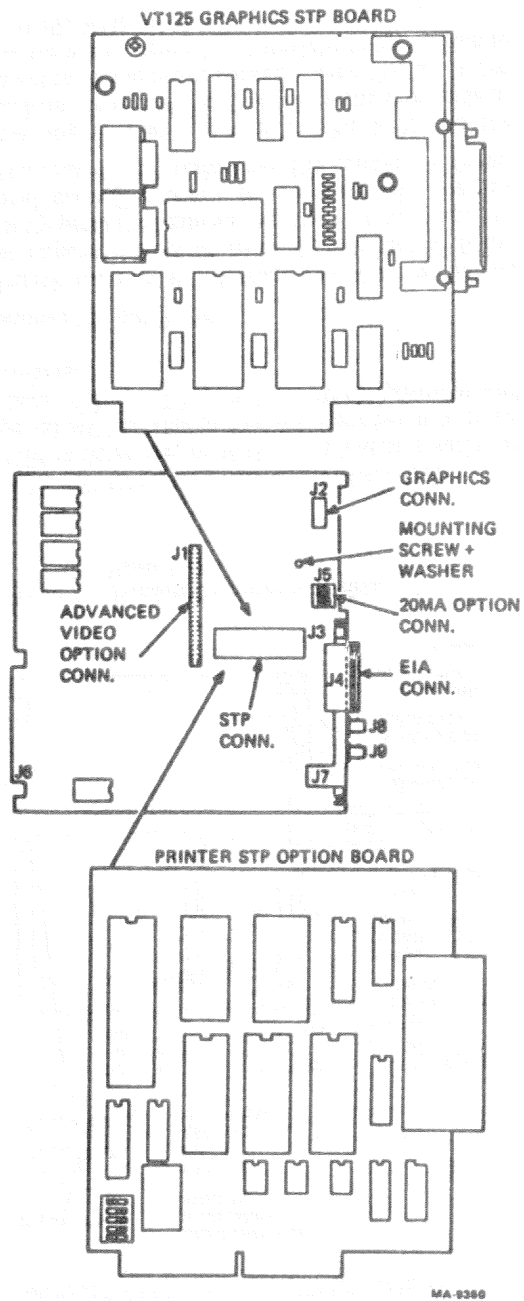


Figure 5-5 Installing Printer Port on VT125 STP Board

NOTE

Check the printer port/STP board to make sure the correct jumpers are installed or switches set. Refer to Chapter 7 for configuration information.

If you remove the printer port/STP board from the terminal, check that pairs of contacts of STP connector J3 short together to make electrical contact. Adjust separated contacts with a scribe.

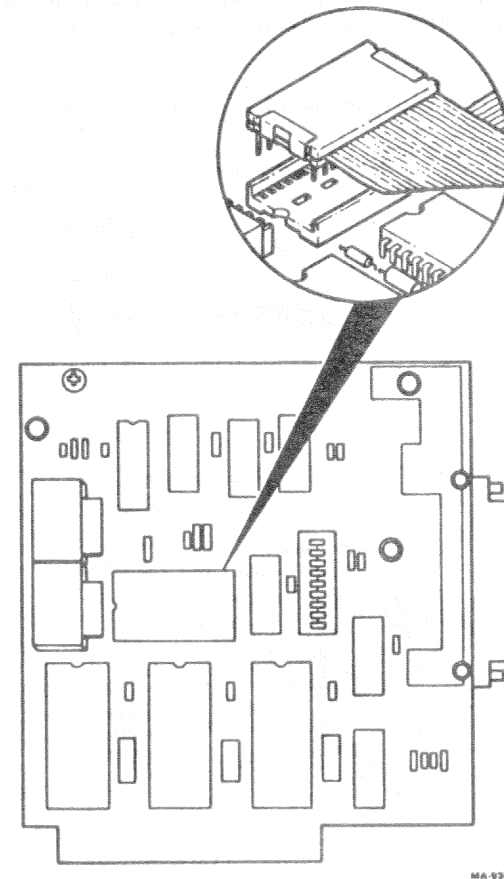


Figure 5-6 VT125 24-Pin Flat Cable on STP Board

MA-9366

MA-9367

5.7 VT105 WAVEFORM GENERATOR BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Disconnect the graphic interconnecting cable from XE90 on the waveform generator board (Figure 5-7).

CAUTION

The graphic interconnecting cable connectors are easily damaged. To prevent damage, use a small screwdriver to alternately lift each end of the connector until it releases from the module.

Refer to Figure 5-7 for correct orientation when reconnecting this cable.

3. Remove the waveform generator board by gently but firmly pulling the board straight out of J2 on the backplane.
4. To install the waveform generator perform steps 1 through 3 in reverse.

5.8 VT125 GRAPHICS BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Pull the terminal controller board and the graphics board partially out of the card cage. Disconnect the ground wire from the BNC connector bracket on the graphics board.
3. Remove the screw holding the STP board to the terminal controller and remove the board (Figure 5-5). Remove the 24-pin cable from the STP board and the graphics board. Remove the 16-pin cable from the terminal controller connector.
4. Pull the graphics board out of the card cage.
5. To install the graphics board, perform steps 1 through 5 in reverse (Figures 5-8 and 5-9).

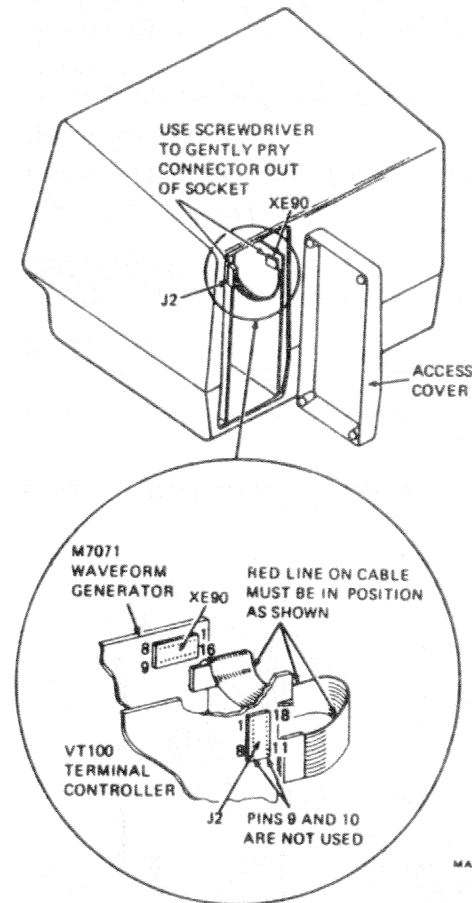


Figure 5-7 VT105 Interconnections

NOTE

The 16-pin cable connects to the bottom 16 connector sockets. Do not misalign the cable in the connector (Figure 5-8).

5.9 20 mA CURRENT LOOP BOARD REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. With a Phillips screwdriver, remove the two screws holding the Mate-N-Lok connector to the bottom of the access cover.

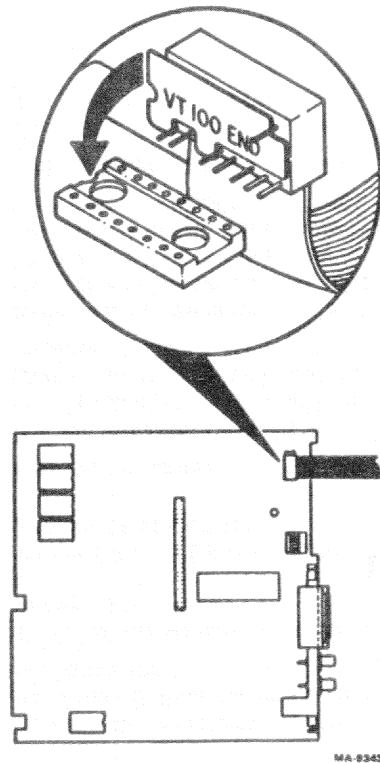


Figure 5-8 VT125 16-Pin Flat Cable on Terminal Controller

3. With a Phillips screwdriver, remove the three screws holding the 20 mA current loop board to the access cover, and remove the board.
4. To install the 20 mA current loop board, perform steps 1 through 3 in reverse.

5.10 KEYBOARD TOP COVER REMOVAL AND INSTALLATION

1. Remove power from the terminal by disconnecting the ac plug.
2. Unplug the keyboard from the monitor.
3. With a blade-type screwdriver, loosen the captive screws holding the keyboard together (Figure 5-10).

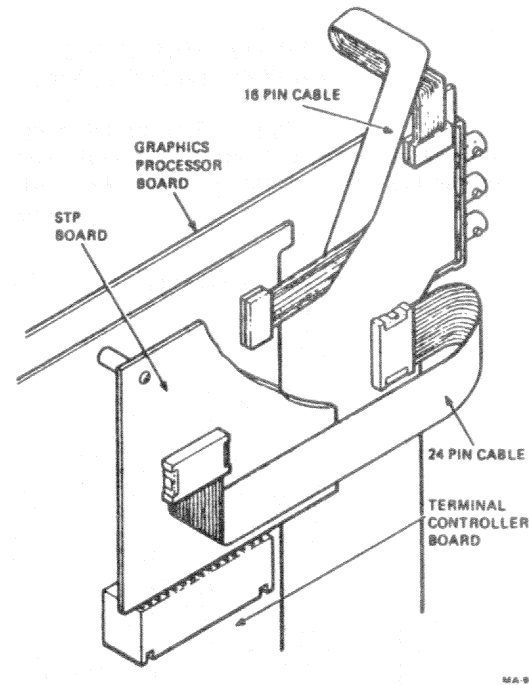


Figure 5-9 VT125 Graphic Cable Connections

4. Remove the top cover by lifting it straight up.
5. To install the keyboard top cover, perform steps 1 through 4 in reverse.

5.11 KEYBOARD REMOVAL AND INSTALLATION

1. Remove the keyboard top cover (Paragraph 5.10).
2. Disconnect keyboard cable J2 from the keyboard.
3. Remove the keyboard.
4. To install the keyboard, perform steps 1 through 3 in reverse.
5. If replacing the keyboard on a terminal with a printer port, move the **PRINT/ENTER** key from the defective keyboard to the new keyboard. If replacing a VT132 keyboard, move the special key to the new board.

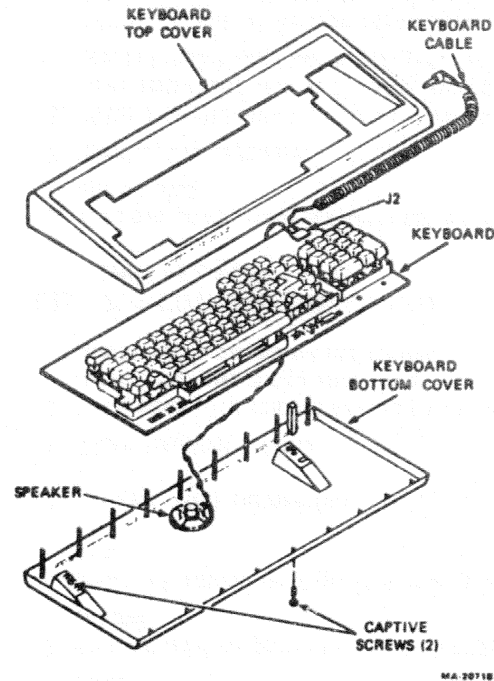


Figure 5-10 Keyboard Disassembly

5.12 KEYBOARD CABLE REMOVAL AND INSTALLATION

1. Remove the keyboard top cover (Paragraph 5.10).
2. Remove the keyboard (Paragraph 5.11).
3. Disconnect the keyboard cable from the speaker.
4. Remove the keyboard cable.
5. To install the keyboard cable, perform steps 1 through 4 in reverse.

5.13 KEYBOARD SPEAKER REMOVAL AND INSTALLATION

1. Remove the keyboard top cover (Paragraph 5.10).
2. Remove the keyboard (Paragraph 5.11).
3. Remove the keyboard cable (Paragraph 5.12).
4. Remove the speaker by sliding it toward the front edge of the keyboard cover.

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

5.14 KEYCAP REMOVAL AND INSTALLATION

The only tool normally needed to install keycaps is a keycap puller. In some cases a pair of long nose pliers may be needed.

1. Remove power from the terminal by turning it off.
2. Starting at the upper left corner of the keyboard, insert the keycap puller between the first cap to be replaced and the adjacent keycap (Figure 5-11).
3. Squeeze the puller legs around the cap and slowly pull straight up to remove keycap (Figure 5-11).
4. If the adapter does not come off with the keycap (Figure 5-11), carefully remove adapter with long nose pliers. Reinstall adapter in the keycap, making sure the pointed end faces the front of cap.

NOTE

In some keyboards the adapter and the keycap may be one molded part.

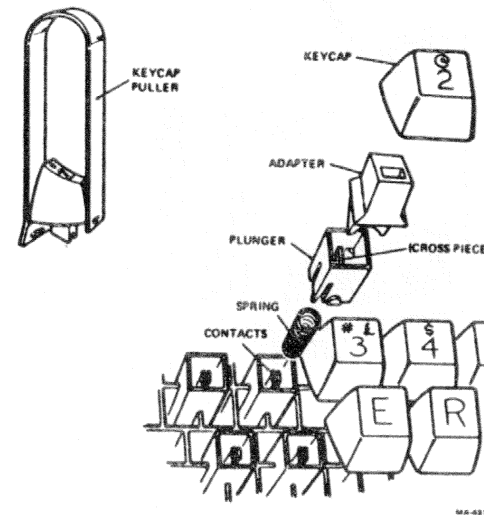


Figure 5-11 Keycap Removal

5. In a very few cases the plunger may also come off. If so, take care to prevent the spring from flying out. Referring to Figure 5-11, replace the plunger and spring as follows.

CAUTION

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

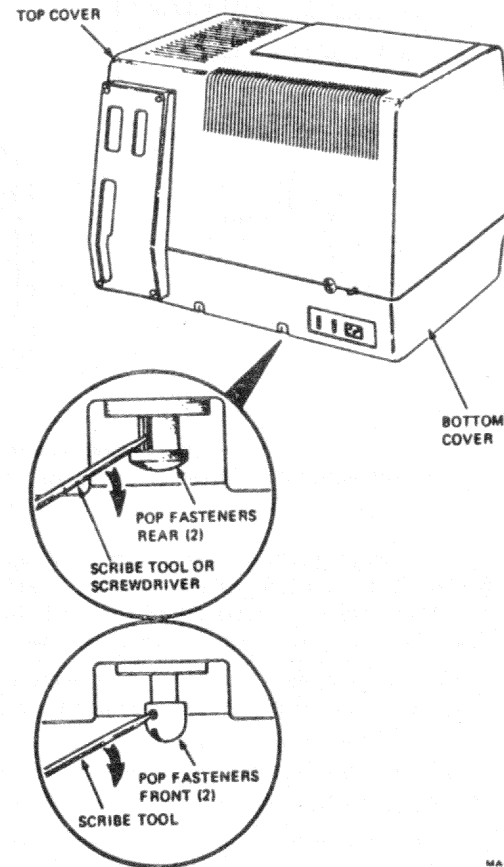
- a. Slide spring into plunger. Place spring and plunger in slot, and over key contacts. Make sure cross piece of plunger is vertical, not horizontal.
 - b. Slowly push plunger down until cross piece touches contacts. Release plunger and check that contacts are separated.
6. Locate proper replacement keycap. Gently press keycap straight down on plunger until it is fully seated.
 7. Repeat previous procedure for each keycap to be replaced.
 8. Store all unused keycaps in shipping bag for later use.

5.14.1 Test After Installation

1. Place terminal off-line.
2. Press each replacement keycap (both lowercase and uppercase) and make sure the proper character(s) are being displayed on the screen.

5.15 TOP COVER REMOVAL AND INSTALLATION

1. Remove power from the terminal by disconnecting the ac plug.
2. Unplug the keyboard.
3. With a small blade-type screwdriver (or a scribe on later terminals) release the two front pop fasteners located under the front lip (Figure 5-12).
4. With a small blade-type screwdriver, release the two rear pop fasteners located on the lower rear edge of the bottom cover (Figure 5-12).
5. Remove the top cover by lifting it straight up.
6. To install the top cover, perform steps 1 through 5 in reverse.



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Figure 5-12 Top Cover Removal

5.16 VIDEO MONITOR BOARD (BALL MONITOR) REMOVAL AND INSTALLATION

1. Remove the top cover (Paragraph 5.15).
2. Remove the circular connector from the base of the CRT (Figure 5-13). Bend the wire harness up and out of the way.
3. Disconnect the four wires from the yoke connection card.
 - Tab 1 - White with Yellow
 - Tab 2 - Red
 - Tab 3 - Blue
 - Tab 4 - Brown
4. Disconnect 4-wire connector J102 at the bottom of the video monitor board.
5. Disconnect 7-wire connector J104 at the bottom center of the video board. Move the harness up and out of the way.
6. Disconnect the green ground wire.
7. Disconnect video input cable J101 from the top edge of the video monitor board.
8. Release the four standoffs and remove the video monitor board.
9. To install the video monitor board, perform steps 1 through 8 in reverse.

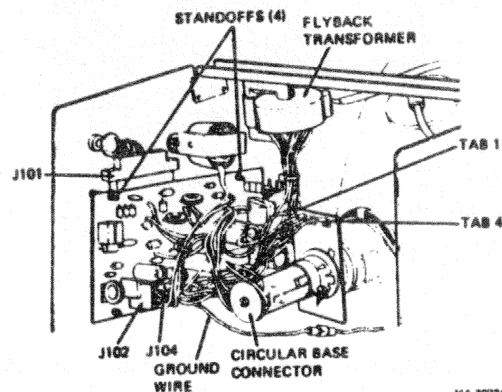


Figure 5-13 Ball Video Monitor Board Removal

5.17 FLYBACK TRANSFORMER (BALL MONITOR) REMOVAL AND INSTALLATION

WARNING

The CRT anode may contain a stored high voltage. Refer to Paragraph 5.26.1 for the anode discharge procedure.

1. Remove the top cover (Paragraph 5.15).
2. Disconnect 7-wire connector J104 at the bottom center of the video monitor board. Move the harness up and out of the way (Figure 5-13).
3. Discharge the high voltage at the CRT anode. Refer to Paragraph 5.26.1 for the procedure.
4. Disconnect the CRT anode wire from the CRT. Refer to Paragraph 5.26.2 for the procedure.
5. Using a 1/4-inch nutdriver, remove the two nuts mounting the flyback transformer to the horizontal crossbrace, and remove the transformer.
6. To install the flyback transformer, perform steps 1 through 5 in reverse.

5.18 VIDEO MONITOR BOARD (ELSTON OR DIGITAL) REMOVAL AND INSTALLATION

1. Remove the top cover (Paragraph 5.15).
2. Remove the circular connector from the base of the CRT (Figure 5-14).
3. Disconnect the white wire connecting the video monitor board to the yoke ground lug.
4. Disconnect the 8-pin connector from the video monitor board.
5. Disconnect the 4-pin connector from the video monitor board.
6. Disconnect the video input connector from the top edge of the video monitor board.
7. Release the four standoffs and remove the video monitor board.

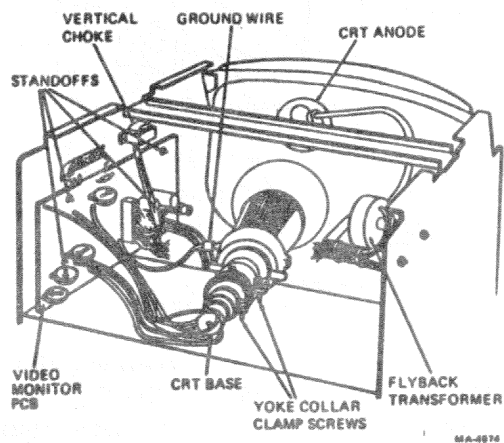


Figure 5-14 Elston/DIGITAL Video Monitor Board Removal

- To install the video monitor board, perform steps 1 through 7 in reverse.

CAUTION

Do not misalign the 8-pin connector when re-connecting the cable. The monitor board may be damaged if the connector is not correctly installed.

5.19 FLYBACK TRANSFORMER (ELSTON OR DIGITAL) REMOVAL AND INSTALLATION

WARNING

The CRT anode may contain a stored high voltage. Refer to Paragraph 5.26.1 for the anode discharge procedure.

- Remove the top cover (Paragraph 5.15).
- Disconnect the 8-pin connector from the video monitor board.
- Remove the screw and washer securing the vertical choke to the monitor chassis. Remove the vertical choke.
- Discharge the high voltage at the CRT anode. Refer to Paragraph 5.26.1 for the procedure.

- Disconnect the CRT anode wire from the CRT. Refer to Paragraph 5.26.2 for the procedure.
- Using a 1/4-inch nutdriver, remove the two nuts mounting the flyback transformer to the monitor chassis.
- To install the flyback transformer, perform steps 1 through 7 in reverse.

CAUTION

Do not misalign the 8-pin connector when re-connecting the cable. The monitor board may be damaged if the connector is not correctly installed.

5.20 BOTTOM COVER REMOVAL AND INSTALLATION

- Remove the top cover (Paragraph 5.15).
- Disconnect the power cord from the terminal.
- Turn the terminal over on its side and remove the four shipping screws (if present) securing the bottom cover to the chassis. Discard the screws and turn the terminal up.
- Locate the four pop fasteners holding the frame to the base and release the fasteners by pulling the plungers up.
- Grasp the metal frame and lift the frame up and out of the terminal bottom cover.
- To install the bottom cover, perform steps 1 through 6 in reverse.

5.21 POWER SUPPLY REMOVAL AND INSTALLATION

- Remove the top cover (Paragraph 5.15).
- Remove the bottom cover (Paragraph 5.20).
- Locate the three pop fasteners on the side of the chassis. Release the pop fasteners by pulling the plungers out (Figure 5-15).

WARNING

Capacitors C9, C14, and the surrounding circuits contain a 300 Vdc charge. To discharge the capacitors, leave the power supply plugged

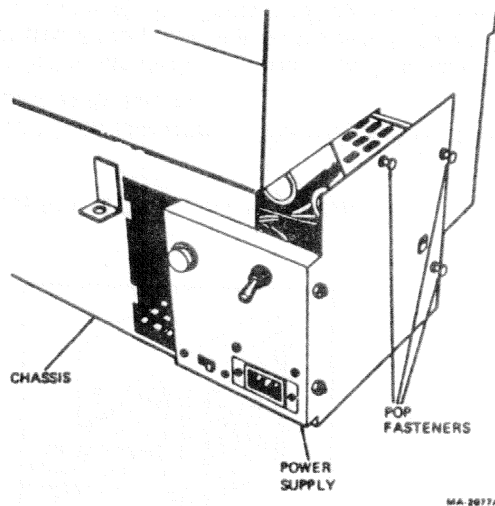


Figure 5-15 Power Supply Removal

into the terminal for a minimum of four minutes after the power cord is removed.

To assure complete discharge of the capacitors after the power supply is out of the terminal, short the capacitors with an insulated wire as shown in Figure 5-16.

4. Grasp the power supply by the end plate and remove the power supply by pulling it straight out.
5. To install the power supply, perform steps 1 through 4 in reverse. Note that there is a grounding tab on the chassis at the back that fits into a small slot in the end of the power supply's switch plate.

5.22 RF SHIELD REMOVAL AND REPLACEMENT

Use this procedure for the VT125.

1. Remove the top cover (Paragraph 5.15).
2. Remove the bottom cover (Paragraph 5.20).
3. Remove the power supply (Paragraph 5.21).
4. Remove the terminal controller board (Paragraph 5.3) and, if present, the graphics boards (VT105: Paragraph 5.7, VT125: Paragraph 5.8).

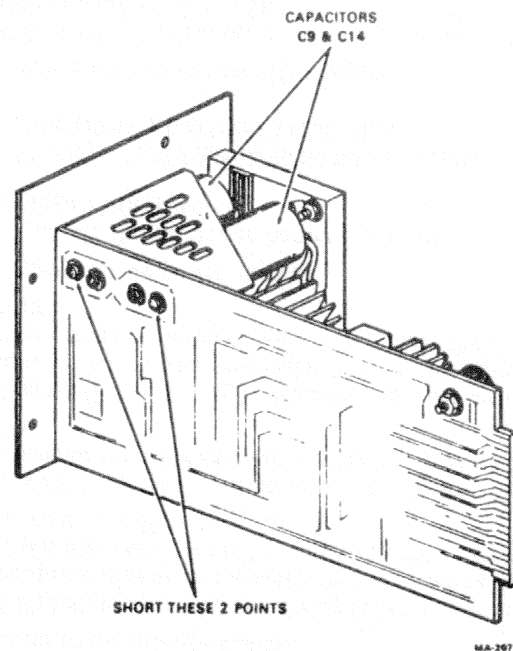


Figure 5-16 Power Supply Capacitor Discharging

5. Loosen, but do not remove, two Phillips screws at the top of the shield (Figure 5-17).
6. Set the chassis on end with the cage up.

NOTE

The terminal rests on several parts that stick out on the bottom. Set the terminal on a protected surface to prevent damage.

There are bumpers attached to both sides of the chassis. They protect the terminal during shipping and can be removed now if necessary.

7. Loosen, but do not remove, two Phillips screws at the bottom of the shield.
8. Slide the shield off the cage. Push the ribbon cable (front of the terminal) and the ground wires (at access opening) as needed to avoid catching the wires on the sheet metal.

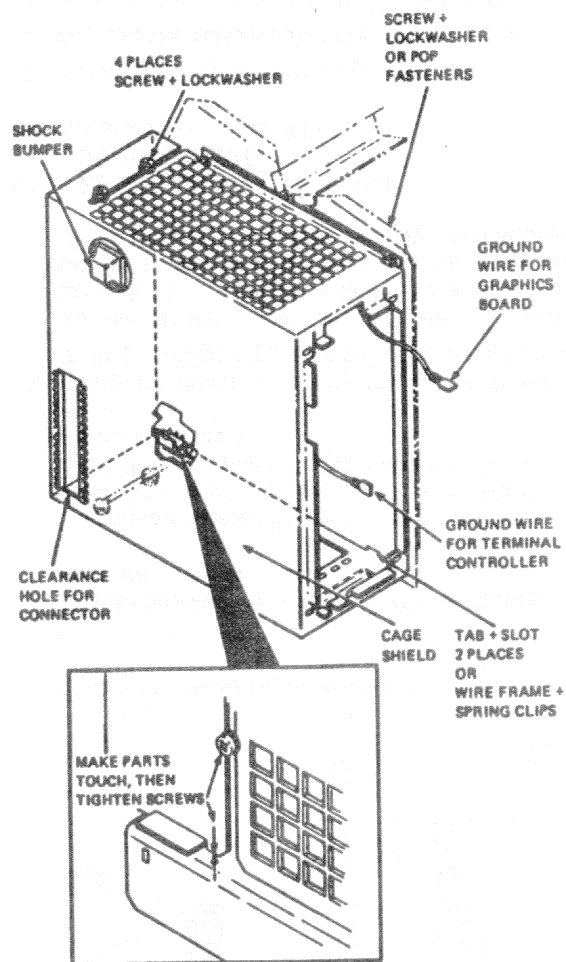


Figure 5-17 FCC Shield on VT100 Cage

9. Tighten the four screws temporarily and set the terminal on its bottom.
10. To install the shield, perform steps 1 through 9 in reverse. At step 8, compress the metal contact fingers on the shield (Figure 5-17) by pressing on the shield until the indicated parts touch.

5.23 DC POWER HARNESS REMOVAL AND INSTALLATION

1. Remove the top cover (Paragraph 5.15).
2. Remove the bottom cover (Paragraph 5.20).
3. Remove the power supply (Paragraph 5.21).
4. Remove the terminal controller board (Paragraph 5.3) and, if present, the graphics boards (VT105: Paragraph 5.7, VT125: Paragraph 5.8).
5. Remove the RF shield if present (Paragraph 5.22).
6. Disconnect 10-pin edge connector J101 from the video monitor board.
7. Remove the card cage by releasing the two pop fasteners (remove two Phillips screws on late model terminals) that hold the top of the card cage to the chassis. Tilt the card cage out slightly, then lift the card cage out of the bottom holding clips (chassis slots on late model terminals).
8. Disconnect the ground wire from the 10-pin connector to the monitor chassis.
9. If VT100: Remove the two E-ring fasteners (spread the spring clips on late model terminals) holding the 22-pin edge connector to the card cage, then remove the connector (Figure 5-18).
If VT105 or VT125: Disconnect the 22-pin edge connector from the expansion backplane (Figure 5-19).
10. Remove the two E-ring fasteners (spread the spring clips on late model terminals) holding the 18-pin edge connector to the chassis, then remove the connector.
11. Remove the dc power harness.
12. To install the dc power harness, perform steps 1 through 11 in reverse.

5.24 VT105/VT125 EXPANSION BACKPLANE REMOVAL AND INSTALLATION

1. Remove the access cover (Paragraph 5.2).
2. Remove the terminal controller and graphics boards (Paragraphs 5.3, 5.7, 5.8).
3. Remove the top cover (Paragraph 5.15).
4. Remove the bottom cover (Paragraph 5.20).

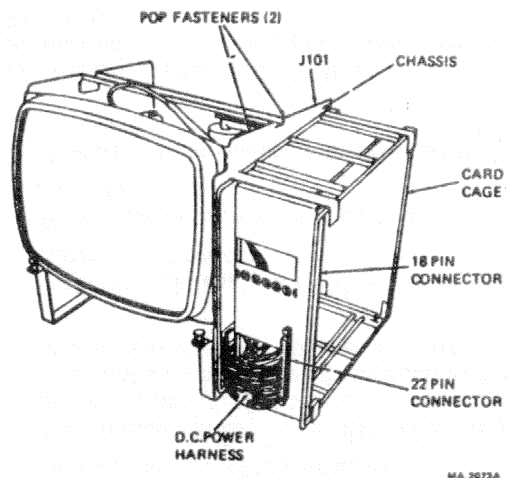


Figure 5-18 VT100 DC Power Harness Removal

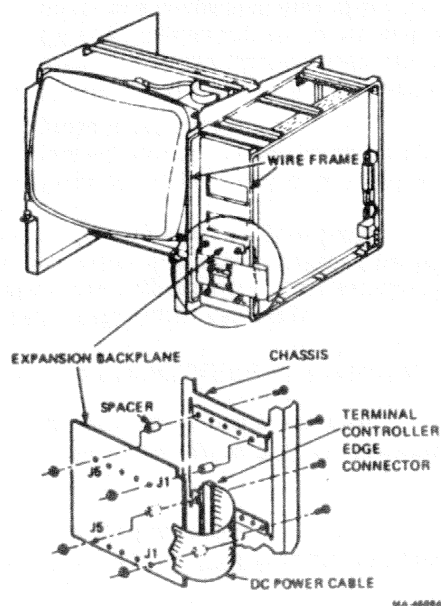


Figure 5-19 Expansion Backplane

5. Remove the power supply (Paragraph 5.21).
6. Remove the RF shield if present (Paragraph 5.22).
7. Disconnect the ground wire from the 10-pin connector to the monitor chassis.
8. Disconnect the 22-pin edge connector from the expansion backplane (Figure 5-19).
9. Remove the four screws and nuts, and two spacers securing the expansion backplane to the card cage.
10. To install the expansion backplane perform steps 1 through 6 in reverse.

5.25 CRT AND YOKE ASSEMBLY REMOVAL AND INSTALLATION

Elston terminals can be repaired with new CRT and Yoke assemblies without having to replace the complete chassis assembly (Field Service Monitor Assembly). When replacing the CRT and Yoke on Ball monitors, replace the flyback, choke, and monitor board with Elston parts at the same time.

WARNING

High voltage is present at the CRT anode. Refer to Paragraph 5.26.1 for the anode discharge procedure.

1. Disconnect the terminal from the power outlet.
2. Remove the top cover (Paragraph 5.15).
3. Discharge the CRT anode (Paragraph 5.26.1).
4. Disconnect the CRT high voltage anode wire (Paragraph 5.26.2).
5. Disconnect the circular connector from the CRT base (Figure 5-14).
6. Disconnect the white wire connecting the video monitor board to the yoke ground connector.
7. Disconnect the 4-pin yoke connector from the monitor board.
8. Remove the top two, then bottom two screws from the CRT frame while supporting the assembly from the bottom of the CRT.
9. Remove the CRT yoke assembly.

WARNING

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

10. To replace the CRT yoke assembly, perform steps 1 through 8 in reverse.

NOTE

Refer to Paragraph 5.27 for the proper CRT storage and disposal procedures.

5.26 CRT DISCHARGE AND ANODE CAP**5.26.1 CRT Anode Discharge**

Before servicing the CRT or its associated circuits, the anode must be discharged. Either of the following methods can be used safely (Figure 5-20).

- Connect the plug end of a VOM lead to chassis ground, and discharge the anode by touching the probe to the CRT anode.
- Gently slip the end of an insulated-handle screwdriver under the plastic anode cap on top of the CRT while shorting the other end of the screwdriver to a nonpainted area of the CRT frame.

5.26.2 Anode Cap Removal and Installation

Disconnect the heavy CRT anode wire from the CRT using the following procedure.

1. Note the position of the anode wire.
2. The connector holds itself in place with spring barbs in the depression of the tube (the anode socket). You must push against one barb, allowing the other side to clear the lip of the anode socket (Figure 5-21).
3. Push at a right angle in the direction that the wire enters the rubber cap.
4. While pushing across, push up on the cap to free one barb.
5. Now push up in the opposite direction to free the other barb.

5.27 FIELD HANDLING of CRTs

You must use the following procedures when handling CRTs in the field.

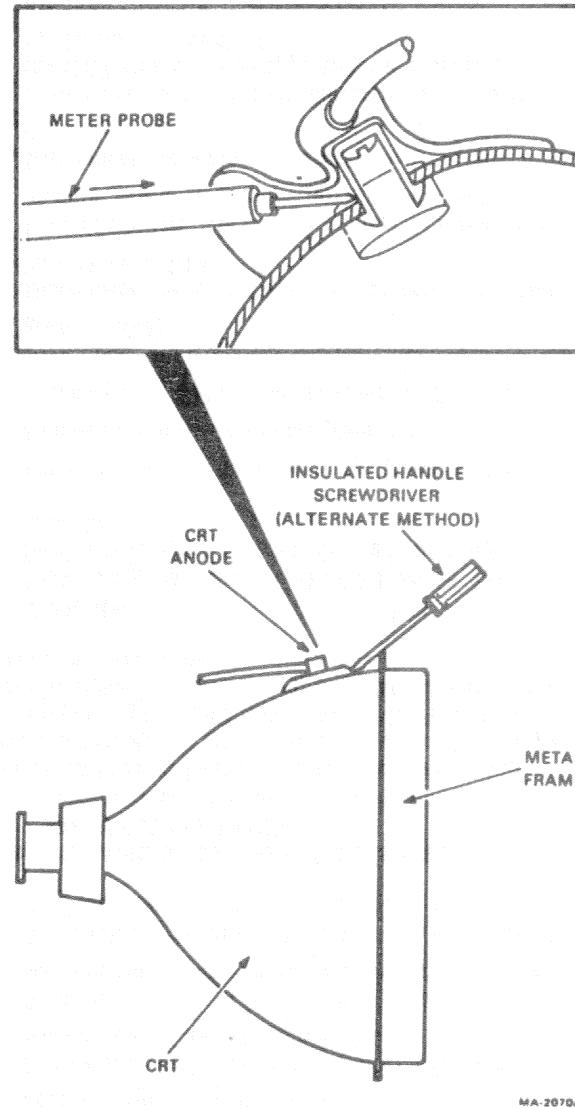


Figure 5-20 CRT Anode Discharging

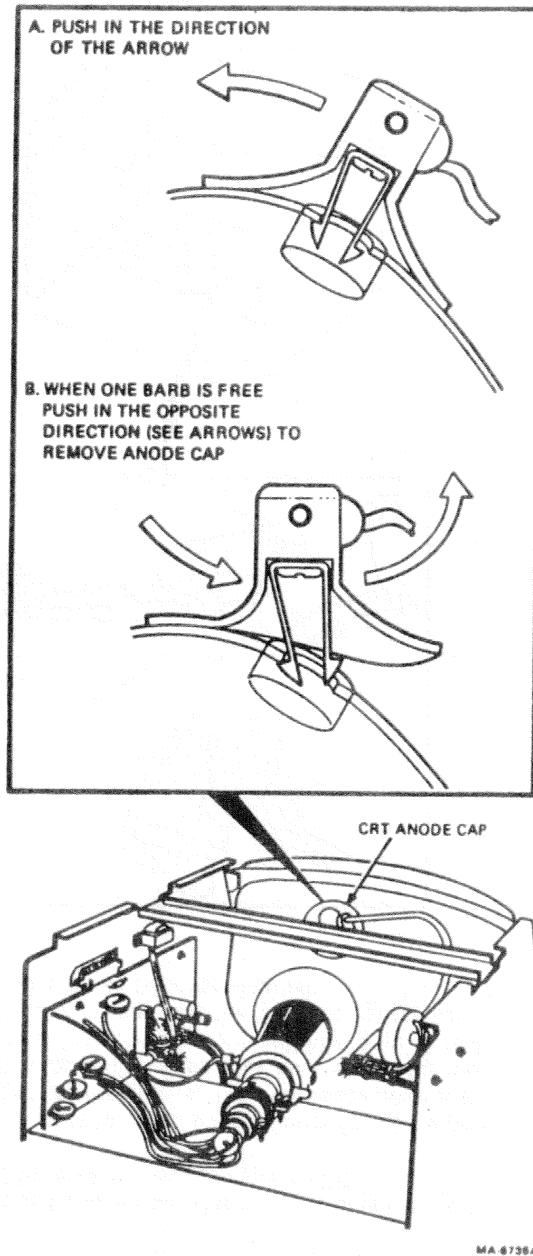


Figure 5-21 Removing Anode Cap

5.27.1 CRT Replacement

1. Replace CRTs only in areas where risks and exposure are limited to trained Field Service personnel.
2. Only DIGITAL service personnel should be in the area during replacement.
3. Any serviceperson relacing a CRT must wear, at least, safety glasses with side guards, or goggles and gloves. The part numbers are:
Goggles PN 29-16141
Gloves PN 29-16146
4. Before servicing the CRT or its associated circuits, you must discharge the anode (Paragraph 5.26.1).

5.27.2 CRT Handling

Take the following precautions when handling any CRT.

- Handle the CRT by the sides adjacent to the tube face. Never handle the CRT by the neck.
- Do not allow the neck to strike anything.
- Never rest a CRT on its neck.
- Never scratch the glass of the CRT. Be particularly careful of this when working around the CRT with any tool.
- Never touch the glass of a CRT with a hot soldering iron.

5.27.3 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 enclosure.

5.27.4 CRT Disposal

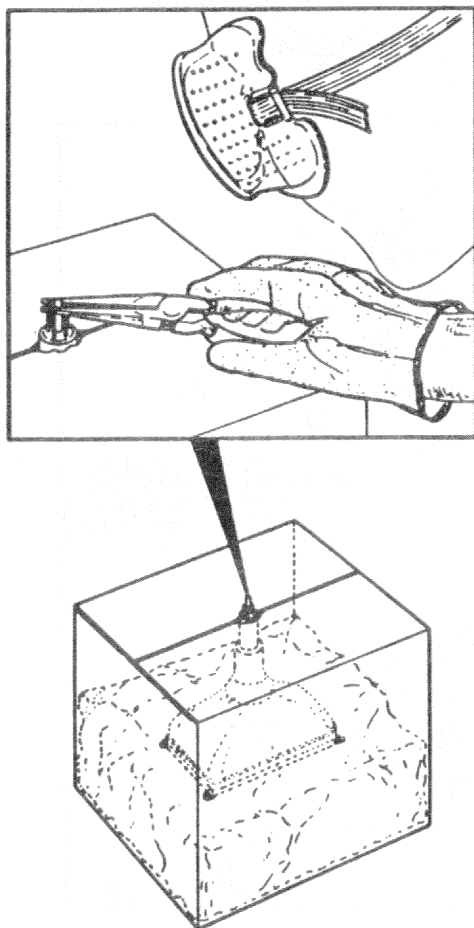
If a regional disposal procedure does not exist in your area, use the following steps to safely dispose of a CRT. Destroy any CRT that is to be scrapped and not returned for repair.

WARNING

Use extreme caution when performing this procedure.

1. Place the scrap CRT in the container in which the replacement was received.

2. Close and seal the container, leaving only the end of the CRT neck exposed (Figure 5-22).
3. Slowly crush the CRT evacuation point with a pair of pliers or wire cutters. The evacuation point is located in the center of the CRT neck end. 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 can no longer implode.



MA 0940

6 OPTIONS

6.1 GENERAL

This chapter contains detailed descriptions on how to install and check out the advanced video option, the 20 mA current loop option, the printer port option, and the VT125 Graphics Processor.

6.2 ADVANCED VIDEO OPTION - VT1XX-AB

The advanced video option adds the following features to the basic VT100.

- Capability of 24 lines of 132 characters each
- Reverse, blink, underline, and bold character attributes
- Alternate character set capability

6.2.1 Advanced Video Option Installation

Use the following procedure to install the advanced video option.

1. Remove the terminal access cover (Paragraph 5.2).
2. Remove the terminal controller board (Paragraph 5.3).
3. Locate the four mounting holes in the terminal controller board and place a standoff in each mounting hole (Figure 6-1).
4. Align advanced video connector J1 and mount the advanced video board on the standoffs (Paragraph 5.4).
5. Reinstall the terminal controller board and terminal access cover.

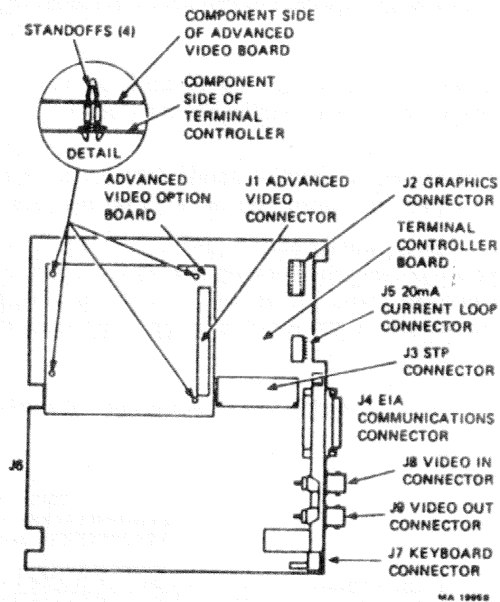


Figure 6-1 Advanced Video Option Installation

6.2.2 Advanced Video Option Checkout

1. Turn the terminal power on and verify that no error was detected during the power-up test.
2. Press the SET-UP key. The words SET-UP A should blink in boldface, the words TO EXIT PRESS "SET-UP" should be underlined, and the ruler should contain alternating normal and reverse video fields.
3. Place the terminal in 132-column mode, and then in LOCAL mode.
4. Exit SET-UP and type the following sequence.
`<ESC> < <ESC>#8`

The screen should now display 24 lines \times 132 columns.

6.3 20 mA CURRENT LOOP OPTION - VTIXX-AA or -CA

The 20 mA current loop option allows the terminal to communicate directly with the computer over short distances without the use of a modem.

6.3.1 20 mA Current Loop Option Installation

1. Remove the terminal access cover (Paragraph 5.2).
2. Perform the following steps for the VTIXX-AC, -CB, -CL, and the VT125.
 - a. *For -AA only:* Remove the current loop option board from the access cover it is shipped in by removing three Phillips screws and two hex-head screws (Figure 6-2).
 - b. Install the current loop option board into the special access cover provided with the option or terminal with the five screws.
3. Set the TRANS (transmit) switch to the NORMAL position (Figure 6-3). (If the terminal must provide current on the transmit line, set the switch to the ACT position.)
4. Set the REC (receive) switch to the NORMAL position (Figure 6-3). (If the terminal must provide current on the receive line, set the switch to the ACT position.)

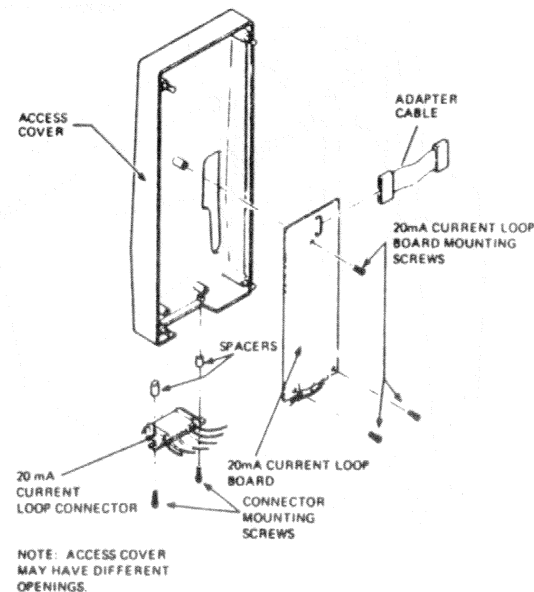
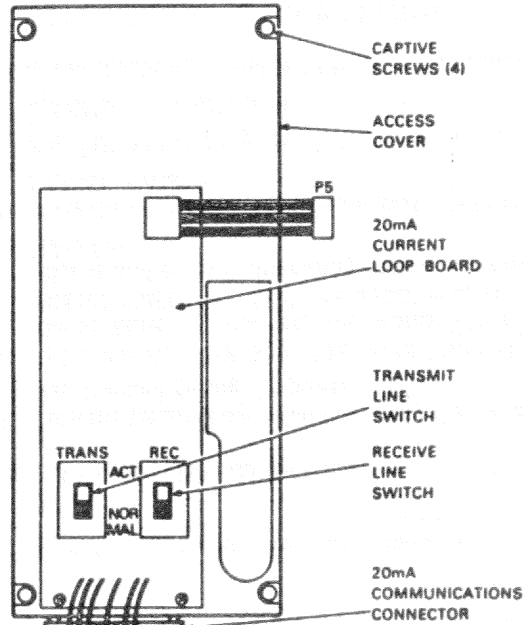


Figure 6-2 20 mA Current Loop Board Installation



NOTE: ACCESS COVER MAY HAVE DIFFERENT OPENINGS.

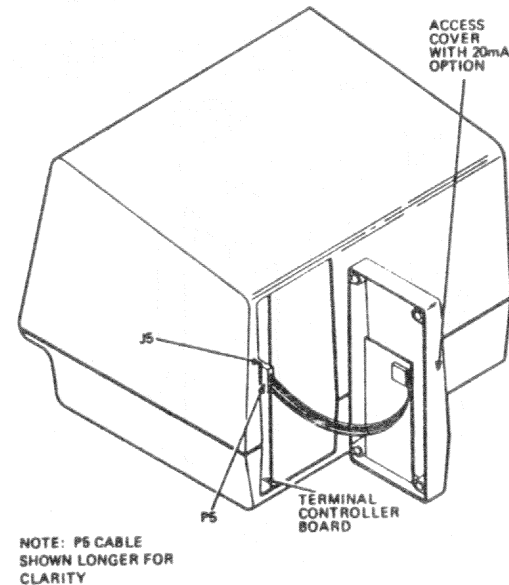
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Figure 6-3 20 mA Current Loop Option

5. Connect P5 to J5 on the terminal controller board (Figure 6-4). Place the access cover next to the opening on the back of the terminal. Connect the other end of the adapter cable to the 20 mA board.
6. Install the terminal access cover containing the 20 mA current loop option in place of the old access cover.
7. Connect the communications line to the Mate-N-Lok connector on the bottom of the access cover.

NOTE

The terminal is designed to use either 20 mA or EIA communications. If EIA is used on a terminal containing the 20 mA option, the cable connecting the 20 mA option board to the terminal controller board must be disconnected from J5 on the terminal controller board.



NOTE: P5 CABLE SHOWN LONGER FOR CLARITY

MA-1997B

Figure 6-4 Installing Access Cover with Current Loop Option

6.3.2 20 mA Current Loop Option Checkout

1. Disconnect the terminal from the communications line.
2. Remove the terminal access cover containing the 20 mA current loopback board and place both switches in the NORMAL position. Reinstall the access cover.
3. Connect the 20 mA loopback connector (PN 70-15503-00) to the Mate-N-Lok connector mounted to the bottom of the access cover.
4. Place the terminal in ANSI-compatible mode (in SET-UP B group 2 switch 3 = 1).
5. Type the following sequence to perform the data loopback test. (Refer to Paragraph 3.4.3 for VT125.)

<ESC>[2;2y

When the test is performed the screen clears and the message WAIT is displayed in the upper left corner of the screen. The entire test takes about six seconds to run.

6. A loopback error is shown by the number 8 being displayed in the upper left corner of the screen. If an error is detected, check the 20 mA board connectors and switch settings, then repeat step 5.
7. Once the test is complete, return the 20 mA current loop board switches to the original positions, remove the loopback connector, replace the access cover, and reconnect the terminal to the communications line.

NOTE

The terminal is designed to use either 20 mA or EIA communications. If EIA is used on a terminal containing the 20 mA option, the cable connecting the 20 mA option board to the terminal controller board must be disconnected from J5 on the terminal controller board.

6.4 VT1XX-AC PRINTER OPTION

The VT1XX-AC option provides an interface between a VT100/VT132 terminal and a serial printer.

6.4.1 Option Installation

Use the following procedure to install the VT1XX-AC option in a VT100/VT132 terminal.

1. Turn terminal power off and remove the terminal access cover (Paragraph 5.2).
2. Remove the terminal controller board (Paragraph 5.3).
3. If installed, remove the advanced video board (AVO) from the terminal controller board (Paragraph 5.4).
4. Reconfigure the VT100 terminal controller board. This consists of removing the ROMs 0, 1, 2, and 3 from the controller board, and replacing them with the ROMs shipped with the printer option. Figure 7-1 shows the ROM locations on the terminal controller board. The VT132 does not use the ROMs sent with the printer option kit. Table 7-1 lists the ROMs that are used in each product.

NOTE

If the terminal controller board ever fails, remove the printer port ROMs. Then, move the ROMs that come with the replacement terminal controller board to the defective board before returning it for repair.

5. Reconfigure the advanced video board (AVO). This consists of removing any ROMs mounted on the board and replacing them with the ROMs shipped with the printer option. Also check, and change if necessary, the jumpers or switches on the AVO board. Figures 7-2 and 7-3 show the new ROMs installed on the AVO board. Tables 7-2 and 7-4 show the correct switch positions and jumper locations for the AVO board. Table 7-3 lists the ROMs that are used in each product.

NOTE

Do not discard the ROMs removed in step 6 until after the terminal and option have been successfully tested. If the AVO board ever fails, remove all ROMs from the board before the board is returned for repair.

6. Install the AVO board on the terminal controller board (Paragraph 5.4).
7. Install the printer interface option board in the STP connector, J3, of the terminal controller board (Paragraph 5.6).
8. Reinstall the terminal controller board in the terminal.
9. If installed, remove the 20 mA current loop option board and connector from the access cover. Reinstall the option board and connector in the new access cover shipped with the printer option (Paragraph 5.9).

NOTE

Discard the old access cover after the terminal and printer option have been successfully tested.

10. Attach the option designation label to the rear of the terminal. Attach the new SET-UP label to the bottom of the keyboard. If the terminal is a VT132, transfer the SET-UP settings to the existing label.
11. Reattach all cables you removed from the rear of the terminal in step 1.
12. Perform the printer option checkout procedure.

6.4.2 Printer Part Option Checkout Procedure

Two different test programs check out the printer interface; the power-up and the printer interface data loopback test.

NOTE

The terminal will fail the NVR section of the power-up test (error code 2) when first powered up after the printer option is installed. Correct the condition by performing a save operation on the current contents of the NVR.

6.4.2.1 Power-Up Test - The power-up test may be started in any of the following ways.

- Turn the terminal power switch on
- Reset the terminal in SET-UP mode
- Type the following sequence in LOCAL.

`<ESC>[2;1y`

The terminal displays Wait while executing the test. When successfully completed, the screen clears.

NOTE

The continuously running test ends only if an error is found, or power is turned off. The VT1XX-AC is not tested during a continuous test.

The error indications for this test are as follows.

- Lighted keyboard indicator (other than ON LINE or LOCAL)
- Character displayed on screen under the blinking cursor
- Unlighted VT1XX-AC indicator (located on the printer interface board)

Table 6-1 shows the keyboard indicator error codes and their meanings.

Table 6-2 shows the error character displayed on the screen under the blinking cursor. Any errors detected by the test are shown on the terminal screen as a character in the upper left corner.

NOTE

If character 4 is displayed, check that the keyboard is plugged in.

Table 6-1 Keyboard Indicator Error Codes

Error	L1	L2	L3	L4
ROM 0 checksum	Off	Off	Off	On
ROM 1 checksum	Off	Off	On	Off
ROM 2 checksum	Off	Off	On	On
ROM 3 checksum	Off	On	Off	Off
Main data RAM	Off	On	Off	On

Table 6-2 Displayed Error Codes

Character	Fault Detected			
	AVO	NVR	KBD	DATA
1	x	-	-	-
2	-	x	-	-
3	x	x	-	-
4	-	-	x	-
5	x	-	x	-
6	-	x	x	-
7	x	x	x	-
8	-	-	-	x
9	x	-	-	x
:	-	x	-	x
:	x	x	-	x
<	-	-	x	x
=	x	-	x	x
>	-	x	x	x
?	x	x	x	x

6.4.2.2 Printer Interface Data Loopback Test - Use the following procedure to perform the printer interface data loopback test.

1. Turn the power switch off. Install the data loopback connector (PN 12-15336) onto the printer interface connector (the upper EIA connector). The data loopback connector is also used to perform the EIA communication interface data loopback test.
2. Turn the power switch on. The terminal performs the power-up test.
3. Enter SET-UP B and place the terminal in the ANSI-compatible mode (group 2 switch 3 = 1). Perform a save operation.
4. Place the terminal in printer port test mode (SET-UP group 5 switch 4 = 1).

5. Enter SET-UP C. Select the proper printer transmit/receive speed. Use either the 7 or 8 keys on the main keyboard to select the speed.
6. Place the terminal ON-LINE and exit SET-UP mode. The screen now displays: PRINTER PORT TEST MODE
7. Type one of the following sequences

<ESC>[2;2y (single pass test)

or

<ESC>[2;10y (continuously running test)

NOTE

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

Any error detected by the test is shown on the terminal screen as a character in the upper left corner. Table 6-2 shows the possible error codes. A printer interface data loopback test error is shown by an X in the Data column.

6.5 VT1XX-CB, -CL INSTALLATION INTO VT100 AND VT105

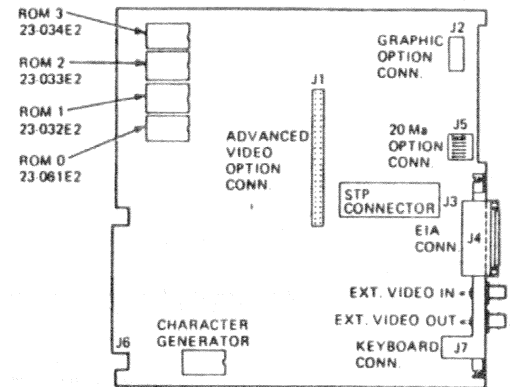
The VT1XX-CB, -CL is a kit of all the parts needed to install a VT125 Graphics Processor in a VT100 or VT105. This section explains the procedure.

NOTE

Before installing the Graphics Processor, check the ROMs and the etch revision level on the terminal controller board (step 3 of this procedure). Compare the numbers of the ROMs on the board with the numbers in Figure 6-5. They should be equal or larger.

Check the etch number on the solder side of the board. Look for the number 5013008 followed by a letter. If the letter is D, E, etc., you can use the board. If the letter is A, B, or C, you cannot use the board. Use the EIA line filter connector (included in kit) with a Revision F board.

If either of these prerequisites cannot be met, consult your Field Service branch office.



23 061 E2 NUMBER SHOULD BE 061 OR LARGER

NOTE: ROMS MAY BE INSTALLED IN ANY ORDER ON TERMINAL CONTROLLER BOARD

MA 4587A

Figure 6-5 Check ROM Numbers

6.5.1 Tools Needed

You need the following tools to install the VT125 Graphics Processor.

- 1/4 inch nutdriver
- 2 Phillips screwdrivers
- Needlenosed pliers
- 3/16 inch blade screwdriver

6.5.2 Installation Procedure

1. Turn off the power and remove the access cover (Paragraph 5.2).
2. Remove the top and bottom covers (Paragraphs 5.15 and 5.20).
3. Remove the terminal controller board (Paragraph 5.3).
4. On VT100: Remove the terminal controller edge connector by performing one of the following two steps.
 - a. Release the two retaining rings from the edge connector with needlenosed pliers.

- b. Lifting the clips at the top and bottom of the edge connector and discard.

On VT105: Disconnect the power cable from the VT105 expansion backplane, and remove the backplane (Paragraph 5.24).

5. The new expansion backplane has two capacitors on it, and its terminal controller edge connector has an alignment key in it. Remove this key with needlenose pliers unless installing the option in a terminal with a Revision F or higher terminal controller board. Install the new expansion backplane with four 12.7 mm (1/2 in) \times 4-40 screws and keps nuts and four 6.4 mm (1/4 in) spacers. Install the screws at the connector positions marked J1 and J5 on the board (Figure 6-6). The dc power cable must be flat against the chassis or the backplane will not fit.

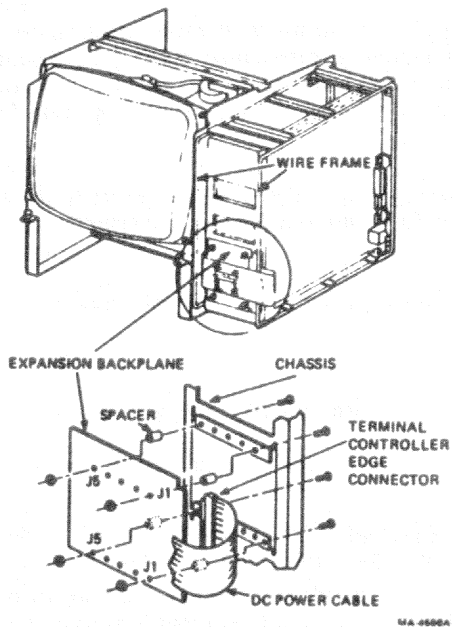
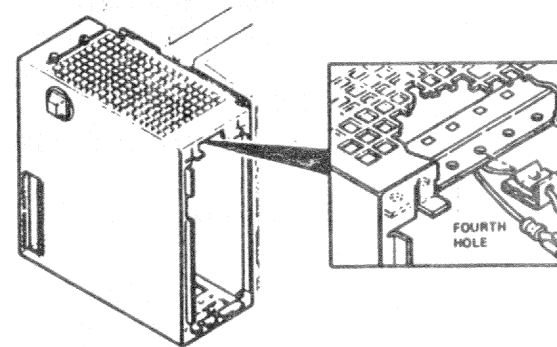


Figure 6-6 Installing Expansion Backplane

6. Bend the dc power cable around so the opening faces the CRT. Use needlenose pliers to remove the alignment key (if installed) from the connector opening in the dc power cable. Install the connector onto the board edge connector, passing the cable around the wire frame if present (Figure 6-6).
7. Install card guides into the top and bottom of the card cage at the VT125 connector position.
8. At the fourth hole from the left on top of the chassis (over the BNC bracket), press the ground clip with a wire onto the chassis (Figure 6-7).
9. Install the FCC RF shield (Paragraph 5.22).



NOTE:
INSTALL CLIP BEFORE
INSTALLING SHIELD.

Figure 6-7 Installing Ground Clips

10. Put the chassis into the bottom and top covers (Paragraphs 5.15 and 5.20).
11. Slide the terminal controller board partially into the chassis.
12. Install the VT100 end of the 16-pin flat cable connector to the lower 16 pins of the terminal controller board's graphic connector (marked J2 on the terminal controller board), with the cable entering from the right (Figure 6-8).
13. Install the STP paddle board in the STP connector. Lift the 16-pin cable slightly if needed to clear the spacer when inserting the STP board. Attach it to the terminal controller board with the supplied screw and washer (Figure 6-9).

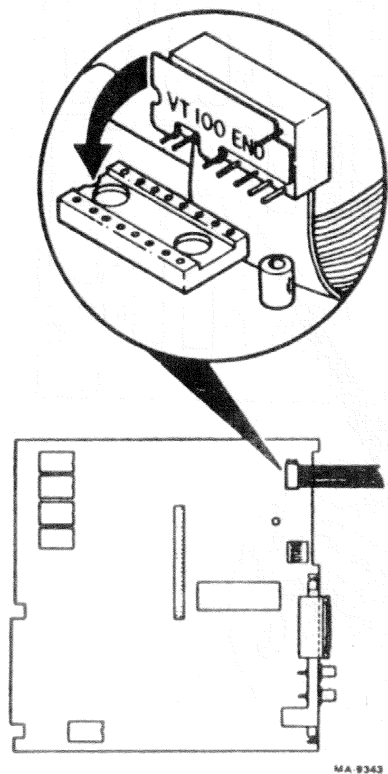


Figure 6-8 16-Pin Flat Cable on Terminal Controller

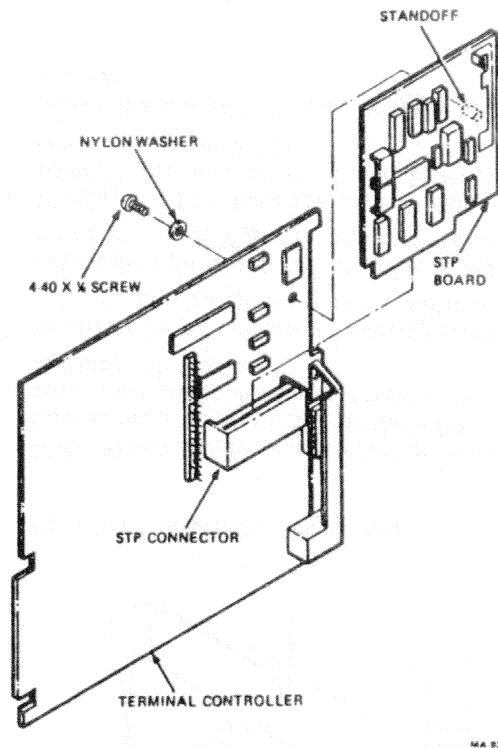


Figure 6-9 Installing STP Board

14. Find the end of the 24-pin cable that has pin 1 on the cable side. Fold the cable under itself to the right approximately 30 mm (one in) from the connector. Install that end into the socket on the paddle board with the cable down (Figure 6-10).
15. Install the VT125 board into the chassis so that it sticks out approximately 5 centimeters (2 inches) more than the terminal controller board.
16. Arrange the 16-pin graphic connector with the cable entering from above and install it into the connector at the top edge of the VT125 board (Figure 6-11).
17. Arrange the 24-pin connector with the cable entering from the right and install it into the 24-pin socket at the right edge of the VT125 board (Figure 6-11).

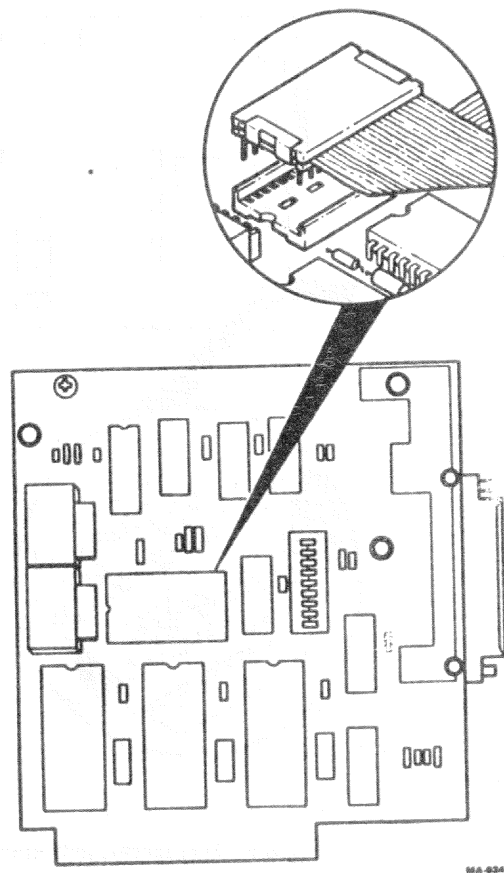


Figure 6-10 24-Pin Flat Cable on STP Board

18. Check the switches on the STP paddle board and set switches 1,3, and 4 off, with all the other switches on (Figure 6-12).
19. Connect the ground wire from the top of the chassis to the quick-connect terminal on the BNC connector bracket (Figure 6-13).
20. Slide both boards into the chassis together, taking care not to stretch the cables. Seat both boards in their sockets one at a time.

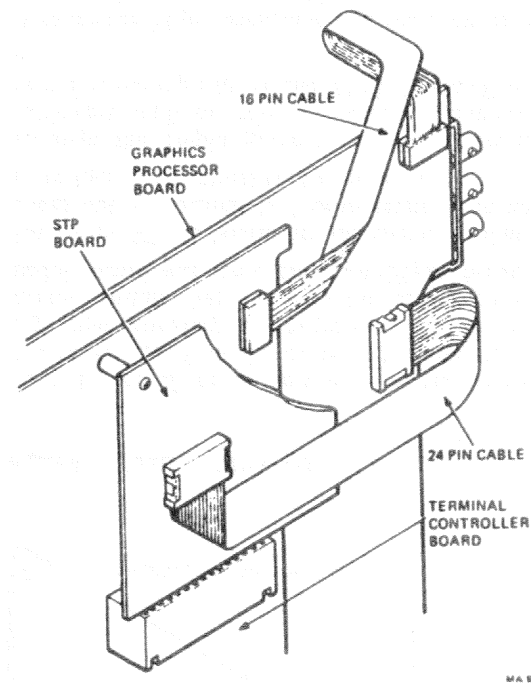
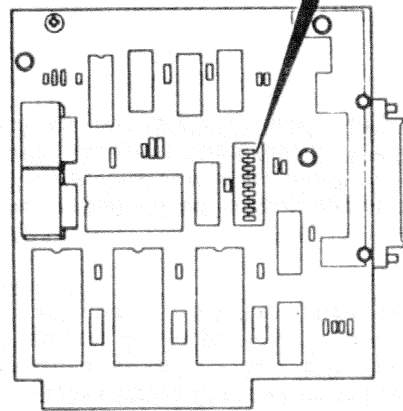
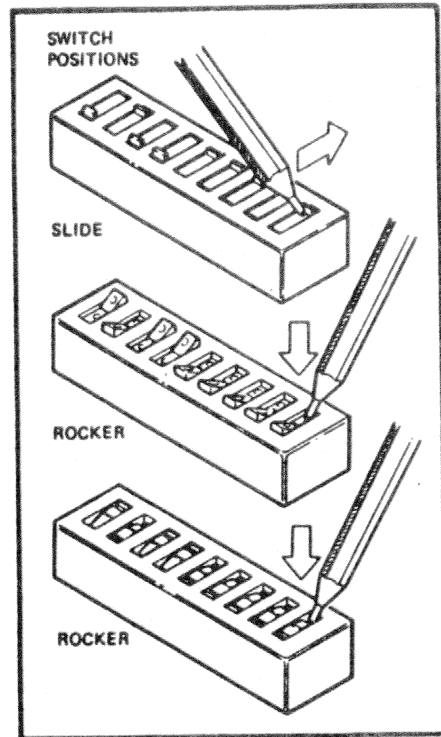


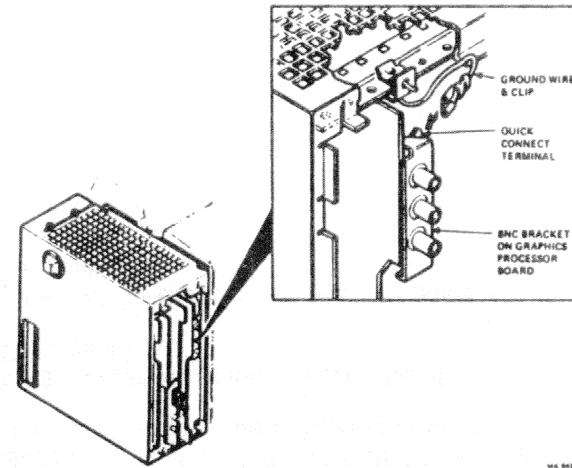
Figure 6-11 Graphic Cable Connections

21. If the 20 mA adapter was installed on the VT100, remove the adapter board from the VT100 access cover and install it into the new access cover (Refer to Paragraph 6.3.1).
22. Install the 20 mA connector cable (if present) to the red connector on the terminal controller board.
23. Adjust the cables in the access opening and install the access cover. Tighten the four screws carefully.
24. If using the EIA interface on a Revision F etch board, make sure to install the EIA line filter connector (Figure 6-14).
25. Attach the new SET-UP label to the bottom of the keyboard.



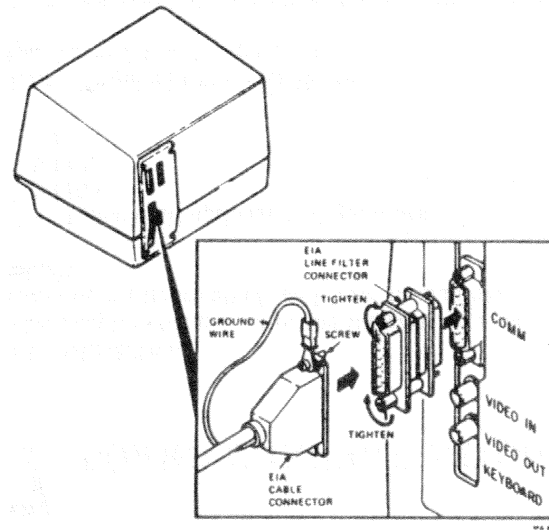
MA-72568

Figure 6-12 STP Board Switch Types



WA-8027A

Figure 6-13 Connecting BNC Bracket Ground Wire



WA-8127

Figure 6-14 EIA Line Filter Connector

6.5.3 Graphics Option Checkout Procedure

Perform the test procedures that are described in Section 3.4. If you have display problems at power up, recheck the flat cables for correct positions. Refer to Figures 6-7, 6-9, and 6-10.

NOTE

The terminal will fail its power up test with a 2 indication the first time you turn it on after installing the option. Check the SET-UP features and save them (SHIFT/S in SET-UP).

7 BOARD CONFIGURATIONS

7.1 GENERAL

This chapter contains all of the information required to correctly configure all of the boards in the following terminals.

VT100 and all optional configurations
VT105
VT132
VT125

7.1.1 Terminal Controller Board

Use Table 7-1 with Figure 7-1.

7.1.2 Advanced Video Option Board - with jumpers

Use Tables 7-2 and 7-3 with Figure 7-2.

7.1.3 Advanced Video Option Board - with switches

Use Tables 7-3 and 7-4 with Figure 7-3.

7.1.4 VT1XX-AC Printer Port Option

Switches 1 and 5 on, 2, 3, and 4 off. These are factory settings, not to be changed. Refer to Figure 7-4.

7.1.5 VT105 Waveform Generator Board

See Figure 7-5.

7.1.6 VT125 Graphics Terminal STP Board

See Figure 7-6.

Table 7-1 Terminal Controller Board ROMs

Used In	ROMs Used				Character Generator
	ROM 0	ROM 1	ROM 2	ROM 3	
VT100	23-031E2 or 23-061E2	23-032E2	23-033E2	23-034E2	-
VT100-WC-WK	23-095E2	23-096E2	23-139E2	23-140E2	23-094E2
VT100/VT11XX-AC	23-095E2	23-096E2	23-139E2	23-140E2	-
VT132	23-095E2	23-096E2	23-097E2	23-098E2	-
VT125 and VT105	23-180E2	23-181E2	23-182E2	23-183E2	-
	23-061E2	23-032E2	23-033E2	23-034E2	-

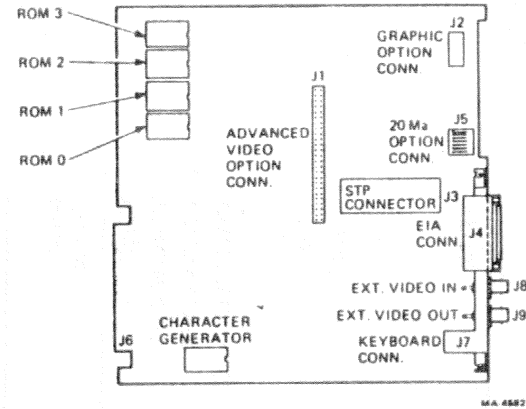


Figure 7-1 Terminal Controller Board

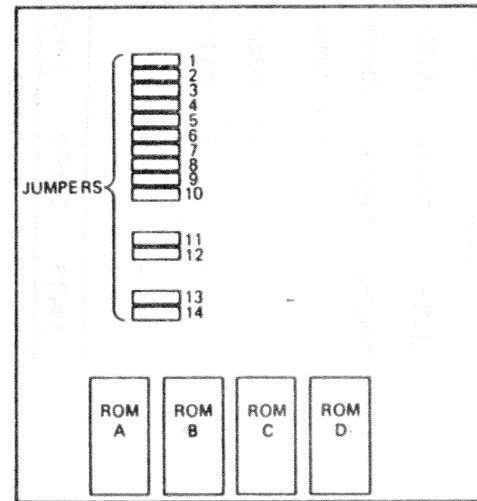


Figure 7-2 Advanced Video Option Board with Jumpers

Table 7-2 Advanced Video Option (AVO) Jumpers

Used In	Jumpers Installed													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
VT100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VT100-WA-WB	x	-	-	-	-	-	x	-	-	-	-	-	-	-
VT100-WC-WK	-	-	-	-	-	x	-	-	-	-	-	-	-	-
VT100/VT1XX-AC	-	-	-	-	-	x	-	-	-	-	-	-	-	-
VT132 (ROMs 99-100) (with basic video ROMs 95-98)	-	-	-	-	-	x	-	-	-	-	-	-	-	-
VT132 ROMs 236-239 or PROMs 224-227 (with basic video ROMs 180-183)	-	-	-	-	-	x	-	x	-	-	x	-	-	x
VT125	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 7-3 Advanced Video Option (AVO) Board ROMs

Board Used In	ROMs Used			
	ROM A	ROM B	ROM C	ROM D
VT100	-	-	-	-
VT100-WA-WB	23-069E2	-	-	-
VT100-WC-WK	23-152E2	-	-	-
VT100/VT1XX-AC	23-284E2	23-185E2	-	-
	or			
	23-186E2	23-187E2	-	-
VT105	-	-	-	-
VT132	23-099E2	23-100E2	-	-
	or			
	23-236E2	23-237E2	23-238E2	23-239E2
	or			
	23-224E2	23-225E2	23-226E2	23-227E2
VT125	-	-	-	-

Table 7-4 Advanced Video Option Switches

Board Used	Switches Closed															
	S1								S2							
	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
VT100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VT100-WA-WB	x	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-
VT100-WC-WK	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
VT100/VT1XX-AC	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
VT132 ROMs 99-100 (with basic video ROMs 95-98)	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
VT132 ROMs 236-239 or PROMs 224-227 (with basic video ROMs 180-183)	-	-	-	-	-	x	-	x	-	-	-	-	-	-	-	x
VT125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

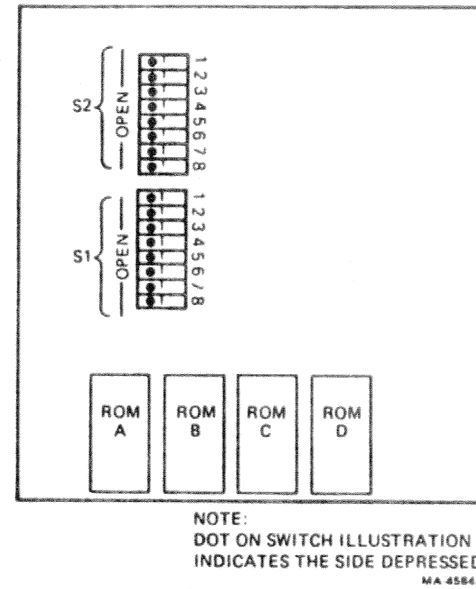


Figure 7-3 Advanced Video Option Board with Switches

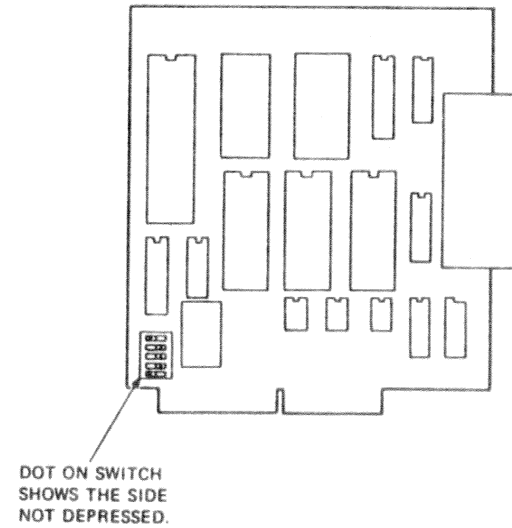


Figure 7-4 VT1XX-AC Printer Port Option Board

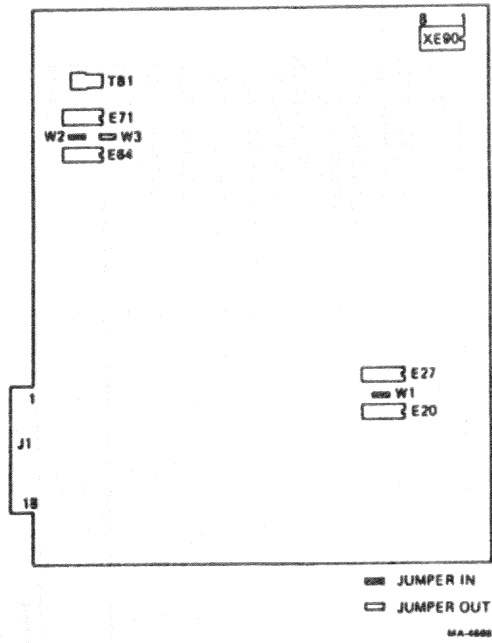


Figure 7-5 VT105 Waveform Generator Board

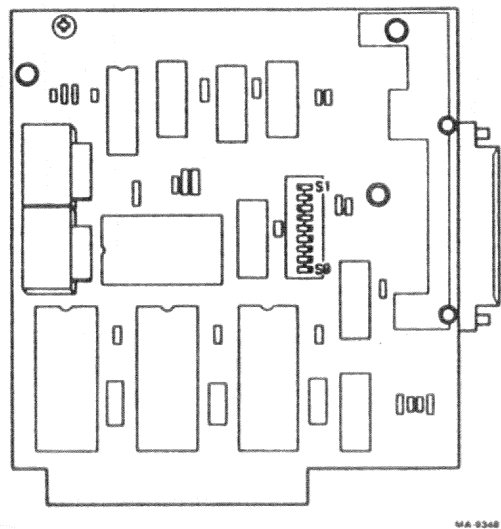


Figure 7-6 VT125 STP Board

APPENDIX A

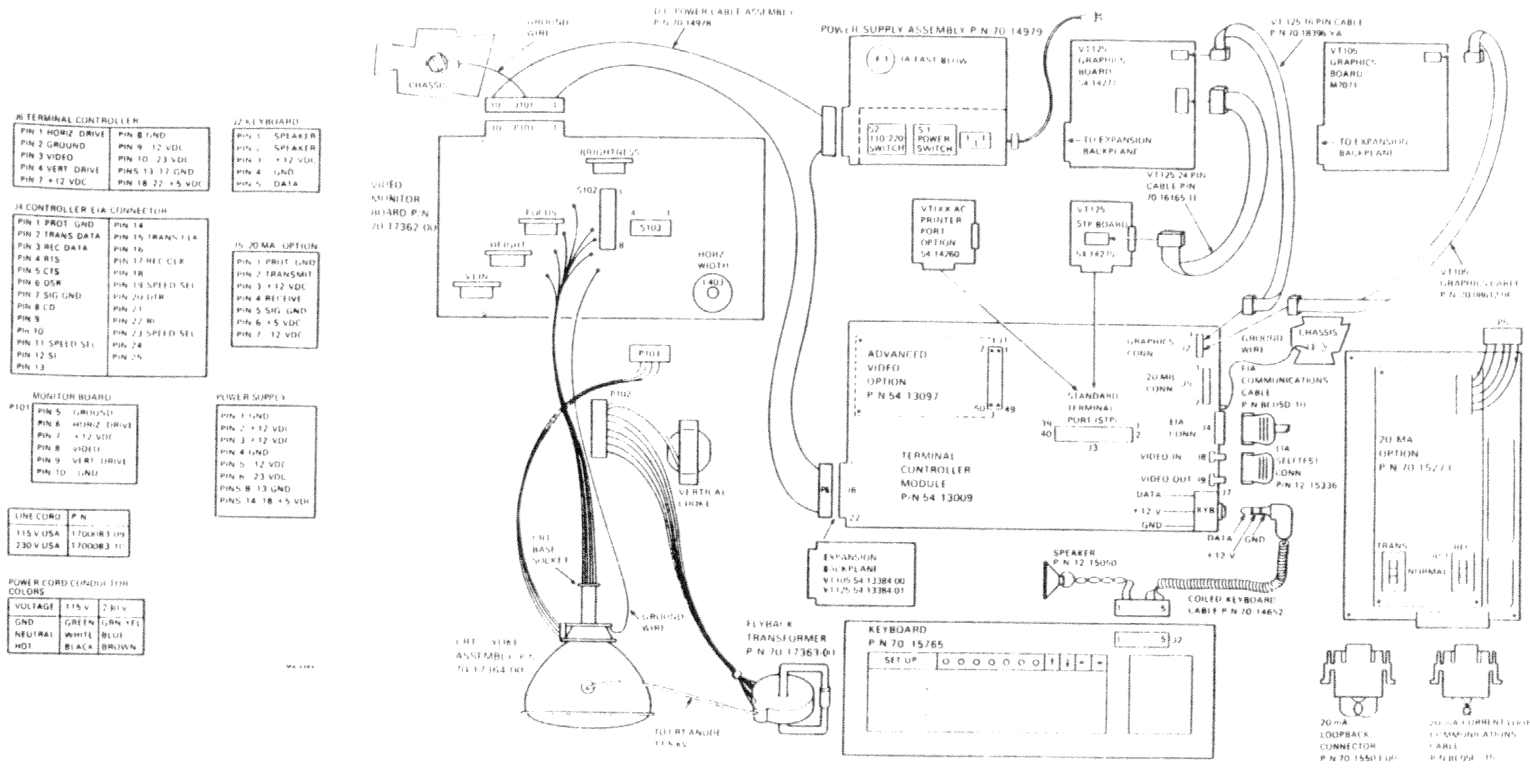


Figure A-1 VT100 Physical Functional Block Diagram

