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USER GUIDE

VT132

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VT132 USER GUIDE

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INTRODUCTION

The VT132 editing terminal is a high performance, block mode or interactive video terminal. It offers a wide variety of easy to use editing and communications features that allow you to easily tailor the terminal to a specific application.

The VT132 editing terminal is easy to use even if you have never operated a video terminal before. It is designed to work very much like a typewriter with additional features which allow you to edit the data before it is sent to the computer.

A checklist label is provided for making a semi-permanent record of the features, unique functions and mode of operation of your terminal. Place this label under the keyboard and keep it up-to-date so that you will have a quick reference to the basic status of your machine.







Operator
information

CHAPTER 1

OPERATOR INFORMATION

INTRODUCTION

Chapter 1 is divided into five parts:

Part 1 – Controls and Indicators – shows all controls and indicators on the terminal and summarizes the function of each, thus providing a quick reference for these functions.

Part 2 – SET-UP Mode – defines the SET-UP mode and describes each SET-UP feature in detail.

Part 3 – Edit Mode – describes the edit mode, and functions the operator can perform in this mode.

Part 4 – Self-Testing the VT132 – outlines the steps required to start the built-in tests and how to interpret the results once the tests have been run.

Part 5 – What to do in the Event of a Problem – provides a procedure to follow in case you encounter any problem with the VT132. A table containing easily recognized failures with the appropriate corrective action is provided. Check this list before calling for service.

Commonly Used Editing Terms and Definitions

The following words and terms are commonly used whenever editing features are discussed.

Attribute – A visual form of a character. It does not change the character but affects the visual presentation. Every character has four available attributes: bold, blink, underline, and reverse. Attributes can be used individually or in any combination.

Block mode transmission – Characters typed into the terminal are transmitted as part of a group rather than individually as they are typed. This reduces the time a computer uses to receive data from the terminal.

Compression – Reduces the number of characters sent to the host computer. Compression removes all space characters at the end of a field and replaces them with a special code the computer recognizes.

Field – A group of consecutive character positions. A field may be protected or unprotected.

Field boundary – The start or end of a field. A boundary is shown by a change in character attributes.

Interactive – The terminal sends data to the host computer as soon as it is typed. The terminal does *not* store data to send later.

Insert mode – The operator can insert characters into an existing field or line. Data already there moves to make room for new data.

Protected field – The operator cannot change or insert characters in that location of the screen.

Scrolling region – The active area of the screen that scrolls up or down when new lines are added. The host computer designates the scrolling region using control sequences.

Unprotected field – The operator can type a character in that location of the screen.

PART 1—CONTROLS AND INDICATORS

The VT132 has a wide variety of controls and indicators the operator uses to monitor and direct terminal operations. They are categorized as follows:

Keyboard controls	Monitor controls
Keyboard indicators	Audible indicators.

KEYBOARD CONTROLS

The VT132 has two keypads on a single detached keyboard (Figure 1-1). The main keyboard arrangement and sculpturing is styled like a standard office typewriter. The auxiliary or numeric keypad allows numeric data to be entered in a calculator like fashion.

The VT132 keyboard controls are divided by key function:

Standard keys	SET-UP mode keys
Special function keys	Edit mode keys.

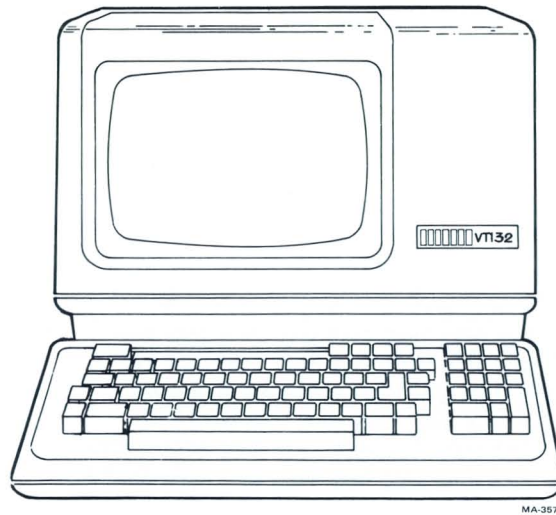


Figure 1-1 VT132 Terminal

Standard Keys

Figure 1-2 identifies those VT132 keys that usually operate as standard typewriter and calculator keys. These keys generate ASCII codes to the host computer. The minus, comma, period, and numeric keys of the numeric keypad normally generate the same codes as the corresponding unshifted keys of the main keyboard. In interactive mode, the main keyboard SHIFT key does not affect codes generated by the numeric keypad.

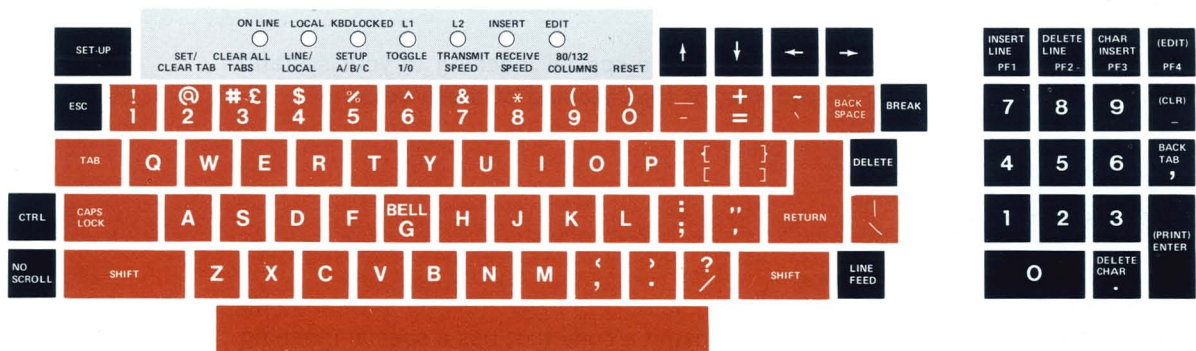


Figure 1-2 VT132 Keyboard Standard Keys

When in keypad application mode, the numeric keypad generates codes that have special meaning to the host computer. Consult your local operating procedures for the specific meanings of the keys. (See Chapter 3 for information concerning the code generated by these keys.)

CAPS LOCK

Enables the transmission of uppercase alphabetic characters only. All numeric and special symbol keys remain in lowercase.

SHIFT

Enables the uppercase function of all keys. If a key does not have an uppercase function the **SHIFT** key is disregarded.

Interactive Mode Special Function Keys

The special function keys shown in Figure 1-3 transmit codes to the host computer that may have special meaning to the application program. To determine the actual operation performed by these keys consult your local operating procedures. The following paragraphs provide a general function description.

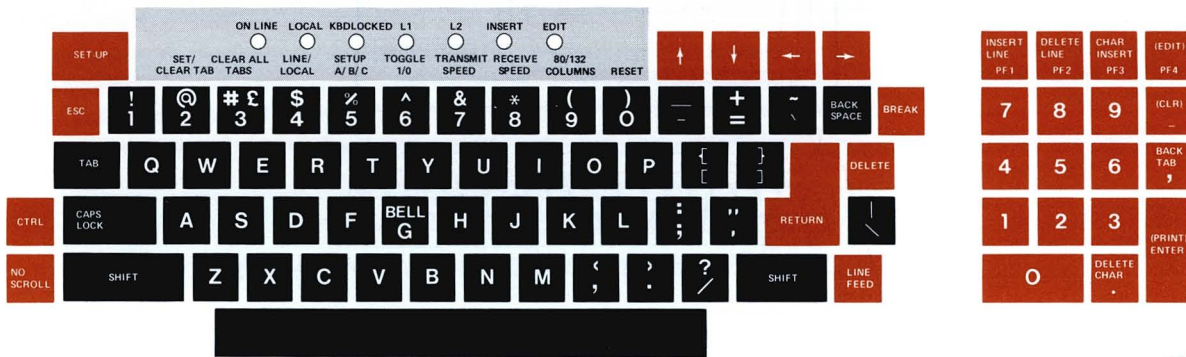


Figure 1-3 VT132 Keyboard Special Function Keys

SET-UP

Places the VT132 in SET-UP mode. While in SET-UP mode terminal features such as tabs and scrolling can be changed.



Each of these keys transmits a code that has a special meaning to your system. Consult your local operating procedures for the meaning of these keys.

BREAK

Transmits a break signal.

PF1 – PF4

In interactive mode each of these keys transmit a code that has a special meaning to your system. Consult your local operating procedures for the meaning of these keys.

DELETE

In interactive mode, this key transmits a delete character code to the host system. A character may or may not be erased from the screen.

RETURN

Transmits either a carriage return (CR) code or a carriage return (CR) and linefeed (LF) code. This is a SET-UP selectable feature.

LINEFEED

Transmits a linefeed code.

NO SCROLL

When first pressed, this key stops transmission of data from the computer to the VT132. When pressed a second time, transmission resumes where it stopped. Check your local operating procedures to ensure that your system recognizes this key.

CTRL

When pressed with another key, **CTRL** transmits a code that has a special meaning to your system.

ESC

Transmits a code that normally has special meaning to your system. In many applications, it tells your system to treat the next keys pressed as a command.

Numeric Keypad

In interactive mode, the numeric keypad enters numbers in calculator fashion. Each key generates the same character as the corresponding numeric key on the main keyboard. The **ENTER** key corresponds to the **RETURN** key. These keys may also be interpreted by the host computer as special function keys. Consult your local operating procedures for the meaning of these keys.

SET-UP Mode keys

Figure 1-4 identifies the keys that have special meanings to the terminal when in SET-UP mode. The three SET-UP modes: SET-UP A, SET-UP B, and SET-UP C are discussed later in this chapter.



Figure 1-4 VT132 Keyboard SET-UP Mode Keys

@ 2 SET/CLEAR TAB

In SET-UP A this key sets or clears individual horizontal tabs.

£ 3 CLEAR ALL TABS

In SET-UP A this key clears all horizontal tabs set in the VT132.

\$
4 **LINE/LOCAL**

In any SET-UP mode this key switches the VT132 between ON LINE and LOCAL. When ON LINE the VT132 can communicate with the host computer. In LOCAL the VT132 cannot communicate with your host computer.

%
5 **SET-UP A/B/C**

In SET-UP mode this key switches the terminal from SET-UP A to SET-UP B to SET-UP C and then back to SET-UP A.

^
6 **TOGGLE 1/0**

In SET-UP B or SET-UP C this key turns the selected feature on or off.

&
7 **TRANSMIT SPEED**

In SET-UP B this key steps the terminal through the transmit baud rate settings in ascending order.

8 **RECEIVE SPEED**

In SET-UP B this key steps the terminal through the receive baud rate settings in ascending order.





(
9 **80/132 COLUMNS**

In SET-UP A this key switches the display line size from 80 to 132 characters per line or from 132 to 80 characters per line.

)
0 **RESET**

This key starts the reset sequence in any SET-UP mode. This is the same as turning the terminal power off and then on.



In SET-UP mode  and  increase and decrease the display brightness. The  and  keys move the cursor left and right.

A

In SET-UP B, the **SHIFT** and **A** keys are used to enter the answerback message.

D

In any SET-UP mode, the **SHIFT** and **D** key combination invokes the factory stored default condition. The default condition resets all SET-UP features. The default feature settings are explained in detail in Part 2 of this chapter.

T

In SET-UP A, the **SHIFT** and **T** key combination invokes the factory stored tab default condition. The default condition resets all current tabs and sets a tab every eight character positions.

P

In SET-UP B, the **SHIFT** and **P** key combination steps the terminal through the preselected parity and bit per character settings.

Edit Mode Keys

Figure 1–5 identifies the special function keys when the terminal is in edit mode. The following paragraphs briefly describe the function of each key.



Figure 1-5 VT132 Keyboard Edit Mode Keys

INSERT LINE PF1

INSERT LINE

Inserts a new line consisting of spaces at the current line shown by the cursor. This key has no effect when:

1. there is a protected field on the current line
2. the cursor is outside the scrolling region.

DELETE LINE PF2

DELETE LINE

Deletes the line shown by the cursor. All remaining lines move up one line and a new line of spaces is placed just before the next line containing a protected field, or if none of the following lines contain a protected field, at the bottom of the scrolling region. This key has no effect when:

1. there is a protected field on the current line
2. the cursor is outside the scrolling region.

**CHAR INSERT**

Turns the insert mode on and off. In insert mode characters are inserted at the cursor location and existing characters move to the right to make room for new characters. Characters do not move beyond the end of the current field or line. Protected fields are not affected.

**(EDIT)**

The **SHIFT** and **(EDIT)** key combination switches the VT132 between edit and interactive modes. The EDIT indicator is on when the terminal is in edit mode.

**(CLR)**

The **SHIFT** and **(CLR)** key combination clears all unprotected data on the screen and moves the cursor to the start of the first unprotected field.

**BACK TAB**

Moves the cursor back to the start of the current unprotected field, the previous unprotected field, the last tab position, or the first unprotected field, whichever comes first.

**(PRINT) ENTER**

Starts the transmission of edited data to the host computer. When the **SHIFT** key is pressed with the **(PRINT)** key the terminal sends data to the optional local printer.

**DELETE CHAR**

Deletes the character indicated by the cursor. Characters to the right of the deleted character move left within the field.

**DELETE**

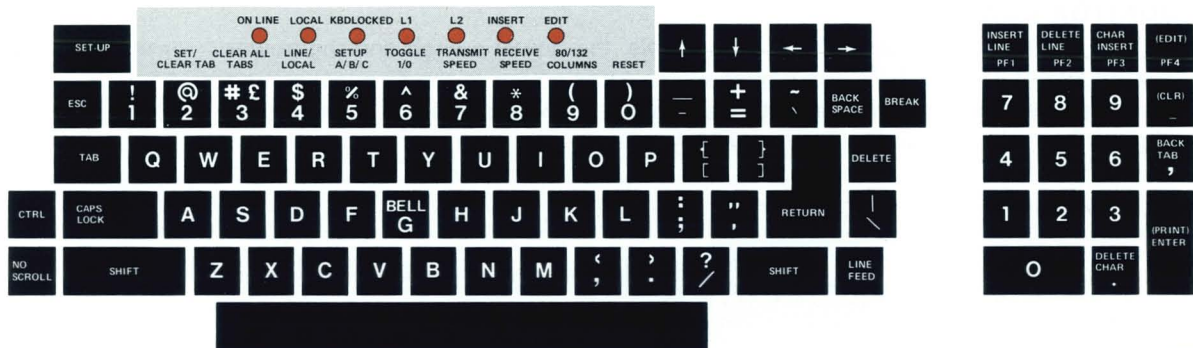
Deletes the character to the left of the cursor. Characters to the right of the deleted character move left within the field.

**TAB**

Moves the cursor to the start of the next unprotected field, the next tab position, or the end of the scrolling region, whichever comes first.

KEYBOARD INDICATORS

Figure 1-6 locates each of the keyboard indicators described in the following paragraphs.



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Figure 1-6 VT132 Keyboard Indicators

ON LINE

The VT132 is on-line and ready to transmit or receive messages.

LOCAL

The terminal is off-line and cannot communicate with the host device. In local mode the keyboard remains active and all characters typed are placed on the screen.

KBD LOCKED

The keyboard has been turned off. The VT132 is still able to receive data from the host computer. This condition can be cleared by entering and exiting SET-UP mode.

L1 and L2

These indicators are turned on and off by the host computer. Consult your local operating procedures for the meaning of the indicator. The L1, L2, INSERT, and EDIT indicators are also used to show self-test errors.

INSERT

The terminal is in insert mode. All characters typed on the keyboard are inserted at the point where the cursor is located. When the insert indicator is off, any character typed on the keyboard replaces the character highlighted by the cursor.

EDIT

The terminal is in edit mode. All characters typed on the keyboard are stored in the VT132 and displayed on the screen. Transmission to the host computer occurs only when the **ENTER** key is pressed or when the host computer sends a specific control sequence to the terminal. In edit mode, all local editing, block transmit, and field related features are active. In interactive mode, the EDIT indicator is off and characters typed on the keyboard are sent immediately to the host computer.

MONITOR CONTROLS

The VT132 monitor contains only two controls, the power switch and the power selector switch (Figure 1-7). The power switch turns power to the terminal on and off. The power selector switch adapts the terminal to the available ac input voltage range: 90 V to 128 V and 180 V to 256 V.

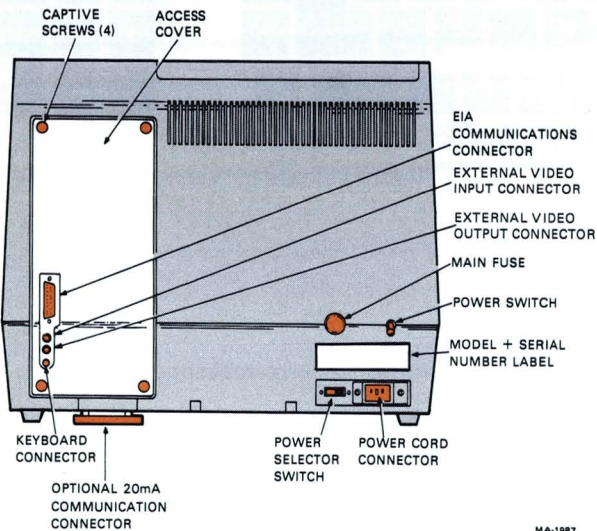


Figure 1-7 VT132 Terminal (rear view)

AUDIBLE INDICATORS (Tones)

There are three audible alarms associated with the VT132: a short tone, a long tone, and a series of long tones.

Short Tone

Sounds (click) whenever a key is pressed, with the following exceptions:

1. **SHIFT** or **CTRL** keys do not generate any keyclick because these keys do not transmit any codes but only modify the codes transmitted by other keys.
2. KBD LOCKED indicator is turned on; in which case, the characters typed are lost.
3. The keyclick feature has been turned off in SET-UP mode.

Long Tone

Sounds (beep) to indicate one of the following conditions:

1. A bell code was received from the computer.
2. The cursor is eight characters away from the right margin and the margin bell feature is enabled.
3. An error was made while entering data in edit mode.

Series of Long Tones

The terminal sounds the long tone several times in rapid succession to indicate that the nonvolatile memory (NVR) had difficulty reading or writing the SET-UP features. If the terminal has difficulty reading the contents of the NVR the factory default condition parameters are invoked automatically. (These parameters are explained later in this section.) When this occurs, check the SET-UP features and then perform the Recall or Save operation again.

PART 2—SET-UP MODE

Unlike most terminals, the VT132 does not use switches or jumpers to individually turn the built-in terminal features on or off. Instead, the VT132 uses a nonvolatile memory (NVR) that always remembers what features have been selected, as if a switch had been set.

The selection and storage of built-in terminal features is performed in a special mode of operation called SET-UP mode. When you enter SET-UP mode, the status of the features stored in temporary memory is shown on the screen. You can change the features and store any new feature selections either temporarily, by leaving SET-UP mode; or on a fixed basis, by performing a Save operation. In either case, the terminal operation reflects the new feature selection. All temporary feature settings are replaced by the features that have been stored on a fixed basis if one of the following events occur:

- A Recall operation is performed
- The terminal is reset
- The terminal power is turned off.

SET-UP mode provides three brief summaries of the current feature status. The first summary – SET-UP A – displays the location of the tab stops set in the terminal and a visual ruler which numbers each character position on the line. The second summary – SET-UP B – displays the status of the interactive features. The third summary – SET-UP C – displays the status of the edit mode features.

SET-UP A

To enter SET-UP A, press the **SET-UP** key. The display has a presentation similar to Figure 1-8. The bottom line of the display consists of a “ruler” that numbers each character position available on a line. The location of each tab stop is shown by a “T” placed above the ruler. If the tab stop(s) set are those desired, you may exit SET-UP A by pressing the **SET-UP** key again or you may now change the tabs to meet your requirements.

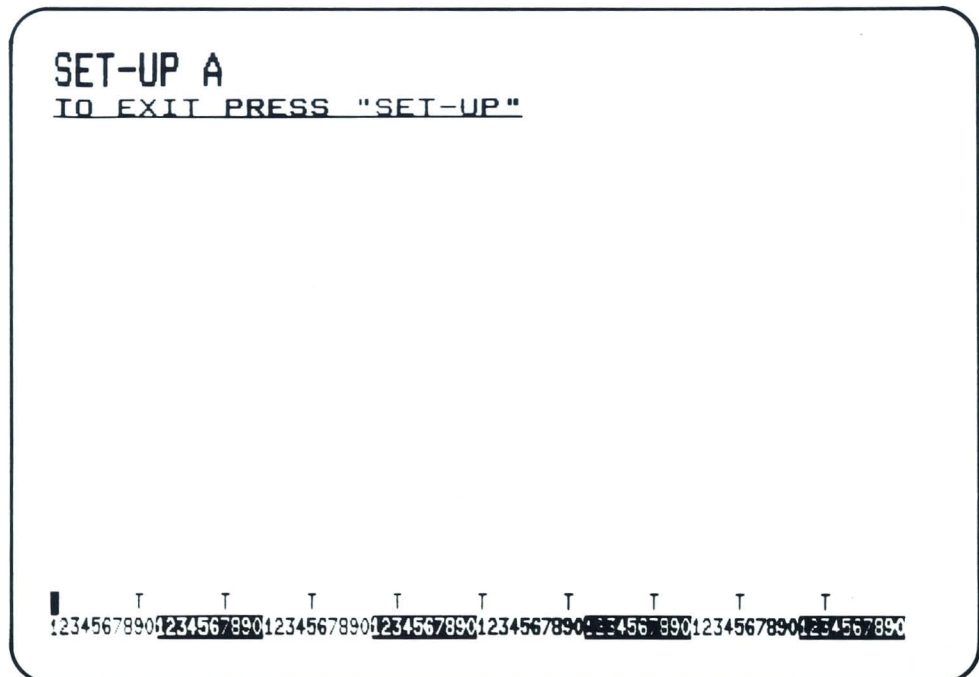
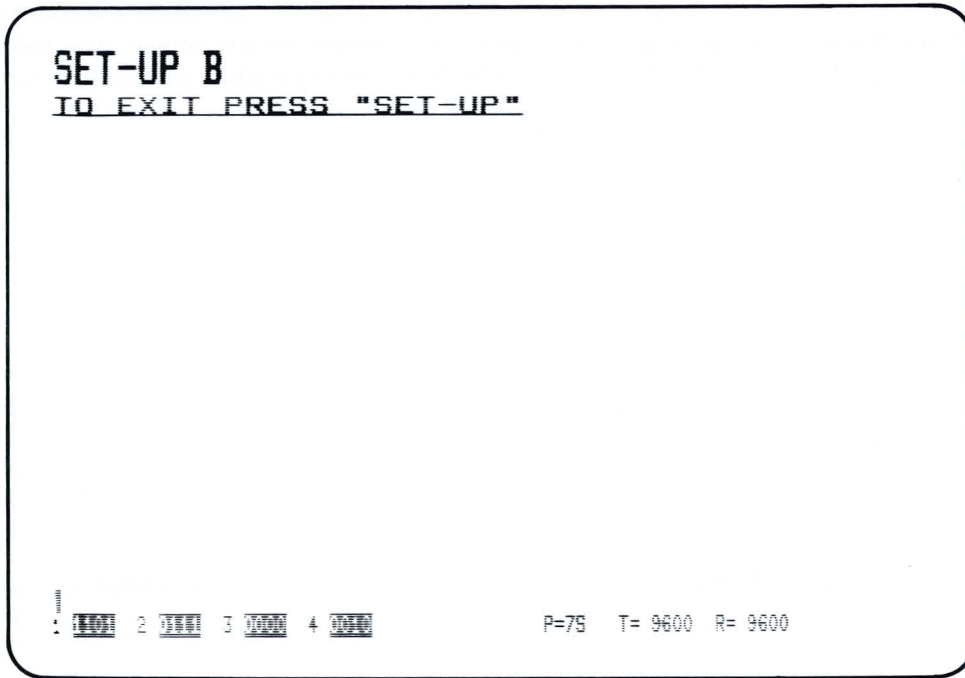


Figure 1-8 SET-UP A Presentation

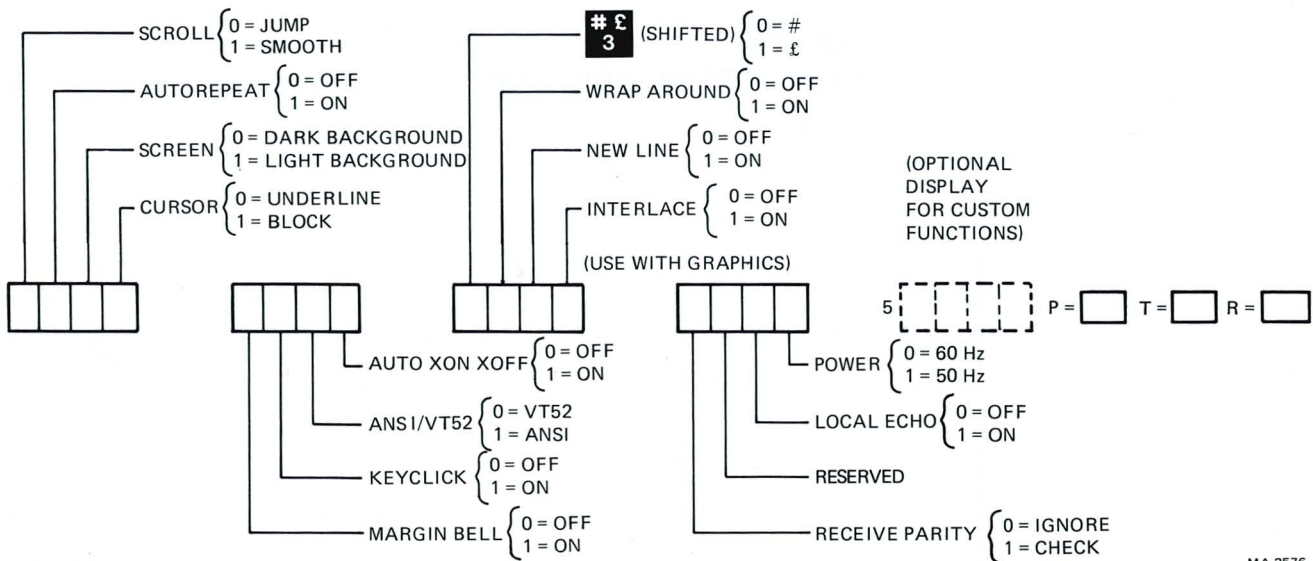
SET-UP B

SET-UP B may only be entered from SET-UP A. To enter SET-UP B from SET-UP A press the **5** key on the main keyboard. The display looks like Figure 1-9. Figure 1-10 summarizes the SET-UP B presentation and allows you to quickly determine which interactive features are enabled. For additional information on each feature refer to the SET-UP Feature Definition section in this chapter.



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Figure 1-9 SET-UP B Presentation



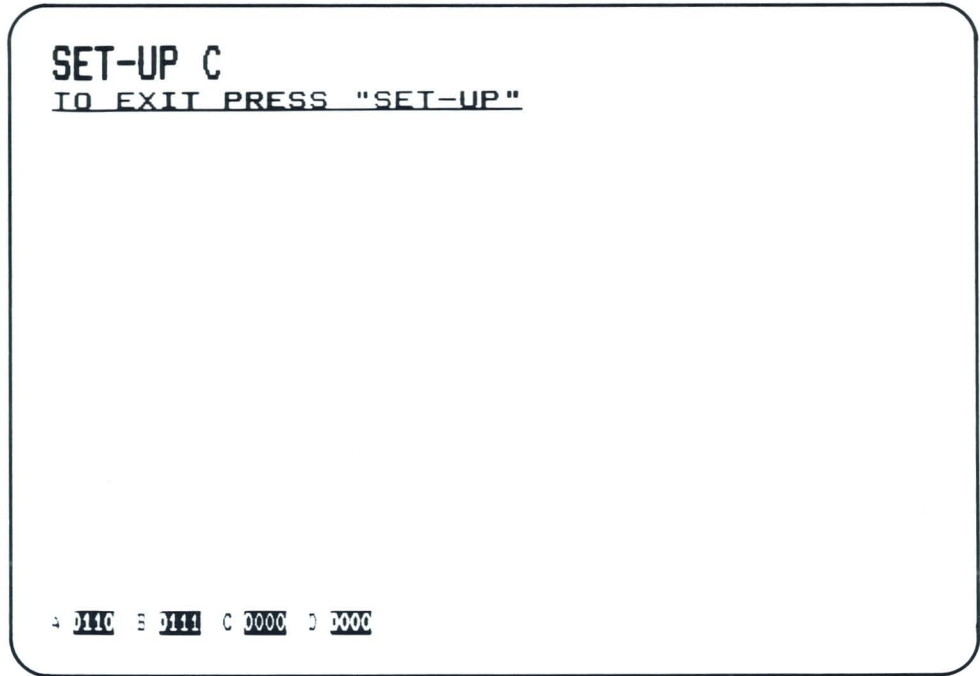
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Figure 1-10 SET-UP B Summary

You may exit SET-UP B by pressing the **SET-UP** key to return to normal operating mode or you can press the **5** key on the main keyboard to enter SET-UP C.

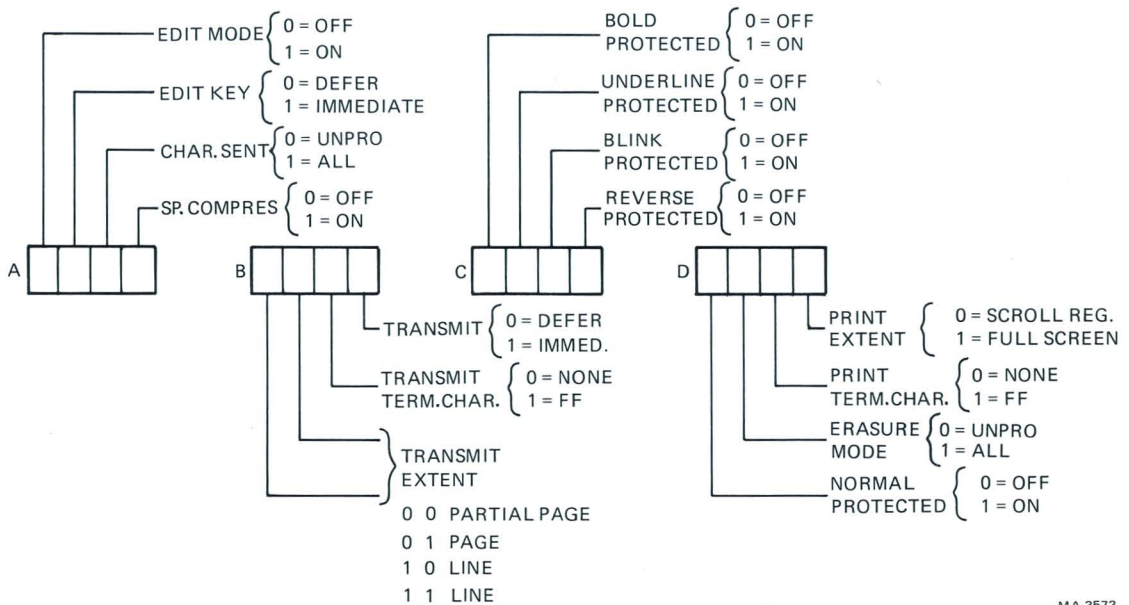
SET-UP C

SET-UP C may only be entered from SET-UP B. To enter SET-UP C from SET-UP B press the **5** key on the main keyboard. The display looks like Figure 1-11. Figure 1-12 summarizes the SET-UP C presentation and allows you to quickly determine which interactive features are enabled. For additional information on each feature refer to the SET-UP Feature Definition section in this chapter.



MA-3574

Figure 1-11 SET-UP C Presentation



MA-3573

Figure 1-12 SET-UP C Summary

You may exit SET-UP C by pressing the **SET-UP** key to return to normal operating mode or you can press the **5** key on the main keyboard to return to SET-UP A.

Determining What a SET-UP Feature Does

SET-UP features are basically a series of options in the VT132 that allow the terminal to be tailored to its operating environment. Table 1-1 lists each feature and places it in one of the following general categories:

Installation	Operator comfort
Computer compatibility	Editing.

The installation category includes initial installation of the terminal and any special options that may be attached to the terminal. If options are added or removed, or the physical location of the installation is changed, verify the setting of these SET-UP features.

Computer compatibility contains the features that must be set correctly so that the VT132 can communicate with the host computer. An error in these settings may cause incorrect data to be sent to or received from the computer; or an error may prevent the VT132 from communicating with the computer. These feature settings must be obtained from the host computer programmer, computer operator, or system manager since there are many combinations of settings designed to work with particular computers and special software. Feature settings normally change only when you need to communicate with a different computer or a unique software package.

The operator comfort category contains SET-UP features designed exclusively for the operator. These features allow the operator to tailor the VT132 to fit individual preference. They do not affect any operations that occur between the terminal and the computer.

The editing category contains SET-UP features associated with the VT132's editing capability. These features define which characters will be protected and what occurs during block mode transmission of data to the host computer. Like the computer compatibility features, the editing features must be set correctly so that the VT132 can communicate with the host computer. An error in these settings may cause incorrect data to be sent to the computer. These feature settings must be obtained from the host computer programmer, computer operator, or system manager since there are many combinations of settings designed to work with particular computers and special software. They normally change only when you need to communicate with a different software package.

The SET-UP Feature Definition section in this chapter describes the specific function of each feature.

Changing a SET-UP Feature

Changing any or all of the SET-UP features is a simple operation and is generally performed by following the same basic steps.

1. Enter SET-UP mode by pressing the **SET-UP** key.
2. Select the appropriate SET-UP mode by pressing the **5** key on the main keyboard. Use this key to switch from SET-UP A to SET-UP B to SET-UP C and back to SET-UP A.
3. Position the cursor above the feature switch or tab stop to be changed. To position the cursor, use the **SPACE BAR**, **←**, **→**, **TAB**, and **RETURN** keys. (Some features do not use this step since a specific key is dedicated to changing the feature.)
4. Change the feature setting by pressing either the **6** key on the main keyboard or the appropriate dedicated key. Each time the key is pressed the feature changes, generally to the opposite state.

Table 1-1 Categories of SET-UP Features

	Installation	Computer Compatibility	Operator Comfort	Editing
ANSI/VT52 mode		X		
Answerback message		X		
Auto repeat			X	
Auto XON/XOFF		X		
Blink protected				X
Bold protected				X
Characters per line		X		
Characters sent				X
Cursor			X	
Edit key				X
Edit mode		X		X
Erasure mode		X		
Interlace	X			
Keyclick			X	
Line/Local		X		
Local echo		X		
Margin bell			X	
New line		X		
Normal protected				X
Parity		X		
Power	X			
Print extent		X		
Print termination char		X		
Receive parity		X		
Receive speed		X		
Reverse protected				X
Screen background			X	
Screen brightness			X	
Scroll		X	X	
Space compression		X		X
Tabs			X	
Transmit				X
Transmit extent				X
Transmit speed		X		
Transmit termination char				X
Underline protected				X
Wraparound		X		
# 3 (shifted)		X		

Table 1-2 provides a summary of SET-UP features, the SET-UP mode you must be in to change a given feature, and the key used to change the feature setting.

Setting the Answerback Message

Setting the answerback message differs from setting any of the other terminal features. An answerback message can be set by using the following steps:

1. Place the terminal in SET-UP B.
2. Press the **SHIFT** and **A** keys simultaneously. The terminal responds by placing **A=** on the screen. (The **SHIFT** key is required. The **CAPS LOCK** key does not work here.)
3. Type the message delimiter character. This may be any character not used in the actual answerback message. The message delimiter character is not part of the answerback message. If a mistake is made when typing the answerback message, type the message delimiter character again and go back to step 2. This is the *only* way to correct errors in the answerback message.
4. Type the answerback message. The message may be up to 20 characters, including space and control characters. Control characters are displayed as a **◆** character to indicate their presence in the message.
5. Type the message delimiter character. Once the message delimiter character is typed the answerback message disappears from the screen.

After completing the above steps the answerback message is temporarily stored in the VT132. It can be stored on a fixed basis with the Save operation.

Setting the Parity

Set the terminal parity by performing the following steps:

1. Place the terminal in SET-UP B.
2. Press the **SHIFT** and **P** keys simultaneously. The terminal then steps through the preset bits per character/parity combinations. Each time the key combination is pressed the feature setting changes. The feature settings are:

7M	7 bits per character/mark parity
7S	7 bits per character/space parity
7O	7 bits per character/odd parity
7E	7 bits per character/even parity
7N	7 bits per character/no parity bit
8O	8 bits per character/odd parity
8E	8 bits per character/even parity
8N	8 bits per character/no parity bit.

After completing the above steps the parity feature is temporarily stored in the VT132. It can be stored on a fixed basis with the Save operation.

Table 1-2 SET-UP Feature Change Summary

	SET-UP A	Changed In SET-UP B	SET-UP C	Key Used To Change Feature
ANSI/VT52 mode		X		6
Answerback message		X		† (see note)
Auto repeat			X	6
Auto XON/XOFF		X		6
Blink protected			X	6
Bold protected			X	6
Characters per line	X	X		6
Characters sent			X	6
Cursor		X		6
Edit key			X	6
Edit mode			X	6
Erase mode			X	6
Interlace		X		6
Keyclick		X		6
Line/Local	X	X	X	4
Local echo		X		6
Margin bell		X		6
New line		X		6
Normal protected			X	6
Parity		X		6
Power		X		6
Print extent			X	6
Print termination char			X	6
Receive parity		X		† (see note)
Receive speed		X		8
Reverse protected			X	6
Screen background		X		6
Screen brightness	X	X	X	↑ or ↓
Scroll		X		6
Space compression			X	6
Tabs	X			2 and 3
Transmit			X	6
Transmit extent			X	6
Transmit speed		X		7
Transmit termination char			X	6
Underline protected			X	6
Wraparound		X		6
# 3 (shifted)		X		6

† A special sequence detailed later in this chapter is required for this feature.

Saving SET-UP Features

SET-UP features may be changed and stored on either a temporary or a fixed basis. To temporarily store a feature, exit SET-UP mode after changing the feature. The terminal now reacts according to the new setting. If a recall operation is performed, or the terminal is reset, or the terminal power is turned off, all temporary feature settings are replaced by features that have been stored on a fixed basis.

To store SET-UP feature settings on a fixed basis, perform a Save operation. This is a simple operation that is accomplished by performing the following steps:

1. Place the terminal in SET-UP mode.
2. Press the **SHIFT** and **S** keys simultaneously. The screen clears and the message "Wait" is displayed in the upper-left corner. After a brief wait, the terminal returns to SET-UP A.

NOTE: The Save operation must be performed at the terminal keyboard. The computer cannot perform this operation, although it can temporarily modify the setting of VT132 features.

After completing these steps, SET-UP features which were temporarily stored are now stored in nonvolatile memory on a fixed basis (until the next Save operation is performed).

Recalling SET-UP Features

Temporarily stored SET-UP feature settings may differ from settings stored on a fixed basis. To return to the fixed settings, perform the recall operation:

1. Place the terminal in SET-UP mode.
2. Press the **SHIFT** and **R** keys simultaneously. The screen clears and the message "Wait" appears in the upper-left corner of the screen. After a brief wait the terminal returns to SET-UP A.

NOTE: When a recall operation is performed the contents of the screen memory are erased.

Resetting the Terminal

The VT132 may be reset from the keyboard. When the terminal is reset, the terminal memory is cleared and the self-test program is run just as if the terminal power switch had been turned off and then back on. To reset the terminal:

1. Place the terminal in SET-UP mode.
2. Press the **0** (zero) key on the main keyboard. The VT132 is reset, the self-test runs, and the terminal reacts according to the SET-UP features fixed in nonvolatile memory.

NOTE: When a reset operation is performed the contents of the screen memory are erased.

SET-UP Default Conditions

The VT132 contains a default condition for all nonvolatile memory features. These default conditions are contained in read only memory (ROM) and are not changeable. When the default conditions are invoked, all feature settings – regardless of how they have been saved – are changed to the default condition.

Default conditions are invoked in two ways: either automatically by the terminal when it has difficulty reading the contents of the nonvolatile memory; or manually by the operator from the keyboard. The two default conditions – general and tab – are described in the following paragraphs.

General Default – The general default condition resets all terminal feature settings. The default settings are listed below and are shown in Figures 1-13 and 1-14.

Parity	7S
Transmit speed	9600
Receive speed	9600
Tabs	Every 8 columns
Characters per line	80
Line/Local	Local
Answerback	None

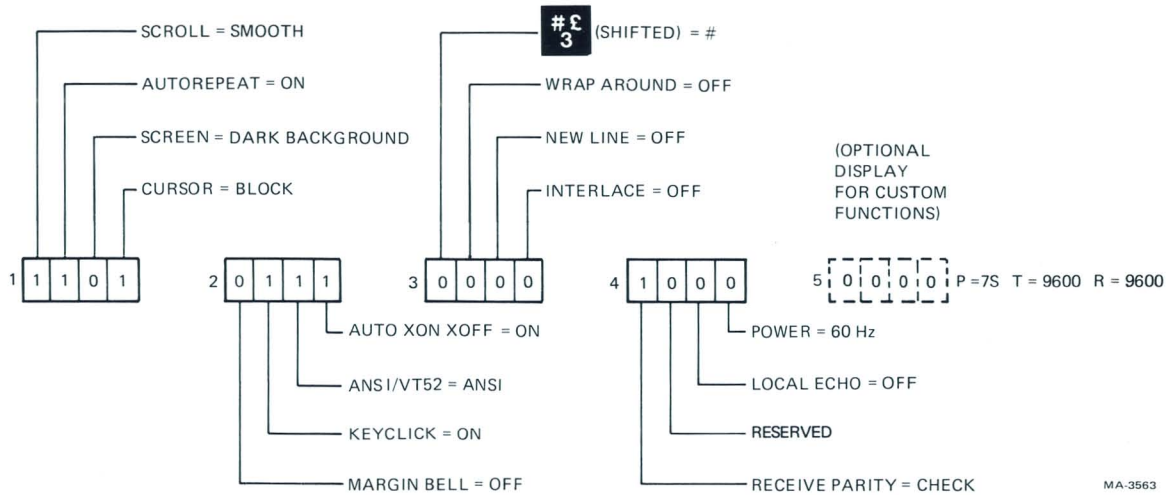


Figure 1-13 SET-UP B Default Conditions

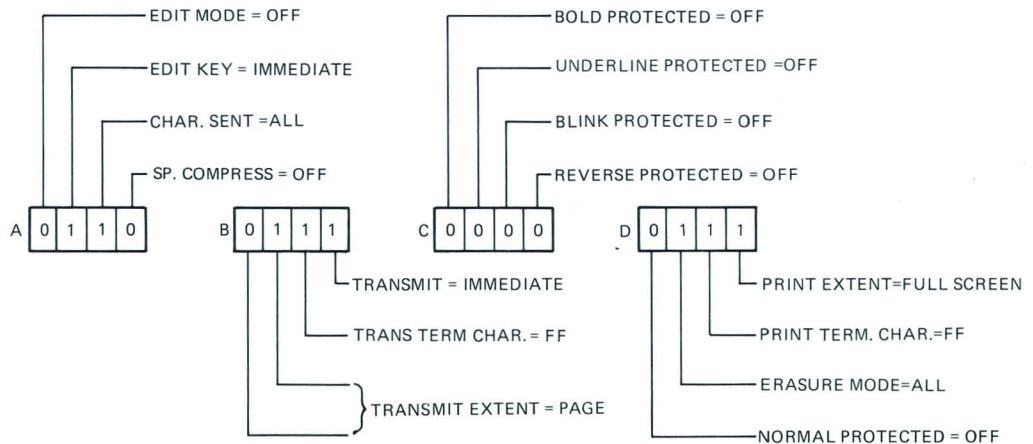


Figure 1-14 SET-UP C Default Conditions

To invoke the general default condition from the keyboard use the following procedure:

1. Place the terminal in SET-UP mode.
2. Press the **SHIFT** and **D** keys simultaneously. The screen clears and after a brief time the terminal returns to SET-UP A.

NOTE: When the general default settings are invoked, the contents of the screen memory are erased.

Once these steps are performed, the SET-UP feature settings are the same as those shown above.

Tab Default – The tab default condition resets all terminal tab settings and sets a new tab at every eighth column. To invoke the tab default condition use the following procedure:

1. Place the terminal in SET-UP A.
2. Press the **SHIFT** and **T** keys simultaneously. The tab setting clears and new tab settings appear every eighth character position.

Once these steps are performed, the default tab condition is set in the terminal.

SET-UP FEATURE DEFINITIONS

This section describes each SET-UP feature in detail (in alphabetical order) and how it affects the terminal.

NOTE: Unless otherwise stated, entering SET-UP mode and changing features does not result in the loss of data displayed on the screen.

ANSI/VT52 Mode

The VT132 terminal follows two programming standards – American National Standards Institute (ANSI) and VT52. In ANSI mode, the VT132 generates and responds to some of the coded sequences specified in ANSI standards X3.41-1974 and X3.64-1977. In VT52 mode, the VT132 is compatible with previous DIGITAL software using the VT52 video terminal. Both ANSI and VT52 modes are outlined in the programmer section of this manual.

Answerback Message

Answerback is a question and answer sequence where the host computer asks the terminal to identify itself. Answerback allows the terminal to identify itself by sending a message to the host. The entire answerback sequence takes place automatically without affecting the screen or requiring operator action. The answerback message may also be transmitted by pressing the **CTRL** and **BREAK** keys simultaneously.

Auto Repeat

Auto repeat automatically repeats a key at about 30 characters per second when the key is held down for more than one half second. Auto repeat affects all keyboard keys except the following:

SET-UP	ENTER
ESC	RETURN
NO SCROLL	CTRL (with any key)

Auto XON/XOFF

The VT132 can automatically generate synchronizing codes XON (DC1) and XOFF (DC3). The XOFF code stops transmission of data from the computer to the terminal; the XON code resumes transmission. With the feature enabled, the VT132 generates the XOFF code when one of the following events occur:

1. The internal buffer is nearly full
2. The **NO SCROLL** key is pressed
3. The terminal is placed in SET-UP mode
4. **CTRL** and **S** keys are pressed simultaneously.

When the buffer empties, or the **NO SCROLL** key is pressed again, or the terminal is taken out of SET-UP mode, or **CTRL** and **Q** keys are pressed simultaneously, the VT132 transmits the XON code to resume transmission from the computer to the terminal.

If the host computer software does not support XON/XOFF codes, data sent during buffer full conditions, or when the terminal is in SET-UP mode, may be lost.

NOTE: The VT132 always stops transmission when an XOFF (DC3) code is received and resumes transmission when an XON (DC1) code is received regardless of the Auto XON/XOFF feature setting.

Blink Protected

When the VT132 is in edit mode, this feature protects all blinking characters on the screen. A protected character cannot be changed or deleted from the keyboard. In interactive mode, this feature is disregarded.

Bold Protected

When the VT132 is in edit mode, this feature protects all bold characters on the screen. A protected character cannot be changed or deleted from the keyboard. In interactive mode, this feature is disregarded.

Characters per Line

The VT132 can display either 80 or 132 characters per line. In 80 character per line mode, the screen is 80 characters wide by 24 lines high. In 132 character per line mode, the screen is 132 characters wide by 24 lines high. In 132 character per line mode, the displayed lines are physically the same width as in the 80 character per line mode but the characters are more compact.

NOTE: When changing from 80 to 132 character per line mode or vice-versa, the current contents of the screen are lost.

Characters Sent

This feature determines what characters shown on the screen are sent to the host computer in edit mode. If the "all" setting is selected, all characters shown on the screen are sent to the host computer. If the "unprotected only" setting is selected only the unprotected data is sent to the host computer. A technical description of this feature is provided in the compression and suppression section of Chapter 3.

Cursor

The VT132 has two cursor displays to indicate the "active positions" or where the next character will be placed on the screen. The cursor may be displayed as either a blinking underline (—) or a blinking block (■).

Edit Key

The edit key feature determines how the VT132 is placed in edit mode. When the feature is set for immediate, pressing the **SHIFT** and **(EDIT)** keys simultaneously switches the terminal between interactive and edit modes. If the feature is set for deferred, the terminal sends a control sequence when the **SHIFT** and **(EDIT)** keys are pressed simultaneously. The computer must echo this control sequence back to the terminal to switch it between interactive and edit modes. See the technical description of the DECEKEM control sequence in Chapter 3 for more information.

Edit Mode

This feature determines whether the terminal is in edit mode (1) or interactive mode (0). Normally the edit mode feature determines the mode the terminal is placed in after a power up or reset operation. Setting this feature does not affect the **(EDIT)** key when changing between edit and interactive mode.

Erasure Mode

This feature determines what characters on the screen the host computer can erase by remote command. When the feature is turned off (0) the host computer can erase only the unprotected data on the screen. When the feature is on (1) the host computer can erase any character on the screen.

Interlace

This feature is used for high resolution options. Interlace should be turned off if such an option is not installed.

Keyclick Tone

The keyclick tone is generated every time a key is pressed. It may be turned on or off but research shows that an operator is more accurate when there is audible feedback from the keyboard. Like the bell tone, the keyclick volume is not adjustable.

LINE/LOCAL

The LINE/LOCAL feature allows the operator to easily place the terminal in either an on-line or local (off-line) condition. When the terminal is on-line (the ON-LINE indicator is on) all characters typed on the keyboard are sent directly to the computer and messages from the computer are displayed on the screen. In the local condition (the keyboard LOCAL indicator is on), the terminal is effectively disconnected from the computer; messages are not sent to or received from the computer; and characters typed on the keyboard are echoed to the screen directly.

Local Echo

When this feature is on, every character sent to the host computer is echoed to the screen automatically. The host computer does not have to transmit the character back to the terminal. If double characters appear on the screen, turn the local echo feature off since the host computer is echoing characters back to the terminal.

Margin Bell

The margin bell feature is like the bell in a typewriter. When the cursor is eight characters from the end of the current line while typing, the VT132 sounds a tone to alert the operator.

New Line

The new line feature enables the **RETURN** key on the terminal to function like the return key on an electric typewriter. When the new line feature is enabled, pressing the **RETURN** key generates the carriage return (CR) and line feed (LF) codes. When a line feed code is received, the code is interpreted as a carriage return and line feed.

When the new line feature is disabled, **RETURN** generates only the CR code; an LF code causes the terminal to perform a line feed only.

If double line feeds occur consistently, turn this feature off since the computer is already performing this function.

Normal Protected

When the VT132 is in edit mode, this feature protects all characters on the screen that are not either bold, blinking, underlined, or reversed. A protected character cannot be changed or deleted from the keyboard. In interactive mode, this feature is disregarded.

Parity

The parity feature defines two separate but interrelated items on the VT132: bits per character and parity. Bits per character defines the transmit and receive character size: 7 or 8 bits. In 8-bit operation, bit 8 is set to a space (or 0) for characters transmitted. Bit 8 is ignored on all characters received.

Parity defines the type of parity bit the VT132 generates for transmitted characters and checks the received characters if the Receive Parity feature is set to "check." The terminal can generate the following bits per character/parity combinations:

7M	7 bits per character/mark parity
7S	7 bits per character/space parity
7O	7 bits per character/odd parity
7E	7 bits per character/even parity
7N	7 bits per character/no parity bit
8O	8 bits per character/odd parity
8E	8 bits per character/even parity
8N	8 bits per character/no parity bit.

Power

During initial installation, the terminal display must be set to the power line frequency. In the U.S. this should be set to 60 hertz.

Print Extent

The print extent feature determines what characters shown on the screen are printed by the optional local printer. When the feature is set for full screen (1) all characters on the screen are printed. When the feature is set for scroll region (0) only the characters located within the scrolling region are printed. (For a definition of the scrolling region see the introduction of this chapter.)

Print Termination Character

This feature indicates to the optional local printer that no more characters are to be printed in the current print sequence. When the feature is set to 1 a form feed control character is the print termination character. When the feature is set to 0 there is no print termination character.

Receive Parity

This feature checks or ignores the parity bit of all received characters. If the feature is set to "check" and the parity feature is set to "odd" or "even," the parity bit of the received characters is checked according to the parity feature setting. If a receive parity error occurs, a checkerboard character (▯) on the screen replaces the character with the error. When the receive parity feature is set to "ignore" or the parity feature is set to "mark," "space" or "none," any parity bit received is ignored.

Receive Speed

The receive speed must be set to match the computer transmit speed. The VT132 is capable of receiving at any one of the following preselected speeds: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19,200 baud.

Receive speed is independent of transmit speed; the terminal may receive data at one speed and transmit data at a different speed.

Reverse Protected

When the VT132 is in edit mode, this feature protects all reverse characters on the screen. A protected character cannot be changed or deleted from the keyboard. In interactive mode, this feature is disregarded. Reverse video characters should not be confused with the screen background feature.

Screen Background

The screen background feature allows the operator to select the background of the screen. In normal mode, the screen displays light characters on a dark background; in reverse mode, the screen displays dark characters on a light background.

Screen Brightness

Unlike most video terminals, the VT132 does not contain switches or knobs to adjust screen brightness. Instead, the VT132 electronically controls screen brightness. This feature eliminates the high failure rate of mechanical controls and still allows the operator to select the desired level of brightness. This setting may be saved like any other feature in the terminal.

Scroll

Scrolling is the upward or downward movement of existing lines on the screen to make room for new lines at the bottom or top of the screen. It can be performed in two ways: jump scroll or smooth scroll. In jump scroll mode, new lines appear on the screen as fast as the computer sends them to the terminal. At the higher baud rates, data may be difficult to read due to the rapid upward movement of lines. In smooth scroll mode, a limit is placed on the speed at which new lines of data may be sent to the terminal. The upward movement of lines occurs at a smooth steady rate allowing data to be read as it appears on the screen.

NOTE: Smooth scroll mode allows a maximum of six lines of data per second to be added at the top or bottom of the screen. The Auto XON/XOFF feature must be enabled and supported by the host computer to ensure that data is not lost when smooth scroll mode is enabled.

Space Compression

The space compression feature replaces trailing spaces with a control code in an unprotected field. This reduces the number of characters sent to the host computer. A technical description of this feature is provided in the compression and suppression discussion in Chapter 3.

Tabs

Just like a typewriter, the VT132 jumps or tabs to preselected points on a line. Tab stops may be individually changed, or totally cleared and then reset.

Transmit

The transmit feature determines what the terminal does when the **ENTER** key is pressed. When set to deferred, the terminal sends a control sequence only to the host computer. The host must then respond with a different control sequence to start sending data. If the feature is set to immediate, data is sent as soon as the **ENTER** key is pressed. A technical description of this feature is provided in the DECTEM control sequence discussion in Chapter 3.

Transmit Extent

The transmit extend feature determines the size of the data block sent to the host computer. There are three block sizes: page, partial page, and line. The page size block is the data within the *entire* scrolling region.

The partial page size block consists of the data from the start of the scrolling region up to but not including the cursor location, or from the last partial page transmit marker up to but not including the cursor location. A nondisplayable partial page transmit marker is automatically placed in memory to mark the end of the partial page block. This ensures that all data is sent to the host computer without any overlap.

The line size block consists of the data within the *entire* line shown by the current cursor location. The **RETURN** or **ENTER** keys may be used to start the transmission of the line block. Transmission of page and partial page blocks can be started by pressing the **ENTER** key only.

Transmit Speed

Transmit speed must be set to match the computer receive speed. The VT132 is capable of transmitting at any one of the following preselected speeds: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19,200 baud.

Transmit speed is independent of receive speed; the terminal may transmit data at one speed and receive data at a different speed.

Transmit Termination Character

This feature indicates the end of the transmit block to the host computer. A technical description of this feature is provided in the DECTTC control sequence discussion in Chapter 3.

Underline Protected

When the VT132 is in edit mode, this feature protects all underlined characters on the screen. A protected character cannot be changed or deleted. In interactive mode, this feature is disregarded.

Wraparound

When this feature is enabled, the 81st or 133rd character (depending on line size selected) put on a line is automatically placed in the first character position of the next line. If wraparound is not enabled, the 81st or 133rd character and all following characters are overwritten onto the last character position of the current line.

£
3 (shifted)

The VT132 contains character sets for the U.S. and the United Kingdom. The difference between the two is one character, the # or £ symbol. When the U.S. character set is selected, the uppercase 3 key on the main keyboard displays the # character. The £ character is displayed when the U.K. character set is selected.

PART 3— EDITING

The VT132 is a flexible editing terminal.

- It performs basic editing functions such as adding and deleting lines and characters on the screen.
- It displays and protects simple data entry formats that aid in typing the required data in the correct sequence.
- It transmits the data typed into the terminal as a block of characters instead of as each character is typed.

These features, used either singly or in combination, increase host computer efficiency. They permit changes to data within the terminal and ensure that data sent to the host computer is accurate, complete, and in the correct order.

This part of the Operator Information chapter is divided into three sections.

Performing basic editing functions
Making a format
Sending data to the host computer

Each section provides information you will need to use those VT132 features.

PERFORMING BASIC EDITING FUNCTIONS

Basic editing functions consist primarily of adding and deleting lines and characters to data already typed into the terminal. To perform any editing function the terminal must be in edit mode.

Placing the Terminal in Edit Mode

Place the terminal in edit mode in either of two ways:

1. Press the **SHIFT** and **(EDIT)** keys simultaneously. The terminal enters edit mode and the EDIT light turns on. (The **SHIFT** key is required. The **CAPS LOCK** key will not work here.)
2. Place the terminal in SET-UP C. Ensure that switch 1 of switch group A equals 1. If the switch is not a 1, place the cursor above the switch and press the **6** key on the main keyboard. This changes the 0 to a 1. Exit SET-UP mode. The terminal is now in edit mode and the EDIT light turns on.

Adding a Line of Data

A line of data can only be added to the screen when the terminal is in edit mode. To add a line of data to the screen use the following procedure.

1. Place the cursor where the new line is to be added (Figure 1-15).
2. Press the **INSERT LINE** key once. The line where the cursor is located and all lines under it, up to either the end of the scrolling region or the first line containing 2 protected field, move down one line. The bottom line moves off the screen and the characters on it are lost (Figure 1-16).

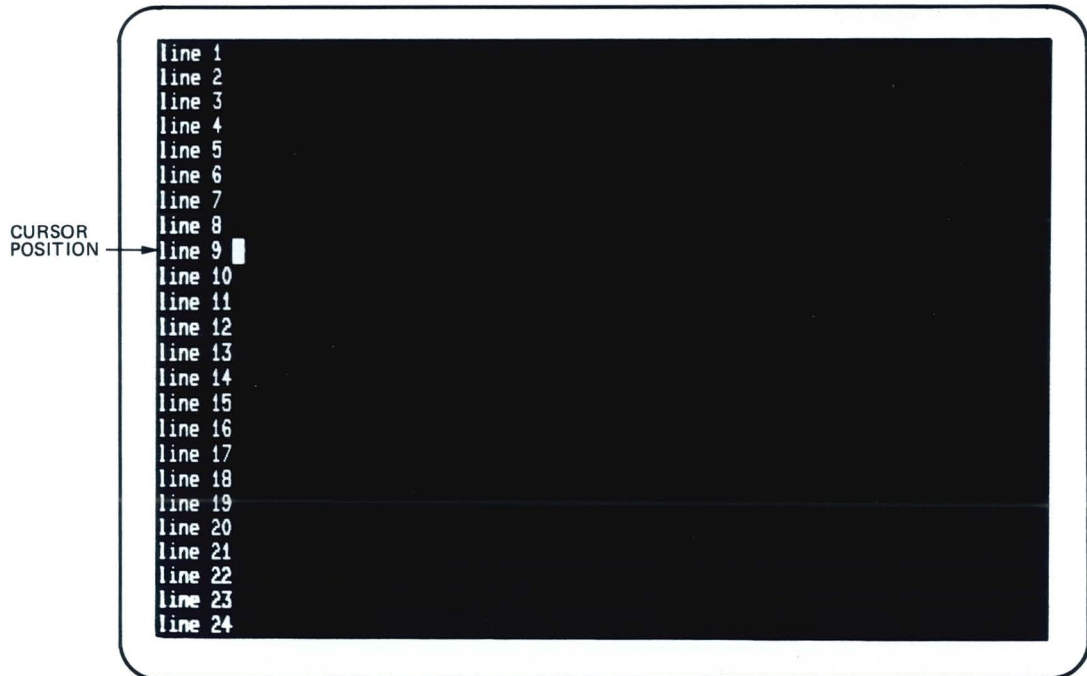


Figure 1-15 Cursor Positioned to Add a Line to the Screen

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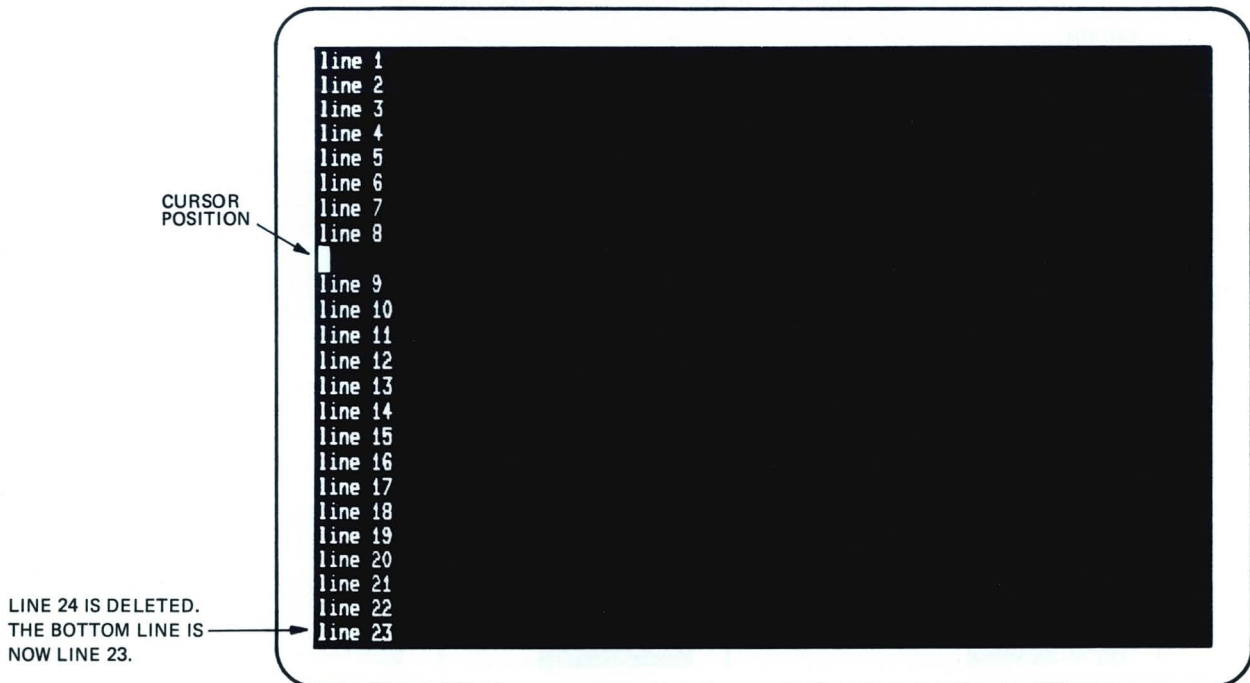


Figure 1-16 Line Added to the Screen

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Deleting a Line of Data

A line of characters can be deleted from the screen only when the terminal is in edit mode. To delete a line of characters from the screen use the following procedure.

1. Place the cursor on the line to be deleted (Figure 1-17).
2. Press **DELETE LINE** key once. The line on which the cursor is located is deleted and all following lines on the screen move up one line (Figure 1-18).

Inserting a Character

In edit mode a character can be inserted in any unprotected character position on the screen. To insert a character use the following procedure.

1. Move the cursor to the point where the character is to be inserted (Figure 1-19).
2. Press **CHAR INSERT** once. The INSERT light turns on to show that the terminal is in the insert character mode.
3. Type the character(s) to be inserted (Figure 1-20). All characters at and to the right of the cursor move right one character position for every character typed. If more characters are inserted than there is room for, characters already on the line or unprotected field are lost. The terminal does not move characters from one line or unprotected field to the next even if the wraparound SET-UP feature is on.
4. Press **CHAR INSERT** once. The INSERT light turns off to show that the terminal is no longer in the character insert mode.

The character insert function has no effect on protected data. If an attempt is made to insert a character into a protected field:

1. the terminal sounds an alarm
2. the terminal moves the cursor to the next unprotected field
3. the character typed is inserted in the unprotected field shown by the cursor.

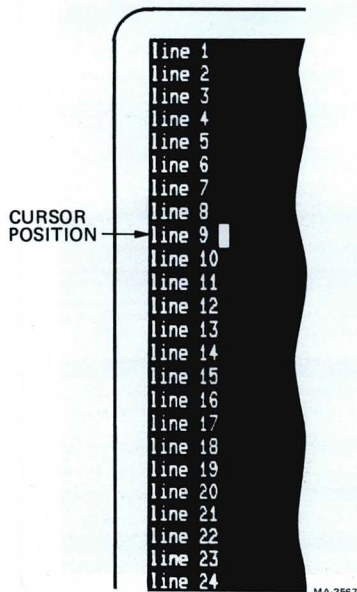


Figure 1-17 Cursor Positioned to Delete a Line from the Screen

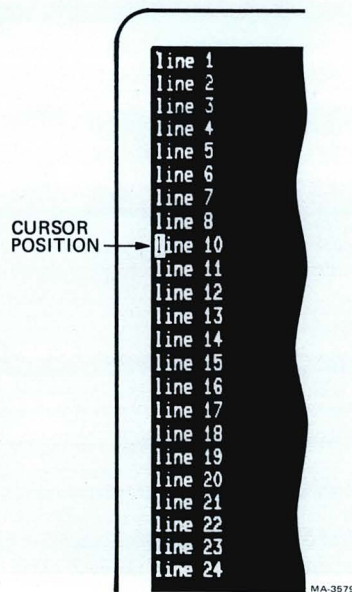


Figure 1-18 Line Deleted from the Screen

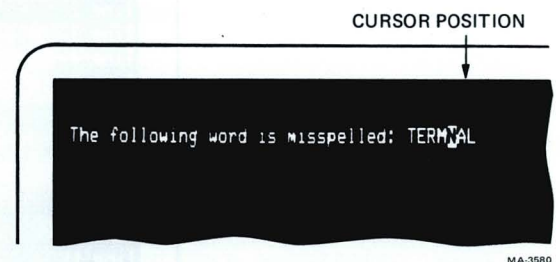


Figure 1-19 Positioning the Cursor to Insert a Character

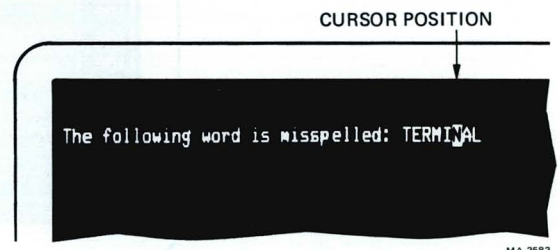


Figure 1-20 Character Inserted

Deleting a Character

There are two ways to delete a character from the screen. The first description shows how to delete a character. The second description shows how to correct errors made when typing. Either way may be used to delete a character from the screen.

Deleting Characters

1. Position the cursor over the character to be deleted (Figure 1-21).
2. Press **DELETE CHAR** once. The character shown by the cursor is deleted from the screen (Figure 1-22). All characters to the right of the deleted character move left one position. A space is inserted at the right end of the line or field. Characters in other fields or on other lines are not affected by **DELETE CHAR**.

The delete character function has no effect on protected characters. If **DELETE CHAR** is pressed while the cursor is located over a protected character the terminal beeps and moves the cursor to the first character of the next unprotected field.

Correcting Typing Errors

1. Position the cursor over the character just to the right of the character you wish to delete (Figure 1-23).
2. Press **DELETE** once. The character to the left of the cursor is deleted (Figure 1-24). The cursor and all other characters in the field or on the line move left one character position to fill the space left by the deleted character. A space is inserted at the right end of the field or line on which the character was deleted.

The delete function has no effect on protected characters. If **DELETE** is pressed while the cursor is in a protected field the cursor moves left to the last unprotected character position and deletes that character.

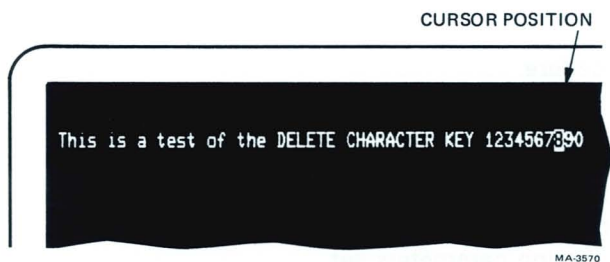


Figure 1-21 Positioning the Cursor to Delete a Character

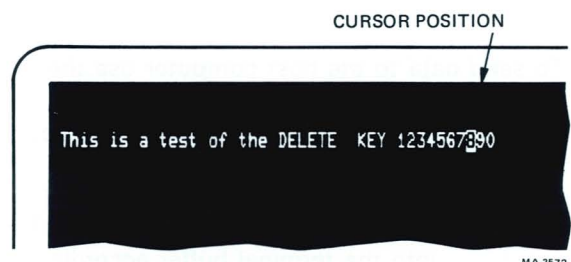


Figure 1-23 Positioning the Cursor to Correct a Typing Error

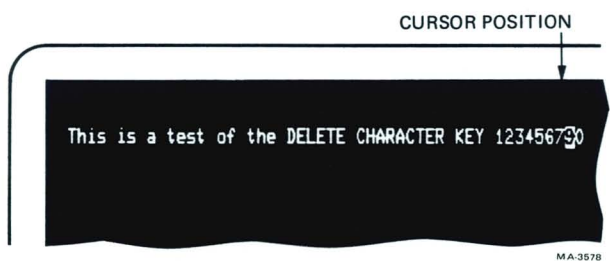


Figure 1-22 Character Deleted

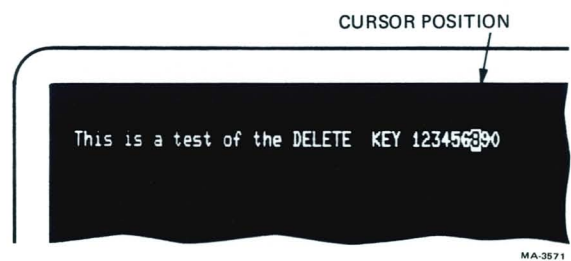


Figure 1-24 Error Deleted

The delete function is not limited to one field or line. Every time **DELETE** is pressed the cursor moves to the left. If the cursor is on the first character position of a line and **DELETE** is pressed the character located in the last position of the preceding line is deleted and the cursor moves to that location. The terminal takes no action if the cursor is located in the first character position of the first line in the scrolling region and **DELETE** is pressed.

Making a Format

A format is simply a guide the operator uses to enter data into the terminal. Formats are normally made to look as much like the source document as possible. This makes it easy to determine what information is needed and the order in which the information is needed.

Formats are loaded into the terminal from the host computer. At the same time the host computer sets the terminal parameters. This ensures that the VT132 reacts correctly to the commands received from the host computer for that particular format.

Figure 1-25 is an example of a typical editing format. In the example all reverse video characters are protected. Turning on the reverse protected SET-UP feature from the keyboard or by remote command from the host computer protects all reverse video characters. To enter data the operator merely fills in the blanks (Figure 1-26). To move the cursor from field to field within the format use **TAB** to move the cursor forward and **BACK TAB** to move the cursor backward. The **(CLR)** key erases all unprotected data from the screen and moves the cursor to the start of the first unprotected field.

Sending Data to the Host Computer

The VT132 is a buffered terminal – in edit mode all data typed into the terminal stays in the terminal buffer until the operator starts the transmit sequence. Only then is data sent to the host computer.

To send data to the host computer use the following procedure.

1. Verify that the terminal is on-line.
2. Press the **ENTER** key. The **RETURN** key also works if the transmit extent switch is set to line mode. The terminal transmits the data typed into the terminal buffer according to the transmission parameters set. The parameters can be set by the operator in SET-UP mode, or by the host computer through the control sequences.

```

NAME
ADDRESS
CITY
SHIP TO:
NAME
ADDRESS
CITY
STATE
ZIP
STATE
ZIP
    
```

Figure 1-25 Sample Format

MA-3568

```

NAME John Q. Customer
ADDRESS 1234 Main St
CITY Anytown
SHIP TO:
NAME Same
ADDRESS Same
CITY Same
STATE Mass
ZIP 01234
STATE Same
ZIP Same
    
```

Figure 1-26 Sample Format with Data

MA-3565

PART 4—SELF-TESTING THE VT132

A self-test mode in the VT132 automatically, or on command, tests the condition of the terminal if a fault is suspected. The self-test program checks the following items:

- Screen Memory (RAM)
- Nonvolatile Memory (NVR)
- Program Memory (ROM)
- Keyboard.

This test is performed automatically whenever the terminal is turned on.

Self-Test Error Codes

There are two broad categories of errors: fatal and nonfatal.

Fatal errors cause the terminal to immediately stop all operations. No intelligible information is displayed on the screen. The screen most likely contains a random pattern of characters. The only error indication (in addition to random characters) is a possible error code displayed on the keyboard LEDs. However, no terminal function, including the lighting of LEDs is guaranteed if a fatal error is found.

Nonfatal errors do not halt the terminal processor. Instead, the terminal is forced to LOCAL mode and an error code character is displayed in the upper-left corner of the screen. The only exception to this is a keyboard (KBD) error. In this case the terminal is not forced into LOCAL mode.

There are five types of nonfatal errors:

- Advanced video data RAM (AVO)
- Nonvolatile data RAM checksum error (NVR)
- Keyboard missing or malfunction (KBD)
- Data loopback error (Data)
- EIA modem control error (EIA)

NOTE: The loopback and EIA tests are not performed on power-up; they must be invoked separately with the proper control sequences. See the programmer section for further information on these tests.

Table 1-3 shows the possible nonfatal error characters that may appear on the screen and the failure represented by each character.

Table 1-3 Nonfatal Error Codes

Character Displayed	Fault Detected				
	AVO	NVR	KBD	Data	EIA
1	X				
2		X			
3	X	X			
4			X		
5	X		X		
6		X	X		
7	X	X	X		
8				X	
9	X			X	
:		X		X	
;	X	X		X	
<			X	X	
=	X		X	X	
>		X	X	X	
?	X	X	X	X	
@					X
A	X				X
B		X			X
C	X	X			X
D			X		X
E	X		X		X
F		X	X		X
G	X	X	X		X
H				X	X
I	X			X	X
J		X		X	X
K	X	X		X	X
L			X	X	X
M	X		X	X	X
N		X	X	X	X
O	X	X	X	X	X

PART 5—WHAT TO DO IN THE EVENT OF A PROBLEM

If it appears there is a problem in the terminal, initiate the power-up self-test procedure. This test helps to determine if the problem lies in the terminal or in some other part of the computer system. Table 1-4 describes the items an operator can check prior to making a service call.

Table 1-4 Problem Checklist

Symptom	Possible Cause and Corrective Action
VT132 does not turn on when the power switch is set to ON	<p>AC power cord is not plugged into wall outlet; plug in cord.</p> <p>AC power cord is not plugged into terminal; plug in cord.</p> <p>Power is not coming from the wall outlet. Check outlet with a known good electrical device (such as a lamp). If no power, call your electrician.</p> <p>AC line fuse blown; turn terminal OFF and have the fuse replaced. (See Figure 1-7 for location.)</p>
No keyboard response	<p>Keyboard cable not plugged into monitor; plug in keyboard cable.</p> <p>KBD LOCKED indicator on; computer has turned the keyboard off. The KBD LOCKED condition may be cleared by entering and exiting SET-UP mode. If condition persists, check with host computer software personnel for a possible operating error.</p> <p>Perform the self-test operation.</p>
Garbled or error characters	<p>Incorrect SET-UP feature selection; correct the SET-UP features. Suggested SET-UP features which may be in error:</p> <ul style="list-style-type: none"> ANSI/VT52 mode Auto XON/XOFF Parity Receive parity Receive speed Transmit speed <p>Perform the self-test operation.</p>
Several successive long tones	<p>The terminal has difficulty reading or writing the SET-UP features stored in nonvolatile memory. Check the feature settings and perform the Save operation.</p>



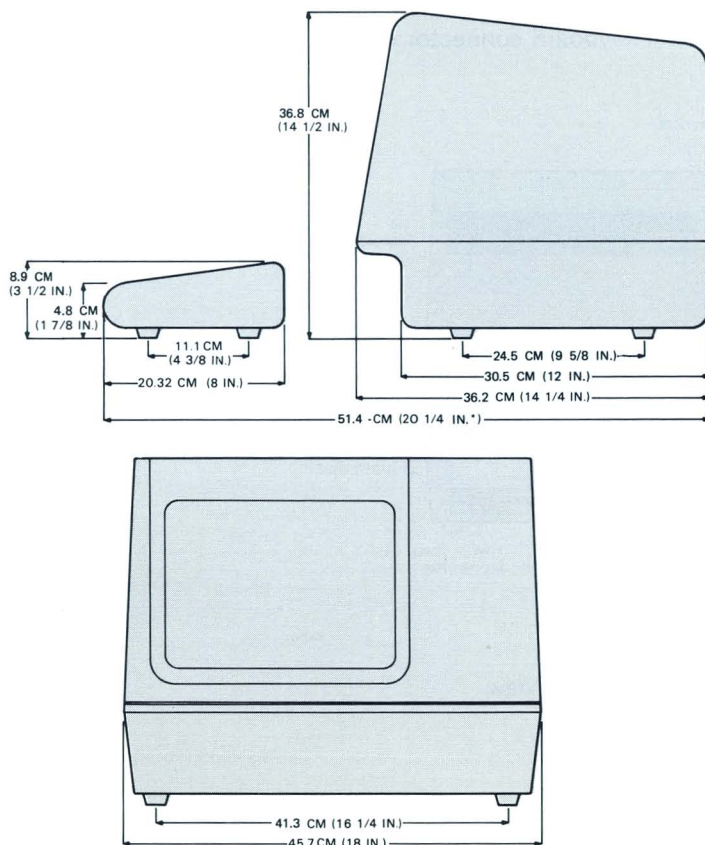
Installation,
interface information,
and specifications

CHAPTER 2 INSTALLATION, INTERFACE INFORMATION, AND SPECIFICATIONS

INSTALLATION

SITE CONSIDERATIONS

The VT132 is a video monitor with a detached keyboard that fits on a desk or tabletop. Dimensions are shown in Figure 2-1.



* MEASUREMENT TAKEN WITH THE KEYBOARD PLACED FLUSH TO FRONT OF TERMINAL UNDER UNDERCUT.

MA-1991

Figure 2-1 VT132 Terminal Dimensions

Few constraints affect selecting a place to install the terminal. Areas that experience extremes in temperature and humidity or subject to high levels of industrial contaminants should be avoided. Guaranteed operating conditions and terminal specifications are provided at the end of this chapter.

Controls and cable connections are located at the rear of the terminal. During installation allow an adequate area for operator access at the rear of the terminal.

NOTE: When installing the system, ensure that all power and signal cables are free from obstructions, sharp bends, and stress.

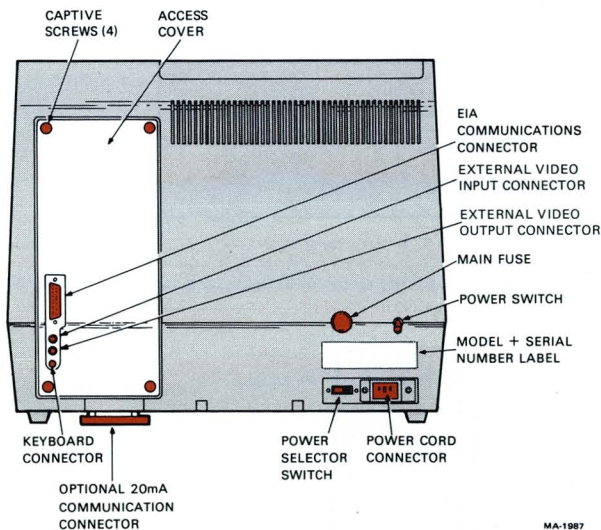
UNPACKING AND INSTALLATION

The VT132 shipping carton contains the following items:

- VT132 monitor
- VT132 detached keyboard
- VT132 power cord
- VT132 SET-UP label
- VT132 User Guide.

To install the VT132 perform the following steps.

1. Remove the VT132 from the shipping carton and place it in the desired work area.
2. Place the keyboard in front of the terminal and plug the keyboard coiled cord into the keyboard connector on the rear of the terminal (Figure 2-2).



MA-1987

Figure 2-2 VT132 Terminal Rear View

3. Verify that the power selector switch shows the correct wall outlet voltage (115 V is standard in the U.S.) and the power switch is off.
4. Connect the power cord to the power cord receptacle on the rear of the terminal and plug the other end of the power cord into a nearby wall outlet.
5. Connect the communications cable to the appropriate communications receptacle.
6. Turn the power switch on. The terminal automatically performs the power-up self test and either the ON LINE or LOCAL light on the keyboard turns on. After approximately one minute the cursor is visible in the upper-left corner of the screen.
7. Select the desired SET-UP features outlined in the operator chapter of this manual and perform a save operation.
8. Once the installation is complete, record the SET-UP features selected on the VT132 SET-UP label and attach the label to the underside of the keyboard.

USER MAINTENANCE

The VT132 requires no periodic maintenance. The terminal surfaces may be cleaned with a moist cloth and mild detergent. Avoid using cleaners with solvents and excess amounts of water. To clean the keyboard, rub the keys with a dry or barely moist cloth. Do not remove the keycaps to clean them more thoroughly. The key switch contacts may be damaged if the keycaps are removed and replaced incorrectly.

The VT132 cabinet is not designed to be weatherproof. Several ventilation openings in the case allow liquids, coins, paper clips, and other small objects to fall into the terminal. Such objects will disturb the electronic operation of the terminal. Never put liquids or metal objects on top of the terminal.

Keep the ventilation slots clear. Blocking these slots by placing objects on top of or under the VT132 may cause the terminal to overheat.

INTERFACE INFORMATION

EIA Interface

The basic VT132 operates on full duplex, asynchronous communication lines. The terminal interfaces to the line with a 25-pin connector mounted on the back of the terminal which meets the requirements of EIA specification RS232-C. Table 2-1 summarizes the EIA connector signals. The following paragraphs explain each signal as used in the basic VT132.

Table 2-1 EIA Connector Signals

Pin Number	Description
1	Protective ground
2	Transmitted data
3	Received data
4	Request to send
5	Clear to send
6	Data set ready
7	Signal ground (common return)
8	Carrier detect
9	Not used
10	Not used
11	Same as pin 19
12	Speed indicator (secondary carrier detect)
13	Not used
14	Not used
15	Transmit clock
16	Not used
17	Receive clock
18	Not used
19	Speed select (secondary request to send)
20	Data terminal ready
21	Not used
22	Ring indicator
23	Same as pin 19
24	Not used
25	Not used

Protective Ground – Pin 1 – This conductor is electrically bonded to the VT132 chassis. Use of this conductor for reference potential purposes is not allowed.

Transmitted Data (from VT132) – Pin 2 – The VT132 transmits serially encoded characters and break signals on this circuit. It is held in the mark state when neither characters nor break signals are being transmitted.

Received Data (to VT132) – Pin 3 – The VT132 receives serially encoded characters generated by the user's equipment on this circuit.

Request to Send (from VT132) – Pin 4 – Asserted at all times when terminal is powered up.

Clear to Send (to VT132) – Pin 5 – Ignored at all times.

Data Set Ready (to VT132) – Pin 6 – Ignored at all times.

Signal Ground – Pin 7 – This conductor establishes the common ground reference potential for all voltages on the interface. It is permanently connected to the VT132 chassis.

Carrier Detect (to VT132) – Pin 8 – Ignored at all times.

Speed Select (from VT132) – Pins 11, 19, and 23 – Alternately called Secondary Request to Send. The basic VT132 maintains this line in the asserted state at all times.

Speed Indicator (to VT132) – Pin 12 – Alternately called Secondary Carrier Detect. Ignored at all times.

Transmission Clock (to VT132) – Pin 15 – Ignored at all times.

Receive Clock (to VT132) – Pin 17 – Ignored at all times.

Data Terminal Ready (from VT132) – Pin 20 – Asserted at all times except under the following conditions:

1. terminal not powered up
2. terminal in LOCAL mode
3. 3.5 second interval following the pressing of **SHIFT - BREAK**.

Ring Indicator (to VT132) – Pin 22 – Ignored at all times.

Electrical Characteristics

Output Voltages – On all signals designated “from VT132,” the mark or unasserted state is -6.0 V to -12.0 V ; the space or asserted state is $+6.0\text{ V}$ to $+12.0\text{ V}$; the space or asserted state is $+6.0\text{ V}$ to $+12.0\text{ V}$.

Input Voltages – On signals designated “to VT132,” -25.0 V to $+0.75\text{ V}$ or an open circuit is interpreted as a mark or unasserted state. $+25.0\text{ V}$ to $+2.25\text{ V}$ is interpreted as a space or asserted state. Voltages greater than $\pm 25\text{ V}$ are not allowed. These levels are compatible with EIA STD RS-232-C and CCITT Recommendation V.28.

Optional 20 mA Current Loop Interface

In most current loop applications, the VT132 will be connected in a passive configuration – that is, current is supplied to the VT132. In this mode, the transmitter and receiver are both passive, both optically isolated, and the transmitter goes to the mark state when power is turned off.

Conversion from active to passive (or vice versa) requires moving a slide switch.

In active mode either the transmitter or the receiver or both may be connected so that the VT132 sources the 20 mA of current. In active mode, isolation is not present and the transmitter goes to the space state when power to the VT132 is turned off.

Figure 2-3 shows the 20 mA current loop interface connector mounted to the access cover and the individual pin assignment.

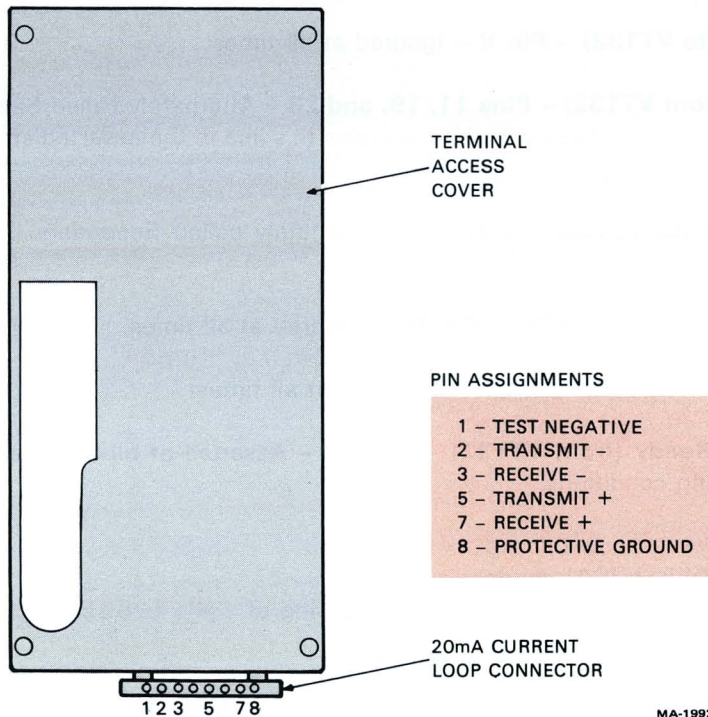


Figure 2-3 20 mA Current Loop Interface

20 mA Current Loop Interface Electrical Characteristics

Transmitter	Min	Max
Open circuit voltage	5.0 V	50 V
Voltage drop marking	-	4.0 V
Spacing current	-	2.0 mA
Marking current	20 mA	50 mA
Receiver		
Voltage drop marking	-	2.5 V
Spacing current	-	3.0 mA
Marking current	15 mA	50 mA

In addition to the above specifications for passive operation, active mode places the transmitter or receiver in series with a source of 17 V ± 5 percent and 660 ohms.

External Video Connections

In addition to the EIA interface, the VT132 can easily interface to external video devices. The video devices may act either as a slave to the VT132 when connected to the composite video output or provide synchronized video to the VT132 video section when connected to the video input. The external video connectors are the two female BNC connectors located on the back of the terminal just below the EIA connector. The upper connector, J8, is the video input; the lower connector, J9, is the video output.

Composite Video Output (J9)

The composite video output provides RS170-like output (see note) by combining the video signal with a composite sync signal. The output has the following nominal characteristics (Figure 2-4).

1. Output impedance = 75 ohms, dc-coupled
2. Sync level = 0 V
3. Black level = approximately 0.3 V when loaded with 75 ohms
4. White level = approximately 1.0 V with a 75 ohm load
5. The composite sync waveform conforms to EIA RS170 standards. The vertical interval is composed of six equalizing pulses, six vertical sync pulses, and six more equalizing pulses. Timing is as follows:

Equalizing pulse width	2.33 μ s \pm 40 ns
Vertical pulse width	27.28 μ s \pm 200 ns
Horizontal pulse width	4.71 μ s \pm 50 ns
Horizontal blank width	$\left\{ \begin{array}{l} 11.84 \mu\text{s} \pm 50 \text{ ns} / 80 \text{ column mode} \\ 12.34 \mu\text{s} \pm 50 \text{ ns} / 132 \text{ column mode} \end{array} \right.$
Front Porch	1.54 μ s \pm 50 ns

NOTE: The use of dc coupling is not in strict agreement with RS170. To agree with RS170 the output load requires a 10 microfarad capacitor in series with the output. Failing to do so violates the 2 mA dc short circuit current requirement. This presents no problem with most monitors which are ac-coupled.

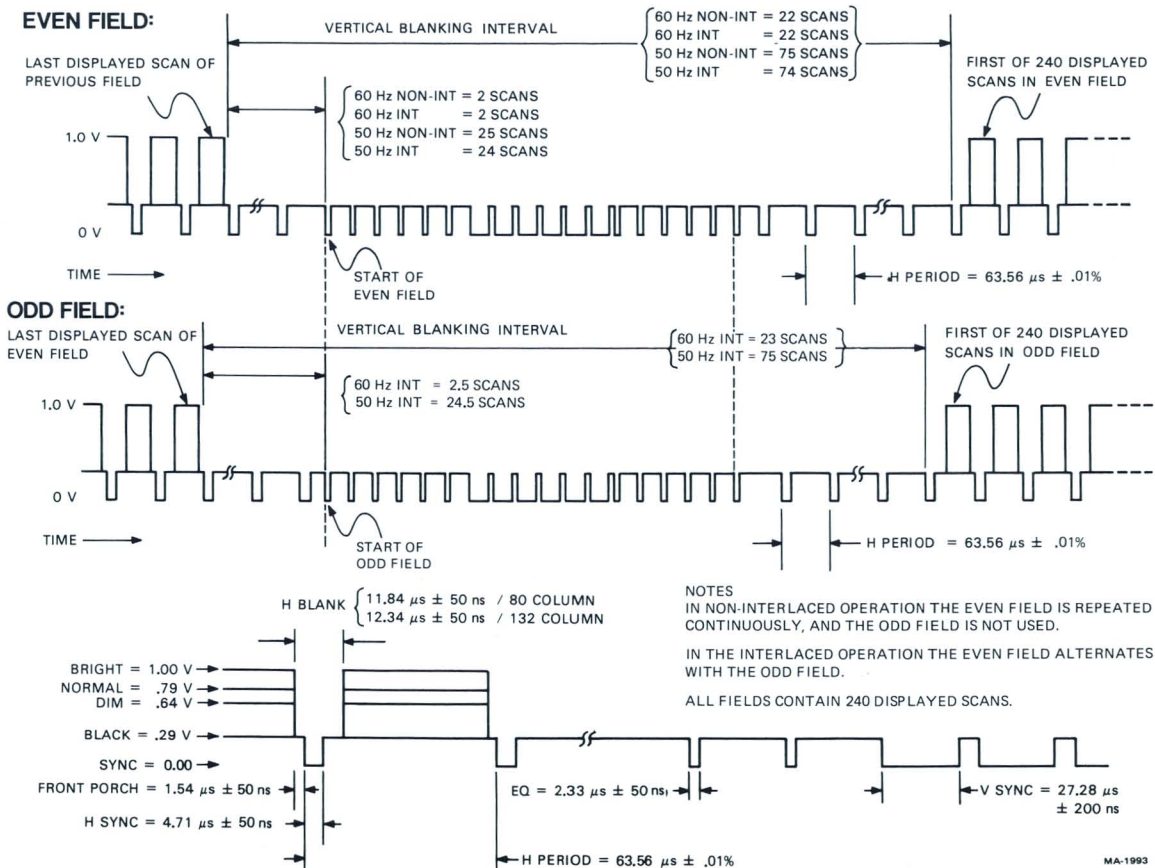


Figure 2-4 Composite Video Output

Video Input (J8)

An analog signal applied to the video input is "ORed" with the internal video signal such that the beam intensity at any point on the screen corresponds to the intensity of that signal which tends to make the beam brighter at that point. This input has the following nominal characteristics.

Input impedance = 75 ohms, dc-coupled
 Black level = 0 V
 White level = 1.0 V
 Maximum continuous input = ± 2.0 V

The external video source must be synchronized to the VT132. It may be done by referencing the composite sync on the composite video output. This means that the VT132 video input will not synchronize with any composite video source including the composite video output of another VT132.

VT132 SPECIFICATIONS**Dimensions**

Monitor	
Height	36.83 cm (14.5 inch)
Width	45.72 cm (18 inch)
Depth	36.20 cm (14.25 inch)
Keyboard	
Height	8.89 cm (3.5 inch)
Width	45.72 cm (18 inch)
Depth	20.32 cm (8 inch)
Table depth (min)	51.4 cm (20.25 inch)

Weight

Monitor	13.6 kg (30 lbs)
Keyboard	2.0 kg (4.5 lbs)
Shipping Weight	18.6 kg (41 lbs)

Environment

Operating	
Temperature	10° to 40° C (50° to 104° F)
Relative Humidity	10% to 90%
Max wet bulb	28° C (82° F)
Min dew point	2° C (36° F)
Altitude	2.4 Km (8,000 ft)
Nonoperating	
Temperature	-40° to 66° C (-40° to 151° F)
Relative Humidity	0 to 95%
Altitude	9.1 km (30,000 ft)

Power	Line voltage	90–128 V RMS single phase, 2 wire 180–256 V RMS single phase, 2 wire (switch-selectable)
	Line frequency	47–63 Hz
	Current	1.9 A RMS max at 115 V RMS 1.0 A RMS max at 230 V RMS
	Input power	250 VA apparent 150 W maximum
	Current limiting	3 A normal blow fuse
	Power cord	Detachable, 3 prong, 1.98 m (6 ft)
Display	CRT Format	12 inch diagonal measure, P4 phosphor 24 lines X 80 characters or 24 lines X 132 characters (selectable)
	Character Character size	7 X 9 dot matrix with descenders 80 column mode, 3.35 mm X 2.0 mm (0.132 inch X 0.078 inch) 132 column mode, 3.35 mm X 1.3 mm (0.132 inch X 0.051 inch)
	Active display size	202 mm X 115 mm (8 inch X 4.5 inch)
	Character Set	95 character displayable ASCII subset (upper and lowercase, numeric and punctu- ation) plus 31 special graphics charac- ters.
	Cursor type	Keyboard-selectable, blinking block char- acter or blinking underline.
	Keyboard	General	83-key detachable unit with 1.9 m (6 ft) coiled cord attached
Key layout		65-key arrangement and sculpturing similar to standard typewriter with 18- key numeric keypad.
Numeric keypad		18-key with period, comma, minus, en- ter, and four general purpose function keys.
Visual indicators		Seven LEDs: ON LINE, LOCAL, KBD LOCKED, L1,L2, INSERT, and EDIT (four are user-programmable).
Audible signals		Keyclick: simulates typewriter bell: 1) sounds on receipt of BEL code; 2) sounds eight characters from right margin (keyboard selectable). Multiple bell: sounds on detection of er- ror in SET-UP save or recall operation.

Communication	Type	EIA
	Speeds	Full duplex with selectable local echo: 50, 75, 110 (two stop bits), 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, 19,200.
	Code	ASCII
	Character format	Asynchronous
	Character size	7 or 8 bits; keyboard-selectable. (Note: if 8-bit character is selected, 8th bit is al- ways space).
	Parity	Even, odd, or none; keyboard-selectable
	Synchronization	Keyboard-selectable via automatic gen- eration of XON and XOFF control codes

ORDERING HARDWARE DOCUMENTATION

The following VT132 Video Terminal hardware manuals can be purchased from the DIGITAL Supplies and Accessories Group.

Part No.	Title
EK-VT132-UG	VT132 User Guide
EK-VT100-J1-002	VT100 Series Pocket Service Guide
EK-VT100-TM	VT100 Series Technical Manual
EK-VT132-IP	VT132 Illustrated Parts Breakdown (IPB)
MP-00748	VT132 Print Set

All purchase orders for hardware manuals should be forwarded to:

Digital Equipment Corporation
Accessories and Supplies Group
Cotton Road
Nashua, N.H. 03060

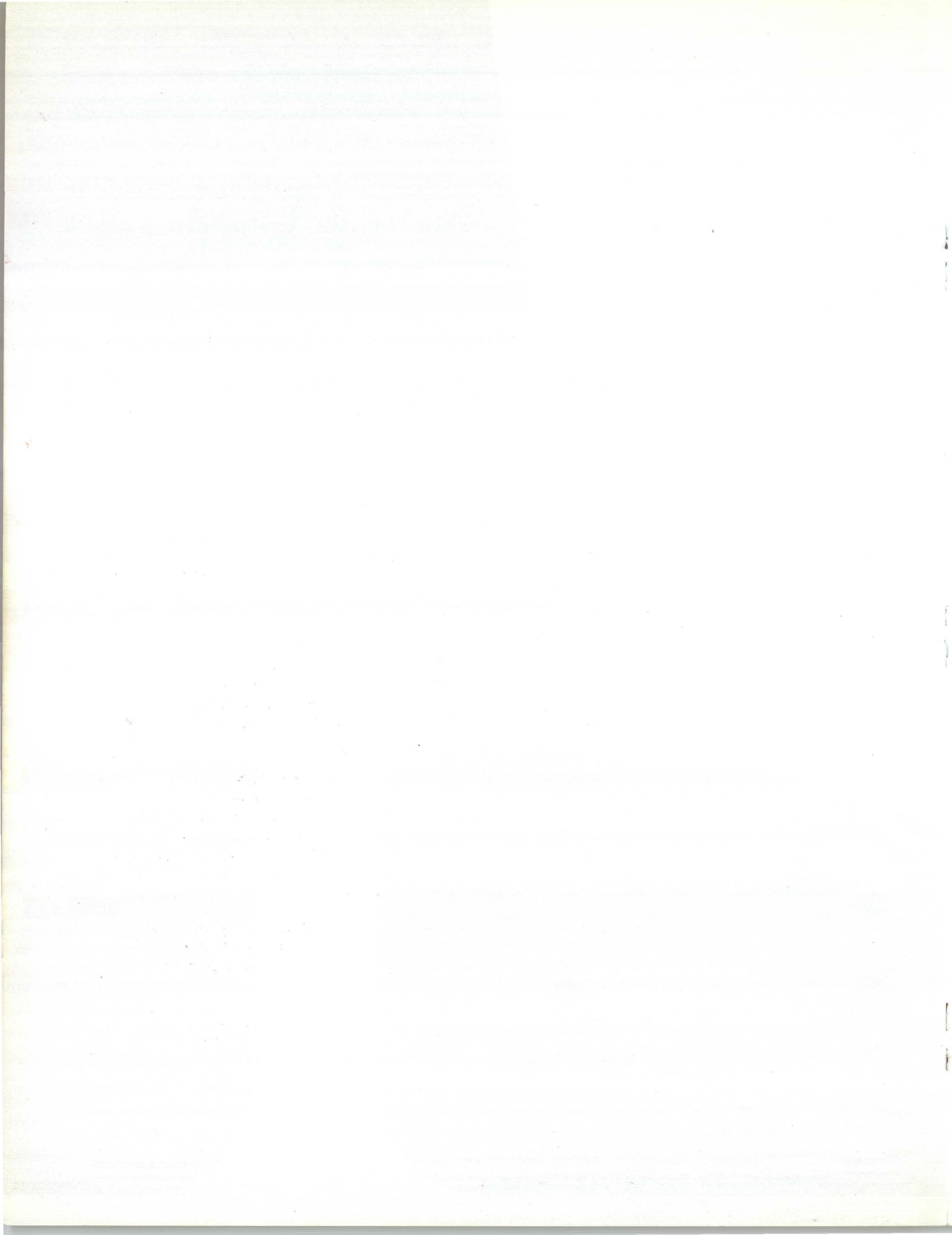
Purchase orders must show shipping and billing addresses and state whether a partial shipment will be accepted.

All correspondence and invoicing inquiries should be directed to the above address.

Contact your local sales office or call DIGITAL Direct Catalog Sales toll free 800-258-1710 from 8:30 AM to 5:00 PM Eastern Standard Time (U.S. customers only). New Hampshire customers should dial (603) 884-6660. Terms and conditions include net 30 days and F.O.B. from the DIGITAL plant. Freight charges will be prepaid by DIGITAL and added to the invoice. Minimum order is \$35.00. Minimum does not apply when full prepayment is submitted with an order. Checks and money orders should be made payable to Digital Equipment Corporation.

The image features a minimalist, abstract design. A large, dark red shape, resembling a stylized letter 'L' or a bracket, is set against a white background. The red shape has rounded corners and a thick white border. The text 'Programmer information' is printed in a clean, white, sans-serif font within the upper right portion of the red area.

Programmer
information



CHAPTER 3

PROGRAMMER INFORMATION

INTRODUCTION

The VT132 does the job of two terminals. It is an interactive terminal and an editing terminal. When the VT132 is interactive it becomes a part of the computer – typing on the terminal is the same as typing on the computer. When the VT132 is an editing terminal data typed on the keyboard stays in the terminal. You can then edit the data and make any changes needed before sending the data to the computer.

When not in edit mode the VT132 acts as a character at a time interactive terminal. When you press a key, a code is sent to the computer. The computer echoes (returns) the code to the terminal. The terminal then changes the code to a character and displays it on the screen. If the computer does not echo the code then the local echo feature should be enabled.

The terminal acts differently in edit mode. In this mode, local editing, block transmit, and field related features of the terminal are in effect. Character entries from the keyboard are compared to the protection code stored in the display memory at the current cursor position. If the character does not violate the protection code it is stored in display memory and the cursor advances. The terminal cannot edit alphabetic versus numeric character types. If the character violates the field protection code the operator is alerted by a beep.

Data is sent to the computer only after it has been visually checked. Pressing the **ENTER** key starts the transmission process. This causes the VT132 to transmit, as a block, the data from the active editing area in the display memory to the host computer.

Since both edit and transmit functions are bounded by the scrolling region, the host computer may use the area outside this region as a protected area. This eliminates the host computer handling data more than once even if the terminal

has been set to transmit protected data. To use the area outside the scrolling region, the host computer must employ either direct cursor addressing or change the scrolling region boundaries.

Edit mode never affects the receive side of the terminal. Any codes transmitted to the terminal are received. If the code received is a control sequence the terminal executes the sequence immediately. In executing most control sequences, there is no difference between edit mode and interactive mode.

When not in edit mode, the VT132 still accepts and executes host computer commands to insert and delete lines, delete characters, and enter and exit the insert character mode.

This section of the manual discusses data flow between the VT132 and the host computer. Included are the codes generated by the keyboard; the transmission protocol followed by the terminal; and the actions of the terminal to control sequences, in both ANSI and VT52 modes of operation.

KEYBOARD

The VT132 keyboard shown in Figure 3-1 has a key arrangement similar to a standard office typewriter. In addition to the standard typewriter keys the VT132 has additional keys and indicators to generate control sequences, cursor control commands, and to show the current terminal status.

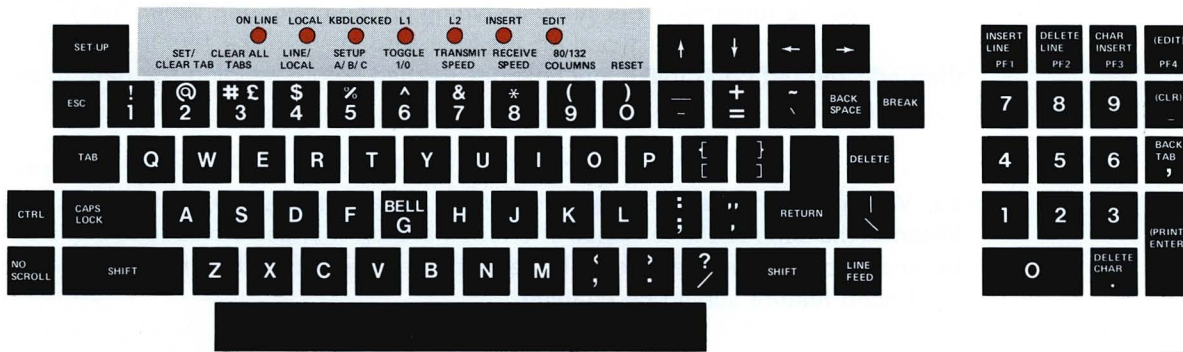


Figure 3-1 VT132 Keyboard

Keyboard Operation

The operator uses the keyboard to transmit codes to the host. Some keys transmit one or more codes to the host immediately when pressed. Other keys such as **CTRL** (control) and **SHIFT** do not transmit codes when pressed, but modify the codes transmitted by other keys. Code-transmitting keys cause the terminal to make a clicking sound to verify that the keystroke has been processed. If two code-transmitting keys are pressed together, two codes are transmitted in the order in which the keys were pressed. The terminal does not wait for the keys to be lifted, but transmits both codes as soon as the keys are pressed. If three keys are pressed simultaneously, the codes for the first two keys are transmitted immediately; the code for the third is transmitted when one of the first two keys is released.

LED Indicators

The keyboard has seven light emitting diodes (LEDs). Two of the LEDs indicate the complementary ON-LINE/LOCAL function. Power on is shown by one of the two LEDs. If the keyboard is connected and power is on, one of these LEDs lights.

A third LED indicates a “keyboard locked” condition. The keyboard has been “turned off” automatically by the terminal due to a full buffer or by the host through the transmission of an XOFF to the terminal.

The four remaining LEDs are programmable, but two have specific meanings for the operator. The code sequences to turn these LEDs on or off are discussed later in this chapter.

NOTE: Applications programs designed to use LEDs L1 through L4 on the VT100 will work with the VT132. On the VT132, however, the labels for L3 and L4 have been changed to INSERT and EDIT, respectively. The operator may become confused if these LEDs are used differently than the label on the keyboard indicates.

SET-UP Key

The **SET-UP** key is at the upper-left corner of the main keyboard. Operations performed in SET-UP mode can be stored in nonvolatile memory (NVR) so that turning the terminal power off does not alter the terminal configuration.

Procedures for changing SET-UP features are provided in the operator chapter of this manual. SET-UP features that may be modified by the host are listed in Table 3-1 and described in detail under the control sequences.

Alphabetic Keys

The VT132 transmits lowercase code unless either or both **SHIFT** keys are down, or unless the **CAPS LOCK** key is down. Pressing **CAPS LOCK** locks only the 26 alphabetic keys in the shifted (uppercase) mode. Table 3-2 shows the codes generated by the alphabetic keys.

Nonalphabetic Keys

Each nonalphabetic key generates two different codes. One code is generated if neither **SHIFT** key is pressed. The other code is generated if either or both **SHIFT** keys are pressed. Unlike the **SHIFT LOCK** key of a typewriter, the **CAPS LOCK** key does not affect these keys; it affects only the alphabetic keys. Table 3-3 shows the nonalphabetic keys and the codes they generate.

Function Keys

Several keys on the main keyboard transmit control codes. Control codes do not produce displayable characters but are codes for functions. When these codes are received by the terminal, the VT132 performs the associated function as shown in Table 3-4.

NO SCROLL Key

When **NO SCROLL** is pressed it generates a single XOFF code and inhibits further scrolling. When pressed again it generates XON. In practice, if the software recognizes XOFF, the host stops transmitting until **NO SCROLL** is pressed again to allow scrolling. If the XOFF/XON feature is disabled (SET-UP function) the **NO SCROLL** causes no action.

Table 3-1 SET-UP Features and Machine States

SET-UP Feature or Machine State	Changeable from Host Computer*	Saved in NVR and Changeable in SET-UP
Alternate keypad mode	Yes (DECKPAM/DECKPNM)	No
ANSI/VT52	Yes (DECKANM)	Yes
Auto repeat	Yes (DECKARM)	Yes
Auto XON/XOFF	No	Yes
Blink protected	Yes (DECPRO)	Yes
Bold protected	Yes (DECPRO)	Yes
Characters per line	Yes (DECCOLM)	Yes
Characters sent	Yes (GATM)	Yes
Cursor	No	Yes
Cursor key mode	Yes (DECCKM)	No
Edit key	Yes (DECEKEM)	Yes
Edit mode	Yes (DECEDM)	Yes
Erase mode	Yes (ERM)	Yes
Interlace	Yes (DECINLM)	Yes
Keyclick	No	Yes
Newline	Yes (LNM)	Yes
Margin bell	No	Yes
Normal protected	Yes (DECPRO)	Yes
Origin mode	Yes (DECOM)	No
Page extent	Yes (DECLTM)	Yes
Parity	No	Yes
Power	No	Yes
Print extent	No	Yes
Print termination char	No	Yes
Receive parity	No	Yes
Receive speed	No	Yes
Reverse protected	Yes (DECPRO)	Yes
Screen	Yes (DECSCNM)	Yes
Scroll	Yes (DECSCLM)	Yes
Space compression	Yes (DECSCFDM)	Yes
Tabs	Yes (HTS/TBC)	Yes
Transmit	Yes (DECTEM)	Yes
Transmit extent	Yes (TTM)	Yes
Transmit termination char	Yes (DECTTC)	Yes
Transmit speed	No	Yes
Underline protected	Yes (DECPRO)	Yes
Wraparound	Yes (DECAWM)	Yes
# 3 (shifted)	Yes (SCS)	Yes

* The mnemonic for the control sequence used to change the feature or machine state is indicated in parentheses.

Table 3-2 Alphabetic Key Codes

Key	Uppercase (octal)	Lowercase (octal)
A	101	141
B	102	142
C	103	143
D	104	144
E	105	145
F	106	146
G	107	147
H	110	150
I	111	151
J	112	152
K	113	153
L	114	154
M	115	155
N	116	156
O	117	157
P	120	160
Q	121	161
R	122	162
S	123	163
T	124	164
U	125	165
V	126	166
W	127	167
X	130	170
Y	131	171
Z	132	172

Table 3-3 Nonalphabetic Key Codes

Lowercase Character	Neither SHIFT Key Down (Octal)	Uppercase Character	Either or both SHIFT Keys Down (Octal)
1	061	!	041
2	062	@	100
3	063	# or £	043
4	064	\$	044
5	065	%	045
6	066	•	136
7	067	&	046
8	070	* (asterisk)	052
9	071	(	050
- (dash)	055	)	051
= (equals)	075	- (dash)	137
[(open bracket)	133	{ (brace)	173
; (semicolon)	073	: (colon)	072
' (apostrophe)	047	" (quote)	042
, (comma)	054	<	074
. (period)	056	>	076
/ (slash)	057	?	077
\ (backslash)	134	| (vertical bar)	174
` (grave accent)	140	~ (Tilde)	176
] (closed bracket)	135	} (closed brace)	175

Table 3-4 Function Key Codes

Key	Octal Value of Code Sent or Received by VT132	Action Terminal Takes if Host Sends that Code
RETURN*	015	Cursor to left margin
LINE FEED	012	Line Feed
BACKSPACE	010	Backspace
TAB	011	Tab
SPACE BAR	040	Deposits space on screen; erases what was there before.
ESC	033	Initial delimiter of a control sequence – interprets the following character string from host as a command, rather than displaying it.
DELETE	177	Ignored by VT132

*The **RETURN** key can be redefined so that it issues 015g 012g (carriage return – line feed). The New Line feature in SET-UP mode provides this capability.

BREAK Key

BREAK causes the transmission line to be forced to its space state for 0.275 seconds \pm 10 percent. If either **SHIFT** key is down, the time is increased to 3.5 seconds \pm 10 percent. Data Terminal Ready is also deasserted during this interval. After the 3.5 second interval DTR is asserted again.

SHIFT and **BREAK** pressed together provide the long-break-disconnect function. Used with properly configured modems with RS-232-C levels, it causes both the local and remote data sets to disconnect. For modems that are connected via the 20 mA current loop, issuing the long space may disconnect the remote data set only.

CTRL and **BREAK** pressed together transmits the answerback message. **BREAK** does not function when the VT132 is in LOCAL mode.

Auto Repeating

All keys auto repeat except: **SET-UP, ESC, NO SCROLL, ENTER, RETURN**, and any key pressed with **CTRL**. Auto repeating works as follows: when a key is pressed, its code(s) is sent once, immediately. If the key is held down for more than one-half second, the code(s) is sent repeatedly at a rate of approximately 30 Hz (less if a low transmit baud rate is used) until the key is released. Auto repeating may be disabled (SET-UP function).

CTRL Key





CTRL is used in conjunction with other keys on the keyboard to generate control codes. If **CTRL** is held down when any of the keys in Table 3-5 are typed, the code actually transmitted is in the range 000₈-037₈.

Table 3-5 Control Codes Generated

Key (shifted or unshifted)	Octal Code Transmitted	Function Mnemonic	Key (shifted or unshifted)	Octal Code Transmitted	Function Mnemonic
A	000	NUL	Q	021	DC 1 or XON
B	001	SOH	R	022	DC 2
C	002	STX	S	023	DC 3 or XOFF
D	004	EOT	T	024	DC 4
E	005	ENQ	U	025	NAK
F	006	ACK	V	026	SYN
G	007	BELL	W	027	ETB
H	010	BS	X	030	CAN
I	011	HT	Y	031	EM
J	012	LF	Z	032	SUB
K	013	VT	[	033	ESC
L	014	FF	\	033	FS
M	015	CR	]	034	GS
N	016	SO	~	036	RS
O	017	SI	?	037	US
P	020	DLE			

The codes generated and keys affected by the **CTRL** key are independent of the **SHIFT** and **CAPS LOCK** keys. It is never necessary to hold both the **CTRL** and **SHIFT** keys in combination with another key to generate a control code. Also, there is only one **CTRL** combination for each of the 32 control characters generated by the keyboard. Because of this, there are three control characters that are generated differently from previous terminals as shown in Table 3-6.

Table 3-6 NUL, RS and US Control Code Generation

Function Mnemonic	Code (Octal)	VT132 code (Key Used)	Previous Terminals (Key Used)
NUL	000	CTRL and SPACE BAR	CTRL and SHIFT
RS	036	CTRL and 	CTRL , SHIFT and 
US	037	CTRL and 	CTRL , SHIFT and 

Cursor Control Keys

The keyboard has four keys labeled with arrows in each of four directions. These keys transmit control sequences. If the host echoes these control sequences back to the terminal, the cursor moves one character up, down, right, or left. Table 3-7 shows the control sequences generated by each key.

Table 3-7 Cursor Control Key Codes

Cursor Key (arrow)	VT52 Mode*	ANSI Mode and Cursor Key Mode Reset*	ANSI Mode and Cursor Key Mode Set
Up	ESC A	ESC [A	ESC O A
Down	ESC B	ESC [B	ESC O B
Right	ESC C	ESC [C	ESC O C
Left	ESC D	ESC [D	ESC O D

* The control function section in this chapter discusses these modes.

Numeric Keypad

In interactive mode *only*, the keys on the numeric keypad normally transmit codes for the numerals, decimal point, minus sign, and comma. In addition, the **ENTER** key transmits the same code as the **RETURN** key. The host cannot tell if these keys were pressed on the keypad or on the main keyboard. Therefore, software requires that considerable numeric data entry need not be rewritten to use the keypad.

However, if software must distinguish between a key on the numeric keypad and the corresponding key on the main keyboard, the host can give a command to place the terminal in keypad application mode. In this mode all keys on the numeric keypad are defined to give escape sequences that may be used by the host as user-defined functions.

The codes sent by the numeric keypad for the four combinations of the VT52/ANSI mode and keypad numeric/application mode are shown in Tables 3-8 and 3-9. None of the keys are affected by pressing **SHIFT**, **CAPS LOCK**, or **CTRL**.

Table 3-8 VT52 Mode 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
(CLR) [-]	- (dash)	ESC ? m
BACK TAB [,]	, (comma)	ESC ? l
DELETE CHAR [.]	. (period)	ESC ? n
ENTER (PRINT)	Same as RETURN key	ESC ? M
INSERT LINE [PF1]	ESC P	ESC P
DELETE LINE [PF2]	ESC Q	ESC Q
CHAR INSERT [PF3]	ESC R	ESC R
(EDIT) [PF4]	ESC S	ESC S

NOTE: The interactive mode functions of the keys are indicated in brackets.

Table 3-9 ANSI Mode 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
(CLR) [-]	- (dash)	ESC O m
BACK TAB [,]	, (comma)	ESC O l
DELETE CHAR [.]	. (period)	ESC O n
ENTER (PRINT)	Same as RETURN key	ESC O M
INSERT LINE [PF1]	ESC O P	ESC O P
DELETE LINE [PF2]	ESC O Q	ESC O Q
CHAR INSERT [PF3]	ESC O R	ESC O R
(EDIT) [PF4]	ESC O S	ESC O S

NOTE: In ANSI mode, if the codes are echoed back to the VT132, or if the terminal is in local mode, the last character of the sequence is displayed on the screen; e.g., PF1 displays a "P."

Editing Keys

The editing keys listed in Table 3-10 are located on both the numeric keypad and the main keyboard. In edit mode these keys generate the codes needed to perform editing functions. The operator chapter of this manual gives a detailed description of each key function. In interactive mode these keys generate the codes outlined in Tables 3-8 and 3-9.

Table 3-10 Editing Keys

Key	Editing Function
INSERT LINE	Inserts a new line at the current line shown by the cursor.
DELETE LINE	Deletes the line on which the cursor is currently located.
CHAR INSERT	Places the terminal in the character insert mode.
(EDIT)	Enters or exits edit mode. (The SHIFT key must be pressed with this key to activate the function.)
(CLR)	Clears all unprotected data in the scrolling region. (The SHIFT key must be pressed with this key to activate the function.)
BACK TAB	Moves the cursor to the start of the current unprotected field or to the start of the previous unprotected field.
ENTER	Initiates block mode transmission.
(PRINT)	Starts the optional local printer sequence. (The SHIFT key must be pressed with this key to activate the function.)
DELETE CHAR	Deletes the character at the cursor location.
DELETE	Deletes the character to the left of the current cursor location.
TAB	Moves the cursor to the next tab stop or to the start of the next unprotected field.

CHARACTER SETS

The VT132 may contain up to five characters sets:

- United Kingdom
- United States (ASCII)
- Special graphics characters
- Alternate character ROM
- Alternate character ROM special graphics characters.

Any two of these character sets can be considered active at any one time. The select character set (SCS) control sequence designates the two active character sets as G0 and G1. The shift in (SI) and shift out (SO) control codes specify which of the two character sets will be used at any one time. SI invokes the G0 character set; SO invokes the G1 character set.

The following rules define the actions of the terminal when transmitting characters from multiple character sets.

1. At the start of transmission, G0 and G1 are presumed to designate the same character sets in both the terminal and the host computer. The terminal cannot normally modify these designations.
2. The operator may type SI (**CTRL-N**) and SO (**CTRL-O**) to select G0 and G1. This allows the operator to select the characters set designated by the host computer.
3. Since the operator can change characters sets without the host computer's knowledge, a SI or SO precedes the first character of a transmitted block. The only exception to this is if G0 and G1 designate the same character set. In this case there is no ambiguity.
4. If, at any time during transmission, the character to be sent is not from the currently designated G0 or G1 sets, the terminal redefines G1 by sending the appropriate SCS control sequence followed by a SO if needed. The character is then sent.
5. If, at the end of data transmission, the last character sent is from a G1 character set, a SI is transmitted to return the terminal to the G0 character set. If the currently designated G1 character set is different from the one in effect at the start of transmission, the original G1 character set is automatically redesignated as G1 by the terminal. Transmission of the SCS control sequence to redesignate the character set precedes sending the end of transmission control character (if one is selected).
6. The terminal never redesignates G0. G0 can be redesignated by the host computer only.
7. The terminal does not transmit any video attribute information.

Special Graphics Character Set

If the special graphics character set is selected, the graphic representations of ASCII codes 137₈ through 176₈ are replaced according to Table 3-11.

Table 3-11 Special Graphics Characters

Octal Code	Graphic With US or UK Set	Graphic With Special Graphics Set
137	-	Blank
140	\	♦ Diamond
141	a	⊞ Checkerboard (error indicator)
142	b	⏎ Horizontal tab
143	c	⏪ Form feed
144	d	⏏ Carriage return
145	e	⏩ Line feed
146	f	° Degree
147	g	± Plus/minus
150	h	⏴ New line
151	i	⏵ Vertical tab
152	j	↘ Lower-right corner
153	k	↗ Upper-right corner
154	l	↖ Upper-left corner
155	m	↙ Lower-left corner
156	n	+ Crossing lines
157	o	- Horizontal line - scan 1
160	p	- Horizontal line - scan 3
161	q	- Horizontal line - scan 5
162	r	- Horizontal line - scan 7
163	s	- Horizontal line - scan 9
164	t	┌ Left 'T'
165	u	┐ Right 'T'
166	v	└ Bottom 'T'
167	w	┘ Top 'T'
170	x	| Vertical bar
171	y	≤ Less than or equal to
172	z	≥ Greater than or equal to
173	{	π Pi
174	|	≠ Not equal to
175	}	£ UK pound sign
176	~	• Centered dot
Note 1:	Codes 152g - 156g, 161g and 164g - 170g are used to draw rectangular grids; each piece of this line drawing set is contiguous with others so that the lines formed are unbroken.	
Note 2:	Codes 157g - 163g give better vertical resolution than dashes and underlines when drawing graphs. Using these segments 120 X 132 resolution may be obtained in 132-column mode.	

COMMUNICATION

Full Duplex Protocol

The terminal operates at speeds up to 19,200 baud. However, the terminal may not be able to keep up with incoming data. The terminal stores incoming characters in a 128-character buffer and processes them on a first-in/first-out basis. When the buffer contents reaches 32 characters, the terminal transmits 023_g (XOFF or DC3). On this signal the host should suspend its transmission to the terminal. Eventually, if the host stops transmitting, the terminal depletes the buffer. When 16 characters remain in the buffer the terminal transmits 021_g (XON or DC1) to signal the host that it may resume transmission. If the host fails to respond to an XOFF from the terminal in a timely manner, the buffer continues to fill. The terminal transmits a second XOFF when the terminal is 16 characters from the end of the buffer. This second XOFF is a last warning to the host to stop transmission to avoid a terminal buffer overflow condition. When the 128-character capacity of the buffer is exceeded a buffer overflow occurs. When the buffer overflows, the VT132 discards incoming characters and displays an error character. To determine if the buffer will overflow, use the following formulas:

$$\text{No. of characters to overflow} = 96 - [3 \times (\text{receiver speed}/\text{transmit speed})]$$

$$\text{Time to respond to XOFF} = \text{No. of characters to overflow} \times (\text{bits per character} + \text{parity bit} + 2)/\text{receiver speed.}$$

Example 1

The VT132 is transmitting 8-bit characters with no parity at 1200 baud and receiving at 1200 baud. The terminal has just sent an XOFF which the host must respond to within 0.775 second to avoid the buffer overflow.

$$\text{No. of characters to overflow} = 96 - [3 \times (1200/1200)] = 93 \text{ characters}$$

$$\text{Time to respond to XOFF} = 93 \times (8+0+2)/1200 = 0.775 \text{ second}$$

Example 2

The VT132 is transmitting 7-bit characters with parity at 300 baud and receiving at 1200 baud. The terminal has just sent an XOFF which the host must respond to within 0.7 second to avoid a buffer overflow.

$$\text{No. of characters to overflow} = 96 - [3 \times (1200/300)] = 84 \text{ characters}$$

$$\text{Time to respond to XOFF} = 84 \times (7+1+2)/1200 = 0.7 \text{ second}$$

Software that does not support receipt of the XOFF/XON signals from the terminal can still use the VT132 provided: the software never sends the ESC code; the baud rate is limited to 4800 or less; and the software does not use smooth scrolling or split screen features.

Alternatively, if XOFF/XON cannot be used, fill characters such as Null (000_g) or Delete (177_g) may be used after certain characters or character strings are sent to the VT132. A reference chart of fill characters required for these functions is included in Appendix C.

Two of the terminal functions, Reset and Self-Test, reinitialize the terminal and erase the buffer. This means characters received after the commands to perform these two functions will be lost without being processed.

To compensate for this, the host may act in one of two ways:

1. Immediately after sending the terminal the commands to perform either the Reset or Self-Test functions, the host may act as if it had received XOFF from the terminal, thus sending no more characters until it receives XON. The terminal transmits XON only after it completes the specified operation and the XOFF/XON feature is enabled.
2. When the first method cannot be implemented, a delay of no less than ten seconds may be used to allow the terminal time to complete the invoked function. This method, however, does not guarantee against the loss of data when an invoked function has detected an error. And while this delay is currently adequate, future options may require a change in the time delay.

The XOFF/XON synchronization scheme has an advantage over requiring the host to insert delays or filler characters in its data stream. Requiring a minimum of software support, XON/XOFF ensures that every character or command sent to the VT132 is processed in correct order. It frees interface programs from all timing considerations and results in more reliable operation.

In addition to the buffer-filling condition, there are two other means of transmitting XOFF/XON: the **NO SCROLL** key; and the **CTRL-S** and **CTRL-Q**. The VT132 coordinates these three sources of XOFF and XON so that the desired effect occurs. For example, if the buffer-filling condition has caused an XOFF to be sent, and then the operator presses the **NO SCROLL** key, a second XOFF is not sent. Instead of sending XON when the buffer empties, the VT132 waits until the operator presses the **NO SCROLL** key again before sending XON. Also, entering SET-UP mode causes the VT132 to temporarily stop taking characters from the buffer. An XOFF is sent if the buffer becomes nearly full. **CTRL-S** and **CTRL-Q** are synchronized with the **NO SCROLL** key. If the XON/XOFF feature is disabled, the buffer-filling condition does not send an XOFF, the **NO SCROLL** key is disabled, and **CTRL-S** and **CTRL-Q** are transmitted as typed.

The VT132 also recognizes the receipt XOFF and XON. Receiving XOFF inhibits the VT132 from transmitting any codes except XOFF and XON. From three to seven keystrokes are stored in a keyboard buffer (some keys transmit two or three codes, e.g., cursor controls). If the keyboard buffer overflows, keyclicks stop and the KBD LOCKED LED lights. Transmission resumes upon receipt of XON.

If the operator transmits an XOFF to the host (by **CTRL-S** or **NO SCROLL**), the host should not echo any further type-in until the user types XON. This places the burden of not overloading the host's output buffer on the operator.

Entering and exiting SET-UP clears the keyboard locked condition.

Transmit Character Rate

Regardless of the transmit baud rate, the VT132 limits the character transmission from the keyboard to a maximum of 60 characters per second. The terminal does this by keeping the transmit line in the mark condition for a variable time period between characters. The 60 character per second limit applies to all transmissions including the answerback, CPR, DSR, and DECREPTARM messages. The only exception to this limit is block transmission. The transmit character rate is not limited during block transmission.

BLOCK TRANSMISSION

When the VT132 is in edit mode, all characters entered from the keyboard are not transmitted directly to the host computer. Instead the characters are stored in display memory and transmitted as a block. The transmission sequence starts by pressing the **ENTER** key or by the DECXMIT remote command.

There are three block transmit modes: line, partial page, and full page.

These modes are qualified by three other modes: space compression/field delimiter mode, guarded area transfer mode, and transmit execution mode. The end of transmission character is also selectable. It may be specified as form feed (FF,014g) or no character sent (function disabled). All modes and selections can be made locally in SET-UP mode or by remote command from the host computer.

Once transmission is initiated or requested the KBD LOCKED LED lights and the keyboard is locked until transmission is complete. The locked condition can be cleared by entering and exiting SET-UP mode. This action also clears any pending transmit requests and aborts any transmissions in progress.

Unlike interactive mode, block mode transmissions are not limited to 60 characters per second. In block mode characters are transmitted one after the other with no delay.

Line Transmit Mode

The line on which the cursor resides is sent according to the modes set. The cursor moves to the start of the first unprotected field on the next line with an unprotected field. If the current line is at the end of the scrolling region or there are no more unprotected fields in the scrolling region, the cursor moves to the first unprotected field of the current line.

Partial Page Transmit Mode

Partial Page extends from the last partial page transmit marker (a nondisplayable memory marker) up to but not including the current cursor position. If a partial page transmit marker is not present or the cursor is before the marker, the start point is the beginning of the scrolling region. Transmission of the partial page is subject to the transmit control modes.

Page Transmit Mode

The entire scrolling region is sent. Transmission of the page is subject to the transmit control modes.

Transmit Execution Mode

Transmission of the data block may be either immediate or deferred. When the execution mode is set for immediate, pressing the **ENTER** key starts sending line, partial page, or page data, as appropriate. When the execution mode is set for deferred, pressing the **ENTER** key causes the terminal to send **ESC S** (033g, 123g). This sequence notifies the host that the terminal wants to transmit data. No further transmission occurs from the terminal until the terminal receives the DECXMIT sequence from the host computer.

Compression and Suppression

Two modes determine how much of the selected transmission block is sent: guarded area transmit mode (GATM) and space compression/field delimiter mode (SCFDM).

If the GATM is set, protected and unprotected fields are sent as encountered in the transmit block. If this mode is reset, a single record separator character (RS, 036g) is sent in place of each protected field.

If the SCFDM is set, all trailing spaces in a field are suppressed. All fields sent are terminated by a single record separator character (RS, 036g) except the last field on a line. This field is delimited by the CR (015g) or CR LF (015g, 012g) characters.

The effects of combining the two modes is shown in Figure 3-2.

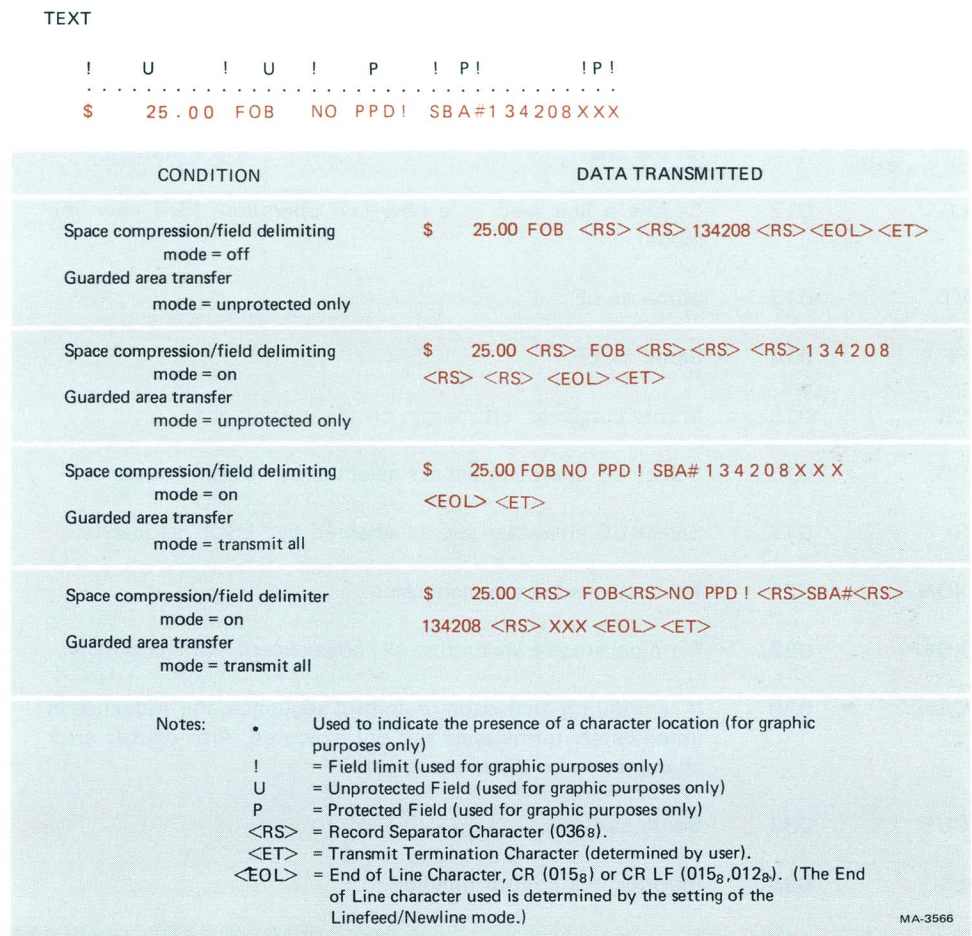


Figure 3-2 SCFDM and GATM Mode Interaction

TERMINAL CONTROL COMMANDS

The VT132 has many control commands that take action other than displaying a character on the screen. In this way, the host can command the terminal to move the cursor, change modes, ring the bell, etc. The following paragraphs discuss the terminal control commands.

Control Characters

Control Characters have values of 000g – 037g, and 177g. The control characters recognized by the VT132 are a subset of ANSI X3.4 – 1977 (ASCII). Table 3-12 shows these control characters. All other control codes cause no action.

Table 3-12 Control Characters

Character	Octal Code	Action Taken
NUL	000	Ignored on input (not stored in input buffer; may be used as fill character; see full duplex protocol).
ENQ	005	Transmits answerback message.
BEL	007	Sounds bell tone from keyboard.
BS	010	Moves cursor left one character position, unless it is at the left margin in which case no action occurs.
HT	011	Moves cursor to the next tab stop, to the next field (Edit mode only) or to the right margin if no further tab stops are present on the line.
LF	012	Causes a line feed or a new line operation. (See new line mode).
VT	013	Same as LF.
FF	014	Same as LF.
CR	015	Moves cursor to left margin on the current line.
SO	016	Select G1 character set, as selected by "ESC" sequence.
SI	017	Select G0 character set, as selected by "ESC(" sequence.
XON	021	Terminal resumes transmission.
XOFF	023	Terminal stops transmitting all codes except XOFF and XON.
CAN	030	If sent during an escape or control sequence, the sequence is immediately terminated and not executed. Also causes error character to be displayed.
SUB	032	Same as CAN.
ESC	033	Introduces a control function.
DEL	177	Ignored on input (not stored in input buffer; may be used as a fill character).

Control characters (codes 000_g to 037_g inclusive) may be imbedded within a control function. Imbedded control characters are executed as soon as they are encountered by the VT132. Processing the control function then continues with the next character received. The exceptions are: if the characters **ESC** occur, the current control function is aborted and a new one commences, beginning with the **ESC** just received. If the character **CAN** (030_g) or the character **SUB** (032_g) occurs, the current control function is aborted. Imbedding control characters allows synchronization characters **XON** and **XOFF** to be interpreted properly without affecting the control function.

CONTROL SEQUENCES

The VT132 is an upward and downward software-compatible terminal; that is, previous DIGITAL video terminals have DIGITAL private standards for control functions. The American National Standards Institute (ANSI) has since standardized control sequences in terminals.

NOTE: ANSI standards allow the manufacturer flexibility in implementing each function. This manual describes how the VT132 responds to the implemented ANSI control functions.

The VT132 is compatible with previous DIGITAL standards. Customers may use existing DIGITAL software designed around the VT52 or new VT132 software. The VT132 has a VT52-compatible mode in which the VT132 responds to control sequences as a VT52. In this mode, virtually none of the new VT132 features can be used.

Throughout this section of the manual references will be made to "VT52 mode" or "ANSI mode." These two terms indicate VT132 software compatibility. All new software should be designed around the VT132 ANSI mode. Future DIGITAL video terminals will not necessarily be committed to VT52 compatibility.

The following ANSI standards were used in implementing the VT132: X3.4 – 1977, X3.4 – 1974 and X3.64 – 1977. The VT132 implements a subset of these standards.

Valid ANSI Mode Control Sequences

Definitions

The following glossary defines the basic elements of the ANSI mode control sequences. A more complete glossary appears in Appendix A.

Control Sequence Introducer (CSI) – An escape sequence that provides supplementary controls and is itself a prefix affecting the interpretation of a limited number of contiguous characters. In the VT132 the CSI is **ESC** [.

Parameter – (1) A string of zero or more decimal characters which represent a single value. Leading zeros are ignored. The decimal characters have a range of 0 (060_g) to 9 (071_g). (2) The values so represented.

Numeric Parameter – A parameter that represents a number, designated by Pn.

Selective Parameter – A string of characters that selects a subfunction from a specified list of subfunctions, designated by Ps. In general, a control sequence with more than one selective parameter causes the same effect as several control sequences, each with one selective parameter, e.g., CSI Psa; Psb; Psc F is identical to CSI Psa F CSI Psb F CSI Psc F.

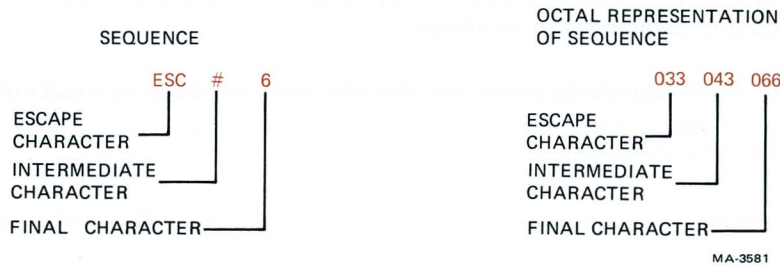
Parameter String – A string of characters separated by a semicolon (073_g).

Default – A function-dependent value assumed when no explicit value, or a value of 0, is specified.

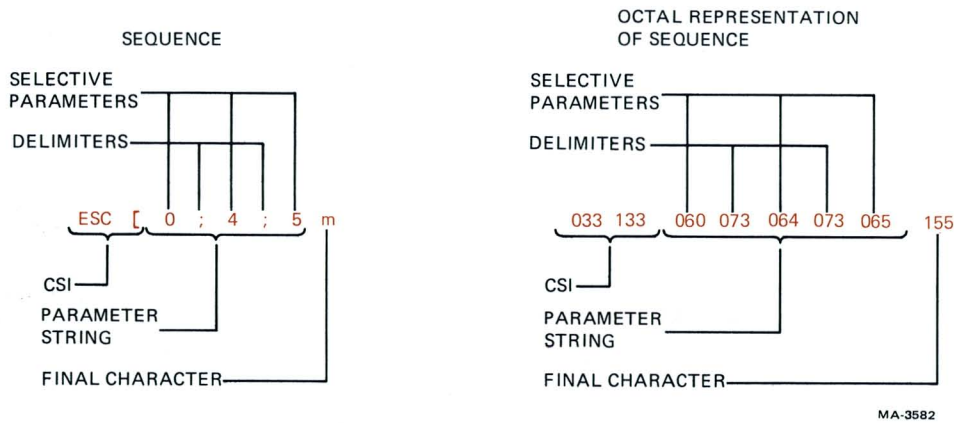
Final Character – A character whose bit combination terminates an escape or control sequence.

Examples

1. Escape sequence for a double width line (DECDWL)



2. Control sequence to turn off all character attributes and then turn on the underscore and blink attributes (SGR).



Alternate sequences which accomplish the same thing:

Sequence	Octal representation of sequence
a <code>ESC [; 4 ; 5 m</code>	<code>033 133 073 064 073 065 155</code>
b <code>ESC [m</code>	<code>033 133 155</code>
<code>ESC [4 m</code>	<code>033 133 064 155</code>
<code>ESC [5 m</code>	<code>033 133 065 155</code>
c <code>ESC [0 ; 0 4 ; 0 0 5 m</code>	<code>033 133 060 073 060 064 073 060 060 065 155</code>

VT132 Control Functions

The following control functions are transmitted from the host computer to the VT132 unless otherwise noted. They may also be typed at the keyboard. Protection restrictions are observed on all commands entered manually. All control functions are a subset of those specified in ANSI X3.64 1977 and ANSI X3.41.

Each control function and escape sequence has been assigned a mnemonic which is a short abbreviation of the name. In general, the mnemonic has been formed by

taking the first letter of each significant word of the name. Control functions designated as private by ANSI and ISO code extension standards (X3.41 1974 and ISO 2022 1973, respectively) are not yet standardized. Therefore, DIGITAL has assigned functions to these sequences and prefixed their mnemonic with "DEC". All other mnemonics are specified by the ANSI standards.

In the list of control functions contained in this section, the characters are shown using the ASCII character set. The case (upper or lower) of the characters sent is significant and must be sent exactly as documented. These characters are spaced apart for clarity only. The SPACE character (040_g) never appears in any of the VT132 recognizable control or escape sequences. The ESCAPE character (033_g) is designated as **ESC**. All graphic characters shown in color are integral to the control or escape sequence. Characters printed in black are used to indicate variable parameters (Ps and Pn) or a possible sequence of parameters (...). Where a variable parameter is indicated the possible values are indicated in the discussion of the function.

The following control functions and escape sequences are arranged in alphabetical order by the sequence mnemonic.

CPR Cursor Position Report – VT132 to Host

ESC [Pn ; Pn R

default value: 1

The CPR sequence reports the active position by means of the parameters. This sequence has two parameter values, the first specifying the line and the second specifying the column. The default condition with no parameters present, or parameters of 0, is equivalent to a cursor at home position.

The numbering of lines depends on the state of the origin mode (DECOM). This control sequence is solicited by a device status report (DSR) sent from the host.

CUB Cursor Backward – Host to VT132 and VT132 to Host

ESC [Pn D

default value: 1

The CUB sequence moves the active position to the left. The distance moved is determined by the parameter. If the parameter value is zero or one, the active position moves one position to the left. If the parameter value is n, the active position moves n positions to the left. If an attempt is made to move the cursor beyond the left margin, the cursor stops at the left margin. **Editor Function**

CUD Cursor Down – Host to VT132 and VT132 to Host

ESC [Pn B

default value: 1

The CUD sequence moves the active position downward without altering the column position. The number of lines moved is determined by the parameter. If the parameter value is zero or one, the active position moves one line downward. If the parameter value is n, the active position moves n lines downward. If an attempt is made to move the cursor below the bottom margin (bottom of scrolling region), the cursor stops at the bottom margin. **Editor Function**

CUF Cursor Forward – Host to VT132 and VT132 to Host**ESC [Pn C***default value: 1*

The CUF sequence moves the active position to the right. The distance moved is determined by the parameter. A parameter value of zero or one moves the active position one position to the right. A parameter value of n moves the active position n positions to the right. If an attempt is made to move the cursor beyond the right margin, the cursor stops at the right margin.

Editor Function**CUP** Cursor Position**ESC [Pn ; Pn H***default value: 1*

The CUP sequence moves the active position to the position specified by the parameters. This sequence has two parameter values, the first specifying the line position and the second specifying the column position. A parameter value of zero or one for the first or second parameter moves the active position to the first line or column in the display, respectively. The default condition with no parameters present is equivalent to a cursor to home action. In the VT132, this control behaves identically with its format effector counterpart, HVP.

The numbering of lines depends on the state of the origin mode (DECOM).

Editor Function**CUU** Cursor Up – Host to VT132 and VT132 to Host**ESC [Pn A***default value: 1*

The CUU sequence moves the active position upward without altering the column position. The number of lines moved is determined by the parameter. A parameter value of n moves the active position n lines upward. If an attempt is made to move the cursor above the top margin (the top of the scrolling region), the cursor stops at the top margin.

Editor Function**DA** Device Attributes**ESC [Pn c***default value: 0*

1. The host requests the VT132 to return a DA control sequence identifying itself with either no parameter or a parameter of 0.
2. Response to the request described above (VT132 to host) is generated by the VT132 as a DA control sequence with the numeric parameters as follows:

Option Present	Sequence Sent
No options	ESC [? 4 ; 2 c
STP (processor option)	ESC [? 4 ; 3 c
GPO (graphics option)	ESC [? 4 ; 6 c
GPO and STP	ESC [? 4 ; 7 c

DCH Delete Character**ESC [Pn P**

DCH causes Pn characters to be deleted from the current field starting with the character at the cursor. The action is the same as if the **DELETE CHAR** key was pressed Pn times. The effects of the sequence are field limited.

DECALN Screen Alignment Display (DEC Private)**ESC # 8**

This command fills the entire screen area with uppercase Es for screen focus and alignment. This command is used by DIGITAL manufacturing and Field Service personnel.

DECANM ANSI/VT52 Mode (DEC Private)

To set: Not Applicable (ANSI)

To reset: **ESC [? 21**(VT52)

This is a private parameter applicable to the reset mode (RM) control sequence. The reset state causes only VT52-compatible control sequences to be interpreted and executed. The set state causes only ANSI-compatible control sequences to be interpreted and executed.

DECARM Auto Repeat Mode (DEC Private)To set: **ESC [? 8 h**(on)To reset: **ESC [? 8 l**(off)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes no keyboard keys to auto-repeat. The set state causes certain keyboard keys to auto-repeat.

DECAWM Autowrap Mode (DEC Private)To set: **ESC [? 7 h**(on)To reset: **ESC [? 7 l**(off)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes any displayable characters received when the cursor is at the right margin to replace any previous characters there. The set state causes these characters to advance to the start of the next line, doing a scroll up if required and permitted.

DECCKM Cursor Keys Mode (DEC Private)To set: **ESC [? 1 h**(application)To reset: **ESC [? 1 l**(cursor)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. This mode is only effective when the terminal is in keypad application mode (see DECKPAM) and the ANSI/VT52 mode (DECANM) is set (see DECANM). Under these conditions, if the cursor key mode is reset, the four cursor function keys send ANSI cursor control commands. If cursor key mode is set, the four cursor function keys send application functions.

DECCOLM Column Mode (DEC Private)To set: **ESC [? 3 h** (132 column)To reset: **ESC [? 3 I** (80 column)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes a maximum of 80 columns on the screen. The set state causes a maximum of 132 columns on the screen.

NOTE: When this function is invoked, the contents of the screen are erased and the cursor moves to the home position.

DECDHL Double Height Line (DEC Private)Top Half: **ESC # 3**Bottom Half: **ESC # 4**

These sequences cause the line containing the active position to become the top or bottom half of a double-height double-width line. The sequences must be used in pairs on adjacent lines and the same character output must 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 move beyond the right margin, in which case it is moved to the right margin.

NOTE: Using double width characters reduces the number of characters per line by half.

DECDWL Double Width Line (DEC Private)**ESC # 6**

This causes the line that contains the active position to become double-width single-height. 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 move beyond the right margin, in which case, it is moved to the right margin.

NOTE: Using double width characters reduces the number of characters per line by half.

DECEDM Editing Mode (DEC Private)To set: **ESC [? 10 h** (edit)To reset: **ESC [? 10 I** (interactive)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. When set, the VT132 is in edit mode and the edit mode LED lights. When reset, the edit mode LED does not light and the VT132 behaves as an interactive terminal.

The state of edit mode can be saved in the nonvolatile RAM (NVR) by the operator and restored on power-up or recall.

DECEKEM Edit Key Execution Mode (DEC Private)

To set: **ESC [? 16 h** (immediate)

To reset: **ESC [? 16 l** (deferred)

This is a private parameter applicable to the set mode (SM) and reset mode (RM) control sequences. When set, the edit key execution mode causes successive pressing of the **(EDIT)** key to switch the terminal between interactive mode and edit mode. When reset, pressing the **(EDIT)** key sends a control sequence to the host computer requesting that edit mode be set or reset.

If the VT132 is in interactive mode, pressing the **(EDIT)** key sends **ESC [? 10 l** to the host computer immediately. This is the "set DECEKEM" control sequence. The host computer must then echo the sequence back to the VT132 to put it in edit mode.

If the VT132 is in edit mode, pressing the **(EDIT)** key sends **ESC [? 10 h** to the host computer immediately. This is the "reset DECEKEM" control sequence. The host computer must then echo the sequence back to the VT132 to put it in interactive mode.

DECHCP Hard Copy (DEC Private)

ESC # 7

This causes the screen to cease updating and freeze while the hardcopy output is enabled. The screen resumes normal operation when the hardcopy is complete. This command is ignored if no hard copy option is installed.

DECID Identify Terminal (DEC Private)

ESC Z

This sequence causes the same response as the ANSI device attributes (DA). This sequence will not be supported in future DIGITAL terminals, therefore, DA should be used by any new software.

DECINLM Interlace Mode (DEC Private)

To set: **ESC [? 9 h** (on)

To reset: **ESC [? 9 l** (off)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state (noninterlace) causes the video processor to display 240 scan lines per frame. The set (interlace) causes the video processor to display 480 scan lines per frame. There is no increase in character resolution. The reset state should be used.

DECKPAM Keypad Application Mode (DEC Private)

ESC =

The numeric keypad transmits control sequences as defined in Tables 3-7 and 3-8.

DECKPNM Keypad Numeric Mode (DEC Private)**ESC >**

The numeric keypad sends ASCII codes corresponding to the characters engraved on the keys.

DECLL Load LEDs (DEC Private)**ESC [Ps q***default value: 0*

Load the four programmable LEDs on the keyboard according to the parameter(s).

Parameter	Meaning
0	Clear LEDs L1 through L4
1	Light L1
2	Light L2
3	Light INSERT (L3)*
4	Light EDIT (L4)*

LED numbers are indicated on the keyboard.

** These LEDs are programmable only in interactive mode. To avoid operator confusion, they should not be used.*

DECLTM Line Transmit Mode (DEC Private)To set: **ESC [? 11 h**(line)To reset: **ESC [? 11 I**(page)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. When set, the VT132 is in line transmit mode. When reset, the VT132 is in page or partial page transmit mode. See the TTM control sequence below.

DECOM Origin Mode (DEC Private)To set: **ESC [? 6 h**(relative)To reset: **ESC [? 6 I**(absolute)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes the origin to be at the upper-left character position on the screen. Line numbers are therefore independent of current margin settings. The cursor may be positioned outside the margins with a cursor position (CUP) or horizontal and vertical position (HVP) control.

The set state causes the origin to be at the upper-left character position within the margins. Line numbers are therefore relative to the current margin settings. The cursor is not allowed to be positioned outside the margins.

The cursor is moved to the new home position when this mode is set or reset. Lines and columns are numbered consecutively, with the origin being line 1, column 1.

DECPRO Protected Fields Attributes (DEC Private)

ESC [Ps }

Ps selects the attributes which imply protection according to the list below. Multiple attributes may be selected in a single sequence by using the semicolon (073g) to separate each parameter string.

Ps	Meaning
0	No fields are protected
1	Bold implies protection
4	Underline implies protection
5	Blinking implies protection
7	Reverse video implies protection
254	All attributes off implies protection

This sequence does not change any attributes of the characters displayed on the screen or of the characters received. The sequence merely changes the way the characters with the specified attributes are interpreted by the editing and transmission modes.

DECRC Restore Cursor (DEC Private)

ESC 8

This sequence causes the previously saved cursor position, graphic rendition, and character set to be restored.

DECRETPARM Report Terminal Parameters (DEC Private)

**ESC [<sol> ; <par> ; <nbits> ; <xspeed> ;
<rspeed> ; <clkmul> ; <flags> x**

These sequence parameters are explained below in the DECREQTPARM sequence.

DECREQTPARM Request Terminal Parameters (DEC Private)

ESC [<sol> x

DECRETPARM is sent by the terminal controller to notify the host of the status of selected terminal parameters. The status sequence may be sent when requested by the host or at the terminal's discretion. DECRETPARM is sent upon receipt of a DECREQTPARM. On power up or reset, the VT132 is inhibited from sending unsolicited reports.

The sequence parameters meanings are:

Parameter	Value	Meaning
<sol>	0 or none	This message is a request (DECREQTPARM) and the terminal is allowed to send unsolicited reports. (Unsolicited reports are sent when the terminal exits SET-UP mode.)
	1	This message is a request; from now on the terminal may only report in response to a request.
	2	This message is a report (DECREPTPARM).
	3	This message is a report and the terminal is only reporting on request.
<par>	1	No parity set
	2	space parity
	3	mark parity
	4	Parity is set and odd
	5	Parity is set and even
<nbits>	1	8 bits per character
	2	7 bits per character
{ <xspeed> <rspeed> }	0	50
	8	75
	16	110
	24	134.5
	32	150
	40	200
	48	300
	56	600
	64	1200
	72	1800
	80	2000
	88	2400
	96	3600
	104	4800
	112	9600
120	19,200	
		} Bits per second
<clkmul>	1	The bit rate multiplier is 16.
<flag>	0-15	This value communicates the four switch values in block 5 of SET-UP B, which are only visible to the user when an STP option is installed. These bits may be assigned for an STP device. The four bits are a decimal-encoded binary number.

DECSC Save Cursor (DEC Private)**ESC 7**

This sequence causes the cursor position, graphic rendition, and character set to be saved. (See DECRC.)

DECSCFDM Space Compression/Field Delimiting Mode (DEC Private)

To set: **ESC [? 13 h** (on)

To reset: **ESC [? 13 I** (off)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes characters to be transmitted as they are encountered. The set state causes all trailing spaces in a field to be suppressed. All fields sent are terminated by a single record separator character (RS, 036g) except the last field, which is delimited by the CR (015g) or CR LF (015g, 012g) characters.

The guarded area transfer mode (GATM) control sequence also affects the data sent. For a detailed explanation on how these two control sequences interact see the compression and suppression discussion located earlier in this chapter.

DECSCLM Scrolling Mode (DEC Private)

To set: **ESC [? 4 h** (smooth)

To reset: **ESC [? 4 I** (jump)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes scrolls to "jump" instantaneously. The set state causes scrolls to be "smooth" at a maximum rate of six lines per seconds.

DECSCNM Screen Mode (DEC Private)

To set: **ESC [? 5 h** (reverse)

To reset: **ESC [? 5 I** (normal)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes the screen to be black with white characters. The state causes the screen to be white with black characters.

DECSTBM Set Top and Bottom Margins (DEC Private)

ESC [Pn ; Pnr

default values: (see below)

This sequence sets the top and bottom margins to define the scrolling region. The first parameter is the line number of the first line in the scrolling region; the second parameter is the line number of the bottom line in the scrolling region. Default is the entire screen (no margins). The minimum size of the scrolling region allowed is two lines, i.e., the top margin must be less than the bottom margin. The cursor is placed in the home position. (See Origin Mode, DECOM.)

DECSWL Single-width Line (DEC Private)**ESC # 5**

This causes the line that contains the active position to become single-width single-height. The cursor remains on the same character position. This is the default condition for all new lines placed on the screen.

DECTEM Transmit Execution Mode (DEC Private)

To set: **ESC [? 14 h** (immediate)

To reset: **ESC [? 14 l** (deferred)

This is a private parameter applicable to set mode (SM) and reset mode (RM) control sequences. When set and the VT132 is in edit mode, pressing the **ENTER** key initiates sending line, partial page or page data, as appropriate. When reset and the VT132 is in edit mode, pressing the **ENTER** key sends **ESC S**, alerting the host that the terminal wishes to transmit data. No further transmission occurs until the terminal receives the DECMIT control sequence.

DECTST Invoke Confidence Test (DEC Private)**ESC [2 ; Ps y**

Ps is the parameter indicating the test to be done. Ps is computed by taking the weight indicated for each desired test and adding them together. If Ps is 0 no test is performed but the VT132 is reset.

Test	Weight
Power up self-test (ROM checksum, RAM, NVR keyboard and AVO if installed)	1
Data loopback	2 (loopback connector required)
EIA modem control test	4 (loopback connector required)
Repeat selected test(s) indefinitely (until failure or power off)	8

DECTTC Transmit Termination Character (DEC Private)**ESC [Ps |**

Ps selects a single transmit termination character according to the following list. If multiple parameter strings are sent, only the character specified by the last parameter string is sent. The final character is a vertical bar (174_g).

Ps	Character
0	None (function disabled)
1	FF (form feed)

DECXMIT Transmit (DEC Private)**ESC 5**

Causes the VT132 to transmit data as if the **ENTER** key had been pressed while the DECTEM control sequence was set to the immediate mode.

DL Delete Line**ESC [Pn M**

Causes Pn lines to be deleted just as if the **DELETE LINE** key had been pressed that number of times. The lines are deleted without regard to protected fields. The area moved up is bounded by the bottom of the scrolling region. New lines are placed at the bottom of the scrolling region to replace the deleted lines. The new lines are filled with spaces whose video attributes match those of the last line moved up. The command has no effect if the cursor is outside the scrolling region.

DSR Device Status Report**ESC [Ps n**

default value: 0

Requests and reports the general status of the VT132 according to the following parameter(s).

Parameter	Meaning
0	Response from VT132 – No malfunctions detected (default)
3	Response from VT132 – malfunction - retry
5	Command from host – please report status (using a DSR control sequence)
6	Command from host-please report active position (using a CPR control sequence)

DSR with a parameter value of 0 or 3 is always sent as a response to a requesting DSR with a parameter value of 5.

ED Erase In Display**ESC [Ps J***default value: 0*

This sequence erases some or all characters in the display according to the parameter. Any complete line erased by this sequence returns that line to single-width mode. The actions of this command are dependent on the setting of the erasure mode (ERM). **Editor Function**

Parameter	Meaning
0	Erase from the active position to the end of the screen, inclusive (default)
1	Erase from start of the screen to the active position, inclusive
2	Erase all of the display – all lines are erased, changed to single-width, and the cursor does not move.

EL Erase In Line**ESC [Ps K***default value: 0*

Erases some or all characters in the active line according to the parameter. The actions of this command are dependent upon the setting of the erasure mode (ERM). **Editor Function**

Parameter	Meaning
0	Erase from the active position to the end of the line, inclusive (default)
1	Erase from the start of the screen to the active position, inclusive
2	Erase all of the line, inclusive

ERM Erasure ModeTo set: **ESC [6 h** (erase all)To reset: **ESC [6 l** (erase unprotected)

This is a parameter applicable to set mode (SM) and reset mode (RM) control sequences. When reset, the erase commands ED (erase in display) and EL (erase in line) do not erase protected data. When set, those commands erase any data regardless of protection.

GATM Guarded Area Transfer ModeTo set: **ESC [1 h** (send unprotected)To reset: **ESC [11** (send all)

This is a parameter applicable to set mode (SM) and reset mode (RM) control sequences. When reset only unprotected data is transmitted. If a protected field is encountered, a record separator (RS,036g) is transmitted. When set, all data is transmitted regardless of protection.

HTS Horizontal Tabulation Set**ESC H**

Set one horizontal stop at the active position.

Format Effector**HVP Horizontal and Vertical Position****ESC [Pn ; Pn f***default value: 1*

Moves the active position to the position specified by the parameters. This sequence has two parameter values, the first specifying the line position and the second specifying the column. A parameter value of either zero or one causes the active position to move to the first line or column in the display, respectively. The default condition with no parameters present moves the active position to the home position. In the VT132 this control behaves identically with its editor function counterpart, CUP. Numbering lines and columns depends on the reset or set state of the origin mode (DECOM).

Format Effector**IL Insert Line****ESC [Pn L**

Causes Pn lines to be inserted just as if the **INSERT LINE** key had been pressed that number of times. The lines are inserted without regard to protected fields. The area moved down is bounded by the bottom of the scrolling region. New lines are placed at the cursor location in the scrolling region. The new lines are filled with spaces whose video attributes match those of the preceding line. The command has no effect if the cursor is located outside the scrolling region.

IND Index**ESC D**

Causes the active position to move downward one line without changing the column position. If the active position is at the bottom margin, a scroll up is performed.

Format Effector

IRM Insert/Replacement Mode

To set: **ESC [4 h** (insert)
 To reset: **ESC [4 I** (replacement)

This is a parameter applicable to set mode (SM) and reset mode (RM) control sequences. When reset, the VT132 is in replacement mode. The INSERT LED (L3) does not light and any incoming characters overlay the character at the cursor position. No other characters are affected. When set, the VT132 is in insert mode. The INSERT LED (L3) lights and any incoming characters cause all characters to the right of the cursor in the current field to shift right one position. Protected fields are shifted. Characters shifted off the line do not wrap around and are lost.

LNM Line Feed/New Line Mode

To set: **ESC [20 h** (new line)
 To reset: **ESC [20 I** (line feed)

This is a parameter applicable to set mode (SM) and reset mode (RM) control sequences. The reset state causes the interpretation of the line feed (LF), defined in ANSI Standard X3.4-1977, to imply only vertical movement of the active position and causes the **RETURN** key (CR) to send the signal code CR. The set state causes the LF to imply movement to the first position of the following line and causes the **RETURN** key to send the two codes CR and LF. This is the new line (NL) option. This mode does not affect the index (IND), or next line (NEL) format effectors.

NEL Next Line**ESC E**

This sequence causes the active position to move to the first position on the next line downward. If the active position is at the bottom margin, a scroll up is performed.

Format Effector**RI Reverse Index****ESC M**

Moves the active position to the same horizontal position on the preceding line. If the active position is at the top margin, a scroll down is performed.

Format Effector**RIS To Initial State****ESC c**

Resets the VT132 to its initial state, i.e., the state when powered on. This also causes execution of power-up and signal INIT H to be asserted briefly.

RM Reset Mode

ESC [Ps ; Ps ;...; Ps I

default value: none

Resets one or more VT132 modes as specified by each selective parameter in the parameter string. Each mode to be reset is specified by a separate parameter. (See Set Mode control sequence.) A summary of the modes is provided at the end of this section.

SCS Select Character Set

The appropriate G0 and G1 character sets are designated from one of five possible character sets. The G0 and G1 sets are invoked by codes SI and SO (shift in and shift out) respectively.

G0 Sets Sequence	G1 Sets Sequence	Meaning
ESC (A	ESC) A	United Kingdom set
ESC (B	ESC) B	ASCII set
ESC (0	ESC) 0	Special graphics set
ESC (1	ESC) 1	Alternate character ROM set
ESC (2	ESC) 2	Standard character set
		Alternate character ROM set
		Special graphics set

The United Kingdom and ASCII sets conform to the "ISO international register of character sets to be used with escape sequences." The other sets are private character sets. Special graphics means that the graphic characters for the codes 137₈ to 176₈ are replaced with other characters. The specified character set is used until another SCS is received.

NOTE: Additional information concerning the SCS control sequence can be found in the Special Graphics Characters discussion of this chapter and in ANSI standard X3.41-1974.

SGR Select Graphic Rendition

ESC [Ps ;...; Ps m default value: 0

Invoke the graphic rendition specified by the parameter(s). All following characters transmitted to the VT132 are rendered according to the parameter(s) until the next occurrence of SGR.

Format Effector

Parameter	Meaning
0	Attributes off
1	Bold or increased intensity
4	Underscore
5	Blink
7	Negative (reverse) image

All other parameter values are ignored.

SM Set Mode**ESC [Ps ;...; Psh***default value: none*

Causes one or more modes to be set within the VT132 as specified by each selective parameter in the parameter string. Each mode to be set is specified by a separate parameter. A mode is considered set until it is reset by a reset mode (RM) control sequence. A summary of the modes is provided at the end of this section.

TBC Tabulation Clear**ESC [Psg***default value: 0*

Parameter	Meaning
0	Clear horizontal tab stop at active position (default case)
3	Clear all horizontal tab stops

Any other parameter values are ignored.

Format Effector**TTM Transfer Termination Mode**

To set: **ESC [16 h** (page)

To reset: **ESC [16 l** (partial page)

This control sequence is applicable only when the DECLTM control sequence is reset.

This parameter is applicable to set mode (SM) and reset mode (RM) control sequences. When set, the full scrolling region is transmitted (page transmit mode). When reset, the scrolling region from the upper-left corner or the last partial page transmit marker to the current cursor position is transmitted (partial page transmit mode).

MODES

The following VT132 modes may be changed with set mode (SM) and reset mode (RM) controls.

ANSI Specified Modes

Parameter	Mnemonic	Function
0	-	Error (ignored)
1	GATM	Guarded area transfer
4	IRM	Insert/replacement
6	ERM	Erasure
16	TTM	Transfer termination
20	LNM	Line feed/new line mode

DEC Private Modes

If the first character in the parameter string is ? (077g), the parameters are interpreted as DEC private parameters according to the following:

Parameter	Mnemonic	Function
0	–	Error (ignored)
1	DECCKM	Cursor key
2	DECANM	ANSI/VT52
3	DECCOLM	Column
4	DECSCLM	Scrolling
5	DECSCNM	Screen
6	DECOM	Origin
7	DECAWM	Auto wrap
8	DECARM	Auto repeating
9	DECINLM	Interlace
10	DECEDM	Edit
11	DECLTM	Line transmit
13	DECSCFDM	Space compression/field delimiting
14	DECTEM	Transmit execution
16	DECEKEM	Edit key execution

Any other parameter values are ignored.

The following modes, specified in ANSI standard X3.64-1977, may be considered permanently set, permanently reset, or not applicable, as noted. Refer to the standard for further information concerning these modes.

Mnemonic	Function	State
CRM	Control representation	Reset
EBM	Editing boundary	Reset
FEAM	Format effector action	Reset
FETM	Format effector transfer	Reset
HEM	Horizontal editing	NA
KAM	Keyboard action	Reset
MATM	Multiple area transfer	NA
PUM	Positioning unit	NA
SATM	Selected area transfer	NA
SRTM	Status reporting transfer	Reset
TSM	Tabulation stop	Reset
VEM	Vertical editing	NA

Valid VT52 Mode Control Sequences

Cursor Up

ESC A

Move the active position upward one position without altering the horizontal position. If an attempt is made to move the cursor above the top margin, the cursor stops at the top margin.

Cursor Down

ESC B

Move the active position downward one position without altering the horizontal position. If an attempt is made to move the cursor below the bottom margin, the cursor stops at the bottom margin.

Cursor Right

ESC C

Move the active position to the right. If an attempt is made to move the cursor beyond the right margin, the cursor stops at the right margin.

Cursor Left

ESC D

Move the active position one position to the left. If an attempt is made to move the cursor beyond the left margin, the cursor stops at the left margin.

Enter Graphics Mode

ESC F

Causes the special graphics character set to be used.

NOTE: The special graphics characters in the VT132 are different from those in the VT52.

Exit Graphics Mode

ESC G

This sequence causes the standard ASCII character set to be used.

Cursor to Home

ESC H

Move the cursor to the home position.

Reverse Line Feed**ESC I**

Move the active position upward one position without altering the column position. If the active position is at the top margin, a scroll down is performed.

Erase to End of Screen**ESC J**

Erase all characters from the active position to the end of the screen. The active position is not changed.

Erase to End of Line**ESC K**

Erase all characters from the active position to the end of the current line. The active position is not changed.

Direct Cursor Address**ESC Y line column**

Move the cursor to the specified line and column. The line and column numbers are sent as ASCII codes whose values are the number plus 037₈; e.g., 040₈ refers to the first line or column, 050₈ refers to the eighth line or column, etc.

Identify**ESC Z**

This sequence causes the terminal to send its identifier escape sequence to the host. This sequence is:

ESC/Z

NOTE: Information regarding options must be obtained in ANSI mode using the device attribute (DA) control sequence.

Enter Alternate Keypad Mode**ESC =**

The numeric keypad sends unique identifiable escape sequences for use by applications programs.

Exit Alternate Keypad Mode**ESC >**

The numeric keypad sends the ASCII codes for the functions or characters engraved on the key.

Enter ANSI Mode**ESC <**

All subsequent control sequences are interpreted according to ANSI Standards X3.64-1977 and X3.41-1974. The VT52 control sequence designed in this section is recognized.

VT132 CONTROL SEQUENCE SUMMARY**ANSI Compatible Mode—Cursor Movement Commands**

Cursor up	ESC [Pn A
Cursor down	ESC [Pn B
Cursor forward (right)	ESC [Pn C
Cursor backward (left)	ESC [Pn D
Direct cursor addressing	ESC [Pl ; Pc H*
	or
	ESC [Pl ; Pc f*
Index	ESC D
Reverse index	ESC M
Save cursor and attributes	ESC 7
Restore cursor and attributes	ESC 8

*Pl = line number; Pc = column number

NOTE: Pn refers to a decimal parameter expressed as a string of ASCII digits. Multiple parameters are separated by the semicolon character (073g). If a parameter is omitted or specified to be 0 the default parameter value is used. For cursor movement commands, the default parameter value is 1.

Line Size (Double-height and Double-width) Commands

Change this line to double-height top half	ESC # 3
Change this line to double-height bottom half	ESC # 4
Change this line to single-width single-height	ESC # 5
Change this line to double-width single-height	ESC # 6

Character Attributes**ESC [Ps ; Ps ; Ps ;...; Ps m**

Ps refers to a selective parameter. Multiple parameters are separated by the semicolon character (073g). The parameters are executed in order and have the following meanings:

Ps	Meaning
0 or none	All attributes off
1	Bold on
4	Underscore on
5	Blink on
7	Reverse video on

Any other parameter values are ignored.

ESC [Ps]

Ps selects the attributes which imply protection. Multiple parameters may be selected in a single sequence.

Ps	Meaning
0	No fields protected
1	Bold implies protection
4	Underline implies protection
5	Blinking implies protection
7	Reverse video implies protection
254	All attributes off implies protection

Editing Commands

Delete character	ESC [Pn P
Delete line	ESC [Pn M
Insert line	ESC [Pn L

Erasing

From cursor to end of line	ESC [K or ESC [0 K
From beginning of line to cursor	ESC [1 K
Entire line containing cursor	ESC [2 K
From cursor to end of screen	ESC [J or ESC [0 J
From beginning of screen to cursor	ESC [1 J
Entire screen	ESC [2 J

Programmable LEDs**ESC [Ps ; Ps ;...; Ps q**

Ps are selective parameters separated by semicolons (073g) and executed in order, as follows:

0 or none	All LEDs off
1	Light L1
2	Light L2
3	Light INSERT (L3)
4	Light EDIT (L4)

Any other parameter values are ignored.

Character Sets (G0 and G1 Designators)

The G0 and G1 character sets are designated as follows:

Character set	G0	G1
United Kingdom (UK)	ESC (A	ESC) A
United States (USASCII)	ESC (B	ESC) B
Special graphics characters and line drawing set	ESC (0	ESC) 0
Alternate character ROM	ESC (1	ESC) 1
Alternate character ROM special graphics characters	ESC (2	ESC) 2

Scrolling Region

ESC [Pt ; Pb r

Pt is the number of the top line of the scrolling region; Pb is the number of the bottom line of the scrolling region. Pb must be greater than Pc.

Tab Stops

Set tab at current column
 Clear tab at current column
 Clear all tabs

ESC H
ESC [g or **ESC 0 g**
ESC [3 g

Transmit Controls

ESC [Ps |

Ps selects a single transmit termination character.

Ps	Character
0	None
1	FF

ESC 5

NOTE: Set mode (SM) and reset mode (RM) also contain transmit controls.

Modes	To Set		To Reset	
	Mode	Sequence	Mode	Sequence
Guarded area xfer	All	ESC [1 h	Unprotect	ESC [11
Insert/replace	Insert	ESC [4 h	Replace	ESC [41
Erasure	All	ESC [6 h	Unprotect	ESC [61
Xfer termination	Page	ESC [16 h	Part page	ESC [161
Line feed/new line	Newline	ESC [20 h	Linefeed	ESC [201
Cursor key mode	Application	ESC [? 1 h	Cursor	ESC [? 11
ANSI/VT52 mode	ANSI	N/A	VT52	ESC [? 21
Column mode	132 Col	ESC [? 3 h	80 Col	ESC [? 31
Scrolling mode	Smooth	ESC [? 4 h	Jump	ESC [? 41
Screen mode	Reverse	ESC [? 5 h	Normal	ESC [? 51
Origin mode	Relative	ESC [? 6 h	Absolute	ESC [? 61
Wraparound	On	ESC [? 7 h	Off	ESC [? 71
Auto repeat	On	ESC [? 8 h	Off	ESC [? 81
Interlace	On	ESC [? 9 h	Off	ESC [? 91
Edit	On	ESC [? 10 h	Off	ESC [? 101
Line transmit	Line	ESC [? 11 h	Page	ESC [? 111
Sp. comp/fld. del.	On	ESC [? 13 h	Off	ESC [? 131
Transmit execute	Immediate	ESC [? 14 h	Deferred	ESC [? 141
Edit key execute	Immediate	ESC [? 16 h	Deferred	ESC [? 161
Keypad	Application	ESC =	Numeric	ESC >

Reports**Cursor Position Report**

Invoked by: **ESC [6 n**
 Response: **ESC [Pl ; Pc R***

*Pl = line number; Pc = column number

Status Report

Invoked by: **ESC [5 n**
 Response: **ESC [0 n** (terminal ok)
ESC [3 n (terminal not ok)

What are you

Invoked by: **ESC [c**
 or
ESC [0 c
 Response: **ESC [? 4 ; Ps c**

Ps is the "option present" parameter with the following meaning:

Ps	Meaning
2	No options
3	STP
6	GPO
7	GPO and STP

Alternately invoked by **ESC Z** (not recommended). Response is the same.

Reset**ESC c**

Reset causes the power-up reset routine to be executed.

Confidence Tests

Fill screen with "E"s **ESC # 8**
 Invoke test(s) **ESC [2 ; Ps y**

Ps is the parameter indicating the test to be done. It is a decimal number computed by taking the "weight" indicated for each desired test and adding them together.

Test	Weight
Power-up self test (ROM checksum, RAM, NVR, keyboard and AVO if installed)	1
Data loopback	2 (loopback connector required)
EIA modem control test	4 (loopback connector required)
Repeat selected test(s) indefinitely (until failure or power off)	8

VT52 Compatible Mode

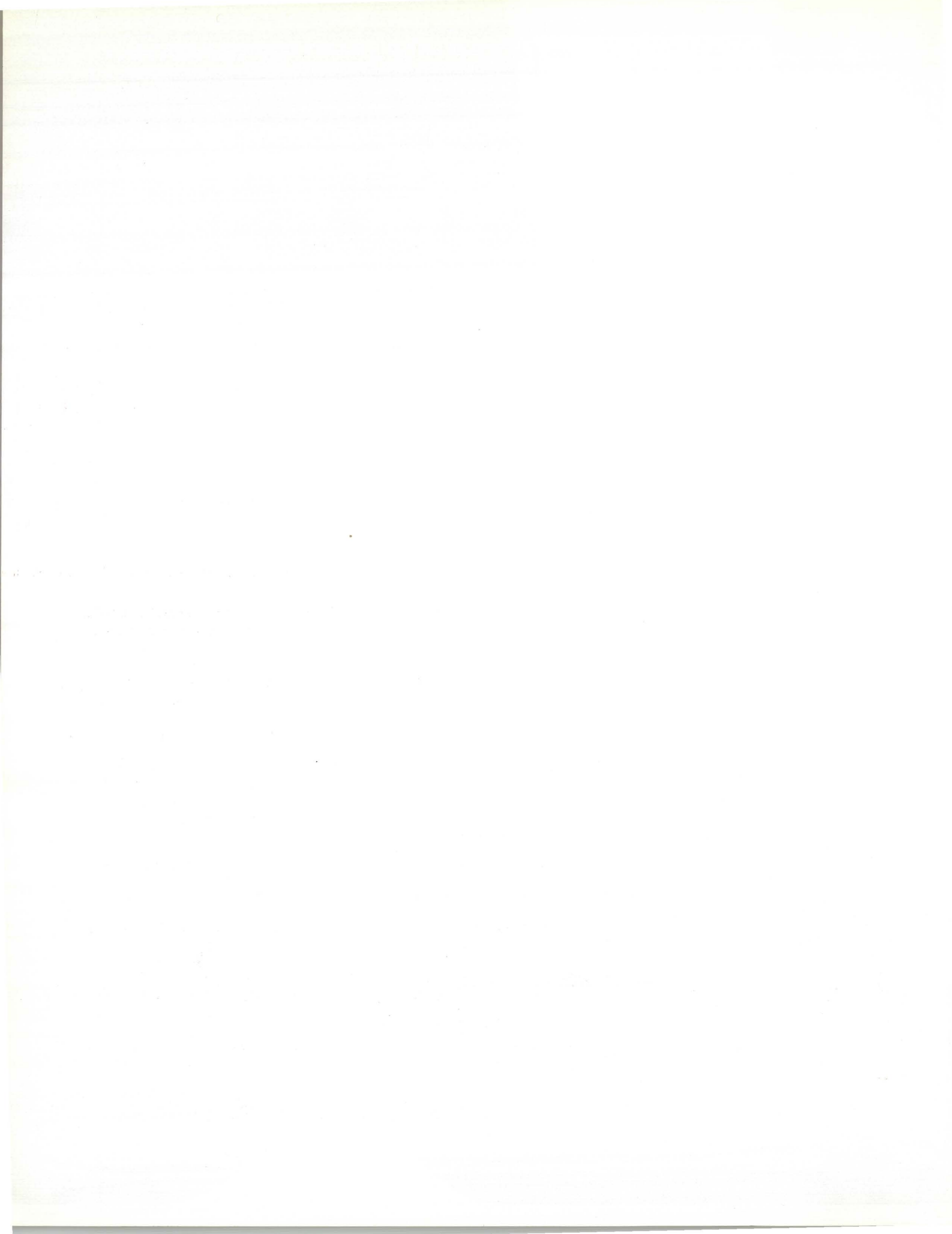
Cursor up	ESC A
Cursor down	ESC B
Cursor right	ESC C
Cursor left	ESC D
Select special graphics character set	ESC F
Select ASCII character set	ESC G
Cursor to home	ESC H
Reverse line feed	ESC I
Erase to end of screen	ESC J
Erase to end of line	ESC K
Direct cursor address	ESC Y lc (see note 1)
Identify	ESC Z (see note 2)
Enter alternate keypad mode	ESC =
Exit alternate keypad mode	ESC >
Enter ANSI mode	ESC <

NOTE 1: Line and column numbers for direct cursor address are single character codes whose values are the desired number plus 037₈. Line and column numbers start at 1.

*NOTE 2: Response to **ESC Z** is **ESC /Z**.*



VT132 Options



CHAPTER 4

VT132 OPTIONS

VT132 options are designed to enhance the basic terminal and allow its use in a wide range of applications. Options currently available are:

- VT1XX-AA 20 mA Current Loop Option
- VT1XX-AE Screen Filter
- VT1XX-ST Terminal Stand.

In the future, additional options will be available. Contact the nearest DIGITAL sales office for further information concerning the options and how to order them.

20 mA CURRENT LOOP OPTION – VT1XX-AA

Connects the VT132 directly to the host computer over a short distance without using a modem. Specifications for the option are in Chapter 2 under interface information.

Installation

Use the following procedure to install the 20 mA Current Loop Option:

1. Remove power from the terminal by disconnecting the ac plug.
2. Unplug the keyboard.
3. Unplug any connectors from the composite video input/output jacks.
4. Disconnect the communications cable.
5. With a blade-type screwdriver loosen the four captive screws holding the access cover; then remove the cover.
6. Set the TRANS switch to the NORMAL position (Figure 4-1). (If the terminal must provide current on the receive line set the switch to the ACT position.)
7. Set the REC switch to the NORMAL position (Figure 4-1). (If the terminal must provide current on the receive line set the switch to the ACT position.)
8. Connect P5 to J5 on the terminal controller board (Figure 4-2).
9. Perform the 20 mA Current Loop Option Checkout.

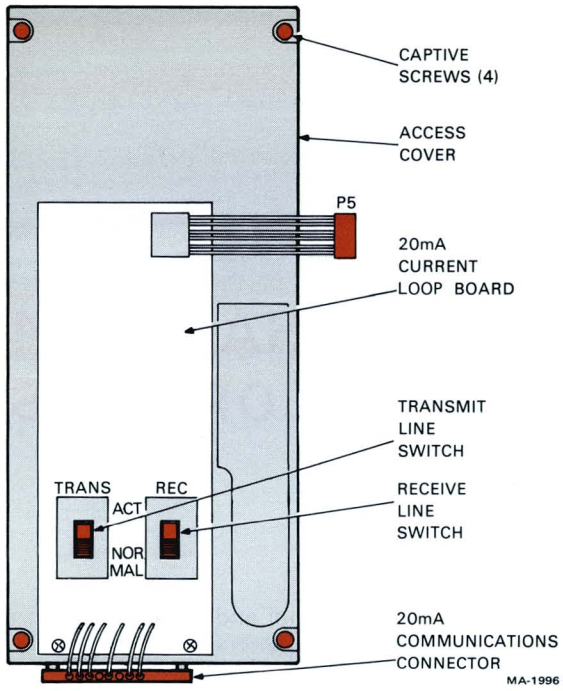


Figure 4-1 20 mA Current Loop Option

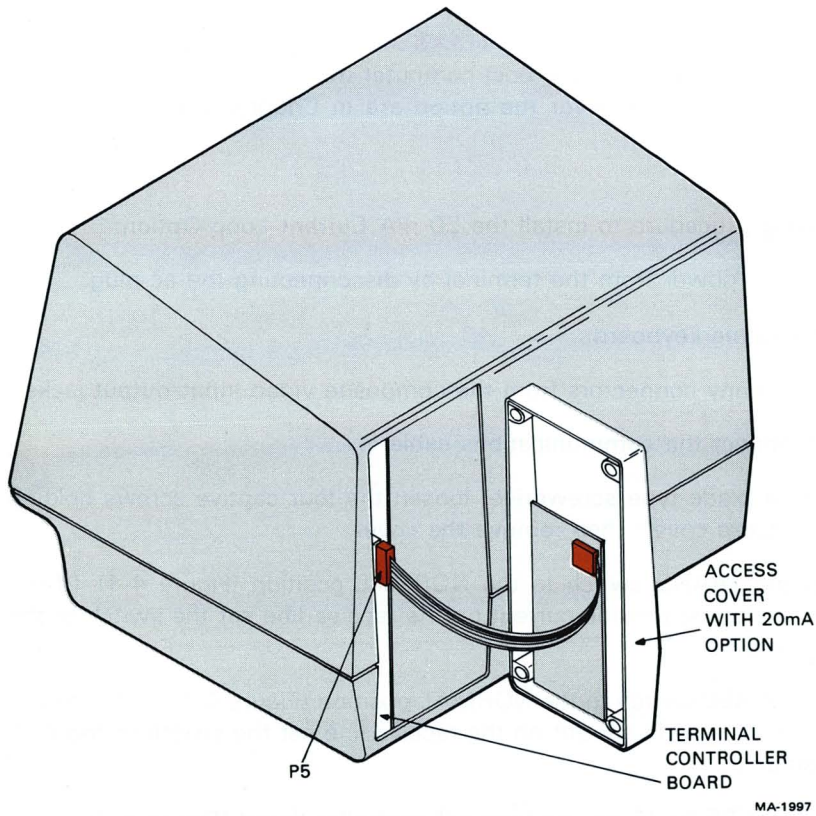


Figure 4-2 20 mA Current Loop Option Installation

Checkout

The VT132 contains an internal data loopback test. The transmit and receive lines are connected to each other via a special external connector. A predefined set of characters are then transmitted. The terminal receives the characters and compares them to the characters transmitted. If they do not match an error is flagged.

Use the following procedure to check out the operation of the 20 mA Current Loop Option.

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

ESC [2 ; 2 y

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

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

VT1XX-AE SCREEN FILTER

The filter reduces glare from overhead lighting and softens the monitor display without dulling the sharpness of the image itself. The light grey filter adheres directly to the face of the screen, thereby avoiding image distortion and maintaining high character resolution and contrast. The filter has a non-glare matte finish and a hard coating that is both abrasion and chemical resistant.

VT1XX-ST TERMINAL STAND

The stand offers ease of use for VT1XX video products, and is styled to give a contemporary look of elegance to any office or computer environment. The unit requires minimal floor space. The stand consists of a keyboard/monitor baseplate securely mounted to a tubular steel center pole that is attached to five pedestal legs providing excellent stability. The stand raises the terminal 26 inches to provide for typing comfort and accuracy.

COMMUNICATIONS CABLES

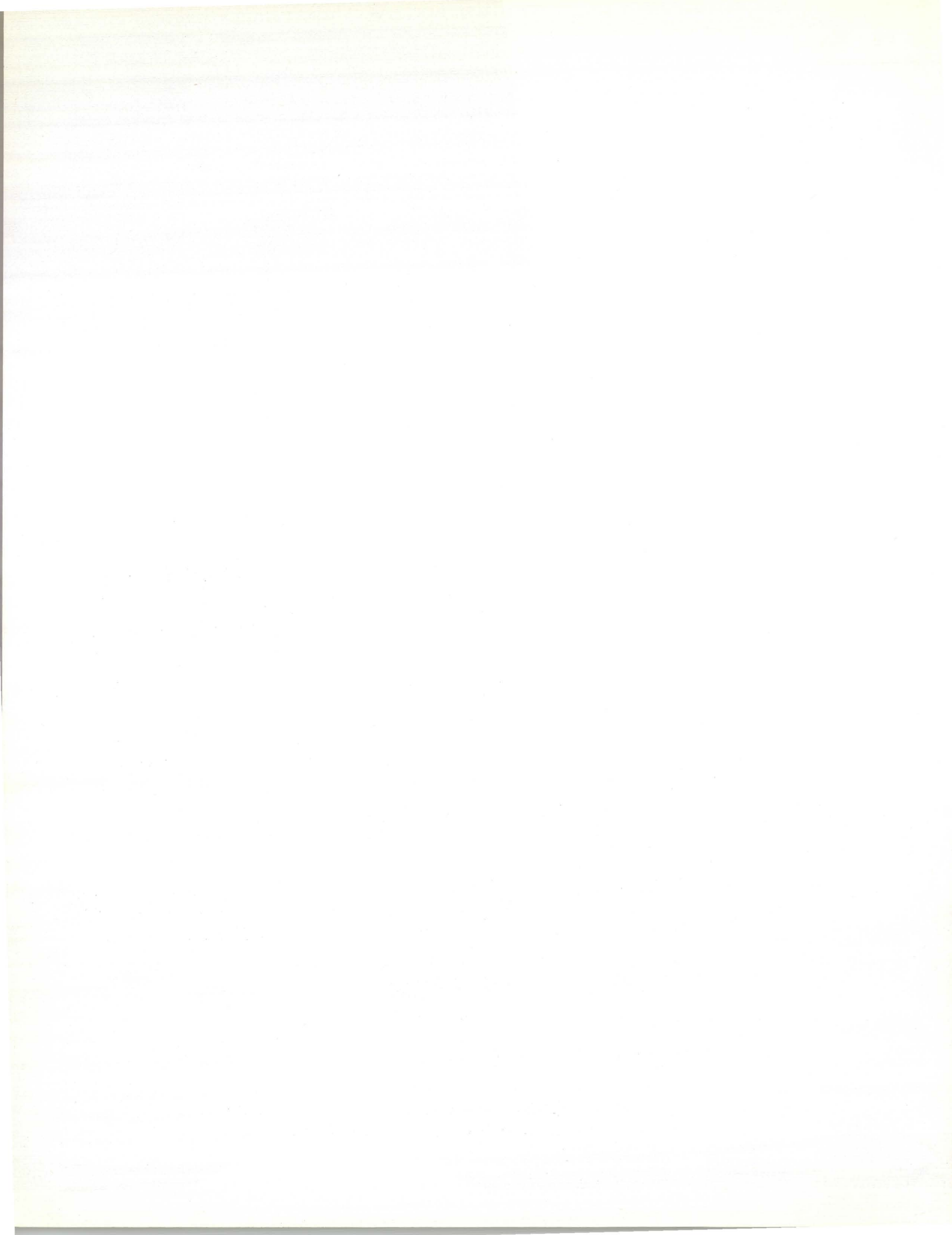
The following communications cables are available for use with the VT132. Contact your local DIGITAL sales office for ordering information.

Table 4-1 Available Communications Cables

Number	Length	Connector Types	Purpose
BC22A-10	10 ft	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT132 and line unit (6-conductor cable).
BC22A-25	25 ft	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT132 and line unit (6-conductor cable).
BC22B-10*	10 ft	RS-232 (female) to RS-232 (male)	Extension; connects VT132 to a modem (14-conductor cable).
BC22B-25*	25 ft	RS-232 (female) to RS-232 (male)	Extension; connects VT132 to a modem (14-conductor cable).
BC03M-xx	variable	RS-232 (female) to RS-232 (female)	Null modem; direct connection between VT132 and line unit.
BC05D-xx**	variable	RS-232 (female) to RS-232 (male)	Extension; connects VT132 to a modem.
BC05F-xx***	variable	Mate-N-Lok	20 mA; direct connection between VT132 with a 20 mA option installed and a line unit.
<p>* This cable cannot be used with a DF01-A acoustic coupler. Use cable BC05D-xx in its place.</p> <p>** For use with a DF01-A acoustic coupler, pin 23 of this cable must be disconnected.</p> <p>*** A BC05F-15 cable is shipped with the VT1XX-AA option.</p>			



Appendixes



APPENDIX A

ANSI DEFINITIONS AND NOTATION

Active position – The character position on the visual display that is to display the graphic symbol representing the next graphic character.

ANSI mode – A VT132 mode in which it recognizes and responds only to escape sequences whose syntax and semantic are in accordance with ANSI standards.

Character position – That portion of a visual display that is displaying or is capable of displaying a graphic symbol.

Control character – A character whose occurrence in a particular context initiates, modifies, or stops a control function.

Control function – An action that affects recording, processing, transmitting, or interpreting data. This can be a control character, escape sequence, or control sequence.

Control sequence – A sequence of characters used to perform a control function. It begins with the control sequence introducer (CSI) and may contain a parameter string.

Control sequence introducer (CSI) – An escape sequence that provides supplementary controls and that is itself a prefix affecting the interpretation of a limited number of contiguous characters.

Cursor – A visual representation of the active position; either a blinking reverse-video or blinking underline.

Cursor control – An editor function that moves the active position.

Default – A function-dependent value assumed when no explicit value, or a value of 0, is specified.

Display – The current active area of the screen, i.e., the area inside the scrolling region, or the entire screen, depending on the origin mode.

Editor function – A control that affects the layout or positioning of previously entered or received information in a printing or cathode ray tube device. It is intended to be interpreted and executed without remaining in the data stream. (See format effector.)

Escape character (ESC) – A control character that provides supplementary characters (code extension) and that is itself a prefix affecting the interpretation of a limited number of contiguous characters.

Escape sequence – A sequence of characters used to perform a control function. The first character is the escape (ESC) control character.

Final character – A character whose bit combination terminates an escape or control sequence designated by F.

Format effector – A control that affects the layout or positioning of information on the screen. It may remain in the data stream subsequent to interpretation and processing. (See editor function.)

Graphic character – A character, other than a control character, that has a visual representation normally handwritten, printed, or displayed.

Home – The character position at the origin. [See origin mode (DECOM)].

Intermediate character – A character whose bit combination precedes a final character in an escape or control sequence.

Numeric parameter – A string of bit combinations that represents a number, designated by Pn.

Parameter – (1) A string of one or more characters that represent a single value; (2) The value so represented.

Parameter string – A string of characters that represent one or more parameter values.

Selective parameter – A string of bit combinations that selects a subfunction from a specified list of subfunctions, designated by Ps. In general, a control sequence with more than one selective parameter causes the same effect as several control sequences, each with one selective parameter, e.g., CSI Psa ; Psb ; Psc F is identical to CSI Psa F CSI Psb F CSI Psc F.

VT52 mode – A VT132 mode in which it recognizes and responds only to escape sequences with DIGITAL VT52-type terminals use.

NOTATION

- I** – An intermediate character in an escape sequence or a control sequence, where **I** is from 40₈ to 57₈ inclusive.
- F** – A final character in (a) An escape sequence, where **F** is from 60₈ to 17₆ inclusive; (b) A control sequence, where **F** is from 100₈ to 176₈ inclusive.
- P_n** – A numeric parameter in a control sequence, where **P_n** is a string of zero or more characters from 60₈ to 71₈ inclusive.
- P_s** – A variable number of selective parameters in a control sequence, with each selective parameter separated from the other by 73₈. **P_s** is a string of zero or more characters from 60₈ to 71₈ inclusive and 73₈.

Example: The format of an escape sequence as defined in American National Standard X3.41 – 1974 and used in the VT132 is:

ESC I...I F

where: **ESC** is the introducer control character (33₈) named escape.

I...I are the intermediate bit combinations that may or may not be present. **I** characters are bit combination 40₈ through 57₈ inclusive in both 7- and 8-bit environments.

F is the final character. **F** characters are bit combinations 60₈ through 176₈ inclusive in escape sequences in both 7- and 8-bit environments.

The occurrence of characters in the inclusive ranges of 0₈ through 37₈ is technically an error condition whose recovery is to execute immediately the function specified by the character and then continue with the escape sequence execution. The exceptions are: if the character **ESC** occurs, the current escape sequence is aborted, and a new one commences, beginning with the **ESC** just received; if the character CAN (30₈) or the character SUB (32₈) occurs, the current escape sequence is aborted.

APPENDIX B

ASCII CODE CHART

Octal Code	Char	Octal Code	Char	Octal Code	Char	Octal Code	Char
000	NUL	040	SP	100	@	140	'
001	SOH	041	!	101	A	141	a
002	STX	042	''	102	B	142	b
003	ETX	043	#	103	C	143	c
004	EOT	044	\$	104	D	144	d
005	ENQ	045	%	105	E	145	e
006	ACK	046	&	106	F	146	f
007	BEL	047	'	107	G	147	g
010	BS	050	(	110	H	150	h
011	HT	051	)	111	I	151	i
012	LF	052	.	112	J	152	j
013	VT	053	+	113	K	153	k
014	FF	054	,	114	L	154	l
015	CR	055	-	115	M	155	m
016	SO	056	.	116	N	156	n
017	SI	057	/	117	O	157	o
020	DLE	060	0	120	P	160	p
021	DC1	061	1	121	Q	161	q
022	DC2	062	2	122	R	162	r
023	DC3	063	3	123	S	163	s
024	DC4	064	4	124	T	164	t
025	NAK	065	5	125	U	165	u
026	SYN	066	6	126	V	166	v
027	ETB	067	7	127	W	167	w
030	CAN	070	8	130	X	170	x
031	EM	071	9	131	Y	171	y
032	SUB	072	:	132	Z	172	z
033	ESC	073	;	133	|	173	{
034	FS	074	<	134	\	174	|
035	GS	075	=	135	|	175	|
036	RS	076	>	136	^	176	~
037	US	077	?	137	—	177	DEL

APPENDIX C

FILL CHARACTER REQUIREMENTS

Fill characters are required to keep the VT132 synchronized with the host computer when the XON/OFF control codes are not used. Table C-1 shows the VT132 fill character requirements for every receive speed at which the terminal is capable of operating. No entry in a column indicates that fill characters are not required in that specific case.

CONTROL FUNCTION OR MODE		ED	NEL IND L.F. RI (SMOOTH SCROLL FEATURE)	DECCOLM, DECALN	IL AND DL*	NEL IND L.F. RI (JUMP SCROLL FEATURE)	EL	DCH*	DECINLM	ALL OTHERS EXCEPT DECTST AND RIS	ANY OTHER** CHARACTER
RECEIVE	19200	400	384	252	190	60	20	14	5	2	2
BAUD	9600	200	192	126	95	30	10	7	3	1	
RATE	4800	100	96	63	48	15	5	4	2		
	3600	75	72	48	36	11	4	3	1		
	2400	50	48	32	24	7	3	2			
	2000	42	40	27	20	6	2	2			
	1800	38	36	24	18	6	2	2			
	1200	25	24	16	12	4	2	1			
	600	13	12	8	6	2	1	1			
	300	7	6	4	3	1		1			
	200	5	4	3	2			1			
	150	4	3	2	2			1			
	134.5	3	3	2	2			1			
	110	3	2	1	2			1			
	75	2	2	1	1			1			
	50	2	1	1	1			1			

* IL, DL, AND DCH CONTAIN VARIABLE PARAMETERS. MULTIPLY THE NUMBER IN THIS COLUMN BY THE VALUE OF THE VARIABLE PARAMETER TO DETERMINE THE REQUIRED NUMBER OF FILL CHARACTERS.

** AT 19200 BAUD, ONE FILL CHARACTER IS REQUIRED FOR EVERY CHARACTER TRANSMITTED TO THE TERMINAL.

OTHER TERMINALS

The terminal is the vital link between the user and the power of the computer. The right terminal or the enhancement to your terminal can make your work easier, more efficient, and more cost effective. For that reason, DIGITAL offers a full range of video and teleprinter terminals and options that can help you tackle any application.

INTELLIGENT VIDEO TERMINAL

At the head of the VT100 class are DIGITAL'S intelligent PDT-11 terminals. The PDT family includes three programmable data terminals: the PDT-11/110, the PDT-11/130, and the PDT-11/150. With their PDP-11 compatible processors and RT-11 operating system, the PDTs permit you to draw on a wide range of existing software.

Local mass storage is available on the PDT-11/130 in the form of 524K bytes of storage provided in dual mini cartridges. Housed within the same VT100 shell, these mini cartridges are file-structured system devices. The PDT-11/150 lets you combine the functionality of the PDT-11 with the dual floppy disk storage of any DIGITAL terminal. With its four ports, the 11/150 allows considerable expansion. Add a terminal controller if you want the flexibility of up to four terminals. For hardcopy, add a printer to the printer port. There's a third port for an EIA link to a host computer.

VIDEO TERMINAL

For the ultimate in video terminals, look to DIGITAL VT100. It combines exceptional versatility with simplicity of operation. And it's designed to allow a wide range of fast and easy field upgrades to meet your changing needs.

There's a detached typewriter-style keyboard with a flexible 3-wire coiled cord. An 18-key numeric/function keypad on the keyboard permits single keystroke control of application-specific functions. The VT100 fits easily on a standard typewriter table. There's an advanced video option that provides 132-column lines on the screen for easy viewing of wide-line printer reports. Double height/double width characters are selectable line by line for easier reading and text formatting. Smooth scrolling a scan at a time lets your operators read new lines at a reasonable speed. Divided-screen displays; blinking, underlining, double intensity, and normal or reverse video character attributes; keyboard and/or computer-settable tab stops; built-in self-test diagnostics; pictorial capability; and many, many more.

30 CHARACTER PER SECOND KEYBOARD PRINTER

LA34/LA38 DECwriter IV

Everything about the 300 baud desktop terminals adds up to convenience. They are smaller, lighter, and quieter than many typewriters. They have sculptured, typewriter-like keys, and a cartridge for simple ribbon changes. All features are set at the keyboard, including four character width adjustments. They also have automatic self-test diagnostics.

The terminal is the link between the user and the power of the computer. Often the right terminal, or the right enhancement to the terminal can make your work easier, more efficient, or more cost effective. For that reason, DIGITAL offers a full range of video and teleprinter terminals and options that can help you tackle any application.

180 CHARACTER PER SECOND KEYBOARD PRINTER

The LA120, DIGITAL's fastest hardcopy terminal, offers better throughput than that of terminals with faster print speeds. The 180 character per second printhead prints bidirectionally and always seeks the next print position. The LA120 offers an unexcelled range of standard features. Over 45 keyboard-selectable features are offered. These features include variable font sizes, tabs, form length and many other features previously available only as options. To guide the operator through the myriad of possible configurations, the carefully human-engineered terminal uses mnemonic commands, a prompting LED display, a special decal and a convenient pocket-sized operator card.

There's lots more to tell about these terminal products. If you would like more information on any of these products just fill out the postage paid card and drop it in a mailbox or write:

DIGITAL EQUIPMENT CORPORATION
Components Group
One Iron Way
Marlboro, MA 01752

ATTN: MARKETING MANAGER
MR2-2/M70

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TECHNICAL DOCUMENTATION

CHANGE NOTICE

VT132 USER GUIDE ADDENDUM EK-VT132-ID-002

The following functionality has been added to the VT132 and is not documented in the User's Guide EK-VT132-UG-002.

HOME KEY

In edit mode, the CLEAR key operates as follows:

- CLEAR - Returns cursor to home
- <SHIFT> CLEAR - Clears unprotected data from screen and returns cursor to first unprotected field on screen.

KAM IMPLEMENTATION

KAM (keyboard action mode) allows the host to lock and unlock the keyboard. The command sequences are as follows:

- To set: ESC | 2 h (locks keyboard)
- To reset: ESC | 2 l (unlocks keyboard).

The keyboard locked condition can be cleared from the keyboard by entering and exiting SET-UP. Locking the keyboard lights the KBD LOCKED LED.

HOST OVERWRITE OF PROTECTED CHARACTERS

The ability for the host to overwrite protected characters in edit mode has been linked to ERM (erasure mode). If ERM is set (erase all), the host can overwrite protected characters. If ERM is reset (erase unprotected only), the host cannot overwrite protected characters. Thus, the cursor moves to the next unprotected field where the character is displayed.

ERM (page 80 of User's Guide)

- To set: ESC | 6 h (erase all)
- To reset: ESC | 6 l (erase unprotected only)

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INSERT/EDIT MODE INTERACTION

It is possible for the VT132 to remain in insert mode after the operator exits edit mode. The operator should be sure to exit insert mode prior to leaving edit mode. The host can enter and exit insert mode while in character mode by using the IRM sequence (page 82).

PROGRAMMABLE LEDs

The INSERT and EDIT LEDs cannot be lit by using the DECLTM escape sequence (page 74) even in interactive mode. This has been done to avoid confusion.

INSTALLATION, WARRANTY, AND SERVICE INFORMATION

INSTALLATION/WARRANTY

For customers who have purchased directly from DIGITAL, reference the sales agreement for installation and warranty terms purchased with this terminal.

For customers who have purchased, leased, or rented from a vendor other than DIGITAL, contact your vendor for information regarding installation and warranty terms purchased with this terminal.

DIGITAL SERVICES

A wide range of maintenance and customer services are available from DIGITAL for your terminal. Through use of these services, you can design a plan which meets your service needs, from complete DIGITAL maintenance to complete self-maintenance. Vendors supplying DIGITAL products may use these services as factory backup support.

- **On-Site Service**

DIGITAL offers responsive, low cost, factory-level maintenance performed at your site by trained Terminals Service Specialists through:

- Service Agreements which cover all your maintenance needs to include priority response; all labor, materials and travel for a fixed monthly charge.
- Per Call Service which is provided on a "time" and "materials" basis and can serve as a back-up to your own in-house maintenance programs.

- **Off-Site Service**

For those customers who have a significant level of troubleshooting expertise, but require Field Service assistance for the repair of components, DIGITAL has established a worldwide network of Product Repair Centers (PRCs) and the Customer Returns Area (CRA). Through a wide array of service product offerings this logistics network offers cost effective services to include:

- Module Mailer™
- Fixed Price Exchange
- Product Refurbishment

- **Spare Parts**

In an effort to further assist those customers who choose to perform their own computer maintenance, DIGITAL's Customer Spares organization is committed to providing thorough and timely spares support through:

- Spares Inventory Planning
- Component/Subassembly Spares
- Maintenance Test Equipment
- Maintenance Documentation Service
- Emergency Spare Parts

- **Training**

DIGITAL offers hardware maintenance courses through the Educational Services group at any of our 17 worldwide training centers; or depending on your specific training requirements, courses can be provided in your own facilities.

ORDERING SUPPLIES AND ACCESSORIES

Purchase orders for supplies and accessories should be forwarded to:

Digital Equipment Corporation
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Cotton Road
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