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CALLAN DATA SYSTEMS

UNISTAR 100TM

Intelligent Video Terminal

USERS' MANUAL

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CHAPTER 1 OVERVIEW

1.1 PRODUCT DESCRIPTION

The UNISTAR 100 Workstation provides the basis for the compactly packaged Callan Data System 68000 based, 32 bit mirco computer system.The Workstation package consists of a CRT controller and display, a detachable keyboard, a front panel control unit, a Multibus (IEEE 796) cardcage, a switching power supply and two fans.

The standard front panel console consists of 8 programmable LEDs, reset and interrupt switches. The intelligent terminal section off-loads the main CPU sections from a multitude of compute bound functions; this allows many common functions to be implemented conveniently and when implemented, are performed efficiently. The terminal section of this Workstation is compatible with VT100 terminal software drivers. It provides many useful functions including a smooth scroll capability which operates in both forward and reverse directions, a comprehensive set of cursor controls with both reading and writing the cursor, line and screen erasure commands, invisible character attributes and the capability to use up to five distinct character sets. Furthermore, a number of terminal extensions are available which enhance the usefulness of the system. These include a dual screen feature with separate scrolling regions within each screen and a comprehensive line and screen editing capability.

Note: In this manual, the terms Workstation, station and terminal are used interchangeably.

1.2 FEATURES

1.2.1 Display Features

* 12" CRT, non-glare filter and P31 phosphor, 25 lines x 80 characters

* Clear characters on a 9 x 13 dot matrix with 3 dot descenders

* Split screen capability with separate scroll regions within each screen

* A dual mode command processing capability for processing either VT100 or VT52 commands; the mode is selectable either by a hardware switch, a software command or both

* Smooth scrolling capability, in both forward and reverse directions

* Complete cursor control commands

* Read and write cursor commands

* Comprehensive tabulation commands

* Comprehensive line and screen erasure Commands

* Comprehensive line and screen editing commands

* Software control of LEDs on front panel and keyboard

* Software selection of 3 supplied character sets one of which has forms characters which are useful in the construction of forms and graphs; two more character sets are user installable

* Invisible character attributes, to increase intensity, underline, blink, reverse video and overstrike characters

* 95 displayable characters

* Monitor mode to display all 33 control characters

* Local self diagnostic

1.2.2 Indicators and keys

* 16 status lights on the keyboard and front panel; 8 are programmable
* 82 typewriter like keys including 4 cursor control keys, 5 function keys and a 18 key auxiliary keypad
* 3 computer controlled keyboard modes
* Smooth scroll control key
* Break key

1.2.3 Communications Interface

* RS232 CPU Interface
* 15 separate Baud rates from 50 to 9600 Baud
* 7 or 8 data bits
* Parity enable or parity ignore
* Odd or even parity

1.2.4 Internal Controls

* Video Adjustments
* Reverse video intensity
* Bold intensity adjustment

1.2.5 Switch Selectable Features

* AUTOWRAP mode select
* Auto XON/XOFF transmission select
* LNM mode (Linefeed/Newline) select
* Margin bell select
* VT100/VT52 mode select
* Blinking or steady cursor select
* Block or dash cursor select

* Normal or reverse video select

* On Line or Local/Test mode select

1.2.6 External Controls

* Video intensity adjustment

* Video contrast adjustment

* Keyclick enable/disable select

1.3 CONTROLS

The following is a brief description of important Workstation controls and components:

1.3.1 Video Unit

The large screen area of the front of the unit displays 25 lines of 80 characters each.

1.3.2 Rear Access Cover

This large removable cover of the main unit allows easy access to the system modules located in the enclosed cardcage and easy access to a number of video adjustments without exposing the CRT, the video processor and the power supply. The Multibus Bus cards can be operated on extenders with this cover removed. The cover is secured with the two large screws at the rear of the cover.

1.3.3 Keyclick Enable Switch

The Keyclick Enable Switch is a rotary two position switch located at the lower right side of the main housing. There are three switches in this area and the Keyclick Enable Switch is the center one. This switch controls the automatic electronic keyclick feature when a key is depressed. Facing the switch, rotate the switch clockwise to activate this feature.

1.3.4 Video Intensity Control

The video Intensity Control switch is located just forward of the Keyclick Enable Switch. Rotate the control clockwise to increase the brightness of the display.

1.3.5 Video Contrast Control

The video Contrast Control is located just behind the Keyclick Enable Switch. Rotate the control clockwise to increase the contrast of the display. The recommended adjustment is to adjust the intensity to maximum; then adjust contrast to a comfortable setting. A low contrast setting results in a not fully displayed cursor.

1.3.6 Front Panel LEDs

These 8 LED's are located on the front panel. The lights are denoted, from left to right, D7 thru D0. These lights are controlled by the host computer. D7, D6, and D5 are reserved for future use as 68000 CPU board panel displays.

1.3.7 Keyboard Connecting Cable

This cable connects the Keyboard module to the main Workstation unit. This telephone style coiled cable provides easy disconnect at either the keyboard or Workstation and allows flexible keyboard positioning for operator comfort.

1.3.8 Keyboard Module

The keyboard module consists of an LED display and two keyboard modules, a main and an auxiliary keypad. The keyboard features sculptured keys and contoured key rows arranged like an office typewriter, permitting convenient operator use. The keyboard layout is identical to the DEC VT00 keyboard layout.

1.3.9 The Main Keyboard

The main keypad is organized like a conventional typewriter and consists of the majority of alphanumeric keys, the control keys, the space bar, the scroll control key, the PF0 function key, the break key and the the cursor control keys.

1.3.10 The Auxiliary Keypad

The auxiliary keypad is an 18 key keypad located to the right of and on the main keypad. This keypad is often used for high speed data input. The keyboard contains a comma, a minus, a period, an ENTER, four function and 10 numeric keys.

1.3.11 LED Keyboard Display

The keyboard LED display is located on the keyboard over the numeric keys. The display is used to indicate a number of Workstation states which are independent of the application program and to indicate programmable system states which are dependent on the application program. The On Line, Local, Keybd Locked and Scroll Disable lights represent independent terminal states; L1 through L4 represent programmable dependent system states.

1.3.12 Video Adjustments

Some of the video adjustments are located on the rear main bulkhead. After removing the rear access cover and facing the rear of the unit, the video adjustments are located on this bulkhead just to the left and above the fan housing. These adjustments are set at the factory and normally should not be changed. However, the user may easily adjust these controls using a screwdriver. The top faint adjustment controls the faint (normal intensity) character intensity. Rotate the control clockwise to increase intensity. The bottom reverse adjustment controls the reverse video intensity. Rotate clockwise to increase reverse video intensity. Refer to the CD100 Maintenance Manual for a description of the remainder of video adjustments.

1.3.13 Switch Selectable Options

The switch Selectable Options are set by two vertical banks of DIP switches located below the video adjustments. Switch bank 1 is the top bank and switch bank 2 is just below this. These switches determine a multitude of hardware selectable options. For initial checkout and operating the diagnostic described in section 1.4, all switches should be in the ON position (to the right when facing the switches). For the majority of software and setup procedures the usual choice is that all switches are placed in the ON (right) position. The exact setting of these switches is critical for the correct operation of the Workstation. Set these switches cautiously with respect to the ON and OFF positions. A switch being in the ON position does not <u>necessarily</u> imply its designated function is enabled. Furthermore, some of these switches determine terminal modes which later may be

altered under host computer control. Refer to section 2.6 for a complete description of these switches.

1.4 INITIAL CHECKOUT PROCEDURE

1. Connect keyboard to main unit via the keyboard connecting cable.

2. Remove the two rear cover mounting screws and remove the cover. Verify or set voltage selector and line frequency to match the line power requirements.

   The voltage and frequency are both selected by the voltage selector switch. The left position is 60HZ/115V and the right position is 50HZ/230V.

   Set the Local/On Line switch to local (OFF) to prepare for running the diagnostic. Be sure all other switches are set to the right (ON) position.

3. Turn the power switch OFF, check to verify that the line cord is properly installed and the plug is connected to the appropriate power source.

4. Turn on the power switch. The station will execute the self-test diagnostic when power is applied to the unit and the Local/On Line switch is set to Local.

   The following sequence of events occurs if the unit is operating satisfactorily:

   a. The local LED on the main keyboard will illuminate, indicating the keyboard unit is receiving power.

   b. After a one second delay, the eight lights on the keyboard and diagnostic lights on the front panel will illuminate. After one half second, all lights will be off (except On Line).

c. Light D01 on front panel will be on, indicating end of Test 1, the CPU test.

d. After one second, light D1 will be on, indicating end of Test 2, the PROM integrity test.

e. After approximately 80 seconds, light D2 will be on, indicating the end of Test 3, the Memory diagnostic.

f. After one second, light D3 will be on, indicating the end of Test 4 and that the Memory to Memory hardware logic is properly functioning.

g. After one second, light D4 will be on, indicating the end of Test 5, indicating the internal clocks are properly functioning.

h. Lastly, the unit will display the character set.

7. Enable Keyclick by rotating the keyclick Enable switch clockwise.

8. Press the return key. A slight audible click will be heard and the cursor will move to position 1, the furthermost left position of the second line.

9. Type 22 linefeeds; the top line will scroll off the screen and what was the second line will move to the top of the screen, and the original bottom line will be blank.

10. Turn off the unit and re-configure for on-line operation. Reset Local/On Line DIP switch to On Line (ON).

CHAPTER 2 OPERATOR INFORMATION

2.1 GENERAL INFORMATION

The UNISTAR 100 Integrated Workstation is a video terminal containing an integrated 68000 microcomputer system, disks and based on Multibus/IEEE 796 system bus architecture. Data generated by the keyboard is asynchronously transmitted via an internal serial connection to the 68000 microcomputer and circuit boards in the cardcage; data generated by these boards and transmitted by the same connection either is displayed on the screen or implements a terminal control operation (such as erase the screen or turn on an LED).

Also, inputs generated by the front panel are directly transmitted to the card cage motherboard, which may be utilized by the computer.

Detailed operation of the terminal is modified by hardware switch settings described in this chapter and by the software commands described in Chapter 3, PROGRAMMERS INFORMATION.

This chapter describes, from the operator's viewpoint, the operation of the various sections of the workstation. The last part of the chapter describes the power up/self diagnostic sequence.

2.2 THE VIDEO SECTION

2.2.1 Displayed Characters

Characters received from the RS232 interface are displayed on the screen. Normally the 95 characters of the primary ASCII character set (20 Hex through 7E Hex) are displayed and the 33 control characters (00 Hex through 1F Hex and 7F Hex) are not displayed. The controls either perform specified functions or are ignored. However, if the terminal is in the software settable monitor Mode, the special graphics associated with these codes are displayed and the usual control action is ignored.

The host computer under software control may select 3 character sets which are resident in the primary ROM supplied with the Workstation. These sets are the US ASCII, the UK and the Special

Graphics set. Furthermore, if the alternate character ROM has been installed by the user, the host computer may specify two additional character sets. These sets are the called the Alternate character set and the Alternate Special Graphics character set. The actual character font or the special graphics in the alternate ROM, are completely user defined.

2.2.2 Partitions

The terminal's video controller displays 25 lines of 80 characters each. The terminal supports a split-screen capability. whereby these 25 lines are considered to be divided into two groups called partitions. One partition may contain p complete lines (where p must be greater than or equal to zero but less than or equal to 25); therefore, the other partition contains 25-p lines. A partition is defined and selected by software command. On power up, the screen is separated so that the top partition contains the customary 24 lines and the bottom partition contains 1 line.

2.2.3 Scroll Area

Under software control, the partition itself may be divided into two regions: a scroll region nested within the partition, and a fixed line region, part of which is above and part of which is below the scroll region.

Display or control operations may or may not be restricted to the scroll region. However, the scroll process is always restricted within this region.

2.2.4 Attributes

Under software control, the terminal assigns a number of attributes or renditions to displayable characters. Examples of these attributes are bold (increased intensity), blinking and underlined characters. Also, attributes may be combined to form compound attributes such as blinking underlined characters.

2.2.5 Modes

The behavior of the terminal is affected by a number of modes. Some of these modes are initialized by the rear panel switch settings described in this chapter, and others are set by software commands from the host to the terminal. Others are affected by both the switch setting and software commands. Any mode which may be set by either a switch setting or by a software command is first initialized according to the switch setting on power up, a terminal reset command or any change whatsoever in any switch settings. After the mode is set, it may be changed by a software command from the host. Thus, a mode indicated by a rear panel setting does not necessarily reflect the current terminal mode. Modes which are affected only by the rear panel switches are Auto XON/XOFF and Margin bell. Modes which are affected by software commands only are Insert/Replace, Vertical Editing, Cursor Key, Origin, Monitor and Special Erasure. Modes which are affected by both the rear panel switches and software commands are Linefeed/New Line, ANSI/VT52 and Autowrap.

2.3 FRONT PANEL LED

The Front Panel LED section consists of the Run light and LED's D7 through D0. LED's D7, D6, and D5 are reserved for future use by Callan Data Systems as 68000 CPU board status indicator. The remaining LED's D4-D0 are used by the terminal controller during LOCAL mode self test and are available in ON-LINE as programmable displays through the terminal controller.

2.4 THE KEYBOARD MODULE

2.4.1 Keypad LED Display

Eight LED's are on the keyboard. Four, L1 through L4 are software controllable, whereas the remaining four represent states of the terminal. These four LED's are described in the following sections.

Online LED

The On Line light indicates that the station is set by the rear panel Local/On Line switch to the On Line position. In this mode, the usual mode, characters and controls typed on the keyboard are transmitted to the host computer via the RS232 connection. When this light is on, the Local light is off.

Local LED

The Local light indicates that the station is in the Local/test mode as set by the rear panel Local/On Line switch. In this mode, characters and controls generated at the keyboard are "looped back" and are received as an input from the RS232 interface. This mode is useful for diagnostic purposes. In fact when in this mode, and power is first turned on or a terminal reset is executed, the terminal initiates the self-test diagnostic. When this light is on, the On Line light is off.

Keybd Locked LED

The Keyboard Locked LED, usually indicates that the host computer has deactivated the keyboard. The host computer locks the keyboard by transmitting the XOFF control character to the terminal. Until the keyboard is unlocked by a transmission of an XON, struck keys will be ignored. Another reason why this light is on is if the terminal is in the Local mode and the rear panel Auto XON/XOFF is enabled (switch 1-7 ON) and the operator strikes control S to stop scrolling, the terminal will send an XOFF character. But this character is echoed by the terminal controller which in turns locks the keyboard. In this case, type control Q to unlock the keyboard.

Scroll Disabled LED

The Scroll Disabled light indicates that the terminal is not processing input characters and controls and therefore, scrolling cannot occur. This condition occurs when the XON/XOFF feature is enabled (switch 1-7 ON) and control S has been entered at the keyboard to suspend scrolling. To exit this condition to permit scrolling, the user must type control Q, whereby the light will go off.

Lights L1 through L4

These lights are controlled by software commands from the host computer.

2.4.2 Main and Auxiliary Keypads

The main keypad contains control and alphanumeric keys which are arranged like a standard office typewriter. The keypad also contains one of the 5 function keys, 4 cursor control keys and the break key. The auxiliary keypad contains the 4 other function keys, the numbers and the characters and controls often used for high speed operator input.

The keys, when struck individually or in combination with the shift and control keys, produce codes which are transmitted to the host computer. All 128 ASCII codes may be generated. (Refer to Appendices B, C and D for the code sequences produced).

Under software control, the keyboard may be placed into a number of alternate modes. If the terminal is in the ANSI/VT100 mode, under software control, the keyboard may be placed into either of two modes, the Numeric or the Keypad Application mode. The default or power up mode is called the Numeric mode. In this mode, on the auxiliary keypad the 10 numerals, the minus, the period, the comma, and the ENTER keys send the same ASCII codes as the corresponding keys on the main keypad. In the alternate keypad mode (the Keypad Application mode) the 10 numerals, the minus, the period,the comma and the ENTER keys send different sequences than in the Numeric mode.

Also, while the unit is in the ANSI/VT100 mode, the 4 cursor control keys are affected by the state of Cursor Key mode. The default or power up state is called Cursor Key mode reset. When in this state, the cursor control keys generate the code sequences which, if echoed by the host computer, will implement the indicated cursor control functions. If Cursor Key mode is set (by software command), the four cursor control keys transmit different code sequences which when echoed do not result in the indicated cursor movements.

If the terminal is in the VT52 mode, the keyboard may also be placed in either the Numeric or the Application modes and the comments decribing the differences between modes is as described above, although the actual code sequences generated are

different (refer to Appendix C). But in the VT52 mode, the cursor keys do not have an alternate mode.

The advantage of the keyboard having alternate modes is that in many applications it is useful for the application program to differentiate between the same captioned keys on the main auxiliary keypads. Refer to Appendices B, C and D for a description of the code sequences generated by the various keypad modes.

The keyboard has an auto repeat feature. This allows a key to be automatically repeated at the rate of approximately 20 characters per second when the key is held down for more than one half a second. The auto repeat feature affects all keys except the following: PF0, ESC, SLOW SCROLL, TAB, RETURN and CNTRL (with any other key). The ENTER key on the auxiliary keyboard has the auto repeat attribute.

Standard Alphanumeric Keys

On the main keypad, the non-control keys generate codes dependent on the combination, if any, of the CAPS LOCK, SHIFT, and CNTRL keys, which may be depressed simultaneously. However, the auxiliary keypad, the PF0, the four cursor control keys, the BREAK key and the Scroll control key are not affected by these three control keys.

BREAK KEY

Typing the BREAK key causes the transmission line to forced to its zero state for 0.2333 seconds plus or minus 10 percent.

BACKSPACE

Depression of this key will transmit the ASCII code for the backspace (08H) to the host computer.

CAPS LOCK

The CAPS LOCK Key is a toggle action key. When the CAPS LOCK function is enabled, the LED on the key is illuminated and the terminal transmits upper case alphabetic characters regardless of the state of the SHIFT key. To disable this function, press the key again, whereby the LED will go off and the terminal will transmit the codes as adjusted by the SHIFT key.

CURSOR CONTROL KEYS

The four cursor control keys are used to control the position of the cursor. In the ANSI/VT100 mode with the Cursor Key mode reset or in the VT52 mode, these keys transmit the correct code sequence which if echoed by the host, will enable the terminal to perform the indicated cursor movements.

The up arrow key moves the cursor up one row, unless the cursor is already at the top of the scrolling region or at the top of the currently selected partition. The down arrow moves the cursor down one row, unless the cursor is already at the bottom of the scrolling region or at the bottom of the selected partition. The left arrow moves the cursor left one character position unless at the left margin. And the right arrow move the cursor right one character position unless at the right margin.

If the terminal is in the ANSI/VT100 mode and the Cursor Key mode is set, the code sequences generated by the cursor keys will be ignored by the terminal if echoed by the host computer.

CNTRL

This key is used in conjunction with an alphanumeric key to generate an ASCII control code. (Refer to Appendix B for the specific codes generated.)

DELETE

Depression of this key transmits the delete character code (7FH) to the host computer.

ENTER

In either the ANSI or VT52 modes and in Numeric mode, the ENTER key produces the identical codes as return key on the main keypad. These keys generate the ASCII carriage return code (0DH). In the Keypad Application mode, the ENTER key generates a specific code sequence for ANSI or VT52 modes. The code sequences generated are listed in Appendix C and D.

ESC

This key trnsmits the ASCII escape character code (1BH),

FUNCTION KEYS (PF0 through PF4)

The five function keys, PF0 on the main keypad and PF1 through PF4 on the auxiliary keypad, transmit special code sequences, which are described in Appendices B and C. The sequences generated are not affected by the VT100 or VT52 mode choice or by Numeric or Keypad Application mode choice. Also, if the terminal is in the ANSI mode, only the last character of the code sequence generated by these keys will be displayed at the terminal if the host computer echoes the sequences. No other action occurs, however. If the terminal is in the VT52 mode, the code sequences generated by these keys are completely ignored if echoed by the host computer.

LINEFEED

This key transmits the ASCII linefeed code (0AH).

RETURN

This key transmits the ASCII carriage return code (0DH).

SHIFT

The shift key is used in conjunction with other keys to generate specific codes. Usually the shift used with an alphabetic key produces codes for upper case characters. (Refer to Appendix B for the specific codes generated.)

SLOW SCROLL

This key does not transmit a code to the host computer but rather controls the smooth scroll feature. Smooth scroll is enabled and disabled by successive depressions of this key.

Scrolling is the process whereby all lines of the scrolling region are either shifted up or down one row, depending upon the direction of the scroll, to make room for a new line of incoming data. For forward scroll, the scroll region is shifted up, the original top line is lost and the bottom line is erased. The new incoming data is displayed at the bottom of the scroll region. For reverse scroll, the scroll region is shifted down,

the original bottom line is lost and the top line is erased. The new incoming data is displayed at the top of the scrolling region. When the smooth scroll feature is disabled, the scrolling process appears to occur instantly and discontinuously. When the feature is enabled the scrolling process occurs relatively slowly and continuously.

As long as sufficient data is available, the smooth scroll rate is maintained at 4.6 and 3.9 lines per second at 60 and 50 HZ operation, respectively. The effect is as if the data is on a continuously and steadily moving scroll behind the partition.

Control of the incoming data rate, which could be greater than the smooth scroll rate, is accomplished by two mechanisms. The first, activated by the rear panel XON/XOFF switch, is the process of having the terminal automatically transfer an XOFF (DC3) when the terminal's input buffer is fairly full. The host's software must be designed to stop transmitting until the terminal automatically sends an XON (DC1), which is done when the input buffer is almost empty. The second mechanism, independent of the XON/XOFF switch, is when the buffer is very full, Request To Send (RTS) of the RS232 terminal is deactivated. Then when the buffer is fairly empty, Request To Send is reactivated. Thus, the host computer's RS232 interface, in the many cases which use these signals, automatically limits its own transmission rate.

If the terminal is in the smooth scroll mode and the operator types either XOFF (Control S) or XON (Control Q), the terminal does not necessarily transmit these codes. Under these circumstances, XOFF and XON are used by the terminal to suspend and resume, respectively the scrolling process. Of course, if XOFF is used to suspend the scrolling process, the terminal subsequently transmits an XOFF when the input buffer has been sufficiently filled. Likewise, an XON subsequently is sent to the host when the terminal's input buffer is sufficiently empty.

Occasionally, the terminal will be taken out of slow scroll mode without a depression of the smooth scroll key. This will occur if the host computer selects the alternate partition which may contain a scrolling region with less than 2 lines, the minimum necessary for smooth scrolling. When this happens, the terminal is automatically removed from the smooth scroll mode. Now if the

host computer reselects the original partition, it will remain in the non smooth scroll mode.

One last use of the smooth scroll key is to remove the terminal from Monitor mode. If the host computer places the terminal into Monitor mode, then the only way for the terminal to be removed from this mode is by the operator depressing the smooth scroll control key.

TAB KEY

The TAB key transmits the ASCII code for Tab. If the host computer echoes this code, the cursor advances to the next set tab position. If no tabs are set to the right of the current active position, the cursor advances to the last character position. Tabs are set and reset under computer control. On power up or reset, tabs are set at every eighth character position beginning with the ninth character position.

2.5 THUMB WHEEL ADJUSTMENTS

Three user adjustments are located on the right underside of the unit:

2.5.1 Video Intensity

This adjustment sets the overall screen intensity. It is operated in conjunction with the video contrast adjustment described in section 2.7.First, adjust video intensity to its maximum. Then adjust the contrast until the characters appear clear. Then readjust the video intensity to a comfortable operational level. Contrast can then also be fine-tuned as required.

Rotate the thumbwheel clockwise to increase display intensity and rotate counterclockwise to decrease intensity.

2.5.2 Keyclick Enable

Keyclick provides an acoustic feedback when a key, other than control, is depressed. Rotate the switch clockwise to enable keyclick; rotate counterclockwise to disable keyclick.

2.5.3 Video Contrast

This control is used to adjust the background and character intensity. This control is used in conjunction with Video Intensity described in 2.7.

Rotate clockwise to increase contrast, rotate counterclockwise to decrease contrast.

2.6 REAR PANEL DIP SWITCH SETTINGS

Access to the two banks of eight switches is gained by removing the outer case. These switches modify the terminal's behavior. When facing the rear of the unit, the ON position is to the right and the OFF is to the left. Note that if a switch is in the ON position it does not <u>necessarily</u> imply that the associated function is enabled. The following page describes the various switch options.

SW1 - UPPER SWITCH BANK

SWITCH NUMBER	SWITCH NAME	OFF POSITION (LEFT)	ON POSITION (RIGHT)
1-8	Autowrap	Autowrap Enabled	Autowrap Disabled
		Enabled	Disabled
1-7	XON/XOFF	Disabled	Enabaled
1-6	New line mode	Enabled	Disabled
1-5	Margin Bell	Enabled	Disabled
1-4	ANSI/VT52 mode	VT52 mode	ANSI mode
1-3	Cursor Blink	Steady Cursor	Blinking Cursor
1-2	Cursor type	Dash Cursor	Block Cursor
1-1	Screen mode	Reverse Video	Normal Video

SW2 - LOWER SWITCH BANK

2-8	Local/Online	Local/Test mode	Online
2-7	Data length	7 data bits	8 data bits
2-6	Parity	Even parity	Odd parity
2-5	parity	Process parity	Ignore parity
2-4	Baud rate select code		
2-3	"		
2-2	"		
2-1	"		

BAUD RATE SELECT CODE (N=ON; F=OFF)

4 3 2 1 SW2		
N N N N	9600 BAUD	
N N N F	7200	
N N N F	4800	
N N F F	3600	
N F N N	2400	
N F N F	2000	
N F F N	1800	
N F F F	1200	
F N N N	600	
F N N F	300	
F N F N	150	
F N F F	134.5	
F F N N	110	(2 stop bits)
F F N F	75	(2 stop bits)
F F F N	50	(2 stop bits)

Figure 2-1
Rear Panel DIP Switch Settings

2.6.1 Autowrap

The Autowrap feature defines the cursor movement when the cursor is at the last character position of a line. The last character position is defined as column 80 for single width type lines and column 79 for double width type lines. If the previous character was placed on the screen at any other than the last character position and then the cursor advances to this last position and then a displayable character is received, then cursor remains at this position. But, subsequently, if a character without an intervening cursor move, then the controller executes an automatic carriage return linefeed and the character is displayed at column 1 of the next line. Also, the cursor advances to column 2. The autowrap feature is specified by switch 1-8 in the off position. However, as previously described, the Autowrap feature may be enabled and disabled under software control.

2.6.2 XON/XOFF

The XON/XOFF feature provides a technique for coordinating the incoming data rate with the scroll rate of the display during smooth scroll mode. Because the smooth scroll rate of 4.6 lines/second (@60HZ) may require a slower character rate than the incoming character rate, the terminal regulates the host computer's data rate by transmitting the XON/XOFF control characters.

When the XON/XOFF feature is enabled (switch 1-7 ON) and the input buffer is almost full, the terminal transmits the XOFF control character (DC3). Later, when a number of scrolls have occurred and the buffer is almost empty, the terminal transmits the XON control character (DC1). Incidentally, the terminal automatically resorts to another technique to regulate the data rate independent of the XON/XOFF feature.Again, if the internal buffer gets very full the video terminal deactivates its Request To (RTS) RS232 status signal. If the receiving hardware responds to these signals, it may suspend transmission to the terminal until the terminal reactivates Request To Send (RTS) which is done when the input buffer is about one half full.

2.6.3 New Line Mode

If New Line Mode is enabled (switch 1-6 ON), then the terminal controller follows the carriage return character with a line feed on transmission and follows the linefeed character with a carriage return on reception. If New Line Mode is not enabled, the carriage return or the linefeed are not followed by any character in either case. New Line Mode is initialized according the rear panel Dip switch every time the controller in powered-up or anytime any rear panel switch is changed. New Line Mode may be set or reset under host computer command thus altering the mode indicated by the rear panel switch.

2.6.4 Margin Bell

The Margin Bell feature sounds an alarm whenever the cursor is moved to character position 72 on the screen and a character is received to be displayed at that position. Margin Bell is disabled if switch 1-5 is ON and is enabled if OFF.

2.6.5 VT52/VT100 Mode

The terminal controller functions in either of two major modes: VT52 mode or ANSI/VT100 mode.

The OFF position (switch 1-4 OFF) corresponds to the VT52 mode. In this mode the terminal will respond to 18 commands from the host computer; all of which, except one, are designated by simple two character escape sequences. The exception is the direct cursor positioning command requires a four character sequence. The Auxiliary keypad can exists in two modes, the keypad numeric mode or the keypad application mode. Also, this mode includes contains a number of editing commands such as delete line and insert line.

The ON position corresponds to the ANSI/VT100 mode. In this mode an extensive array of commands are available to control the terminal. Also, the keyboard may function in a variety of modes. The auxiliary keypad may exist in two modes as described above. Additionally, the cursor keys function in either of two modes. Communication with the terminal is in multi-character Ascii character sequences according to the protocol outlined in the ANSI standard X3.64. The host computer may change the initial mode setting so that the mode indicated by the rear panel switch

does not necessarily reflect the actual current terminal mode.

2.6.6 Cursor type

The cursor type is controlled by switch 2-3. In the ON position, the controller uses a blinking cursor; in the OFF position the cursor does not blink.

2.6.7 Cursor Shape

If this switch (1-2) is in the ON position, the terminal generates a reverse video block cursor; if the switch is in the OFF position, the terminal generates a dash cursor.

2.6.8 Reverse Video

If this switch (1-1) is in the ON position, character representation is light characters on a dark block matrix; if the switch is in the OFF position, character representation is dark characters on a light block background.

2.6.9 Local/Online

This switch (2-8) determines if the keyboard communicates with the external host computer or internally with the terminal itself. In the Online mode (switch 2-8 ON), data generated by the keyboard action is transmitted through the RS232 connection to the host computer. The transmission itself will in no way change the status or display of the workstation. Only when a receiving CPU processes the data and transmits the data back to the station is the state of the station altered. If the switch is in the Local/Test mode (switch 2-8 OFF), the characters generated by the keyboard are processed as if they were received directly from a host computer.

Also, if the switch is in the Local mode when power is turned on, the terminal initiates the self-test program. Refer to section 1.4 for a description of the diagnostic.

2.6.10 Data Length

If this switch (2-7) is in the ON position, the terminal transmits 8 data bits and expects to receive 8 data bits over the communication line. If the switch is in the OFF position, the communication uses 7 data bits. The data bits are exclusive of the start, stop or parity bits.

2.6.11 Parity

If parity is enabled (described in the next section), and the Parity switch (2-6) is ON, odd parity is generated for transmission over the RS232 communication line and odd parity is verified on received data. If the switch is OFF, even parity is generated and verified.

2.6.12 Parity Enable

If this switch (2-5) is in the ON position, parity is neither generated on transmission nor checked on reception over the communication line. If the switch is in the OFF position, parity is generated on transmission and is checked on reception. The sense of the parity is according to that outlined in the previous section.

When a parity, end of frame or data overrun error is detected during reception, the ASCII graphic for a delete, the checkerboard, is displayed.

2.6.13 Baud Rate Select

The Baud rate is determined by switches 4 thru 1 on the lower switch bank. Refer to Figure 2.1 for the switch settings. If the selected baud rate is strictly greater than 110 Baud, then 1 stop bit is generated by the terminal for transmission, and the hardware checks for 1 stop bit on reception. If the Baud rate is less than or equal to 110 Baud, then 2 stop bits are generated and checked.

2.7 REAR VIDEO ADJUSTMENTS

Two attribute intensity adjustments are located on the rear panel for Faint and Reverse Video character fields. Both are set at the factory and should not normally require readjustment.

2.7.1 Faint

The normal intensity characters are called faint and are at a lower intensity than bold (highlighted) characters. The choice of character intensity is selected by the host computer under software control. The Faint (normal intensity) adjustment is rotated clockwise to increase the intensity of normal intensity characters.

2.7.2 Reverse Video

This adjustment is rotated clockwise to increase the intensity of reverse video characters.

2.8 INSTALLATION OF ALTERNATE ROM

Two additional character sets can be implemented via the installation of a custom programmed 2716 EPROM. These alternate character sets are selectable under computer command. Refer to the UNISTAR System Manual for the appropriate installation procedures.

2.9 POWER UP AND DIAGNOSTIC SEQUENCE

When power is first applied to the unit, an approximate 2 second delay occurs after which one of two sequences occur: If the rear panel Local/On Line switch is in the Online position, the alarm is sounded, the screen is erased, the cursor is placed in the home position and the terminal is ready to communicate via the RS232 line.

If the switch is in the Local/Test position, the diagnostic is initiated. This diagnostic is briefly described in Chapter 1. If the test pattern is not displayed on the screen, then the front panel light indicates the last successful test.

CHAPTER 2 OPERATOR INFORMATION

CHAPTER 3 PROGRAMMERS INFORMATION

3.1 GENERAL INFORMATION

This chapter concentrates on those aspects of the workstation that are controlled by the host computer. Communication with the terminal and LED display sections of the workstation is done via an RS232 connection using asynchronous 7 bit code sequences.

Using intelligence in the terminal section the host computer can display, organize and manipulate characters on the screen; control and read the cursor; control the LED'S on the keyboard or on the front panel; and, can modify the code sequences generated by the keyboard.

The programmer should be aware that a computer installed in the card cage may receive various hardware signals from the front panel.

3.1.1 VT100/VT52 Mode Operation

The terminal controller functions in either of two major modes: VT52 or VT100 mode. The mode is reinitialized according to the rear panel DIP switch on power up or at any time this switch is changed. The OFF position corresponds to the VT52 mode and the ON position corresponds to the VT100 mode. At any time after the mode is set by a switch setting, the mode may be changed under command control by the host processor.

In the VT52 mode, the terminal responds to a limited instruction set. All instructions except one are specified by simple two character escape sequences. The VT52 direct cursor positioning command is the exception. The majority of the terminal's capabilities are evoked when the terminal is in the VT100 mode. In this mode, the terminal responds to an extensive array of commands. The communication protocol used corresponds to the ANSI X3.64 standard.

Later, the software mechanisms for switching to and from the VT52 and VT100 modes are described. Thus, even though many capabilities of the terminal are only available in the VT100 mode, they are readily available in the VT52 mode by temporarily switching the terminal under software

control into the VT100 mode, setting the appropriate state or executing the appropriate command, and then switching back to the VT52 mode. In this manual, the modes VT100 and ANSI are used interchangeably.

3.1.2 Partitions

Physically the screen displays 25 lines of 80 characters each. From the software point of view, however, the screen is divided into two logical screens called partitions. The top partition, partition 0, may contain p lines and the bottom partition, partition 1, contains 25-p lines.

A partition may contain 0 lines; but if smooth scroll is to occur in the partition it must contain at least 2 lines. When the terminal is initialized either on power up or execution of the RIS command, the screen is partitioned with partition 0 having 24 lines and partition 1 having 1 line. This organization is convenient for the operation of most existing software. The partition may be changed by the PSR command and a specific partition is selected by the SSPR command.

3.1.3 Scroll Area

Each partition may further be divided into a scroll region embedded within the partition and a fixed line area having some of its lines above and some below the scroll region. The scroll area is defined by the SSCRL, Set Scroll Area, command.

Usually, the transfer of characters and the cursor control commands are restricted to within the selected scroll region. For instance, if the cursor is at the last line of the scrolling region and a linefeed character is received, the lines within the region scroll up one line. Also, if the cursor is at the top line of the scrolling region and the reverse line feed command is received, then the lines within the region scroll down one line. As far as the cursor movement commands are concerned, when the cursor is within the scroll region, a cursor up or a cursor down command never moves the cursor past the scroll boundaries. But certain commands are dependent on the state of ORIGIN mode. For instance, if ORIGIN mode is reset, the absolute cursor position command, CUP, or the cursor position report, CPR, is with respect to the partition origin and not

the scroll region origin. If ORIGIN mode is set, then these commands use coordinates with respect to the scroll region origin.

3.1.4 Character Processing

Display character processing consists of the received character being entered at the current cursor location, called the active position. The cursor then advances one character position to the right on the current line, called the active line. A character position requires one physical screen position for normal width lines and two physical screen positions for double width lines. Refer the to section on double height/width lines in this chapter for a discussion of this point. The cursor movement, when at the last character position, depends on the rear panel switch settings and a number of software setable modes described in this chapter.

3.1.5 Alternate Character ROM

An alternate character set is available providing the alternate ROM is installed. The active character set is determined by two mechanisms. First the host software should choose either the G0 or the G1 character set class. The G0 class is initialized at power up or is reselected by the host transmitting the SI control character. The G1 class is selected at any time by the host transmitting the SO control character. Five character sets are available in either the G0 or G1 class:

1. The USASCII set which is defined by the standard character ROM supplied at the factory; this set is listed in Appendix A.
2. The United Kingdom set; this set is identical to the USASCII set described above but replaces the American pound sign with the English pound sign.
3. The Special Graphics set which defines a number of special graphics and form characters; also, this character set is defined in the supplied character ROM.
4. The Alternate Character ROM Standard character set; this character set is defined in the user supplied alternate ROM.
5. The Alternate Character ROM Special Graphics set; this character set is supplied by the user in the alternate character ROM.

The specific set which is active in each class is defined by the SCS, Select Character Set, command. The ASCII set in the G0 class is defined as active at power up or upon execution of the RIS command.

Each of the five character sets in the G0 group is identical to its counterpart in the G1 group.

3.1.6 Graphic Form Characters

As described in the above section, a number of graphic form characters are available as part of the Special Graphics character set. These characters are useful in the construction of forms and charts. Refer to Appendix A for a description of these characters.

3.1.7 Attributes

Using the SGR command, characters may be assigned a number of attributes: characters may blink, be displayed at increased intensity, be displayed in reverse video, can be underlined and be overstruck. Or, any combination of these attrributes may be used simultaneously. Once a rendition is defined, all characters transferred to the partition have this rendition until changed by the SGR command. Thus, the attributes associated with a character are defined when they are transferred to the screen and not, as in some systems, where they are placed. Prime rendition means non-blinking, normal intensity, normal video, not underlined and not overstruck characters. Reverse video means dark characters on a light block matrix unless the reverse video rear panel switch is in the reverse position (whereby reverse video means light characters on a dark block matrix).

3.1.8 Terminal Control

Terminal control is executed by using the 32 control characters of the C0 set, the delete character or by the escape sequences, all of which are discussed in this chapter.

3.1.9 Slow Scroll Considerations

Activation of the slow scroll capability is exercised by use of the slow scroll key on the lower left portion of the keyboard or by the host computer executing a mode reset or set command with the SLWSCRL parameter as described in Chapter 2. However, if the host computer's RS232

connection does not respond to the hardware's Request To Send (RTS) signal then the host's software explicitly must be designed so as to accommodate the smooth scroll feature.

Specifically, the host's RS232 driver must be designed to recognize the XON (DC1) and XOFF (DC3) control characters. When the host receives XOFF it should transmit no more than 8 characters until it receives an XON.

3.1.10 Modes

The behavior of the terminal is affected by a number of modes. Some of these modes are initialized by the rear panel DIP switch settings whenever a power up situation is encountered, the RIS terminal command is executed or any DIP switch is changed. Other modes are set by software commands from the host to the terminal. And others are affected by both the switch setting and software commands. Any mode which may be set by either a switch setting or by a software command is first initialized, as described above, according to the switch setting on power up, a RIS terminal command or any change whatsoever in any rear panel switch settings. After the mode is set, it may be changed by a software command from the host. Thus, a mode indicated by a rear panel setting does not necessarily reflect the actual current terminal mode. Modes which are affected only by the rear panel switches are AUTO XON/XOFF and MARGIN BELL. These modes are described in Chapter 2. Modes which are affected either by software command and the rear panel switches or only by software command are briefly described here and more fully described later in the chapter.

Modes which are affected by both the rear panel DIP switch settings and software control are LNM mode (Linefeed/New Line) which determines the action of the keyboard on the operator striking a carriage return character or the action of the terminal upon receipt of a linefeed character; ANSI mode which determines if the terminal interprets commands according to VT100 or VT52 format; and AUTOWRAP mode which determines the action of the cursor when at the last character position of the line.

The SLWSCRL mode is toggled by the SLOW SCROLL keyboard key or is affected by software command.

Modes which are affected by software command are

IRM (Insert/Replace) which specifys whether a received character is inserted at or replaces the character at the current cursor position; VEM (Vertical Editing Mode) which determines the action of the terminal upon receiving the Insert or Delete line commands; CURKY (Cursor Key) which determines the particular command sequence that the cursor keys send to the host when a keyboard cursor key is struck; ORIGIN (Origin) which determines the origin used for the absolute cursor positioning or cursor reading commands; MONIT (Monitor) which determines the interpretation and display of the control characters received from the host; and, EDIT (Special Erasure Edit) which determines the extent of erasure for the erase commands.

3.1.11 Keyboard Modes

The keyboard may be placed in a number of modes. If the terminal is operating in the VT100 mode, the cursor keys may send one of two sequences. If CURKY mode is reset, then the cursor keys generate the code sequences which, if echoed by the host computer, affects the indicated cursor movements. If CURKY is set, then the cursor keys send different code sequences and the terminal does not implement the indicated cursor movements if the code sequences are echoed by the host computer. CURKY mode is set or reset by the SM and RM commands.

Additionally but independently of CURKY mode is the mode of the auxiliary keypad. The default state of this keypad is called the Numeric mode. In this mode, the keypad sends the natural codes which are indicated on the keypad key captions. In the alternate mode, the Keypad Application mode, the keys on the auxiliary keypad generate different sequences than their counterparts on the main keyboard. It may be useful in many programs to differentiate between the same captioned key on the main and auxiliary keypads. The Numeric or Keypad Application modes are specified by the Keynum or Keyapp commands, respectively.

If the terminal is operating in the VT52 mode the cursor keys operate only in one mode but the main and auxiliary keypads may operate in either of two modes as described above (although the code sequences generated in VT00 and VT52 modes for the various cases are different).

These keyboard modes are described by the VEXTA, Enter Keypad Numeric Mode and VENT, Enter Keypad Application mode commands.

3.1.12 Double Height/Width Lines

A line may be specified to be double width, top half of a double height/double width or bottom half of a double height/double width line. A single character sent to the terminal when the cursor is on an active double width line requires two physical character positions. The first position is occupied by the character and the second position is occupied by a blank. If a single character is sent to the terminal when the cursor is on an active top half of a double height/double width line, the character representation is the same as a double width line only. However, if the character is sent when the cursor is on an active bottom half of a double height/double width line, the first physical character is always the dash character and the second physical character is the blank character. Thus in this case, regardless of what character is sent to the terminal, the dash-blank sequence is always displayed. For cursor movement commands a move of N characters to the right or left of any line which is defined as double width (or double height/double width) moves the cursor 2N physical character positions on the screen. But any vertical movement of the cursor is always exactly as specified in the command. Thus a vertical movement of N lines always moves, if possible, the cursor N lines regardless of the height attributes of any intervening lines.

3.1.13 LED Control

Using the LED command, the computer can control 9 LEDS. These are the four rightmost LED'S (L1 through L4) on the keyboard and the 7 LED'S (D4 through D0) on the front panel. This command is completely described in the LED command description.

3.1.14 Power Up Sequence

The power up sequence is described in the RIS command section.

3.2 CONTROL CHARACTER PROCESSING

The following paragraphs describe the C0 set control characters and their processing. The control characters not listed are ignored. Control character processing may be imbedded within control sequence processing. For instance if a linefeed character is imbedded within a sequence to move the cursor, the cursor sequence will be interrupted to execute the linefeed before the cursor movement command concludes. Refer to Appendix F for the hexidecimal values of each of the control characters.

CHARACTER	ASCII	ACTION
Bell	BEL	Sounds the alarm at the terminal; no other action.
Backspace	BS	Moves the cursor left one position, if possible.
Horizontal Tab	HT	Moves the cursor to the tab next defined tab position. Tabs are set by the HTS command and are cleared by the TBC command. A total of 16 possible tabs may be set. If the cursor is at the last tab position, receipt of a tab will move the cursor to column 80 for single width characters or 79 for double width characters.
Linefeed	LF	Moves the cursor down one line if possible. If the cursor is at the last line of the region, the scroll region will scroll up one line. If the cursor is past the last line of the scroll region but not at the last line of the partition, the cursor will move down one line. And lastly, if the cursor is past the scroll region and at the bottom line of the partition, the cursor remains at the current line. In each of the above cases, if LNM mode is set, the terminal automatically executes a carriage return.

Table 3-1
Control Character Processing

Vertical Tab	VT	The vertical tab functions exactly like the linefeed character.
Form Feed	FF	The Form feed functions exactly line the linefeed character.
Carriage Return	CR	Moves the cursor to column 1. Note that in LNM mode, if the CR was generated by the terminal's keyboard, the terminal follows the CR with a LF character.
Shift In	SI	This character activates the currently selected G0 character set. This character is used in conjunction with the SO control code, defined below, to conveniently shift back and forth between the G0 and G1 character sets. Refer to the SCS, Select Character Set, command for the procedure to select a specific character set within either the G0 or G1 domain.
Shift out	SO	As described above, This control character selects the currently selected G1 character set.
XON	DC1	On receipt of this character, the terminal resets KAM mode. In this mode, the keyboard is unlocked and responds to all character depressions. Also, the Keybd Locked LED is off. The keyboard is locked upon the terminal's reception of the XOFF control character described below.

Table 3-1
Control Character Processing
(Continued)

XOFF	DC3	On receipt of this character, the terminal sets KAM mode. In this mode, the terminal keyboard is locked and the Keybd Locked LED is on. If the keyboard is locked, the keyboard responds only to the smooth scroll control key. The keyboard is unlocked on receipt of the XON control character described above.
Cancel	CAN	This control character cancels any partially received escape sequence and displays the delete character block.
Sub	SUB	This control character is interpreted as a CAN.
Delete	DEL	This character cancels any incomplete escape sequences. The delete character block is not displayed. Otherwise, the character is ignored.
Escape	ESC	This character announces the initiation of an escape sequence.

Table 3-1
Control Character Processing
(Continued)

3.3 ESCAPE SEQUENCE OVERVIEW

This section describes the format and structure of escape sequences. Terminal control operations other than those specified by control codes are implemented using escape sequences. The actual control functions for VT100/ANSI mode are described in section 3.4 and the control functions for VT52 mode are described in Section 3.5.

3.3.1 Standards

The ASCII code structure used by the terminal is defined by ANSI Standard X3.4-1977. Control function communication is accomplished using a subset in accordance with ANSI Standard X.3.64-1979.

3.3.2 Control Sequence Format

In ANSI(VT100) mode, the terminal uses either two character control sequences or multiple character (more than two) control sequences.

In VT52 mode, the terminal uses two character control sequences or in one command only (Direct Cursor Address) a four character sequence. Two character control sequences use the form:

ESC F

Where ESC is the escape character (1BH) and F is a single character indicating the control function.

The Direct Cursor Address uses the following form:

ESC Y line column

Where ESC is the escape character, Y is the ASCII character Y and line and column are each single ASCII characters representing the line and column, respectively.

In VT100 mode, multiple character escape sequences are used in communicating to and from the workstation a number of more complex commands and to indicate that certain keys were struck at the keyboard. The possible formats for multiple character control sequences are:

a. ESC [Pl; P2 F
b. ESC (P
c. ESC) P
d. ESC # N

Form a is the most commonly used. ESC is the escape character (1BH), [is the left bracket character (5BH), Pl is an ASCII character sequence (and possibly preceded by the ? character) which represents a decimal number, ; is the semicolon character (3BH) which acts as a parameter delimiter for the next parameter P2 which follows and F is a single final character indicating the

specific function to be performed. Again, the Pi are command parameters, separated by semicolons. For this form, in many cases a parameter may be null or the sequence may not contain any parameters. For example, the cursor position command may take the following forms:

```
ESC [ Pl ; P2 H
ESC [ ; P2 H      same as  ESC [ 0 ; P2 H
ESC [ Pl H        same as  ESC [ Pl ; 0 H
ESC [ H           same as  ESC [ 0 ; 0 H
```

Forms b and c are used to specify a particular G0 and G1 character sets, respectively. The (character is the left parenthesis (28H),) is the right parenthesis (29H) and P is an ASCII character representing a character set choice.

Form d is used to specify double height/double width lines or to specify the Screen Alignment Display command. The # character is the pound sign character (23H).

An escape sequence is restricted to less than 29 ASCII characters.

Command processing is aborted if incorrect syntax or an illegal parameter is detected. The terminal resumes character processing after the character which induced the error condition. An incomplete control sequence may be cancelled by transmitting the CAN (18H) or DEL (7FH) control characters.

3.4 ANSI (VT100) CONTROL SEQUENCES

The following sections describe the multi character control sequences applicable to the terminal while it is in VT100 mode. For readability, the commands are presented in the following order: the partition commands, the cursor movement commands, the edit commands and then all the remaining commands. Appendix I is an alphabetical list of the commands by command terminator.

Each command section is headed by the command mnemonic, the command name and the permissible formats. Unless otherwise stated after a command, the direction of command communication is from the host processor to the terminal.

3.4.1 PSR - Partition Screen

Formats: ESC [Pl p
ESC [p

PSR divides the 25 physical lines of the screen into two logical groups called partitions. A partition may consist of n lines (n greater than or equal to 0 but less than or equal to 25) and the other partition must contain 25-n lines. Partition 0 is the top group of lines and partition 1 is the bottom group. If Pl is null or 0, partition 0 consists of the complete 25 line screen and partition 1 will consist of a 0 line (null) screen. If Pl is not null or not 0, then Pl is the first line of partition 1. Thus, partition 0 contains Pl-1 lines and partition 1 contains 25-Pl+1 lines. A partition is selected using the SSPR command. If an illegal partition is requested, the command is ignored. The state of the terminal after command execution is as follows:

a. The screen is erased;
b. Partition 0 is selected;
c. The cursor is moved to the home position;
d. The scroll regions are set to the partition boundaries and ORIGIN mode is reset;
e. The graphic rendition of each partition is set to normal;
f. Each line in the partition is set to normal height and width;
g. The Standard character set is activated; and,
h. The tabs are reset to every eighth position, beginning at character position nine.

Smooth scrolling only occurs in a partition containing two or more lines.

Example: ESC [11 p will divide the screen such that the top partition contains 10 lines and the bottom partition contains 15 lines.

3.4.2 SSCRL - Set Scroll Area

Formats: ESC [Pl ; P2 r
ESC [; P2 r
ESC [; r
ESC [r

SCRL defines the scroll region within the selected partition. If the cursor is within or at the

boundaries of the scroll region, cursor movement and scrolling is restricted to within this region independent of the state of ORIGIN mode. However when ORIGIN mode is reset, the direct cursor command, CUP, may move the cursor with respect to the partition origin and not the scroll origin; and therefore, the cursor may be moved outside of the scroll region. Also, when ORIGIN mode is reset the Cursor Position Report, CPR, yields coordinates with respect to the partition origin. If ORIGIN mode is set, then CUP moves the cursor with respect to the scroll region and therefore the cursor cannot be moved outside the scroll region. Also, if ORIGIN mode is set, CPR yields coordinates with respect to the scroll region.

If a parameter is null or zero it is transformed to 1, the first line of the scroll region. P1 is the top line number of the scroll region and P2 is the bottom line number. If both parameters are null or zero, the scroll area is reset to the full partition. In any case, ORIGIN mode is always reset and the cursor is moved to the partition origin. For this command to be honored, the size of the scroll region must be at least 1 line; although the region must contain 2 or more lines if smooth scroll is to occur.

Example: Partition 1 is selected and contains 15 lines numbered from 1 through 15. The command ESC [3; 15 r will subdivide the partition into a 13 line scroll region with 2 lines fixed above and no fixed lines below. If ORIGIN mode is reset, the lines are numbered from 3 to 15 within the scroll region; if ORIGIN mode is set, they are numbered from 1 to 13.

3.4.3 SSPR - Select Partition

Formats: ESC [P1 s
ESC [s

SSPR selects or activates a specified partition. If P1 is 0 or null, partition 0, the top partition, is selected; if P1 is 1, partition 1 is selected. Other vales of P1 are ignored. When a partition is selected the cursor position, the character set, the graphic rendition and the state of ORIGIN mode are restored to their values when the partition was deselected. For convenience, a 0 line partition may be selected. Of course, any characters sent to the terminal are ignored.

3.4.4 CUB - Cursor Backwards

Format: ESC [Pl D
ESC [D

CUB moves the cursor left Pl character positions. If Pl is 0 or null, a move of 1 is attempted. If the active line has the double width attribute, then the cursor moves left two times that number of physical screen character positions. If the number of character positions specified for the move is greater than the current cursor column position, then the number of character positions is truncated so as to move the cursor to column 1.

Example: The cursor is at column 2 of row 10. ESC [0 D backspaces the cursor to column 1 of row 10.

3.4.5 CUD - Cursor Down

Formats: ESC [Pl B
ESC [B

CUD moves the cursor down the number of rows indicated by Pl. If Pl is 0 or null, a move down of 1 is attempted. If the cursor is currently above or within the scroll region, the move is confined to that region. And if Pl is greater than the number of lines below the active line to the scroll region bottom boundary, the cursor moves to the bottom line of the scroll region. If the cursor is below the scroll region the move occurs unless Pl is greater than the number of lines below the active line to the bottom partition boundary. In this case, the cursor moves to the bottom partition boundary. If any intervening lines have the double height attribute, a move down of Pl lines moves the cursor down exactly that number of physical lines.

Example: The selected partition contains 10 lines. The scroll region starts at line 2 (counting from 1) and ends at line 8 with respect to the partition boundaries. The cursor is at line 2 of the scroll region. ESC [20 B moves the cursor to line 8 (the last line of the scroll region) with respect to the partition.

3.4.6 CUF - Cursor Forwards

Formats: ESC [Pl C
ESC [C

CUF moves the cursor right Pl positions. If Pl is 0 or null, a move of 1 character position is attempted. For lines having the single width attribute this means 1 physical character position; and, for lines having double width attribute this means 2 physical character positions. If Pl is greater than the number of character positions to the right of the cursor, the cursor moves to the last character position on the screen. For lines having the single width attribute, this is character position 80, physical position 80; for lines having the double width attribute, this is character position 40, physical position 79.

Example: The cursor is at physical column 5, row 10. The line is a double width line. ESC [C advances the cursor to column physical column 7 of the same line.

3.4.7 CUU - Cursor Up

Formats: ESC [Pl A
ESC [A

CUU moves the cursor up Pl rows. If Pl is 0 or null, a move of 1 is attempted. If the cursor is currently at or below the top boundary of the scroll region the move is performed, although any move is truncated so as not to move past the top boundary of the scroll region. However, if the cursor is currently above the top boundary of the scroll region the move is done, although the move is now truncated so as not to move past the top boundary of the partition.

Example: The cursor is at line 10 of partition 1. ESC [8 A will move the cursor to line 2 of partition 1.

3.4.8 CUP - Cursor Position

Formats: ESC [Pl ; P2 H
ESC [Pl ; H
ESC [; P2 H
ESC [Pl H
ESC [H

CUP moves the cursor to a specified row and column number within the active partition. The first

coordinate is the row number and the second coordinate is the column number. The top half and the bottom halves of double height lines each count as one unit. But for double width lines the column number means the character position. Thus, for this command the actual physical column position on the screen for P2 is 2*(P2)-1. If ORIGIN mode is reset, then the move is with respect to the partition origin; if ORIGIN mode is set, then the move is with respect to the scroll region origin. A parameter value of 0 or null is treated as 1. If any parameter is such that the move is outside the appropiate boundary, the move is truncated so as to move to that boundary.

Example: Partition 0 contains 10 lines numbered 1 to 10. The scroll area begins at line 2 and ends at line 9. ORIGIN mode is set. ESC [H homes the cursor to row 1, column 1 of the scroll region. This is line 2, column 1 with respect to the partition boundaries.

3.4.9 CPR - Cursor Position Report

Format: ESC [P1 ; P2 R (Terminal to host)

CPR is a data sequence used to report the cursor position to the host. The report is requested by the host using the DSR request (Device Status Report) with option P1 set to 6. The cursor responds using the CPR sequence described in this section. P1 is the row number and P2 is the column number. If ORIGIN mode is reset, the coordinates returned are with respect to the partition origin. If ORIGIN mode is set, the coordinates returned are with respect to the scroll region origin. Leading zeros are always supressed. The first row or column number is called 1. For double width lines, the character position rather than the actual column position is returned.

Example: Partition 0 contains a scroll region embedded within the partition. ORIGIN mode is reset. The cursor is at home. The cursor position is requested by: ESC [6 n. The terminal responds with ESC [1 ; 1 R.

3.4.10 CURSV - Cursor Save

Format: ESC 7

This command saves the partition's current cursor position, graphic rendition, the character set class and the SCS character set within the class. These parameters may be restored by the CURRS (Cursor Restore) command described in the next section.

Example: The cursor is currently at row 10, column 5. Bold character rendition is currently active as well as an alternate character set. The sequence ESC 7 is transmitted to the terminal to save the above mentioned parameters. Later, after the cursor position as well as the selected character set has changed, the command ESC 8 is given. The cursor returns to row 10, column 5 and the alternate character set is reactivated.

3.4.11 CURRS - Cursor Restore

Format: ESC 8

The Cursor Restore command restores the partition's cursor position, graphic rendition and character set previously saved by the Cursor Save command described in the previous section.

Example: The cursor was at row 10, column 5 when the sequence ESC 7 was sent to the terminal. After the cursor has been moved, the sequence ESC 8 is sent to the terminal. The cursor moves back to row 10, column 5.

3.4.12 HVP - Horizontal and Vertical Cursor Position

Formats:
```
ESC [ Pl ; P2 f
ESC [ Pl ; f
ESC [ ; P2 f
ESC [ Pl f
ESC [ f
```

HVP functions identically to the CUP (Cursor Position) command.

3.4.13 INDX - Index

Format: ESC D

This command is treated exactly like a linefeed character.

3.4.14 NXTLN - Next Line

Format: ESC E

This command is equivalent to a linefeed followed by a carriage return.

3.4.15 RIND - Reverse Index

Format: ESC M

RIND acts like a reverse (backwards) linefeed. If the active cursor position is below or within the scroll region, the RIND command moves the cursor up one position unless the cursor is already at the top scroll region boundary. In this case, the cursor does not move but the scroll region scrolls down one line. That is, all the current lines within the scroll region move down 1 position, the original bottom line is lost, and the top line of the scroll region is erased. If the active cursor position is above the scroll region, but not at the top partition boundary, the cursor moves up one line position. If the cursor is at the top partition boundary, no action occurs. This command is not affected by the state of LNM mode.

Example: Partition 1 is selected. The scroll region starts at line 2 and ends at line 4 within this partition. The cursor is currrently at line 2 when the sequence ESC M is received by the terminal. Lines 2 through 4 move down one line position, leaving a blank line in place of the original line 2 and the original line 4 is lost and replaced by the original line 3.

3.4.16 DCH - Delete Character in Line

Formats: ESC [Pl P
ESC [P

DCH deletes Pl characters of the active line. If the active line has the double width attribute, then 2*Pl physical characters are deleted. The characters starting from the cursor position, inclusive and going from left to right are

deleted. The characters remaining on the line are shifted left filling up the vacancies created by the deleted characters. The vacated character positions on the right are erased. If Pl is 0 or null, one character is deleted. If more characters are specified than remain on the line, then the remainder of the line is erased.

Example: The cursor is at column 78; the Graphic Rendition of character position 78, 79 and 80 is reverse video. ESC [2 P moves the reverse video characters at column 80 to column 78. Positions 79 and 80 are set to normal video blanks.

3.4.17 ICH - Insert Character in Line

Formats: ESC [Pl @
ESC [@

ICH inserts Pl prime rendition blanks at the active position. If the line's current attribute is double width, then 2*Pl blanks are inserted. The characters beginning at and to the right of the active position are shifted right Pl character positions.

Characters shifted off the screen are lost. If Pl is 0 or null, 1 character is inserted. If Pl is greater than the number of characters to the right of the cursor, only that number of blanks are inserted. This command does not change the cursor position.

Example: The cursor is at column 1. ESC [0 @ shifts all the characters on the active line 1 position right; the character previously at column 80 is lost and column 1 contains a blank.

3.4.18 DL - Delete Line

Formats: ESC [Pl M
ESC [M

DL deletes Pl lines from the current scroll region. If VEM mode is reset, then Pl lines from the active line, inclusive, down are deleted; the remaining lines are moved up and the vacancies replaced by prime rendition blank lines. If Pl is greater than the number of lines remaining in the scroll region, the remaining lines are deleted. If VEM mode is set, the Pl lines from the active line, inclusive, up are deleted; the remaining lines at the top of the scroll region are moved

down and the vacancies replaced by prime rendition blank lines. If Pl is null or 0, one line is deleted. If Pl is greater than the number of lines between the top of the scroll region and the active line, then that number of lines is deleted. Note that double height lines count as two lines as always. If the cursor is currently outside the scroll region, the command is ignored. If the user desires to delete lines outside the scroll region, the scroll region first must be set to the partition boundaries or at least must include the edit lines using the SSCRL command.

Example: The scrolling region contains lines 1 through 10; the active line number is 2; VEM mode is reset. ESC [3 M deletes lines 2 ,3 and 4; lines 5 through 10 move up 3 rows; and the original lines 8, 9 and 10 are erased.

3.4.19 IL - Insert Line

Formats: ESC [Pl L
ESC [L

IL inserts Pl lines at the active line. If VEM mode is reset, Pl lines containing all prime rendition blanks are inserted at and below the active line. Lines pushed passed the bottom scroll region boundary are lost. If VEM mode is set, Pl lines containing all prime rendition blanks are inserted at and above the active line. Lines from and including the active line are pushed up. Lines pushed up past the top scroll region boundary are lost. In either case, the cursor does not move.

If Pl is 0 or null, 1 line is inserted. If Pl is greater than the number of lines remaining from the active line to the bottom scroll boundary, in the case VEM mode is reset or the number of lines from the top scroll boundary to the active line, in the case VEM mode is set, then that number is used for Pl.

If the cursor is currently outside the scroll region, this command is ignored. To insert a line outside the scroll region, use the SSCRL command. The scroll region first must be set to the partition limits or at least must include the edit lines. The scroll region may then be reset to its former boundaries.

Example: The selected scroll region contains 10 lines. The active line is line 4; VEM

mode is set. ESC [L moves lines 2 through 4 up one row; the original top line is lost and line 2 is now at the partition top. The original line 4 is erased.

3.4.20 EL - Erase in Line

Formats: ESC [Pl K
ESC [K

EL erases part or all of the active line. Erasure means setting the specified area to prime rendition blanks. Three variations of this command are defined:

Pl	ACTION
0 or null	Erase from the cursor position, inclusive, to the end of the active line.
1	Erase from the beginning of the active line to the active cursor position, inclusive.
2	Erase the entire active line. If the current line was defined as either top half or bottom half of a double height line, it will remain so defined.

In each of the above cases, the cursor position does not change after command execution.

Example: The cursor is at column 10. ESC [1 K erases characters 1 through 10, inclusive, of the active line.

3.4.21 ED Erase in Display

Formats: ESC [Pl J
ESC [J

ED erases a specified portion of the screen. Erasure means setting the specified area to prime rendition blanks. The erasure limits for this command are determined by the Active Edit Boundaries. The Active Edit Boundaries are dependant upon both the states of both ORIGIN and EDIT modes. If ORIGIN mode is reset, independant of the state of EDIT mode, the Active Edit Boundaries are the partition boundaries. If ORIGIN mode is set, the Active Edit Boundaries are

the partition limits if EDIT mode is reset or the scroll boundaries if EDIT mode is set.

Three variations of this command are defined:

Pl	ACTION
0 or null	Erase from the current cursor position, inclusive, to the lower Active Edit Boundary.
1	Erase from the top Active Edit Boundary to the cursor position, inclusive. The cursor does not move.
2	Erase the entire Active Edit region; that is, the area between the top line to the bottom line of the Active Edit Boundaries The cursor does not move in this command. Also, if lines within the Active Edit Boundaries had the attribute of double height, either top half or bottom half, they are redefined as having normal height/width attributes.

Example: The cursor is at line 2, column 10 in the scroll region. ESC [2 J erases all lines within the partition. The cursor does not move.

3.4.22 DA - Device Attributes

Formats: ESC [Pl c (Host to terminal)
ESC [?1 ; 2 c (Terminal to host)

The DA command with Pl option equal to null or zero is used by the host to request the terminals Device Attributes report. The terminal always responds with the report ESC [?1 ; 2 c.

3.4.23 DSR - Device Status Report

Formats: ESC [0 n (Terminal to host)
ESC [5 n (Host to terminal)
ESC [6 n (Host to terminal)

The DSR command is used by the host to request either the terminal position or the terminal status.

The options are described by the following table:

Pl	DIRECTION	ACTION
0	Terminal to Host	This is a response to the status request using Pl equal to 5 described below. A response with Pl equal to 0 implies the terminalis available to process commands.
5	Host to terminal	This is a request by the host for the terminal status. The only response is Pl equal to 0, indicating the terminal is ready.
6	Host to terminal	This is a request by the host for the current cursor position. The terminal responds using the CPR, Cursor Position Report.

Example 1: The host transmits ESC [5 n to the terminal; the terminal responds with ESC [0 n indicating the terminal is ready.

Example 2: The host transmits ESC [6 n requesting the cursor position; the terminal responds with the CPR sequence: ESC [0 ; 0 R. This sequence indicates the cursor is in the home position.

3.4.24 HTC - Horizontal Tabulation Set

Format: ESC H

HTC sets one horizontal tab stop at the current cursor character position. Thus if afterwards the current cursor position is to the right of this set position and the terminal recieves a TAB, the cursor moves to that tab stop. The maximum number of tab stops is 16; and, any attempt to set additional tabs stops is ignored. Incidentally, there is always an automatic tab set at the last character position of a line. This is physical position 80 for single width lines and physical position 79 for double width lines. Tabs are cleared either individually or totally by the TBC, Tabaulation Clear command.

Example: The current line width attribute is normal. The cursor is at column 5. The following sequence is sent to the terminal: ESC [3 g ESC H CR HT. The cursor moves to column 1 and then back to column 5.

3.4.25 ID - Identify

Format: ESC Z

This command requests the terminal's identification sequence. The command illicits the exact same response as the DA request (Device Attributes). For a number of reasons, it is recommended for new applications that the user refrain from using this command and instead use the DA command.

Example: The host sends ESC Z to the terminal; the terminal responds with ESC [?1 2 c

3.4.26 KEYAPP - Enter Keypad Application Mode

Format: ESC =

This command sets the keyboard into the keypad application mode. In this mode, the non function keys on the auxiliary keypad generate different code sequences than in the numeric mode. That is, the keys send three character code sequences to the host when struck. Refer to Appendix D for the exact code sequences transmitted.

Example: The host sends ESC = to the terminal. Then the ENTER key is struck on the auxiliary keypad. The terminal transmits the sequence ESC O M.

3.4.27 KEYNUM - Enter Keypad Numeric Mode

Format: ESC >

This command sets the keyboard into the keyboard numeric mode. The non function keys on the auxiliary keypad when struck generate the normal ASCII codes indicated on the keycaps. These codes are identical to their counterparts on the main keypad. Refer to Appendix D for a description of the code sequences generated in the various keypad modes.

Example: The sequence ESC > is sent to the terminal; the Enter key is depressed. The terminal transmits the CR (0DH) to the host.

3.4.28 LED - LED control

Format: ESC [Pl ; P2 ; . . . q
ESC [q

The LED command controls LEDs L1 through L4 on the keyboard and lights D4 through D0 on the front panel. From the host's point of view, the lights are numbered sequentially from 1 through 11 according to the following table:

LIGHT NAME	LED NUMBER
L1	1
L2	2
L3	3
L4	4
*	5*
*	6*
D4	7
D3	8
D2	9
D1	10
D0	11

* These LED's are reserved for Callan Data Systems future used. They may not be supported in future systems as programmable LED's.

Table 3-2
LED Control

This command turns on all lights indicated in the parameter sequence. If a null or a zero parameter is encountered, then all lights are turned off before the next parameter is examined.

Example 1: ESC [q turns off all LED's.

Example 2: ESC [; 11 q turns off all lights then turns on light D0.

3.4.29 RIS - Reset To Initial State

Format: ESC c

RIS resets the terminal to the power on state. This includes:

a. Clearing the terminal's RS232 input and output character buffers;
b. Erasing the screen;
c. Resetting partition 0 to 24 lines and partition 1 to 1 line;
d. Selecting partition 0;
e. Positioning the cursor to home;
f. Selecting the G0, ASCII, character set;
g. Setting the SGR character rendition to prime;
h. Resetting tabs to every 8th position;
i. Defining all lines as having single height/width attributes;
j. Resetting those terminal modes which are set either by the rear panel DIP switches or under software control to the values indicated by the rear panel switches; these modes are: LNM, VT100/VT52 and AUTOWRAP; and,
k. Setting the workstation's software modes to the power on state; these modes are illustrated by the following chart:

MODE	NAME	STATE
IRM	Insert/Replace	Reset
VEM	Vertical Editing	Reset
CURKY	Cursor Key	Reset
ANSI	VT100/VT52	DIP 1-4
SLWSCR	Smooth Scroll	Reset
ORIGIN	Origin	Reset
AUTOWRAP	Autowrap	DIP 1-8
MONIT	Monitor	Reset
EDIT	Special Editing	Reset

Table 3-3
Power on States

3.4.30 SM - Set Mode

Format: ESC [P1 ; P2 ; . . . h

The SM command and the RM command described in the next section are designed to be used together to set and reset a number of terminal modes which alter the terminal's behavior. The command sets switches which are described in the following sections. As indicated by the format, multiple switches may be set with a single command. If a parameter is null or 0, it is ignored during command processing.

3.4.31 RM - Reset Mode

Format: ESC [P1 ; P2 ; P3 ; . . . l

The RM command and the SM command described in the previous section are designed to be used together to set and reset a number of terminal modes. This command resets the terminal modes indicated by the parameters P1, P2 . . ., etc.

As indicated by the format, multiple modes may be set using a single command. Any null or 0 parameter encountered during command processing is ignored. The description of the modes follows in the next section.

3.4.32 Mode Description

Any or all of the modes may be simultaneously set or reset by using the Set and Reset Mode commands, respectively.

A mode is specified by a decimal ASCII string. Certain modes must be preceded by the question mark (3FH). A number of the modes described in the following sections are initialized during power up or by execution of the RIS command according to settings of the rear panel DIP switches. These modes are: LNM mode, ANSI mode and AUTOWRAP. The other modes described here are not affected by the rear panel DIP switches. In the mode descriptions which follow, the specifying parameter is enclosed in parenthesis following the mode mnemonic.

IRM (4) - Insert/Replace Mode

In the reset (default) state, a received character replaces the character at the active cursor position. In the set state, a received character is inserted at the active position. Thus, in this state, the characters beginning at and to the right of the active position are shifted right 1 character position. The rightmost character is lost. For double width characters, the appropiate character is inserted followed by a prime rendition blank.

Example: The active line begins with the the phrase: The line begins.... The cursor is at cursor column position, 5. The sequence ESC [4 h a c t i v e SP is sent to the terminal. The active line now appears as follows: The active line begins .....

VEM (7) - Vertical Editing Mode

The Vertical Editing Mode affects the insert and delete line commands, IL and DL, respectively. The power up state of VEM is reset. In this state, lines are deleted from the active line down by the DL command and the active line down is pushed down by the IL command.

If VEM is set, lines are deleted from the active line up by the DL command and the active line up is pushed up by the Il command.

Example: ESC [4 ; 7 l resets IRM and VEM mode.

LNM (20) - Linefeed/New line mode

When this mode is reset, the linefeed and carriage returns are processed as is either when received from the host computer or generated by the keyboard. If LNM mode is set, the terminal follows keyboard generated carriage returns with linefeeds on transmission to the host and generates a carriage after receiving a linefeed. This mode is initialized upon power up or by execution of the RIS command according to the setting of rear panel DIP switch 1-6.

Example: The host sends ESC [20 h to the terminal. The auxiliary keypad is in numeric mode. When the ENTER key is depressed, the carriage return/linefeed sequence is always generated.

CURKY (?1) - Cursor Key Mode

When this mode is reset, the four cursor control keys on the keyboard send the appropriate escape sequences which, if echoed by the host computer, move the cursor according to the directions indicated on the keycaps. The reset state is the power up state. When this mode is set, the cursor keys send different sequences. Refer to appendix G for the exact codes sent.

Example: The sequence ESC [?1 h is sent to the terminal; the user strikes the up arrow key. The terminal responds with ESC O A.

ANSI (?2) - VT100/VT52 Mode

In the reset state, the terminal interprets command sequences according to the VT52 format described herein. In the set state, the terminal interprets commands according to the VT100 format. This mode is initialized on power up or when the RIS command is executed according to the setting on the rear panel DIP switch 1-4.

Example: Rear panel DIP switch 4 is in the off position. The sequence required to set a full 25 line partition and return to VT52 mode is as follows: ESC < ESC [p ESC [?2 l.

SLWSCRL (?4) - Slow Scroll Mode

If SLWSCRL is reset, the power up state, the terminal executes jump scroll as described in the section on Slow Scroll Considerations. If this state is set, then the terminal scrolls smoothly and slowly. The state of SLWSCRL is toggled by the scroll control key on the keyboard. Thus, the user may change the state of SLWSCRL which was set by the host software by depressing that key. Another situation where the SLWSCRL state is altered without a host command is if the terminal is currently in a smooth scroll mode and a partition is selected having less than two lines, then SLWSCRL is reset.

Example: The sequence ESC [?4 h is sent to the terminal. The terminal is in the smooth slow scroll mode.

ORIGIN (?6) - Origin Mode

ORIGIN mode defines the origin used for the absolute cursor positioning, reporting and the erasure commands. When this mode is reset, the default state, the cursor moves to the partition origin which then is the origin for the CUP, HVP and CPR commands. When ORIGIN mode is set, the cursor moves to the scroll region origin which then is the origin for those commands. Also, if ORIGIN and EDIT modes are set, then erasure, as defined by the ED command, is with respect to the scroll region. Whether or not ORIGIN mode is set or reset, scrolling is always confined to the scroll region.

Example: The command sequence ESC [?6 h moves the cursor to the upper left corner of the scroll region.

AUTOWRAP (?7) - Autowrap Mode

AUTOWRAP mode determines the action of the cursor when the cursor is at the last character position of a line. This is character position 80, physical position 80 for single width lines and character position 40, physical position 79 for double width lines. Suppose a displayable character was previously sent to this position. If Autowrap is reset and another displayable character follows then this character overlays the last character. If Autowrap is set and a displayable character follows, then the terminal executes an automatic carriage return/linefeed before processing the second character. The initial state of AUTOWRAP is set according to the sense of rear panel DIP switch 1-8 when power is first applied or whenever the RIS command is executed.

Example: AUTOWRAP mode is set. The cursor is currently at line 2 column 79 when the following sequence is sent to the terminal: 1 2 3. The 1 is displayed on line 2, column 79; the 2 is displayed on line 2, column 80; and the 3 is displayed on line 3, column 1. The cursor is currently at line 3, column 2.

MONIT (?90) - Monitor Mode

Monitor mode determines the terminal's response to the 33 control characters (00H to 1FH and 7FH). When this mode is reset, the default state, received control characters implement their control function and are not displayed. When this mode is enabled, the control operation is not implemented but an associated graphic character is displayed. Appendix A contains the graphics associated with control characters assuming the standard character ROM is used. The graphic characters used in the standard character ROM are the ones stored in the first 32 locations of the ROM (and location 7F Hex) and are therefore the same ones used for the G0, Special

Graphics character set. It is noticed from Appendix A that the graphics displayed are not always indicative of the control characters sent. For example, the graphic displayed for linefeed is VT! If extensive debugging is required, perhaps the user may burn a more appropriate PROM having more representative graphics for the 32 control characters. Refer to Section 4.3 for the required procedure.

Obviously, MONITOR mode can not be reset by the host computer. The user may reset MONIT mode by toggeling the scroll control key on the keyboard. Alternatively, he may recycle power to the terminal.

Example: The host sends the sequence ESC [?90 h to the terminal; the linefeed character (0AH) is followed. The terminal displays the VT graphic.

EDIT (?91) - Special Erasure Edit Mode

EDIT mode determines the bounds of erasure for the ED command. If either ORIGIN or EDIT mode is reset, erasure is always with respect to the partition boundaries. But if both ORIGIN and EDIT modes are set, than erasure is with repect to the scroll boundaries.

Example: The scroll region begins at row 6 and ends at row 10, inclusive. The terminal receives the following sequence: ESC [?6 ; ?91 h ESC [2 J. The entire scroll region and only the scroll region is erased.

3.4.33 SDHL - Set Double Height/Width Line

Format: ESC # 3 (Set top half)
ESC # 4 (Set bottom half)

The above sequences assign either top half or bottom half, respectively, the double height/width attributes to the active line. The sequences are designed to be used in pairs on adjacent lines and the same character output should be sent to both

lines to form full double height characters. If the line was single width/single height, all characters to the right of the center of the screen are lost. The cursor remains over the same character position unless it would be to the right of the right margin, in which case it is moved to the right margin. If the line attribute was already double height/width, the command is ignored. The top half of a double height line consists of the character followed by a blank. The bottom half consists of the dash followed by a blank regardless of the character transmitted to the terminal.

Example: The sequence ESC # 3 is sent to the terminal. The characters from physical position 1 through 40 are expanded thereby occupying position 1 through 80. The characters originally at physical positions 41 through 80 are shifted off the screen and are lost.

3.4.34 SNHW - Set Normal Height/Width Line

Format: ESC # 5

This command assigns the normal height/width attribute to a line. If the attribute previously was double width, either double height/double width or double width, then the current line is compressed. All spaces between the characters are removed. The line then consists of 40 characters on the screen, followed by 40 blanks. If the line's attribute was normal, no action occurs.

Example: The current line has the double width attribute. The cursor is at character position 2, physical position 3. The sequence ESC # 5 is transmitted to the terminal. The characters previously at physical positions 1, 3, 5, . . . etc., are packed into positions 1,2,3, etc. Positions 41 through 80 are set to blanks. The cursor is moved to physical position, 2.

3.4.35 SDWL - Set Double Width Line

Format: ESC # 6

This command assigns the attribute double width (only) to the active line. If the line previously was single height/single width, all characters to the right of the screen are lost. The cursor remains over the same character position unless it

would be to the right of the right margin, in which case, it is moved to the right margin. If the line has the attribute double width already, the command is ignored.

3.4.36 SAD - Screen Alignment Display

Format: ESC # 8

This command fills the entire screen area with upper case "E"s. This pattern is useful for screen alignment and adjustments. This command is equivalent to the host partitioning the screen into partition 0 having 25 lines and partition 1 having 0 lines, then transmitting 25 lines of "E"s. The cursor is then homed.

3.4.37 SCS - Select Character Set

Formats: ESC (Pl
ESC) Pl

The host processor may choose between five character sets. Three are stored in the primary ROM, supplied with the terminal, and two the user may supply by programming an alternate ROM. The G0 or the G1 domain is activated by the host processor sending the control codes SI and SO (Shift in and Shift out), respectively. In the power up state, the G0 domain is active and the ASCII set is selected. The code sequences required to select the various character sets in each of the domains are described by the following table:

G0 SEQUENCES	G1 SEQUENCES	SET CHOSEN	LOCATION OF CHARACTER SE'
ESC (A	ESC) A	United Kingdom	Primary ROM
ESC (B	ESC) B	ASCII	Primary ROM
ESC (0	ESC) 0	Special Graphics	Primary ROM
ESC (1	ESC) 1	Alternate Set	Alt. ROM
ESC (2	ESC) 2	Alternate Special Graphics	Alt. ROM

Table 3-4
Alternate Character Sets

Example: The sequence ESC (A ESC) 1 is sent to the terminal. When the host sends the SI control character, the United Kingdom set is selected; when the host sends the SO control character, the Alternate character ROM standard character set is selected.

3.4.38 SGR - Select Graphic Rendition

Formats:
```
ESC [ P1 ; P2 ; P3 . . .    m
ESC [ ; P1 ; P2 . . . m
ESC [ P1 ; P2 ; ; P3 . . . m
ESC [ m
```

The SGR command sets the rendition or auxiliary attributes that are associated with the characters as they are received and displayed. These attributes are described in the following table:

P1	ATTRIBUTES
0 or null	Primary Rendition
1	Bold
4	Underline
5	Slow blink
7	Reverse Video
99	Overstrike

The above attributes may be assigned individually or in any combination. If an undefined parameter is used in the command string, the command is ignored. The attributes are accumulated from command to command. That is, the attributes specified by the command are logically anded to the previous SGR rendition. However, if at any time a null zero parameter is specified, the primary rendition is restored.

The terminal uses the transparent attribute philosophy whereby the assignment of character attributes do not consume character positions on the screen. However, each line is restricted to 15 rendition changes. If the active line already has 15 rendition changes and a character is received which would require an additional rendition change, the character is laid into the line using the same graphic rendition as the overlaid characters. In other words, the new graphic rendition is not yet honored. This use of the new rendition resumes as soon as the condition occurs where the active line has less than 15 rendition changes.

Example: The sequence ESC [1 ; 0 ; 5 ; 99 m is sent to the terminal. Henceforth all characters transmitted to the screen blink and are overstruck. The characters do not have the attribute of bold.

3.4.39 TBC - Tabulation Clear

Formats: ESC [Pl g
ESC [g

TBC clears tab stops set by the HTC command. Two options are available: If Pl is 0 or null, any horizontal tab stops at the current cursor character position are removed. If Pl is 3, all horizontal tab stops are cleared. Other values of Pl are ignored. This command does not remove the automatic tab stop at the last character position of the line.

Example: The active line has normal height/width attributes. Furthermore, a number of tab stops are currently set. The cursor is at column 1 when the sequence ESC [g TAB is received. The active position is now column 80.

3.5 VT52 CONTROL SEQUENCES

The following sections describe the control sequences applicable to the terminal while it is in the VT52 mode. The host processor may use many of the VT100 features such as select partition boundaries, Set scroll region boundaries, select character set or SGR by using the VT52 command to transfer into the VT100 mode. Then after the appropriate VT100 commands have been executed, the host uses the VT100 RM command with the ?2 option to switch the terminal back into the VT52 mode.

3.5.1 VANS - Enter VT100 Mode

Format: ESC <

This command switches the terminal into the VT100 mode.

3.5.2 VENT - Enter Keypad Application Mode

Format: ESC =

This command sets the keyboard into the Keypad Application mode. In this mode, the non function keys on the auxiliary keypad generate different code sequences than in the numeric mode. That is, these keys send three character code sequences to the host when struck. The code sequences sent to the host when the keypad is in VT52 Keypad Application mode are different sequences when the keypad is in VT100 Keypad Application mode. Refer to Appendix C for a description of the various keypad code sequences.

Example: The terminal is in VT52 Keypad Application mode when the ENTER key is struck on the auxiliary keypad. The terminal transmits to the host the sequence ESC ? M.

3.5.3 VEXTA - Enter Keypad Numeric Mode

Format: ESC >

This command sets the keyboard into the Keyboard Numeric mode. The non function keys on the auxiliary keypad when struck generate the normal ASCII codes indicated on the keycaps and which are identical to their counterparts on the main keypad. Refer to Appendix C for a description of the code sequences generated in the various keypad modes.

Example: The sequence ESC > is sent to the terminal; The ENTER key is depressed. The terminal transmits the code 0DH to the host.

3.5.4 VUP - Cursor Up

Format: ESC A

This command moves the cursor up one line position. The cursor does not move past the top scroll or partition boundary. The restrictions that apply to the CUU command apply here also.

3.5.5 VDOWN - Cursor Down

Format: ESC B

This command moves the cursor down one line position. The cursor does not move past the bottom scroll or partition boundaries. The restrictions that apply to the CUD command, apply here also.

3.5.6 VRIGHT - Cursor Right

Format: ESC C

This command moves the cursor right 1 character position. The Restrictions that apply to the CUF command, apply here also.

3.5.7 VLEFT - Cursor Left

Format: ESC D

This command moves the cursor left 1 character position, if possible. If the cursor is already at column 1, no action occurs. The attributes and restrictions which apply to the CUF command, apply here also.

3.5.8 VENTGR - Enter Graphic Character Set Mode

Format: ESC F

This command activates the Special Character set. This is the same character set activated by the VT100 command, ESC (0.

Example: The sequence ESC F c displays the FF (Formfeed graphic) at the terminal.

3.5.9 VEXTGR - Exit Graphic Character Set Mode

Format: ESC G

This command removes the terminal from the Special Graphics Character Set Mode.

3.5.10 VHOME - Home Cursor

Format: ESC H

This command returns the cursor to the home position. This command functions exactly like the VT100 ESC [H command sequence.

Example: The processor was previously executing a program in the VT100 mode. The scroll region was different than the partition. Also, ORIGIN mode was set. The host sends the terminal the following sequence: ESC [?2 e ESC H. The Workstation is now is VT52 mode and cursor homes to the upper left corner of the scroll region.

3.5.11 VREVLF - Reverse Linefeed

Format: ESC I

This command executes a cursor up movement. If the cursor is at the top line of the selected scroll region, a scroll down occurs. This command functions identically to the RINDR command.

3.5.12 VEREOS - Erase to the End of Screen

Format: ESC J

This command erases the screen from the current cursor position, inclusive, to the end of the Active Edit Boundary. This command functions identically to the ED command with P1 set to 0 or null.

3.5.13 VEREOL - Erase to End of Line

Format: ESC K

This command erases the active line from the current cursor position, inclusive, to the end of the line. This command functions identically to the EL command with P1 set to 0 or null.

3.5.14 VDL - Delete Line

Format: ESC U

This command deletes the active line. The comments concerning VT100 VEM mode apply to this command.

3.5.15 VIL - Insert Line

Format: ESC V

This command inserts a single prime rendition line at the active line. The behavior of the edit process as defined by the VT100 VEM mode, apply here.

3.5.16 VCLRH - Clear Screen and Home Cursor

Format: ESC W

This command clears the Active Edit area, according to the VT100 mode flags and then homes the cursor.

Example: The terminal is placed in the VT100 mode to set both ORIGIN and EDIT modes. A scroll region is defined within the current partition. The following sequence is sent to the terminal: ESC [?2 1 ESC W. The terminal is now in the VT52 mode, the scroll region is erased and the cursor is moved to the upper left corner of the scroll region.

3.5.17 VDIRC - Direct Cursor Address

Format: ESC Y line column

This command moves the cursor, within the partition, to the absolute cursor position specified by the line and column. The first ASCII character after the Y represents the line number and the second character after the Y represents the column number. This command is <u>independant</u> of ORIGIN or EDIT modes, the move is always absolute

with respect to the partition boundaries. To generate the ASCII character to represent a coordinate, add 1F hexidecimal to the coordinate value. If a coordinate is specified which would move the cursor off the selected partition, then that value is ignored and the current coordinate is retained.

Example: The command ESC Y ! ! positions the cursor to line 2, column 2 of the current partition.

3.5.18 VID - Identify

Format: ESC Z

This sequence instructs the terminal to respond with the Identifier escape sequence. This sequence is always ESC / Z.

APPENDIX A
CHARACTER GRAPHICS

HEX	MONITOR MODE	NORMAL MODE	DESCRIPTION
00			blank
01	♦		diamond
02	▨		checkerbd
03	H_T		horiz. tab
04	F_F		form feed
05	C_R		car. ret
06	L_F		linefeed
07	°		degree
08	±		plus/minus
09	N_L		new line
0A	V_T		vert. tab
0B	┘		l.r. corner
0C	┐		u.r. corner
0D	┌		u.l. corner
0E	└		l.l. corner
0F	┼		int. lines
10	⎺		horiz. line 1
11	─		horiz. line 3
12	─		horiz. line 5
13	─		horiz. line 7
14	_		horiz. line 9
15	├		left "T"
16	┤		right "T"
17	┴		bottom "T"
18	┬		top "T"
19	│		vertical bar
1A	≤		less or =
1B	≥		greater or =
1C	π		pi
1D	≠		not equal to
1E	£		U.K. pound
1F	•		centered dot

HEX	MONITOR MODE	NORMAL MODE	DESCRIPTION
20			space
21	!	!	
22	"	"	
23	#	#	
24	$	$	
25	%	%	
26	&	&	
27	'	'	apostrophe
28	(	(	
29	)	)	
2A	*	*	
2B	+	+	
2C	,	,	comma
2D	-	-	dash
2E	.	.	period
2F	/	/	slash
30	0	0	zero
31	1	1	
32	2	2	
33	3	3	
34	4	4	
35	5	5	
36	6	6	
37	7	7	
38	8	8	
39	9	9	
3A	:	:	colon
3B	;	;	
3C	<	<	
3D	=	=	
3E	>	>	
3F	?	?	

APPENDIX A
CHARACTER GRAPHICS
(continued)

HEX	MONITOR MODE	NORMAL MODE	DESCRIPTION
40	@	@	
41	A	A	
42	B	B	
43	C	C	
44	D	D	
45	E	E	
46	F	F	
47	G	G	
48	H	H	
49	I	I	
4A	J	J	
4B	K	K	
4C	L	L	
4D	M	M	
4E	N	N	
4F	O	O	
50	P	P	
51	Q	Q	
52	R	R	
53	S	S	
54	T	T	
55	U	U	
56	V	V	
57	W	W	
58	X	X	
59	Y	Y	
5A	Z	Z	
5B	[	[	
5C	\	\	
5D	]	]	
5E	^	^	
5F	_	_	underscore

HEX	MONITOR MODE	NORMAL MODE	DESCRIPTI
60	`	`	single quc
61	a	a	
62	b	b	
63	c	c	
64	d	d	
65	e	e	
66	f	f	
67	g	g	
68	h	h	
69	i	i	
6A	j	j	
6B	k	k	
6C	l	l	
6D	m	m	
6E	n	n	
6F	o	o	
70	p	p	
71	q	q	
72	r	r	
73	s	s	
74	t	t	
75	u	u	
76	v	v	
77	w	w	
78	x	x	
79	y	y	
7A	z	z	
7B	{	{	
7C	|	|	
7D	}	}	
7E	~	~	
7F	///		delete ch

APPENDIX B
KEYS NOT AFFECTED BY KEYBOARD MODES

KEY CAPTION	UNSHIFTED ASCII	UNSHIFTED HEX	SHIFTED ASCII	SHIFTED HEX	CONTROL UNSHIFTED ASCII	CONTROL UNSHIFTED HEX	CONTROL SHIFTED ASCII	CONTROL SHIFTED HEX
ESC	ESC	1B	ESC	1B	ESC	1B	ESC	1B
! 1	1	31	!	21	1	31	!	21
@ 2	2	32	@	40	NULL	00	NULL	00
# 3	3	33	#	23	#	23	#	23
$ 4	4	34	$	24	4	34	$	24
% 5	5	35	%	25	5	35	%	25
^ 6	6	36	^	5E	6	36	RS	1E
& 7	7	37	&	26	7	37	&	26
* 8	8	38	*	2A	8	38	*	2A
(9	9	39	(	28	9	39	(	28
) 0	0	30	)	29	0	30	)	29
_ -	-	2D	_	5F	US	1F	US	1F
+ =	=	3D	+	2B	=	3D	+	2B
~ `	`	60	~	60	NUL	00	NUL	00
BACK SPACE	BS	08	BS	08	BS	08	BS	08
TAB	HT	09	HT	09	HT	09	HT	09
Q	q	71	Q	51	DC1	11	DC1	11
W	w	77	W	57	ETB	17	ETB	17
E	e	65	E	45	ENQ	05	ENQ	45
R	r	72	R	52	DC2	12	DC2	12
T	t	74	T	54	DC4	14	DC4	14
Y	y	79	Y	59	EM	19	EM	19
U	u	75	U	55	NAK	15	NAK	15
I	i	69	I	49	HT	09	HT	09

APPENDIX B
KEYS NOT AFFECTED BY KEYBOARD MODES
(continued)

KEY CAPTION	UNSHIFTED ASCII	UNSHIFTED HEX	SHIFTED ASCII	SHIFTED HEX	CONTROL UNSHIFTED ASCII	CONTROL UNSHIFTED HEX	CONTROL SHIFTED ASCII	CONTROL SHIFTED HEX
O	o	6F	O	4F	SI	0F	SI	0F
P	p	70	P	50	DLE	10	DLE	10
{ [	[	5B	{	7B	ESC	1B	ESC	1B
}]	]	5D	}	7D	GS	1D	GS	1D
DEL	DEL	7F	DEL	7F	DEL	7F	DEL	7F
A	a	61	A	41	SOH	01	SOH	01
S	s	73	S	53	DC3	13	DC3	13
D	d	64	D	44	EOT	04	EOT	04
F	f	66	F	46	ACK	06	ACK	06
G	g	67	G	47	BEL	07	BEL	07
H	h	68	H	48	BS	08	BS	08
J	j	6A	J	4A	LF	0A	LF	0A
K	k	6B	K	4B	VT	0B	VT	0B
L	l	6C	L	4C	FF	0C	FF	0C
: ;	;	3B	:	3A	;	3B	:	3A
" '	'	27	"	22	'	27	"	22
RETURN	CR	0D	CR	0D	CR	0D	CR	0D
| \	\	5C	|	7C	FS	1C	FS	1C
Z	z	7A	Z	5A	SUB	1A	SUB	1A
X	x	78	X	58	CAN	18	CAN	18
C	c	63	C	43	ETX	03	ETX	03
V	v	76	V	56	SYN	16	SYN	16
B	b	62	B	42	STX	02	STX	02
N	n	6E	N	4E	SO	0E	SO	0E

APPENDIX B
KEYS NOT AFFECTED BY KEYBOARD MODES
(continued)

KEY CAPTION	UNSHIFTED ASCII	UNSHIFTED HEX	SHIFTED ASCII	SHIFTED HEX	CONTROL UNSHIFTED ASCII	CONTROL UNSHIFTED HEX	CONTROL SHIFTED ASCII	CONTROL SHIFTED HEX
M	m	6D	M	4D	CR	0D	CR	0D
< ,	,	2C	<	3C	,	2C	<	3C
> .	.	2E	>	3E	.	2E	>	3E
? /	/	2F	?	3F	/	2F	?	3F
LINE FEED	LF	0A	LF	0A	LF	0A	LF	0A
SPACE BAR	SP	20	SP	20	SP	20	SP	20

APPENDIX C
VT52 SPECIAL KEY CODES

CURSOR CONTROL KEY CODES

CURSOR KEY	ESCAPE SEQUENCE GENERATED
Up arrow	ESC A
Down arrow	ESC B
Right arrow	ESC C
Left arrow	ESC D

AUXILIARY KEYPAD CODES

KEY	KEYPAD NUMERIC MODE	KEYPAD APPLICATION MODE
0	0	ESC ? p
1	1	ESC ? q
2	2	ESC ? r
3	3	ESC ? s
4	4	ESC ? t
5	5	ESC ? u
6	6	ESC ? v
7	7	ESC ? w
8	8	ESC ? x
9	9	ESC ? y
-	- (dash)	ESC ? m
,	, (comma)	ESC ? l
.	. (period)	ESC ? n
ENTER	CR	ESC ? M
PF0	ESC T	ESC T
PF1	ESC P	ESC P
PF2	ESC Q	ESC Q
PF3	ESC R	ESC R
PF4	ESC S	ESC S

APPENDIX D
VT100 SPECIAL KEY CODES

CURSOR CONTROL KEY CODES

CURSOR KEY	ESCAPE SEQUENCE GENERATED CURSOR KEY MODE RESET	CURSOR KEY MODE SET
Up arrow	ESC [A	ESC O A
Down arrow	ESC [B	ESC O B
Right arrow	ESC [C	ESC O C
Left arrow	ESC [D	ESC O D

AUXILIARY KEYPAD CODES

KEY	KEYPAD NUMERIC MODE	KEYPAD APPLICATION MODE
0	0	ESC O p
1	1	ESC O q
2	2	ESC O r
3	3	ESC O s
4	4	ESC O t
5	5	ESC O u
6	6	ESC O v
7	7	ESC O w
8	8	ESC O x
9	9	ESC O y
-	- (dash)	ESC O m
,	, (comma)	ESC O l (l is 6C Hex)
ENTER	CR	ESC O M
PF0	ESC O T	ESC O T
PF1	ESC O P	ESC O P
PF2	ESC O Q	ESC O Q
PF3	ESC O R	ESC O R
PF4	ESC O S	ESC O S

APPENDIX E
SPECIAL GRAPHICS

HEX CODE	UK/US GRAPHIC	SPECIAL GRAPHIC
5F	- (under score)	SP (space)
60	` (single quote)	(diamond)
61	a	(checkerboard)
62	b	(horizontal tab symbol)
63	c	(formfeed symbol)
64	d	(carriage return symbol)
65	e	(linefeed symbol)
66	f	(degree symbol)
67	g	(plus/minus)
68	h	(new line)
69	i	(vertical tab symbol)
6A	j	(lower right corner)
6B	k	(upper right corner)
6C	l	(upper left corner)
6D	m	(lower left corner)
6E	n	(crossing lines)
6F	o	(horizontal scan line 1)
70	p	(horizontal scan line 3)
71	q	(horizontal scan line 5)
72	r	(horizontal scan line 7)
73	s	(horizontal scan line 9)
74	t	(left "T")
75	u	(right "T")
76	v	(bottom "T")
77	w	(top "T")
78	x	(vertical bar)
79	y	(less than or equal to)
7A	z	(greater than or equal
7B	{	(Pi)
7C	|	(not equals to)
7D	}	(UK pound sign)
7E	~	(centered dot)

Note: The codes 6A to 78 are used to draw rectangular grids; each symbol is contiguous with its adjacent symbol so that the graphs formed are unbroken. The horizontal scan line 5 (71 H) should be used to connect grid vertices.

APPENDIX F
CONTROL CHARACTERS

CONTROL CHARACTER	HEX CODE	ACTION TAKEN
NUL	00	Ignored.
ENQ	05	Ignored.
BEL	07	Sounds the alarm at the terminal.
BS	08	Moves cursor left one character position.
HT	09	Moves cursor to next defined horizontal tab.
LF	0A	Moves the cursor down 1 line, if possible; LF cannot move cursor past lower scroll Boundary. If cursor is at lower scroll Boundary, a scroll up is performed.
VT	0B	Interpreted as a formfeed.
FF	0C	Interpreted as a linefeed.
CR	0D	Moves the cursor to column 1.
SO	0E	Invokes the G1 character set designated by The SCS control sequence.
SI	0F	Select the G0 character set designated by The SCS control sequence.
X0N	11	Unlocks keyboard.
XOFF	13	Locks keyboard.
CAN	18	Cancels an incomplete escape sequence and displays the error symbol.
SUB	1A	Interpreted as CAN.
ESC	1B	Announces the initiation of an escape Sequence.
DEL	7F	Cancels an incomplete escape sequence.

Note: All other control codes are Ignored.

APPENDIX G
MODE OPTIONS

MODE NAME	MNEMONIC	VALUE	OPTIONS SET	RESET
Insert/ Replace	IRM	4	*Inserts character at active position	Replaces character at active position.
Vertical Editing	VEM	7	*Edit movement Above active Line.	Edit movement Below active Line.
New Line	LNM	20	Follow received linefeeds with CR; insert keyboard generated carriage returns with a linefeed.	Do not insert additional characters into received linefeeds or keyboard generated carriage returns.
Cursor Key	CURKY	?1	Cursor keys send sequence denoted in the right column of Appendix D.	Cursor keys send sequence denoted in the left column of Appendix D.
VT100/ VT52	ANSIF	?2	Places terminal in the VT100 mode.	Places terminal in the VT52 mode.
Slow Scroll	SLWSCRL	?4	Places terminal in slow/smooth scroll mode.	Places terminal in jump scroll mode.
Origin	ORIGIN	?6	Origin is with respect to the scroll region.	Origin is with respect to the partition region.
Autowrap	AUTOWRP	?7	Autowrap the character to the next line whenever a character is sent the second time to the last screen position.	Do not autowrap.
Monitor	MONIT	?90	*Set monitor mode to display control characters.	Do not set monitor mode.

APPENDIX G
MODE OPTIONS
(continued)

MODE NAME	MNEMONIC	VALUE	OPTIONS SET	RESET
Special Erasure Edit	EDIT	?91	*When both ORIGIN and this mode are set, erase with respect to scroll boundaries.	Always erase with respect to the partition boundaries.

Note: The * indicates that the indicated mode is not included in the DEC's VT100 command repertoire.

APPENDIX H
GRAPHIC RENDITIONS

NAME	PARAMETER VALUE IS SGR COMMAND	
Primary Rendition	0	
Bold	1	
Underline	4	
Slow blink	5	
Reverse Video	7	
Overstrike	99	Not available in the DEC repertoire.

APPENDIX I
VT100 COMMAND SUMMARY

COMMAND SEQUENCE		COMMAND DESCRIPTION
ESC 7		Save cursor.
ESC 8		Restore cursor.
ESC D		Index cursor; same as linefeed.
ESC E		Next line; same as CR LF.
ESC H		Set tab at current character position.
ESC M		Reverse Index.
ESC Z		Request by host for terminal I.D.
ESC c		Reset to Power on state.
ESC =		Enter Keypad Application Mode.
ESC >		Enter Keypad Numeric Mode.
ESC M		Reverse Index.
ESC [@	*	Insert 1 blank character in line.
ESC [0 @	*	Insert 1 blank character in line.
ESC [Pl @	*	Insert Pl blank characters in line.
ESC [A		Move cursor up 1.
ESC [0 A		Move cursor up 1.
ESC [Pl A		Move cursor up Pl.
ESC [B		Move cursor down 1.
ESC [0 B		Move cursor down 1.
ESC [Pl B		Move cursor down Pl.
ESC [C		Move cursor forwards 1.
ESC [0 C		Move cursor forwards 1.
ESC [Pl C		Move cursor forwards Pl.
ESC [D		Move cursor backwards 1.
ESC [0 D		Move cursor backwards 1.
ESC [Pl D		Move cursor backwards Pl.
ESC [H		Home cursor.
ESC [; H		Home cursor.
ESC [Pl H		Move cursor to row Pl; column 1.
ESC [Pl ; H		Move cursor to row Pl; column 1.
ESC [; P2 H		Move cursor to row 1; column P2.
ESC [Pl ; P2 H		Move cursor to row Pl; column P2.
ESC [J		Erase from cursor to end of Edit region.
ESC [0 J		Erase from cursor to end of Edit region.
ESC [1 J		Erase from top of Edit region to cursor.
ESC [2 J		Erase the Edit region.
ESC [K		Erase from cursor to End of line.
ESC [0 K		Erase from cursor to End of line.
ESC [1 K		Erase from beginning of line to cursor.
ESC [2 K		Erase the active line.
ESC [L	*	Insert 1 line.
ESC [0 L	*	Insert 1 line.
ESC [Pl L	*	Insert Pl lines.

* Indicates that the associated command is not available in DEC's VT100 command repertoire.

APPENDIX I
VT100 COMMAND SUMMARY
(continued)

COMMAND SEQUENCE		COMMAND DESCRIPTION
ESC [M	*	Delete 1 line.
ESC [0 M	*	Delete 1 line.
ESC [Pl M	*	Delete Pl lines.
ESC [P	*	Delete 1 character in line.
ESC [0 P	*	Delete 1 character in line.
ESC [Pl P	*	Delete Pl characters in line.
ESC [Pl ; P2 R		Report cursor position.
ESC [c		Request terminal device attributes.
ESC [0 c		Request terminal device attributes.
ESC [?1 ; 2 c		Report to host the device attributes.
ESC [f		Move cursor to home.
ESC [; f		Move cursor to home.
ESC [Pl ; f		Move cursor to row Pl; column 1.
ESC [Pl f		Move cursor to row Pl; column 1.
ESC [; P2 f		Move cursor to row 1; column P2.
ESC [Pl ; P2 f		Move cursor to row Pl; column P2.
ESC [Pl ; P2 . . . h		Set modes Pl, P2 . .(see Appendix G).
ESC [g		Remove tab stop at cursor position.
ESC [0 g		Remove tab stop at cursor position.
ESC [3 g		Remove all tabs.
ESC [Pl ; P2 ; . . l		Reset modes Pl, P2 .....
ESC [m		Set primary character rendition.
ESC [0 m		Set primary character rendition.
ESC [; m		Set primary character rendition.
ESC [Pl ; P2 ; P3 m		Set renditions Pl, P2 and P3.
ESC [Pl ; ; P2 ; P3 m		Set renditions P2 and P3.
ESC [Pl ; 0 ; P2 m		Set rendition P2 only.
ESC [0 n		Report to host terminal is ready.
ESC [5 n		Request by host for terminal status.
ESC [6 n		Request by host for cursor position.
ESC [p	*	Set partition 1 to 25 lines.
ESC [0 p	*	Set partition 0 to 25 lines.
ESC [Pl p	*	Partition screen at line Pl.
ESC [q		Turn off all LED's.
ESC [0 q		Turn off all LED's.
ESC [; Pl q		Turn off all LED's; set LED Pl.
ESC [Pl ; P2 . . . q		Turn on LED 1, 2 . . . Pl not 0.
ESC [r		Reset scroll area to partition.
ESC [; r		Reset scroll area to partition.
ESC [; P2 r		Reset scroll area to 1 ; P2.
ESC [Pl ; P2 r		Reset scroll area to Pl ; P2.
ESC [s	*	Select partition 0.
ESC [Pl s	*	Select partition Pl.

* indicates that the associated command is not available in DEC's VT100 command repertoire.

APPENDIX I
VT100 COMMAND SUMMARY
(continued)

COMMAND SEQUENCE	COMMAND DESCRIPTION
ESC # 3	Set top half of double height/width line.
ESC # 4	Set bottom half of double height/width line.
ESC # 5	Set normal height/width line.
ESC # 6	Set double width line.
ESC # 8	Set screen to alignment pattarn.
ESC (A	Set G0 set UK character set.
ESC (B	Set G0 set ASCII character set.
ESC (0	Set G0 set special graphics set.
ESC (1	Set G0 set Alternate character set.
ESC (2	Set G0 set alternate special graphics set.
ESC) A	Set G1 set UK character set.
ESC) B	Set G1 set ASCII character set.
ESC) 0	Set G1 set special graphics set.
ESC) 1	Set G1 set alternate character set.
ESC) 2	Set G1 set alternate special graphics set.

APPENDIX J
VT52 COMMAND SUMMARY

COMMAND SEQUENCE		COMMAND DESCRIPTION
ESC <		Enter VT100 mode.
ESC =		Enter Keypad Application Mode.
ESC >		Enter Keypad Numeric Mode.
ESC A		Move cursor up 1.
ESC B		Move cursor down 1.
ESC C		Move cursor right 1.
ESC D		Move cursor left 1.
ESC F		Enter the graphic character set mode.
ESC G		Exit the graphic character set mode.
ESC H		Home cursor.
ESC I		Execute a reverse linefeed.
ESC J		Erase to end of screen.
ESC K		Erase to end of line.
ESC U	*	Delete line.
ESC V	*	Insert line.
ESC W	*	Clear screen and home cursor.
ESC Y line column		Move cursor to line column.
ESC Z		Request terminal identification.

* Indicates that the associated command is not available in DEC's VT52 command repertoire.

APPENDIX K
REAR PANEL DIP SWITCH SETTINGS

SW1 - UPPER SWITCH BANK

SWITCH NUMBER	SWITCH NAME	OFF POSITION (LEFT)	ON POSITION (RIGHT)
1-8	Autowrap	Autowrap Enabled	Autowrap Disabled
1-7	XON/XOFF	Disabled	Enabaled
1-6	New line mode	Enabled	Disabled
1-5	Margin Bell	Enabled	Disabled
1-4	ANSI/VT52 mode	VT52 mode	ANSI mode
1-3	Cursor Blink	Steady Cursor	Blinking Cursor
1-2	Cursor type	Dash Cursor	Block Cursor
1-1	Screen mode	Reverse Video	Normal Video

SW2 - LOWER SWITCH BANK

2-8	Local/Online	Local/Test mode	Online
2-7	Data length	7 data bits	8 data bits
2-6	Parity	Even parity	Odd parity
2-5	parity	Process parity	Ignore parity
2-4	Baud rate select code		
2-3	"		
2-2	"		
2-1	"		

BAUD RATE SELECT CODE (N=ON; F=OFF)

4 3 2 1	SW2	
N N N N	9600 BAUD	
N N N F	7200	
N N N F	4800	
N N F F	3600	
N F N N	2400	
N F N F	2000	
N F F N	1800	
N F F F	1200	
F N N N	600	
F N N F	300	
F N F N	150	
F N F F	134.5	
F F N N	110	(2 stop bits)
F F N F	75	(2 stop bits)
F F F N	50	(2 stop bits)

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