VT101

VIDEO TERMINAL
USER GUIDE

VT101
VIDEO TERMINAL
USER GUIDE

The Federal Communications Commission of the United States Government has published regulations which govern the allowable limits of emanation of radio frequency energy of computing devices and associated peripherals.

These regulations are concerned with interference to radio communication, such as radio and TV.

The regulations require equipment for end use in the United States to be labeled and to be accompanied by the notice appearing below.

To minimize the potential for interference, Digital supplied interconnecting cables should be used.

NOTICE
This equipment generates and uses radio frequency energy. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against radio and television interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, the user is encouraged to try to correct the interference.

Printed in U.S.A.

The following are trademarks of Digital Equipment Corporation, Maynard, Massachusetts.

DEC	DECnet	IAS
DECUS	DECsystem-10	MASSBUS
DIGITAL	DECSYSTEM-20	PDT
Digital Logo	DECwriter	RSTS
PDP	DIBOL	RSX
UNIBUS	EduSystem	VMS
VAX	OMNIBUS	VT
OS/8		

CHAPTER 3   TRANSMITTED CHARACTERS

CHAPTER 4   RECEIVED CHARACTER PROCESSING

CHAPTER 5   COMMUNICATION

CHAPTER 6   INSTALLATION

CHAPTER 7   OPTIONS

CHAPTER 8   MAINTENANCE AND TROUBLESHOOTING

CHAPTER 9   ACCESSORIES AND SUPPLIES

APPENDIX A   VT101 SPECIFICATIONS

APPENDIX B   SET-UP SUMMARY

APPENDIX C   TRANSMITTED CHARACTER CODES

APPENDIX D   PROGRAMMING SUMMARY

APPENDIX E   CONTROL FUNCTIONS (SEQUENCE FORMATS)

APPENDIX F   VT101/VT100 DIFFERENCES

Figures

Tables

PRODUCT INTRODUCTION
The VT1Ø1 Video Terminal uses a keyboard and a video display to communicate with a computer. It is both an input and an output device. Keyboard entries are transmitted to the computer, and at the same time, characters received from the computer are displayed on the video screen. The VT1Ø1 terminal can be connected to the computer directly or over a communication line using a modem or data set.

BOOK INTRODUCTION
This user guide is written for three general audiences: the operator (general operating information), the applications programmer (interface and control function descriptions), and the hardware installer (specific installation and checkout information).

The information in this user guide is divided by function. This allows you to reference a specific chapter according to the function to be performed. The chapters are arranged by frequency of use. Since operating information is frequently used by the operator it is at the beginning. Installation is performed only once so it is placed toward the end of the book.

The book is divided into the following chapters.

Chapter 1 is a general description of how the terminal operates and of all the controls and indicators. It also describes the general operating procedures. Detailed operating information may depend on the computer and its software.

Chapter 2 defines and describes each SET-UP feature in detail. The procedure for selecting each feature is also provided. Many SET-UP features alter the way the VT1Ø1 communicates with the computer (over the communication line). Detailed information on communication and the related SET-UP features is provided in Chapter 5.

Chapter 3 describes the characters and codes transmitted by the terminal, and illustrates the keys used for these codes.

Chapter 4 describes how the terminal processes received characters, and how control functions are used to control the display. The chapter also describes processing, transmission, and representation of characters by the terminal. This chapter can be used by the applications programmer when creating software for the terminal.

Chapter 5 describes how the terminal communicates with the computer using the standard Electronic Industry Association (EIA) interface. Also, there are descriptions of communication features and methods used to prevent input buffer overflows. The Break signal is defined in this chapter.

Chapter 6 describes the environmental conditions which should be considered before installing the terminal. There are detailed unpacking and installation procedures. The chapter also contains a step-by-step procedure for powering up the terminal and verifying proper operation.

Chapter 7 describes the 20 mA current loop interface option and provides installation and checkout instructions.

Chapter 8 describes all maintenance and troubleshooting procedures used by the operator prior to requesting service. The troubleshooting information describes the self-tests of the terminal.

Chapter 9 briefly describes each accessory and supply, including the part number and ordering information.

Appendix A provides the VT101 specifications.

Appendix B is a summary of the SET-UP feature displays.

Appendix C is a summary of the codes generated by the VT101 terminal.

Appendix D is a summary of VT101 programming control functions.

Appendix E describes the ANSI code extension techniques used to create escape and control sequences.

Appendix F describes the differences between the VT101 and VT100 terminals.

GENERAL
This chapter contains a general overview of how the VT1Ø1 operates and provides a description of its controls and indicators. There is a brief summary of basic operating procedures. Detailed operating information may depend on the computer software.

TERMINAL OPERATION
The VT1Ø1 terminal operates in either on-line, off-line, or SET-UP. This section provides an overview of on-line and off-line. On-line and off-line are selected in SET-UP. Chapter 2 describes SET-UP and provides more information about on-line and off-line.

When the ON LINE indicator is on, the VT1Ø1 terminal is on-line. While on-line, the terminal can transmit and receive character codes. Keyboard entries are placed in a keyboard character buffer until transmitted to the computer. Character codes received by the terminal are placed in an input character buffer until processed. When processed, the received characters are taken from the buffer and displayed on the screen. Figure 1-1 is a general block diagram of the VT1Ø1 terminal while on-line.
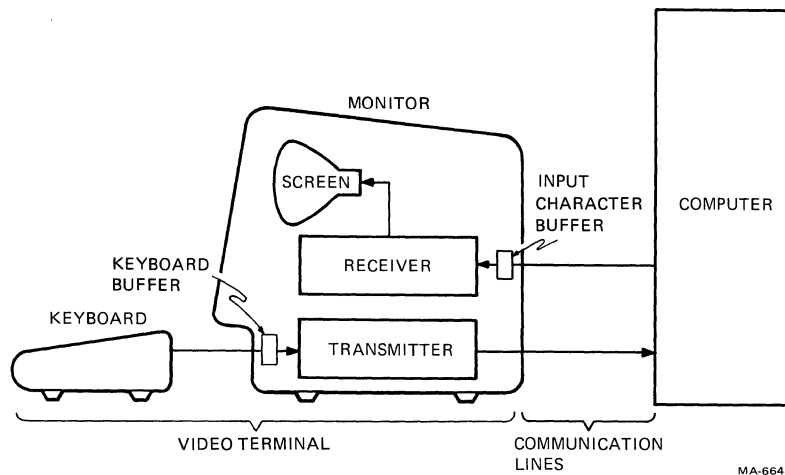
Figure 1-1   On-line General Block Diagram
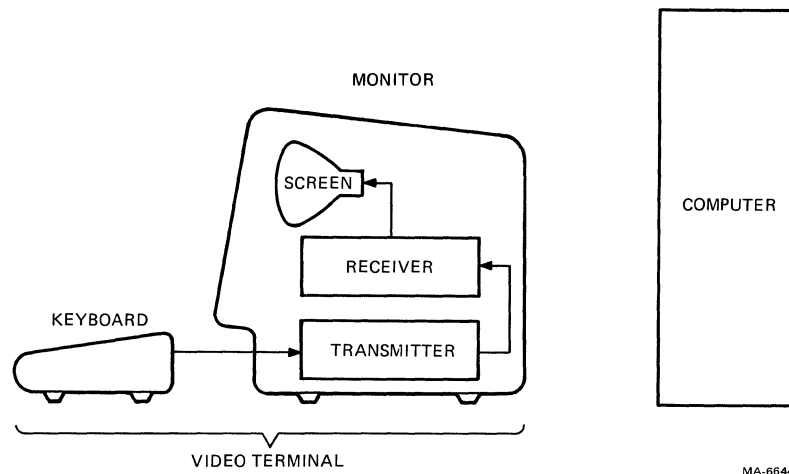
Figure 1-2   Off-line General Block Diagram

When the OFF LINE indicator is on, the VT1Ø1 terminal is off-line. While off-line, the terminal cannot transmit or receive character codes. The terminal is considered disconnected from the communication line. Therefore, character codes transmitted to the terminal while it is off-line are lost. Keyboard entries are displayed on the screen. Figure 1-2 is a general block diagram of the VT1Ø1 terminal while off-line.

CONTROLS AND INDICATORS
The VT1Ø1 terminal has many different controls and indicators. They can be classified in four groups: monitor controls, keyboard controls, keyboard indicators, and audible indicators.

Monitor Controls
The VT1Ø1 terminal has two controls mounted on the monitor backpanel. (Refer to Figures 1-1 and 1-2 to identify the monitor.) The two controls are the voltage selection switch and the power switch (Figure 1-3).

The voltage selection switch allows the VT1Ø1 terminal to operate within the available ac input voltage range (Table 1-1). When selecting the ac input voltage range, the fuse must be changed. Refer to Chapter 6 for more information about changing the fuse.

CAUTION: Failure to set the voltage selection switch properly and to use the correct fuse may damage the terminal.

NOTE: The voltage selection switch does not select the ac line frequency of the terminal. The ac line frequency is selected using the Power SET-UP B feature. Refer to Chapter 2 for more information about SET-UP features.

1-2
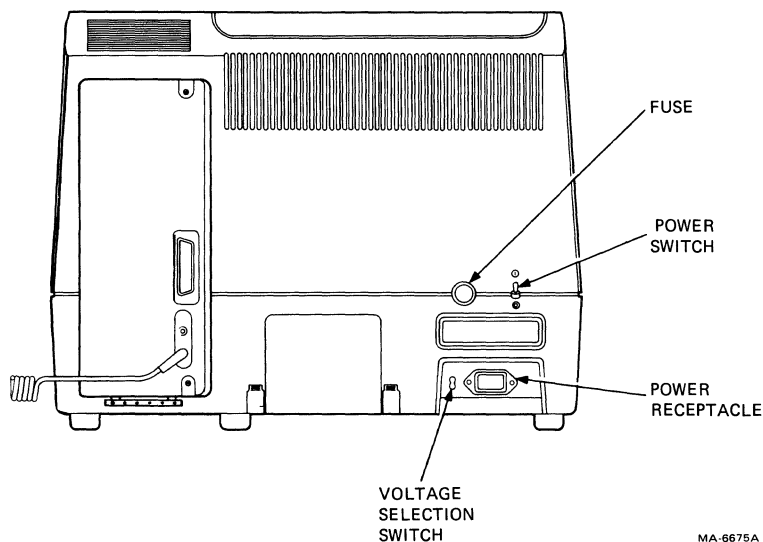
Figure 1-3   Monitor Controls

Table 1-1   Voltage Selection Switch Positions

Position	Operating Range	Fuse
115 V (up)	99 V to 128 V	1.25 A (PN 9000020-01)
220 V (down)	198 V to 256 V	0.75 A slow blow (PN 1211237-00)

The power switch controls ac power to the terminal. When ac power is on, either the ON LINE or OFF LINE indicator is on. Refer to the indicators section in this chapter for more information about keyboard indicators.

NOTE: A step-by-step power-up and checkout procedure is provided in Chapter 6. Read Chapter 6 before using the power switch.

Turning the ac power off may cause the present SET-UP feature selections to change. Refer to Chapter 2 for more information about the effects of the power switch on SET-UP feature selections.

Keyboard Controls
The VT101 terminal keyboard has a main keyboard and auxiliary keypad (Figure 1-4). The main keyboard is arranged and operates like a standard office typewriter. The auxiliary keypad is arranged for rapid entry of numeric data or function characters.
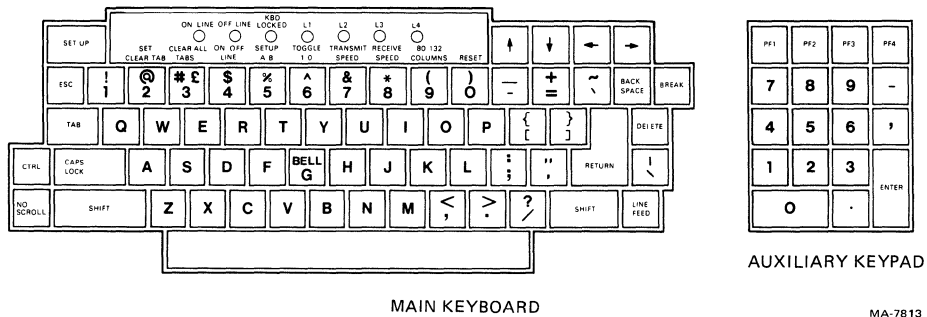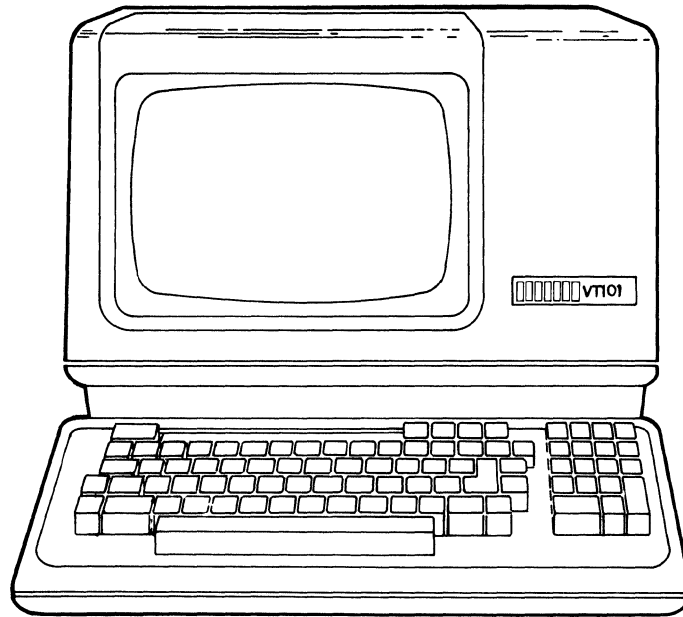
Figure 1-4   VT1Ø1 Terminal Keyboard

Some keys on the keyboard immediately generate one or more character codes when pressed. Other keys, such as CTRL, SHIFT, and CAPS LOCK, do not generate character codes but modify the character codes generated by other keys. If two character code keys are pressed at the same time, the character codes are generated immediately. The terminal does not wait for the keys to lift, but generates the character codes as soon as possible. If three character code keys are pressed at the same time, the character codes of the two keys pressed first are generated immediately. The character code of the third key is generated after the first key lifts.

The keys are divided into four groups: standard keys, function keys, SET-UP keys, and auxiliary keypad keys.

1-4
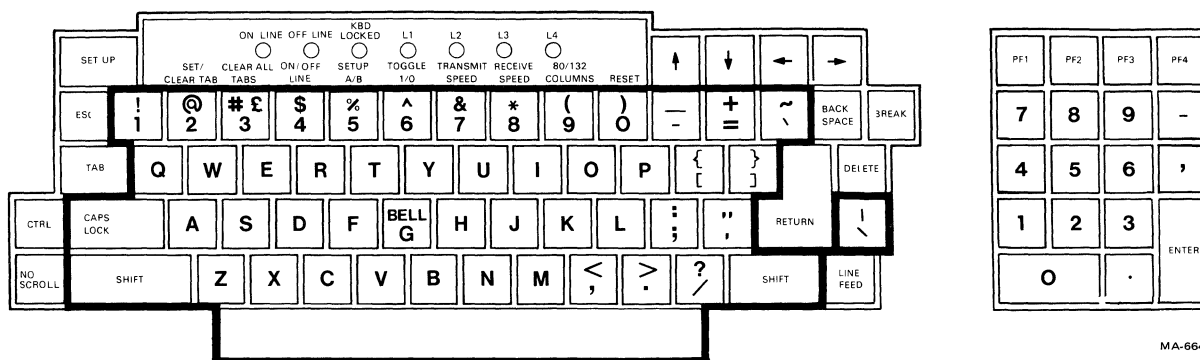
Figure 1-5   Standard Keys

Standard Keys

Figure 1-5 identifies the keys that are labeled as standard typewriter keys. SHIFT and CAPS LOCK modify the standard key character codes generated. They are described in the following paragraphs. All the character codes generated by the standard keys are described in Chapter 3.

CAPS LOCK

CAPS LOCK is a two-position locking key. If it is locked in the down position, alphabetic keys generate uppercase character codes regardless of SHIFT. If it is locked in the up position, alphabetic keys generate lowercase character codes. Numeric and special symbol keys are not affected by CAPS LOCK. CAPS LOCK does not affect the function keys or auxiliary keypad keys.

SHIFT

When SHIFT is pressed, the standard keys on the main keyboard generate uppercase character codes. SHIFT does not affect the function keys or auxiliary keypad keys.

Function Keys

Figure 1-6 identifies the function keys on the VT101 terminal. These keys generate function character codes. The use of these character codes is defined by the computer software or communication system. All character codes generated by the function keys are described in Chapter 3. The following paragraphs provide a general description of each function key.

NO SCROLL

NO SCROLL controls scrolling in the VT101 terminal. Scrolling is the upward or downward movement of existing lines on the screen to allow new lines to be displayed. When this key is first pressed, scrolling stops. When pressed again, scrolling continues.
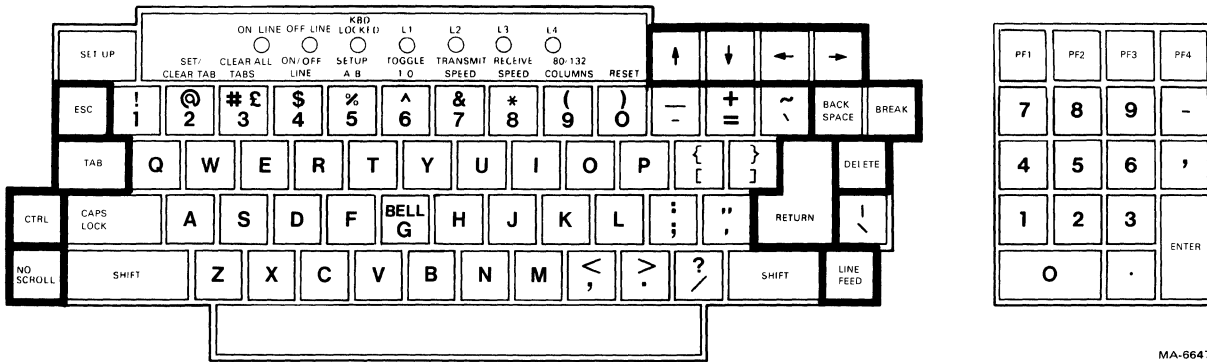
Figure 1-6   Function Keys

NOTE: NO SCROLL operates only when the Auto XON/XOFF SET-UP B feature is on. If the feature is off, this key does not function. Refer to Chapter 2 for more information about the Auto XON/XOFF SET-UP feature.

BREAK

BREAK generates a break signal. Refer to Chapter 5 for more information about the break signal and its use.

When **SHIFT** is in the down position, **BREAK** generates a long break disconnect. Refer to Chapter 5 for more information about long break disconnect and its use.

When **CTRL** is pressed, **BREAK** generates the answerback message. The answerback message is entered in SET-UP. Refer to Chapter 2 for more information about the answerback SET-UP feature.

These keys generate cursor control commands. The cursor is an indicator on the screen that shows the line and column where the next character is displayed.

ESCAPE

ESC generates the escape control character code.

TAB

TAB generates the tab control character code.

1-6

CONTROL

When **CTRL** is pressed, pressing another key may generate a control character code. Control character codes are described in Chapter 3.

BACKSPACE

BACKSPACE generates the backspace (BS) control character.

DELETE

DELETE generates a delete (DEL) control character code. The deleted character may or may not be erased from the screen depending on computer software.

RETURN

RETURN generates either a carriage return or the carriage return (CR) and line feed (LF) control character codes. The characters generated are selected using the Line Feed/New Line SET-UP B feature. Refer to Chapter 2 for more information about the Line Feed/New Line SET-UP feature.

LINE FEED

LINE FEED generates a line feed (LF) control character code.

SET-UP Keys

Figure 1-7 identifies the keys used while operating in SET-UP. There are two SET-UP feature displays: SET-UP A and SET-UP B. The following paragraphs describe the keys used in SET-UP.
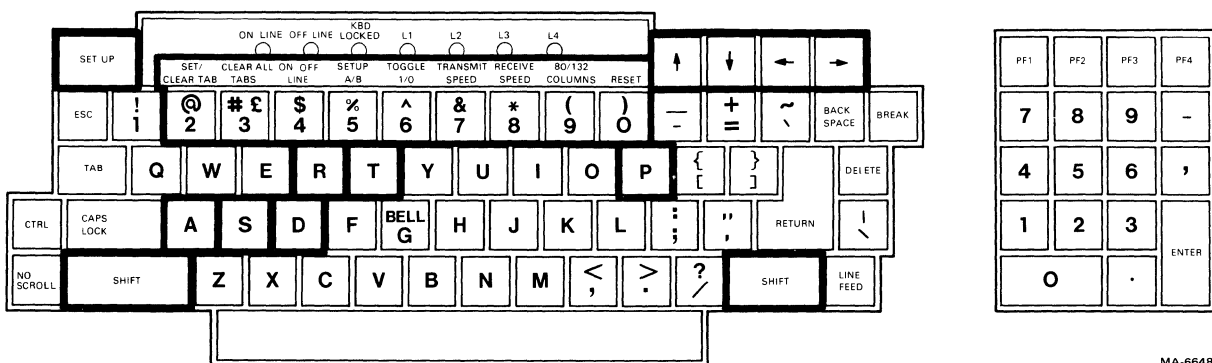
Figure 1-7   SET-UP Keys

SET UP SET-UP

SET-UP places the terminal in SET-UP. In SET-UP, the VT101 terminal SET-UP features can be changed.

@ 2 SET/CLEAR/TAB

In SET-UP A, SET/CLEAR TAB sets or clears individual horizontal tabs stops. This key does not function in SET-UP B.

 # £ 3 CLEAR ALL TABS

In SET-UP A, CLEAR ALL TABS clears all horizontal tab stops. This key does not function in SET-UP B.

$ 4 ON/OFF LINE

In any SET-UP display, ON/OFF LINE switches the terminal between on-line and off-line. In on-line, the terminal can transmit and receive character codes. In off-line, the terminal cannot transmit or receive character codes and keyboard entries are displayed on the screen.

% 5 SET-UP A/B

In any SET-UP display, SET-UP A/B switches the terminal between SET-UP A and SET-UP B.

^ 6 TOGGLE 1/0

In SET-UP B, TOGGLE 1/0 changes the feature selected by the cursor. This key does not function in SET-UP A.

& 7 TRANSMIT SPEED

In SET-UP B, TRANSMIT SPEED selects the transmit speed (baud rate) used by the terminal. This key does not function in SET-UP A.

⁸₈ RECEIVE SPEED

In SET-UP B, **RECEIVE SPEED** selects the receive speed (baud rate) used by the terminal. This key does not function in SET-UP A.

⁽₉ 80/132 COLUMNS

In SET-UP A, 80/132 COLUMNS selects the display line size. The size is either 80 or 132 columns per line. This key does not function in SET-UP B.

⁾₀ RESET

In any SET-UP display, **RESET** starts the reset sequence. This sequence has the same result as turning the power switch off and then on.

In any SET-UP display, ↑ (up arrow) increases and ↓ (down arrow) decreases the brightness of the display.

In any SET-UP display, ← (left arrow) and → (right arrow) move the cursor left and right.

A

In SET-UP B, hold down the **SHIFT** key, press the **A** key; then release both keys to enter the answerback message. When entering the answerback message all keyboard keys can be used.

D

In any SET-UP display, hold down the SHIFT key, and press the D key to select the default SET-UP feature selections. A default selection is provided for each SET-UP feature.

P

In SET-UP B, hold down the **SHIFT** key, and press the P key to change the data/parity bits selection.

R

In any SET-UP display, hold down the SHIFT key, and press the R key to recall the SET-UP features stored in user permanent memory.

S

In any SET-UP display, hold down the SHIFT key, and press the S key to store the SET-UP features in user permanent memory.

T

In SET-UP A, hold down the SHIFT key, and press the T key to select the tab default SET-UP feature selections. All tab stops are cleared and a tab stop is set at every eighth character position.

Auxiliary Keypad Keys
The auxiliary keypad can be used to generate either the same character codes as the main keyboard or function characters. The computer selects the type of characters generated by these keys.

When the auxiliary keypad generates the same codes as the main keyboard, the minus sign, comma, period, and numeric keys of the auxiliary keypad correspond to the unshifted keys on the main keyboard.

When the auxiliary keypad generates function character codes, the use of these character codes is defined by the computer software. The program function (PF) keys on the auxiliary keypad always generate control sequences. The actions performed by these keys are defined by the computer software.

Indicators
The following paragraphs describe the function of each keyboard indicator shown in Figure 1-8.
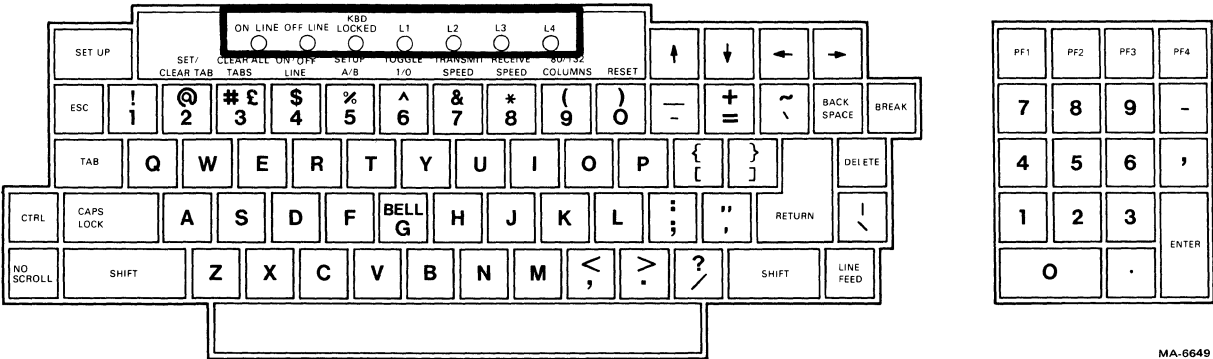
Figure 1-8   Keyboard Indicators

ON LINE
ON LINE is on when the terminal is on-line and can transmit and receive character codes. Either ON LINE or OFF LINE is on to show that ac power is on.

OFF LINE
OFF LINE is on when the terminal is off-line and cannot transmit or receive character codes. When the terminal is off-line, characters from the keyboard are displayed on the screen. Either ON LINE or OFF LINE is on to show that ac power is on.

KBD LOCKED
KBD LOCKED is on when the keyboard is in the locked condition. The keyboard locked condition occurs when the keyboard character buffer is full and cannot hold more characters from the keyboard. The keyboard character buffer holds character codes from the keyboard before they are transmitted to the computer (Figure 1-1). When KBD LOCKED is on, character codes from the keyboard are lost. If the Keyclick SET-UP B feature is on, keyclicks are not generated when keys are pressed.

NOTE: The terminal can receive characters from the computer during the keyboard locked condition.

The keyboard locked condition ends when character codes in the keyboard character buffer are transmitted to the computer. After the characters have been transmitted, KBD LOCKED turns off and keyclicks can be generated (if the Keyclick SET-UP B feature is on).

The keyboard locked condition also ends after entering and exiting SET-UP. However, entering and exiting SET-UP with the KBD LOCKED on, erases the characters held in the keyboard buffer before they are transmitted. Refer to Chapter 2 for more information about entering and exiting SET-UP.

L1 through L4
These indicators are controlled by the computer and are defined by the computer software. However, during power up or reset, L1 through L4 indicate self-test errors. Refer to Chapter 8 for more information about self-test errors.

Audible Indicators
The VT101 terminal uses three audible indicators: a keyclick, a bell tone, and a series of bell tones. The following paragraphs describe these indicators.

Keyclick -- The terminal generates a keyclick when a key is pressed, with the following exceptions:

• SHIFT and CTRL do not generate keyclicks because they do not generate character codes. They modify the character codes generated by other keys.

*   The KBD LOCKED indicator is on; character codes from the keyboard are lost.

*   The Keyclick SET-UP B feature is off.

Bell Tone -- The terminal generates a bell tone in each of the following cases:

*   When bell character is received from the computer,

*   When the cursor is eight characters away from the right margin and the Margin SET-UP B feature is on.

Series of Bell Tones -- The terminal generates a series of bell tones to indicate difficulty in reading or writing the SET-UP features in user permanent memory. If the terminal has difficulty reading the user permanent memory, it uses the default SET-UP feature selections. Refer to Chapter 2 for more information about the SET-UP feature memories.

GENERAL

The VT1Ø1 terminal has many features selected in SET-UP that allow the terminal to be configured for specific applications. This chapter describes SET-UP and each of the SET-UP features.

SET-UP FEATURES

SET-UP features change how the VT1Ø1 terminal operates. They allow the terminal to be configured to operator preference, and they provide compatibility to the computer and ac power source. Table 2-1 divides the SET-UP features into three general types: operator preference, communication compatibility, and installation.

Operator Preference Features

These features configure the terminal to operator preference. They do not affect information transferred between the terminal and the computer.

Communication Compatibility Features

These features configure the terminal so that it is compatible with a computer. There are many combinations of SET-UP features used when communicating with a computer. The features must be selected correctly for the terminal to communicate with the computer. An error in these selections may stop communication or cause incorrect information to be transferred between the terminal and computer.

NOTE: This chapter describes the SET-UP features used to provide compatibility. More information about using these SET-UP features is provided in Chapter 5.

Installation Features

These features configure the terminal for operation in different installations. If the location of the terminal is changed, verify these feature selections.

FEATURE SELECTION

SET-UP features can be selected by the computer or from the terminal keyboard. When the computer changes the feature selections, the current selection is shown by the SET-UP feature display. SET-UP features that can be changed by the computer are listed in Table 2-2. Refer to Chapter 4 for more information about the selection of features by the computer.

Table 2-1   SET-UP Feature Types

SET-UP Feature	Operator Preference	Communication Compatibility	Installation
ON/OFF Line		X	
Screen brightness	X		
Columns per line		X	
Tab stops		X	
Scroll	X	X	
Auto repeat	X		
Screen background	X		
Cursor	X		
Margin bell	X		
Keyclick	X		
ANSI/VT52		X	
Auto XON/XOFF		X	
US/UK character set		X	
Auto wrap		X	
Line feed/new line		X	
Interlace			X
Receive parity		X	
WPS terminal			X
Local echo		X	
Power			X
Data/Parity bits		X	
Transmit speed		X	
Receive speed		X	
Answerback		X	

Table 2-2   SET-UP Features the Computer can Change

SET-UP Feature	Can be Changed
ON/OFF Line	
Screen brightness	
Columns per line	X
Tab stops	X
Scroll	X
Auto repeat	X
Screen background	X
Cursor	
Margin bell	
Keyclick	
ANSI/VT52	X
Auto XON/XOFF	
US/UK character set	X
Auto wrap	X
Line feed/new line	X
Interlace	X
Receive parity	
WPS terminal	
Local echo	
Power	
Data/Parity bits	
Transmit speed	
Receive speed	
Answerback	

SET-UP A
TO EXIT PRESS "SET-UP"

```
█     T     T     T     T     T     T     T     T     T
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

SET-UP B
TO EXIT PRESS "SET-UP"

```
█
1 1101  2 0111  3 0001  4 1000          P=7S   T= 9600  R= 9600
```
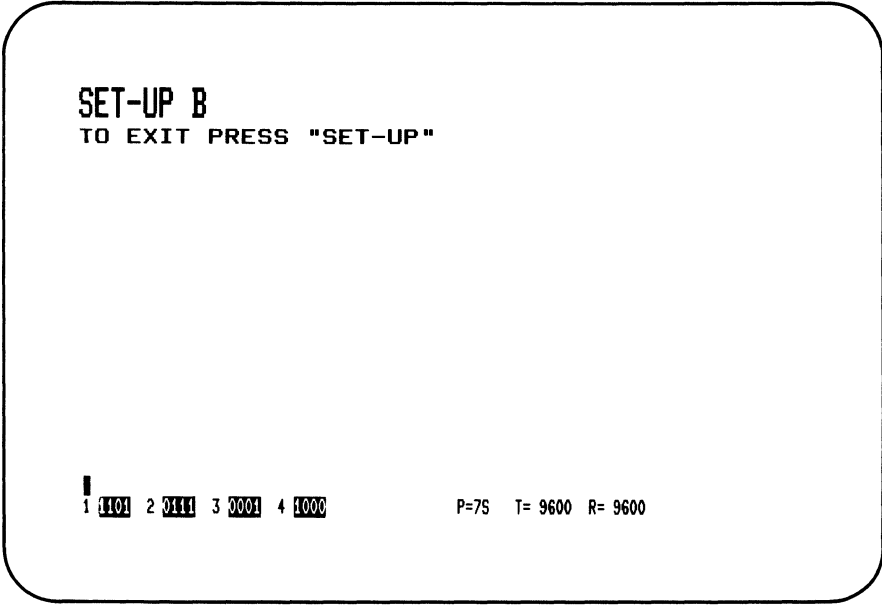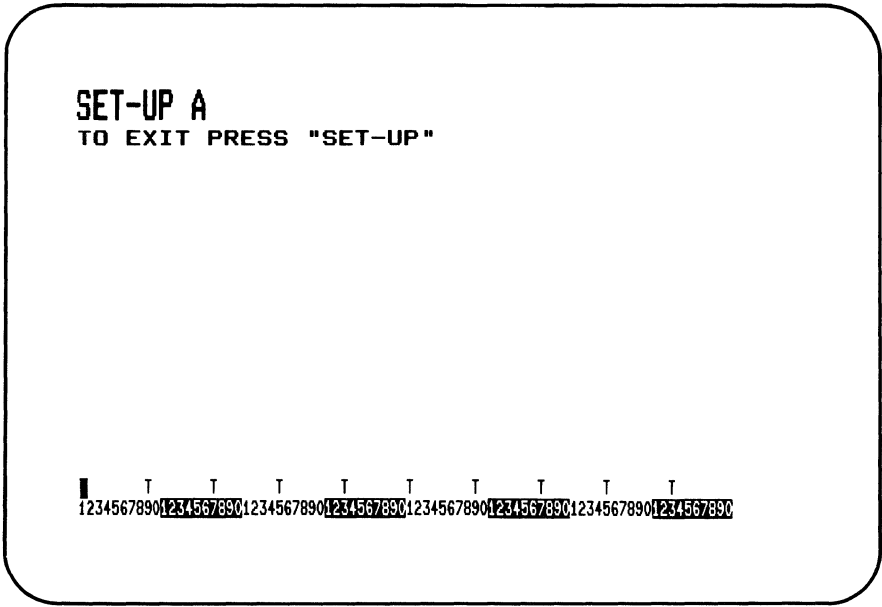
MA-7814

Figure 2-1   SET-UP Displays

To select SET-UP features from the keyboard you must enter SET-UP.
SET-UP has two feature displays: SET-UP A and SET-UP B (Figure
2-1). The SET-UP A feature display shows the location of tab stops
and a visual ruler numbers each column of the line. The SET-UP B
feature display shows the other SET-UP features. Use the following
steps to change a SET-UP feature selection.

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Press **SET-UP A/B** to select the correct SET-UP display.	The selected SET-UP display shows on the screen.
Change the SET-UP feature selection.	The SET-UP display shows the feature selection.
Store the SET-UP features if desired.	The terminal displays wait and then SET-UP A.
Press **SET-UP** to exit SET-UP.	

NOTE: Unless stated in the feature description, entering SET-UP and changing features does not lose characters on the screen. However, entering and exiting SET-UP with KBD LOCKED on clears the keyboard locked condition and erases the keyboard character buffer. The keyboard character buffer holds characters before they are transmitted to the computer.

ENTERING AND EXITING SET-UP
You can enter SET-UP while either on-line or off-line. However, if the terminal is on-line, select the Auto XON/XOFF SET-UP B feature to prevent losing received characters. Refer to the Auto XON/XOFF SET-UP B feature description for more information about this feature.

If the Auto XON/XOFF SET-UP B feature is not used, characters may be lost. Therefore, disconnect the terminal immediately before entering SET-UP. To disconnect a communication line and prevent the terminal from receiving characters while in SET-UP, hold down the BREAK key and press SHIFT. In properly configured modems/data sets this causes a communication line disconnect.

FEATURE MEMORIES
The SET-UP feature selections are stored in three memories: operating (temporary), user permanent, and default (Figure 2-2).

Operating Memory
This memory stores the SET-UP feature selections used to operate the terminal. The terminal always operates according to these features. The features can be selected at the terminal keyboard or by the computer. In SET-UP, the feature selections in the operating memory are shown on the screen. To change the SET-UP feature selections stored in memory perform the following procedure at the terminal keyboard.

2-5
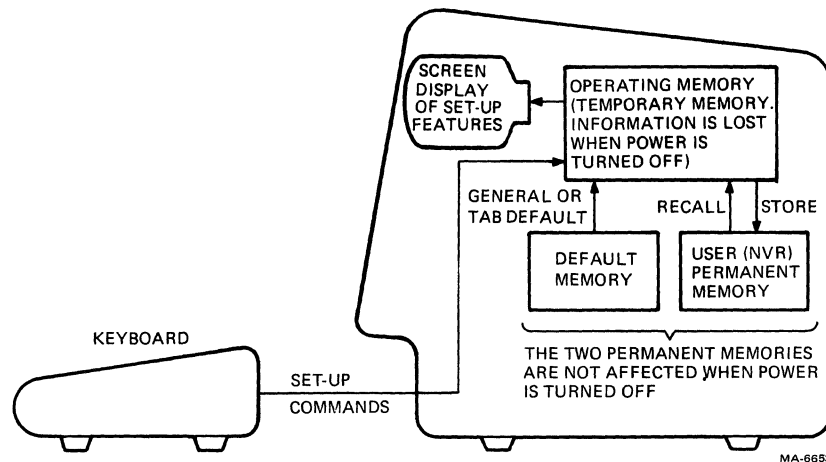
Figure 2-2   SET-UP Feature Memories

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Press **SET-UP A/B** to select the correct SET-UP display.	The selected SET-UP display shows on the screen.
Change the SET-UP feature selection.	The SET-UP display shows the feature selection.
Press the **SET-UP** key exit SET-UP.	The terminal operates according to the new SET-UP feature selections in operating memory.

If a recall or reset procedure is performed, or power to the terminal is turned off and on, all operating memory SET-UP feature selections are replaced by the SET-UP feature selections in user permanent memory.

User Permanent Memory
This memory stores selected SET-UP features permanently. The computer cannot change SET-UP feature selections in user permanent memory. User permanent memory can only be changed by performing a store from the terminal keyboard while in SET-UP. Turning power off does not affect SET-UP feature selections in this memory. SET-UP features are moved between operating memory and user permanent memory by performing store, recall, or reset procedures.

Store -- This procedure stores the operating memory SET-UP feature selections in user permanent memory. Storing is performed from the terminal keyboard. The computer cannot store SET-UP feature selections in user permanent memory. To store SET-UP feature selections in user permanent memory, perform the following procedure.

2-6

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Hold down the **SHIFT** key, press the S key; then release both keys.	The terminal displays wait and then SET-UP A.
Press the **SET-UP** key to exit SET-UP.	

Recall -- This procedure recalls the user permanent memory SET-UP feature selections into operating memory. All feature selections previously in operating memory are erased. Also, the terminal screen is erased. To recall the SET-UP feature selections from user permanent memory into operating memory, perform the following procedure.

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Hold down the **SHIFT** key, press the R key; then release both keys.	The terminal displays wait and then SET-UP A.
Press the **SET-UP** key to exit SET-UP.	

NOTE: Some features selected by the computer may be affected.

Reset -- This procedure resets the terminal, erases the screen, and performs a self-test. Also, reset recalls the user permanent memory SET-UP feature selections into operating memory. All feature selections previously in operating memory are erased. To reset the terminal, perform the following procedure.

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Press **RESET**.	The power-on self-test runs. The terminal operates according to the SET-UP feature selections in user permanent memory. The terminal automatically exits SET-UP.

NOTE: Reset may cause the terminal to disconnect from the computer. Also, the input and keyboard character buffers are erased and some features selected by the computer may be affected.

Default Memory

This memory stores default SET-UP feature selections for all SET-UP features. Default SET-UP feature selections are typical feature selections used by the terminal. The feature selections in default memory cannot be changed by the user. When a default occurs, the operating memory SET-UP feature selections change to default selections. There are two types of default selections: general default and tab default. The SET-UP features in user permanent memory are not changed by a default. A default occurs when the terminal cannot read the user permanent memory, or it has been selected from the keyboard.

General Default -- This changes all SET-UP features to the selections in default memory. SET-UP A features are set to 8Ø columns per line with a tab stop at every eighth column. SET-UP B default features are shown in Figure 2-3. The terminal is off-line and no answerback message is provided. To select a general default from the keyboard, perform the following procedure.

TABS   EVERY 8 COLUMNS
COLUMNS PER LINE   80
ON/OFF LINE   LOCAL
ANSWERBACK   NONE

- SCROLL = SMOOTH
- AUTO REPEAT = ON
- SCREEN = DARK BACKGROUND
- CURSOR = BLOCK

- U.S./U.K. CHARACTER SET = U.S.
- AUTO WRAP=OFF
- LINE FEED/NEW LINE=OFF
- INTERLACE = OFF

- DATA BITS=7
- PARITY=SPACE

| 1 | 1 | 1 | 0 | 1 | | 2 | 0 | 1 | 1 | 1 | | 3 | 0 | 0 | 0 | 0 | | 4 | 1 | 0 | 0 | 0 |

P = 7S   T = 9600   R = 9600

MARGIN BELL = OFF
KEYCLICK = ON
ANS I/VT52 = ANSI
AUTO XON XOFF = ON

RECEIVE PARITY = CHECK
WPS TERMINAL=OFF
LOCAL ECHO = OFF
POWER = 60 Hz

MA-6658
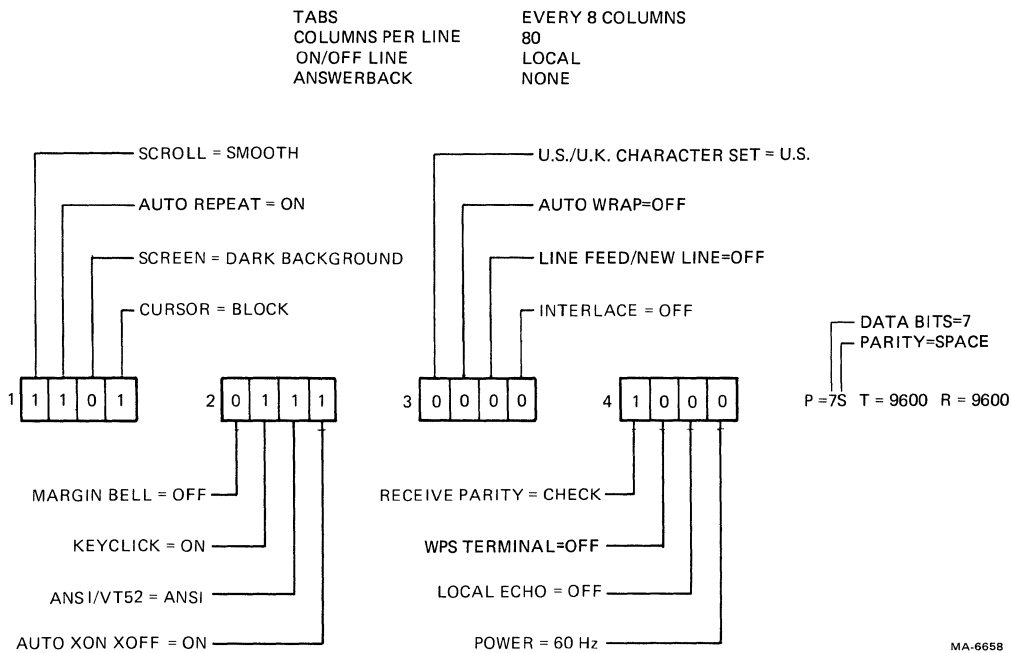
Figure 2-3   SET-UP B Default Feature Selections

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Hold down the SHIFT key, press the D key; then release both keys.	The terminal screen is erased and then SET-UP A is displayed.
Press the SET-UP key to exit SET-UP.	

NOTE: The input and keyboard character buffers are erased.

Tab Default -- This clears all terminal tab stop settings and sets a new tab stop at every eighth column. To select a tab default from the keyboard, perform the following procedure.

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Hold down the SHIFT key, press the T key; then release both keys.	Tab stops are set at every eighth character position in SET-UP A.
Press the SET-UP key to exit SET-UP.	

FEATURE DESCRIPTIONS
SET-UP feature descriptions are arranged according to the SET-UP display in which they appear. There are three types: general SET-UP features (features changed in any SET-UP display), SET-UP A features, and SET-UP B features.

A general procedure for changing each SET-UP feature in the SET-UP display is provided at the beginning of each SET-UP display section. For features needing a more detailed procedure, the procedure is provided with the SET-UP feature description.

General SET-UP Features
The On/Off Line and Screen Brightness SET-UP features may be changed in any SET-UP display. Dedicated keys are used to select these features. Each feature description includes the specific procedure used to select the feature.

On/Off Line -- This feature places the terminal either on-line or off-line (Figure 2-4). While on-line, the keyboard ON LINE indicator is on and the terminal can transmit and receive character codes. Keyboard entries are transmitted to the computer as typed and characters received from the computer are displayed on the screen.
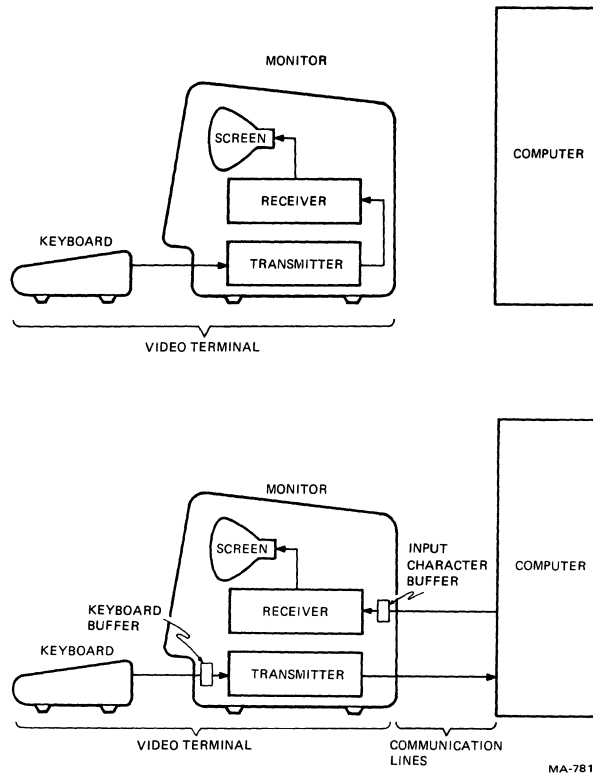
Figure 2-4   ON/OFF Line General Block Diagram

While off-line, the OFF LINE indicator is on. The terminal cannot transmit and receive characters, and it cannot communicate with the computer. Keyboard entries are not transmitted but are displayed on the screen.

When the VT101 terminal is placed off-line, it performs three actions:

1.   Disconnects from the communication line,

2.   Erases the terminal input buffer (where received characters are held before display),

3.   Erases the terminal keyboard buffer (where characters to be transmitted are held before transmission).

To select either On-Line or Off-Line, perform the following procedure.

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Select On-Line or Off-Line by pressing OFF/ON LINE.	The ON LINE or OFF LINE indicator shows the feature selection.
Press the SET-UP key to exit SET-UP.	

Screen Brightness -- This feature adjusts the brightness of the terminal screen. ↑(up arrow) increases screen brightness and ↓(down arrow) decreases screen brightness. To adjust screen brightness, perform the following procedure.

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Adjust brightness by pressing ↑(up arrow) or ↓(down arrow).	SET-UP display is now the selected brightness.
Press the SET-UP key to exit SET-UP.	

SET-UP A Features
The SET-UP A display is similar to Figure 2-5. The display summarizes the number of columns per line and the tab stop feature selections. The bottom line of the display is a ruler which numbers each column position on a line. Each tab stop is shown by a T above the ruler. SET-UP A features are selected using dedicated keys. Each feature description below includes the specific procedure used to select the feature.

Columns Per Line -- This feature selects a display of either 80 or 132 columns per line. When 80 columns per line is selected, the screen is 80 columns wide and 24 lines long. When 132 columns per line is selected, the screen is 132 columns wide and 14 lines long. The displayed lines for the 132 columns per line selection are the same width on the screen as for the 80 columns per line selection, but the columns are closer together (Figure 2-6). To select columns per line, perform the following procedure.

NOTE: When switching between 80 and 132 columns per line, all characters displayed on the screen when entering SET-UP are lost.

```
SET-UP A
TO EXIT PRESS "SET-UP"
```
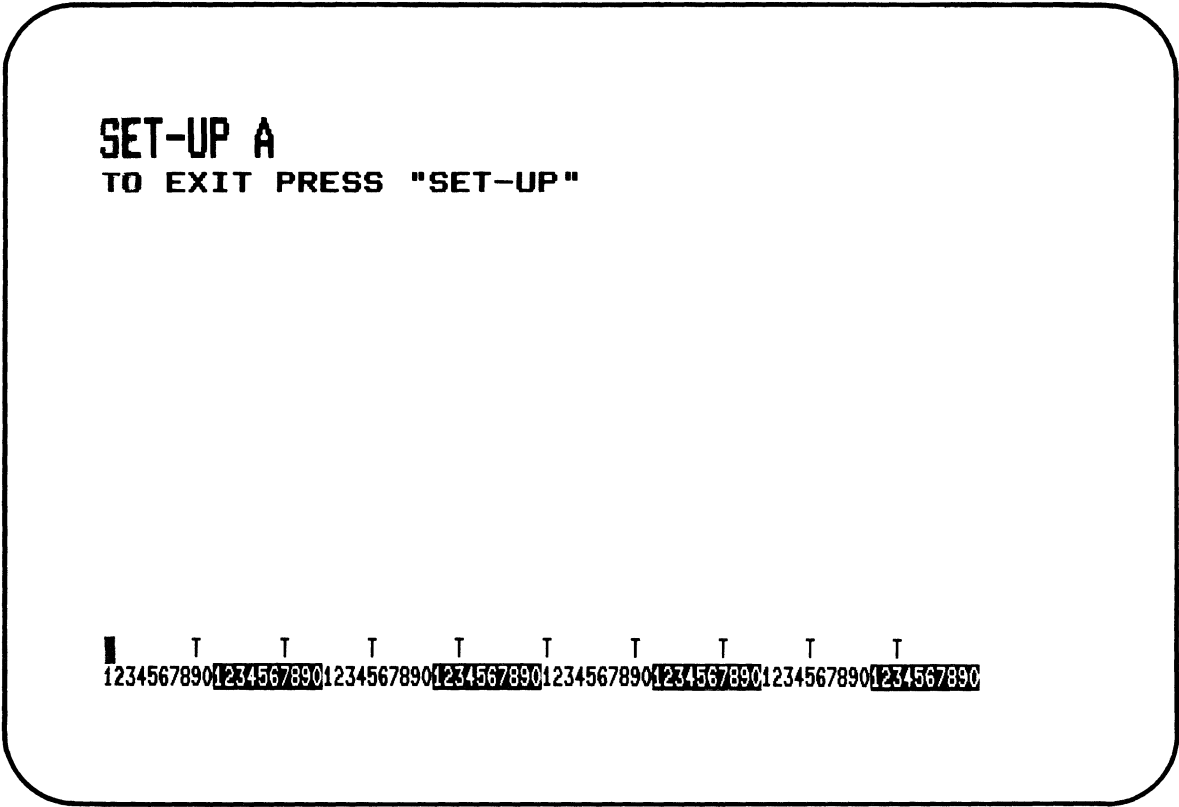
```
  I   I   I   I   I   I   I   I   I
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Figure 2-5   SET-UP A Display

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Select columns per line by pressing 80/132 COLUMNS.	The selection is displayed on the screen.
Exit SET-UP by pressing the **SET-UP** key, or enter SET-UP B by pressing the **SET-UP A/B** key.	

Tab Stops -- Tab stops are column positions selected on lines of the terminal screen. The cursor can tab (advance) to the column with the tab stop. Tab stops can be changed one at a time, or all tabs stops can be cleared and then set one at a time.

2-12

These are characters displayed using 80 columns.

These are characters displayed using 132 columns.
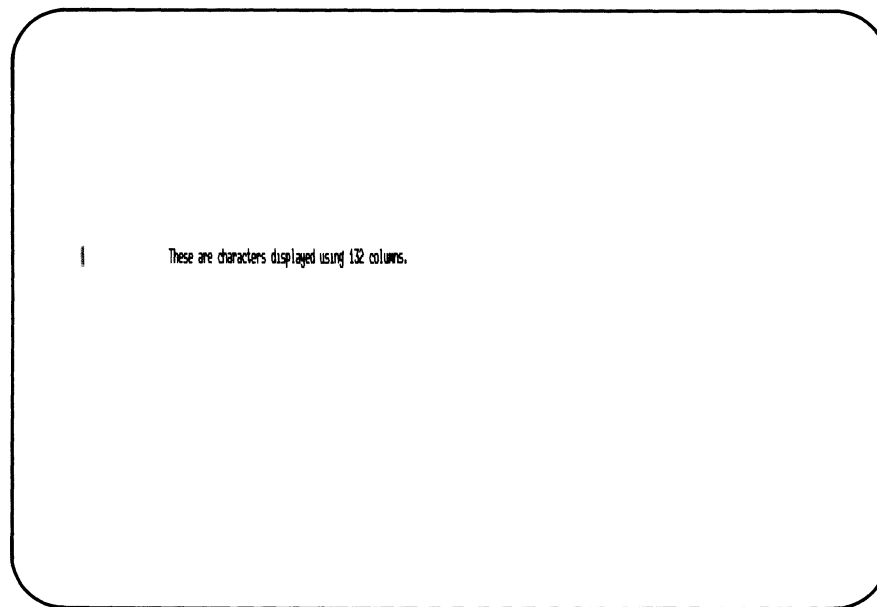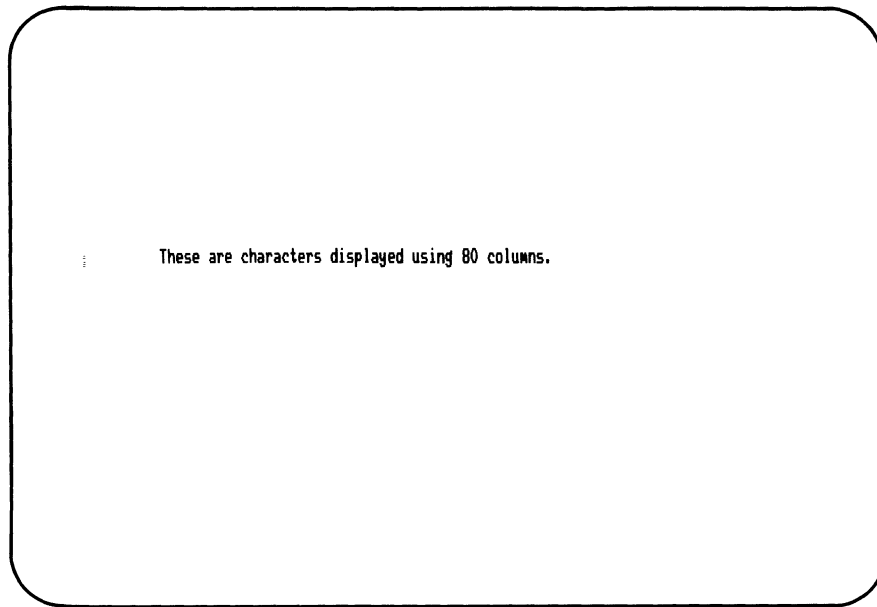
MA-7775

Figure 2-6   80- and 132-Column Displays

SET/CLEAR TAB sets and clears each tab stop one at a time. CLEAR
ALL TABS clears all tab stops. A tab default is provided to set a
tab stop at every eighth column position. (Refer to the Feature
Memories section of this chapter for more information about tab
default.) To select tab stop settings, perform the following
procedure.

2-13

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Press **CLEAR ALL TABS** or SET/CLEAR TABS to select tab stops.	All tabs are cleared. Tabs selected by the cursor are set or cleared. The cursor is moved by using ◄(left arrow), ►(right arrow), RETURN, TAB, and SPACE BAR.
Exit SET-UP by pressing the **SET-UP** key or enter SET-UP B by pressing the **SETUP A/B** key.	

SET-UP B Features
SET-UP B can only be entered from SET-UP A. The SET-UP B display is similiar to Figure 2-7. Figure 2-8 summarizes the SET-UP B display features. The bottom line of the display shows groups of switches indicating the features selected. Also, the data/parity bits, transmit speed, and receive speed feature selections are shown.

The data/parity bits, transmit speed, and receive speed features are selected using dedicated keys. The procedure to select these features is provided in the feature descriptions. All other SET-UP B features are selected using SET-UP switches. To change SET-UP feature switch selections, perform the following procedure.

Procedure	Indication/Comments
Press the **SET-UP** key to enter SET-UP.	SET-UP A is displayed on the screen.
Press **SET-UP A/B** to enter SETUP B.	SET-UP B is displayed on the screen.
Place the cursor over the SET-UP feature switch to be changed.	Cursor is moved by using ◄(left arrow), ►(right arrow), RETURN, TAB, and SPACE BAR.
Select features by pressing TOGGLE 1/0.	Screen displays feature selection.
Exit SET-UP by pressing the **SET-UP** key or enter SET-UP A by pressing the **SETUP A/B** key.	

```
┌─────────────────────────────────────────────────────────
│
│
│   SET-UP B
│   TO EXIT PRESS "SET-UP"
│
│
│
│
│
│
│
│
│
│   █
│   1 1101  2 0111  3 0001  4 1000        P=7S  T= 9600  R= 9600
│
│
└─────────────────────────────────────────────────────────
                                                    MA-6670
```

Figure 2-7   SET-UP B Display

Scroll (Switch 1-1: 0=Jump, 1=Smooth) -- Scrolling is the upward
or downward movement of existing lines on the screen. It makes
room for new lines at the bottom or top of the screen. It can be
performed in two ways: jump scroll or smooth scroll.

With jump scroll selected, new lines are displayed on the screen
as fast as they are received. At the higher receive speeds (baud
rates), the lines displayed may be difficult to read due to their
rapid movement.

With smooth scroll selected, the speed at which new lines can be
displayed is limited. Therefore, the movement of lines occurs at a
smooth steady rate, and they can usually be read easily.

NOTE: Smooth scroll allows a maximum of six lines per second to be
added to the screen. The auto XON/XOFF feature must be selected so
that characters are not lost when smooth scroll is selected.

Auto Repeat (Switch 1-2: 0=Off, 1=On) -- Auto repeat causes a key
to automatically repeat at the rate of about 30 times per second,
when the key is pressed for more than one-half second. Auto repeat
affects all keyboard keys except the following: SET-UP, ESC,
RETURN, ENTER, NO SCROLL, and when CTRL is pressed with any key.
When the feature is turned off, keys do not automatically repeat.
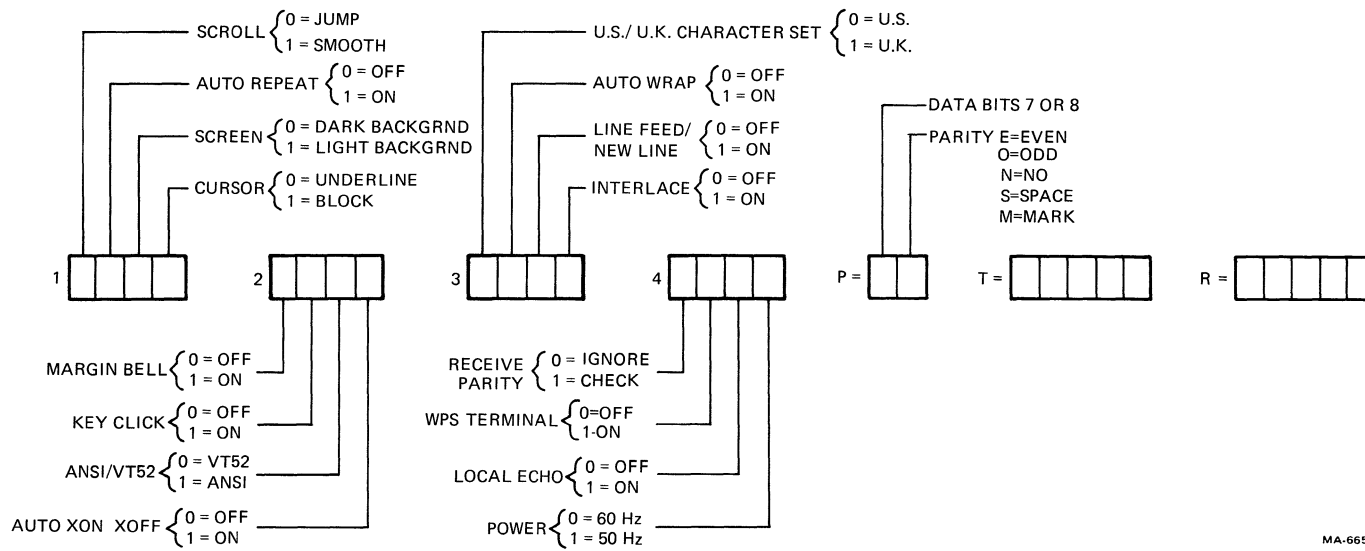
Figure 2-8   SET-UP B Summary

These are characters displayed on a light background.

These are characters displayed on a dark background.
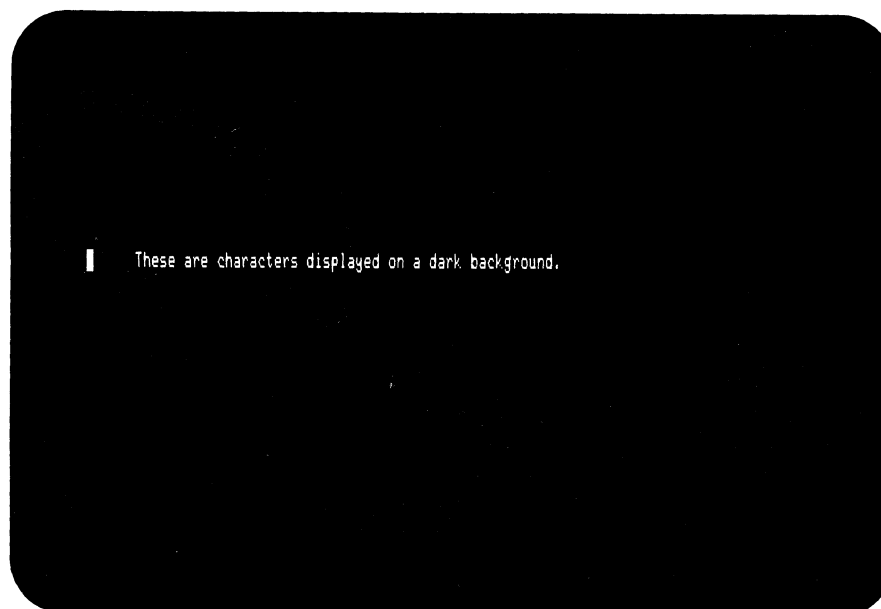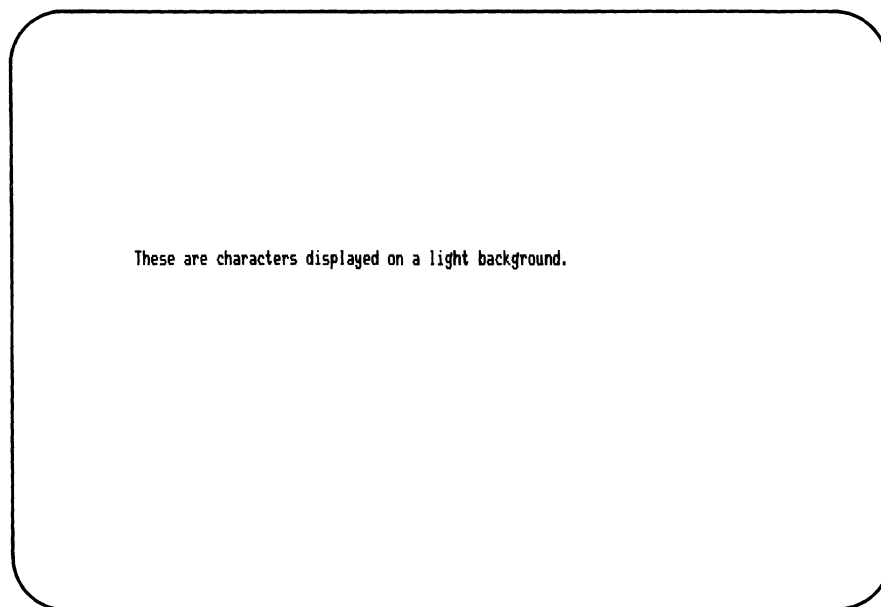
MA-7812

Figure 2-9   Screen Background

Screen Background (Switch 1-3: Ø=Dark, 1=Light) -- This feature selects the type of screen background (Figure 2-9). With dark background selected, the display has light characters on a dark background. With light background (reverse screen) selected, the display has dark characters on a light background.

Cursor Switch (1-4: Ø=Underline, 1=Block) -- The cursor feature provides a choice of two cursor displays to indicate the active position. The active position is where the next character is displayed on the screen. The cursor is displayed as either a blinking underline (_) or a blinking block (■).

Margin Bell (Switch 2-1: Ø=Off, 1=On) -- This feature generates a bell tone when the cursor moves into the eighth character position from the end of the line. The margin bell can be turned on or off. Margin bell volume is not adjustable.

Keyclick (Switch 2-2: Ø=Off, 1=On) -- Keyclick is a sound generated each time a key is pressed, except for SHIFT and CTRL. Keyclick can be turned on or off. However research and experience shows that people usually type more accurately with the keyclick feature on. Keyclick volume is not adjustable.

NOTE: If characters are lost due to a keyboard locked condition, keyclicks are not generated. The keyboard locked condition is indicated by the KBD LOCKED indicator. Refer to Chapter 1 for more information on the KBD LOCKED indicator.

ANSI/VT52 (Switch 2-3: Ø=VT52, 1=ANSI) -- The VT1Ø1 terminal follows two different programming standards for processing control functions: American National Standards Institute (ANSI) and VT52 compatible. With ANSI selected, the terminal generates and responds to control functions per ANSI standards X3.41-1974 and X3.64-1979. With VT52 compatible selected, the terminal is compatible with previous DIGITAL software using the VT52 video terminal. Refer to Chapter 4 for more information on received characters and control functions.

Auto XON/XOFF (Switch 2-4: Ø=Off, 1=On) -- When the terminal receives a character (other than NUL and DEL), the character is placed in an input character buffer. The input buffer stores the received character until the terminal processes it. When processed, the character is removed from the input character buffer.

If received characters are placed into the input character buffer faster than they can be processed, the input character buffer begins to fill.

NOTE: Entering SET-UP stops the terminal from taking characters from the input buffer. When the buffer is full, characters received are lost and the substitute character (▒) is displayed.

The Auto XON/XOFF feature prevents the loss of received characters. When the feature is on, the terminal transmits the XON and XOFF control characters to indicate when the input character buffer is almost empty or full. When the input character buffer is almost full the terminal transmits XOFF (DC3, octal Ø23). The computer should stop transmitting characters when an XOFF is received.

As the terminal continues to remove characters from the input character buffer, the number of characters in the buffer decreases. When the input buffer is almost empty, the terminal transmits XON (DC1, octal Ø21). The computer can continue transmitting characters.

When the Auto XON/XOFF feature is off, the terminal does not use the XON and XOFF characters to prevent the loss of received characters and NO SCROLL does not function.

NOTE: Regardless of the auto XON/XOFF feature selection, the terminal always stops transmitting characters when an XOFF is received. The terminal continues transmitting characters when an XON is received.

US/UK Character Set (Switch 3-1: Ø=#, 1=£) -- The US/UK Character Set feature selects either the United States or United Kingdom character sets. The difference between the two character sets is one character, the # (number) or £ (pound) symbol.

Auto Wrap (Switch 3-2: Ø=Off, 1=On) -- The Auto Wrap feature selects where the next received character is displayed when the cursor is at the right margin. When Auto Wrap is off, the character and all following characters are written into the last column of the current line. When the feature is on, the character is automatically displayed in the first column of the next line.

Line Feed/New Line (Switch 3-3: Ø=Off, 1=On) -- This feature selects control character(s) transmitted by the RETURN key and the action taken by the terminal when receiving a line feed (LF) character. Table 2-3 summarizes the effects of this feature.

When the Line Feed/New Line feature is off, pressing the RETURN key generates the carriage return (CR) control character. When a line feed (LF) control character is received, the cursor moves down to the next line and maintains the current column position.

When the Line Feed/New Line feature is on, pressing the RETURN key generates the carriage return (CR) and line feed (LF) control characters. When a line feed (LF) control character is received, the character causes both a carriage return and line feed. Therefore, a received line feed causes the cursor to move to the left margin of the next line.

Interlace .(Switch 3-4: Ø=Off; 1=On) -- The Interlace feature selects the number of scan lines used to create characters on the screen. With Interlace on, the terminal uses 48Ø scan lines per screen. With Interlace off, the terminal uses 24Ø scan lines per screen. This feature does not add any new information to the screen. However, when on, the Interlace feature may improve the output of hard copy or video devices connected to the video output connector. Usually operators prefer to have this feature off.

Table 2-3   Line Feed/New Line Feature Summary

Selection	Key	Character Sent
Off	RETURN	Carriage return (CR)
Off	LINE FEED	Line feed (LF)
On	RETURN	Carriage return -- line feed (CR LF)
On	LINE FEED	Line feed (LF)

Selection	Character Received	Function
Off	CR	Carriage return (cursor moves to left margin)
Off	LF	Line feed (cursor moves to next line but stays in same column)
On	CR	Carriage return (cursor moves to left margin)
On	LF	Carriage return -- line feed (cursor moves to left margin on next line)

Receive Parity (Switch 4-1: Ø=Ignore, 1=Check) -- This feature either checks or ignores the parity bit of all received characters. If the feature is set to check, the parity bit of the received characters is checked according to the parity feature selection. If a receive parity error occurs, the terminal displays the substitution character (▒) in place of the character with the error. When the feature is set to ignore, any parity bit received is ignored.

NOTE: This feature is used to check the received characters for either odd or even parity. Mark and space parity are not checked.

WPS Terminal (Switch 4-2: Ø=Off, 1=On) -- This feature exchanges the position of the LINE FEED and the \ (backslash) key. Usually this feature is off.
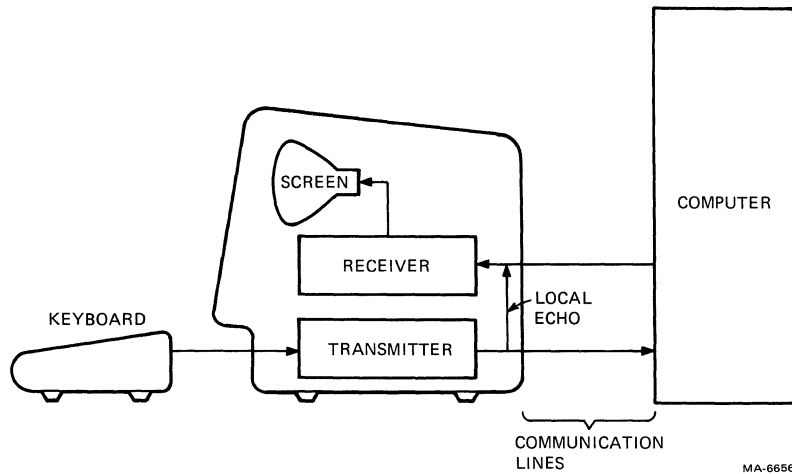
Figure 2-10   Local Echo

Local Echo (Switch 4-3: 0=Off; 1=On) -- When Local Echo is on, every character transmitted to the computer is also automatically displayed on the screen (Figure 2-10). The computer does not have to transmit the character back (echo) to the terminal for display. When this feature is off, characters are only transmitted to the computer. The computer must transmit them back to the terminal for display.

Power (Switch 4-4: 0=60 Hz, 1=50 Hz) -- The Power feature must be selected to match the power line frequency. In the United States, this is usually 60 Hz. When using 50 Hz line frequency, select this feature for 50 Hz.

Data/Parity Bits -- This feature selects two separate but related communication features: data bits per character, and parity selection. Data bits per character selects the number of data bits in each character, either seven or eight bits. However, when eight bits is selected, the eighth data bit is always a space (or 0) for characters transmitted. The eighth data bit on received characters is always ignored.

Parity selects the type of parity bit the terminal generates when transmitting characters and checks when receiving characters. However, to check the parity in received characters, the Receive Parity feature must be selected for Check and the parity selection must be either odd or even. If no parity is selected, the parity bit is not included in the transmitted character and ignored in received characters.

For more information on parity and data bits per character, refer to Chapter 8. The terminal uses the data bits per character and parity selections shown in Table 2-4. To select the Data/Parity feature, perform the following procedure.

2-21

Table 2-4   Data/Parity Bits Selections

P=	Data Bits Per Character	Parity
7M	7	Mark
7S	7	Space
7O	7	Odd
7E	7	Even
7N	7	No parity bit
8O	8	Odd
8E	8	Even
8N	8	No parity bit

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Enter SET-UP B by pressing SET-UP A/B.	SET-UP B is displayed on the screen.
To select the feature, hold down the P key, press the SHIFT key; then release both keys.	The terminal displays the feature selection.
Exit SET-UP by pressing the SET-UP key or enter SET-UP A by pressing the SET-UP A/B key.	

Transmit Speed -- This feature selects the speed (baud rate) and number of stop bits for characters transmitted by the terminal. This feature must be set to match the computer receive speed. The number of stop bits is automatically selected when the transmit speed is set. Table 2-5 lists the transmit speed and number of stop bits used by the terminal. To select the Transmit Speed feature, perform the following procedure.

Table 2-5   Transmit Speed and Number of Stop Bit Selections

Speed (Baud Rate)	Stop Bits
50	1
75	1
110	2
134.5	1
150	1
200	1
300	1
600	1
1200	1
1800	1
2000	1
2400	1
3600	1
4800	1
9600	1
19200	1

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Enter SET-UP B by pressing SET-UP A/B.	SET-UP B is displayed on the screen.
Select the transmit speed by pressing TRANSMIT SPEED.	The terminal displays the feature selection.
Exit SET-UP by pressing the SET-UP key or enter SET-UP A by pressing the SET-UP A/B key.	

Receive Speed -- The Receive Speed feature selects the speed (baud rate) and number of received characters stop bits expected by the terminal. The Receive Speed feature of the terminal must be set to match the computer transmit speed. The number of stop bits is automatically selected when the receive speed is set. Table 2-6 lists the receive speed and number of stop bits used by the terminal. To select the Receive Speed feature, perform the following procedure.

Table 2-6   Receive Speed and Number of Stop Bit Selections

Speed (Baud Rate)	Stop Bits
50	1
75	1
110	2
134.5	1
150	1
200	1
300	1
600	1
1200	1
1800	1
2000	1
2400	1
3600	1
4800	1
9600	1
19200	1

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Enter SET-UP B by pressing SET-UP A/B.	SET-UP B is displayed on the screen.
Select the receive speed by pressing RECEIVE SPEED.	The terminal displays the current feature selection.
Exit SET-UP by pressing the SET-UP key or enter SET-UP A by pressing the SET-UP A/B key.	

Answerback -- The Answerback feature provides the terminal with a 20-character identifying message that can be transmitted to the computer. The answerback message is transmitted under the following conditions.

1. The answerback message is transmitted by a direct request for identification from the computer. The computer transmits the Enquire (ENQ, octal 005) control character to the terminal and the terminal responds with the answerback message. The entire sequence takes place automatically, without affecting the screen or requiring operator action.

2. The operator manually transmits the answerback message from the keyboard. Hold down the CTRL key, press the BREAK key; then release both keys to manually transmit the answerback message.

To enter the answerback message, perform the following procedure.

Procedure	Indication/Comments
Press the SET-UP key to enter SET-UP.	SET-UP A is displayed on the screen.
Enter SET-UP B by pressing SET-UP A/B.	SET-UP B is displayed on the screen.
Hold down the SHIFT key, press the A key; then release both keys.	The terminal displays A = (Figure 2-11).
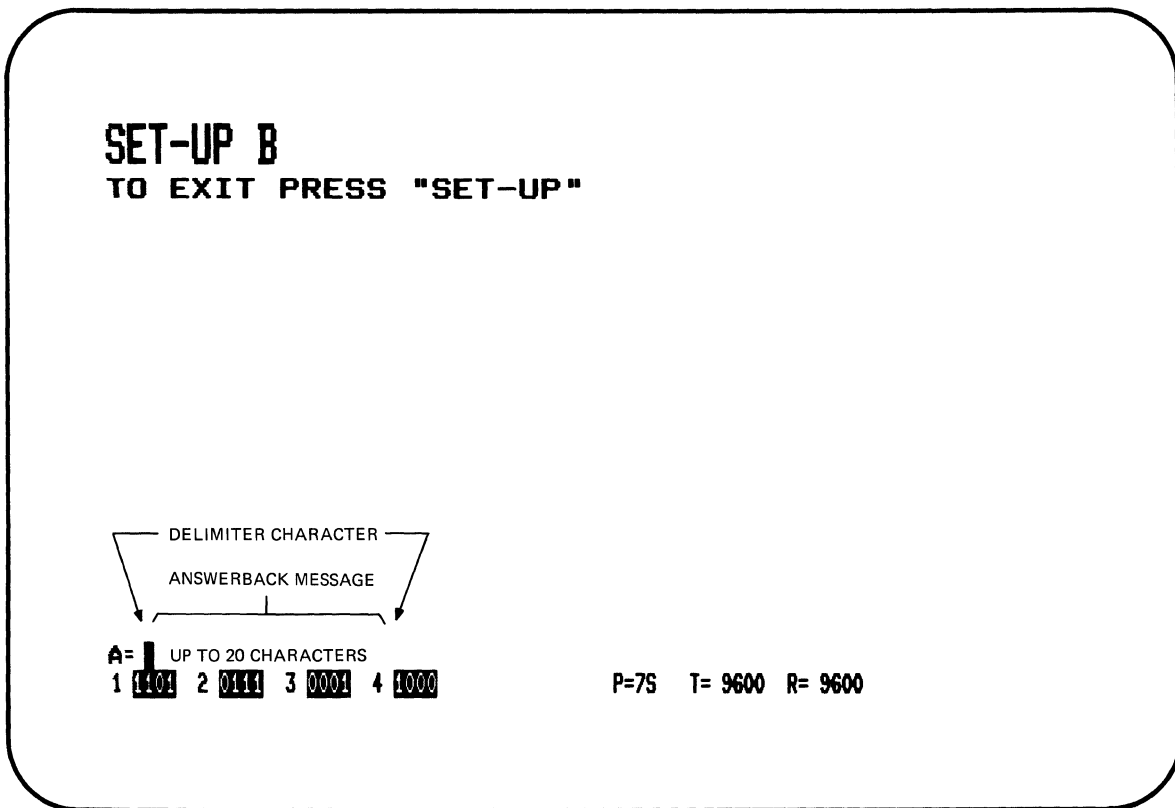
Figure 2-11   Answerback Message Summary

Procedure	Indication/Comments
Type the message delimiter character.	This is any character not used in the answerback message. The message delimiter character is not transmitted as part of the answerback message.
Type the answerback message.	The answerback message may be up to 20 characters. If control characters are used they are displayed as the (◆) character. If a mistake is made while typing the message, type the delimiter character already used and return to the third step of the procedure. This is the only way to correct errors in the answerback message.
If less than 20 characters are in the message, type the delimiter character.	If 20 characters are typed, the message is automatically entered into operating memory. If less than 20 characters are typed, the delimiter character is used to enter the message into operating memory.
Exit SET-UP by pressing the **SET-UP** key or enter SET-UP A by pressing the **SET-UP A/B** key.	

GENERAL
This chapter describes the character codes generated by the VT101 terminal. The keys are divided into three groups: standard keys, function keys, and auxiliary keypad keys.

STANDARD KEYS
The standard keys are shown in Figure 3-1. Table 3-1 lists the character codes generated by the main keyboard. The terminal generates American Standard Code for Information Interchange (ASCII) character codes. Lowercase ASCII character codes are generated when SHIFT or CAPS LOCK are not pressed. Uppercase ASCII character codes are generated when either SHIFT or CAPS LOCK are pressed. CAPS LOCK does not affect the nonalphabetic keys.

FUNCTION KEYS
The function keys are shown in Figure 3-2. These keys generate character codes whose function is defined by the computer software or communication system. The following paragraphs describe the function keys.

OCTAL CODES GENERATED BY KEYBOARD
(SHIFTED CODES SHOWN ABOVE KEYCAP LEGENDS
UNSHIFTED CODES SHOWN BELOW KEYCAP LEGENDS)
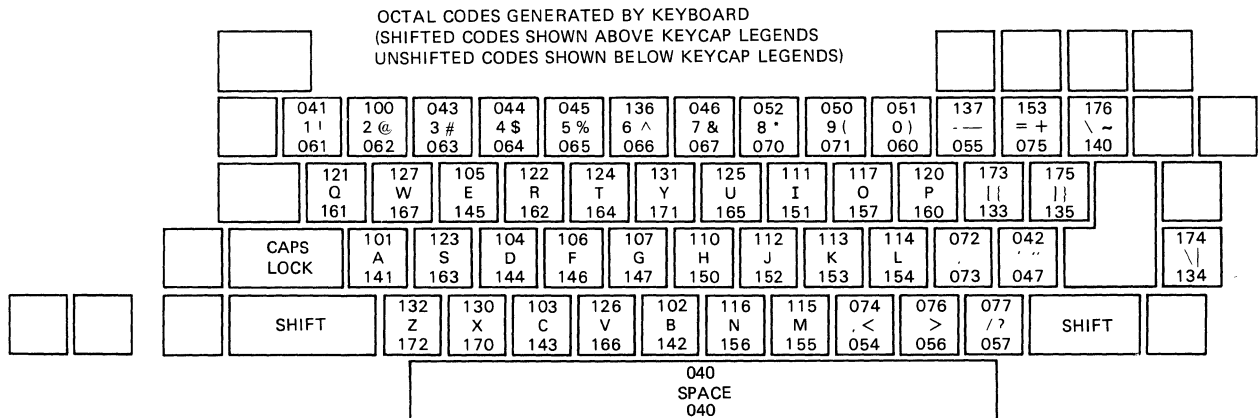
MA-7418

Figure 3-1   Standard Key Codes

Table 3-1 Standard Key Character Codes

Lowercase Character	SHIFT Not Pressed (Lowercase Octal Code)	Uppercase Character	SHIFT Pressed (Uppercase Octal Code)
a	141	A	101
b	142	B	102
c	143	C	103
d	144	D	104
e	145	E	105
f	146	F	106
g	147	G	107
h	150	H	110
i	151	I	111
j	152	J	112
k	153	K	113
l	154	L	114
m	155	M	115
n	156	N	116
o	157	O	117
p	160	P	120
q	161	Q	121
r	162	R	122
s	163	S	123
t	164	T	124
u	165	U	125
v	166	V	126
w	167	W	127
x	170	X	130
y	171	Y	131
z	172	Z	132
1	061	!	041
2	062	@	100
3	063	# or L	043
4	064	$	044
5	065	%	045
6	066	^ (circumflex)	136
7	067	&	046
8	070	*	052
9	071	(	050
0	060	)	051
- (minus)	055		137
=	075	+	053
` (grave accent)	140	~ (tilde)	176
[	133	{	173

Table 3-1 Standard Key Character Codes (Cont)

Lowercase Character	SHIFT Not Pressed (Lowercase Octal Code	Uppercase Character	SHIFT Pressed (Uppercase Octal Code
]	135	}	175
;	073	:	072
' (apostrophe)	047	"	042
\	134	|	174
, (comma)	054	<	074
. (period)	056	>	076
/	057	?	077

Figure 3-2 Function Keys

BREAK Key
The **BREAK** key generates a Break signal. The Break signal function is defined by the computer system. Refer to Chapter 5 for more information about the Break signal.

Hold down the **SHIFT** key, and press the **BREAK** key to generate a Long Break Disconnect. A Long Break Disconnect usually disconnects the terminal from the communication line. Refer to Chapter 5 for more information about Long Break Disconnect.

Hold down the **CTRL** key, and press the **BREAK** key to generate the answerback message. Refer to Chapter 2 for more information about the Answerback SET-UP B feature.

↑ ↓ ← → Cursor Control Keys
The cursor key character codes generated by the terminal depend on the ANSI/VT52 feature selection. When the ANSI/VT52 feature is set for ANSI compatibility, the cursor keys generate sequences that depend on the cursor key mode selection. Cursor key mode is

Table 3-2   Cursor Control Key Codes

| | ANSI Mode | | |
Cursor Key	Cursor Key Mode Reset	Cursor Key Mode Set	VT52 Mode
↑	ESC [A Ø33 133 1Ø1	ESC O A Ø33 117 1Ø1	ESC A Ø33 1Ø1
↓	ESC [B Ø33 133 1Ø2	ESC O B Ø33 117 1Ø2	ESC B Ø33 1Ø2
→	ESC [C Ø33 133 1Ø3	ESC O C Ø33 117 1Ø3	ESC C Ø33 1Ø3
←	ESC [D Ø33 133 1Ø4	ESC O D Ø33 117 1Ø4	ESC D Ø33 1Ø4

usually selected by the computer. Refer to Chapter 4 for more information about cursor key character selection. Table 3-2 lists the ANSI and VT52 compatible cursor key character codes.

Control Character Keys
Figure 3-3 shows the keys that generate control characters. Control characters can be generated in two ways:

1.   Hold down the CTRL key, and press any of the unshaded keys in Figure 3-3.

2.   Press any of the shaded keys in Figure 3-3 without using the CTRL key. The shaded keys are dedicated keys that generate control characters without using CTRL.
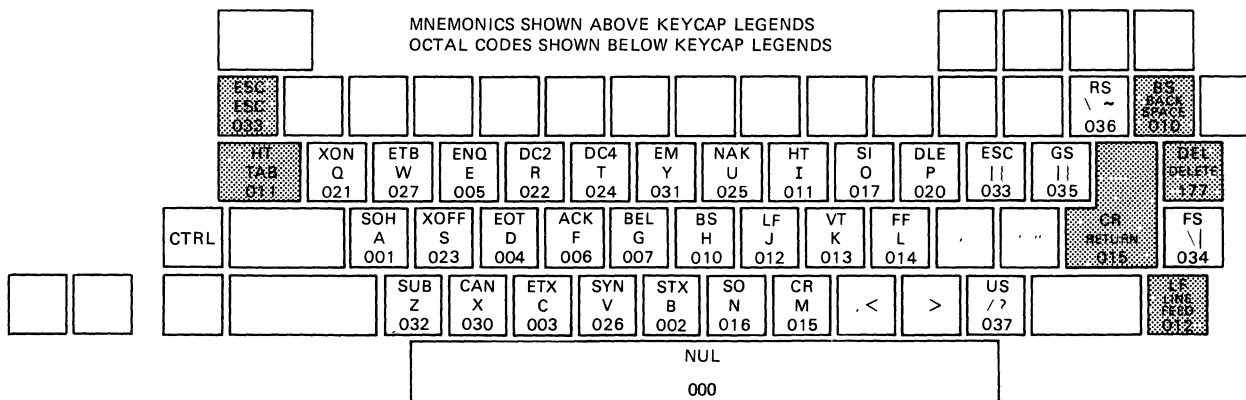
Figure 3-3   Function Key Control Codes

Table 3-3 lists the control character codes generated by the terminal. No details are provided about the function of the control character codes because different computer systems may use each control character differently.

AUXILIARY KEYPAD KEYS

The characters generated by the auxiliary keypad keys change depending on the selection of two features: ANSI/VT52 and Alternate Keypad features. The Alternate Keypad feature is usually selected only by the computer. Refer to Chapter 4 for more information about keypad character selection.

When alternate keypad mode is not selected (numeric keypad mode is selected), the auxiliary keypad generates the numeric, comma, period, and minus sign character codes used by the main keyboard.

NOTE: SHIFT and CAPS LOCK do not affect the codes generated by the auxiliary keypad.

When alternate keypad mode is selected, the auxiliary keypad generates control functions. Table 3-4 lists the character codes generated by the auxiliary keypad.

Table 3-3   Control Codes Generated

Name	Mnemonic	Code (Octal) Sent	Key Pressed with CTRL	Dedicated Key
Null	NUL	000	Space Bar	
Start of heading	SOH	001	A	
Start of text	STX	002	B	
End of text	ETX	003	C	
End of transmission	EOT	004	D	
Enquire	ENQ	005	E	
Acknowledge	ACK	006	F	
Bell	BEL	007	G	
Backspace	BS	010	H	BACK SPACE
Horizontal tab	HT	011	I	TAB
Line feed	LF	012	J	LINE FEED
Vertical tab	VT	013	K	
Form feed	FF	014	L	
Carriage return	CR	015	M	RETURN (ENTER)*
Carriage return line feed	CR LF	015 012		RETURN (ENTER)*
Shift out	SO	016	N	
Shift in	SI	017	O	
Data link escape	DLE	020	P	
Device control 1	DC1 (XON)	021	Q	
Device control 2	DC2	022	R	
Device control 3	DC3 (XOFF)	023	S	
Device control 4	DC4	024	T	
Negative acknowledge	NAK	025	U	
Synchronous idle	SYN	026	V	
End of transmission Block	ETB	027	W	
Cancel previous word or character	CAN	030	X	
End of medium	EM	031	Y	
Substitute	SUB	032	Z	
Escape	ESC	033	[	
File separator	FS	034	\	
Group separator	GS	035	]	
Record separator	RS	036	~	
Unit separator	US	037	?	
Delete	DEL	177		DELETE

* The RETURN key character code can be changed by the line feed/new line feature. When off, this feature causes RETURN to generate a single control character (CR). When on, this feature causes RETURN to generate two characters (CR, LF). Also, depending on the auxiliary keypad mode selected, RETURN and ENTER may generate the same control codes.

Table 3-4   Auxiliary Keypad Codes

	ANSI Mode		VT52 Mode	
Key	**Numeric Keypad Mode**	**Alternate Keypad Mode**	**Numeric Keypad Mode**	**Alternate Keypad Mode**
0	0 060	ESC O p 033 117 160	0 060	ESC ? p 033 077 160
1	1 061	ESC O q 033 117 161	1 060	ESC ? q 033 077 161
2	2 062	ESC O r 033 117 162	2 062	ESC ? r 033 077 162
3	3 063	ESC O s 033 117 163	3 063	ESC ? s 033 077 163
4	4 064	ESC O t 033 117 164	4 064	ESC ? t 033 077 164
5	5 065	ESC O u 033 117 165	5 065	ESC ? u 033 077 165
6	6 066	ESC O v 033 117 166	6 066	ESC ? v 033 077 166
7	7 067	ESC O w 033 117 167	7 067	ESC ? w 033 077 167
8	8 070	ESC O x 033 117 170	8 070	ESC ? x 033 077 170
9	9 071	ESC O y 033 117 171	9 071	ESC ? y 033 077 171
-	-(minus) 055	ESC O m 033 117 155	-(minus) 055	ESC ? m 033 077 155
,	,(comma) 054	ESC O l 033 117 154	,(comma) 054	ESC ? l 033 077 054
.	.(period) 056	ESC O n 033 117 156	.(period) 056	ESC ? n 033 077 156
ENTER*	CR or CR LF 015 015 012	ESC O M 033 117 115	CR or CR LF 015 015 012	ESC ? M 033 077 115
PF1	ESC O P 033 117 120	ESC O P 033 117 120	ESC P 033 120	ESC ? P 033 077 120
PF2	ESC O Q 033 117 121	ESC O Q 033 117 121	ESC Q 033 121	ESC ? Q 033 077 121

Table 3-4   Auxiliary Keypad Codes (Cont)

| | ANSI Mode | | | | VT52 Mode | | | |
Key	Numeric Keypad Mode			Alternate Keypad Mode		Numeric Keypad Mode		Alternate Keypad Mode	
PF3	ESC 033	O 117	R 122	ESC O R 033 117 122		ESC R 033 122		ESC ? R 033 077 122	
PF4	ESC 033	O 117	S 123	ESC O S 033 117 123		ESC S 033 123		ESC ? S 033 077 123	

* When numeric keypad mode is selected (alternate keypad mode off), the **ENTER** character code can be changed by the line feed/new line feature. When off, this feature causes **ENTER** to generate a single control character (CR, octal 015). When on, this feature causes **ENTER** to generate two characters (CR, octal 015 and LF, octal 012).

GENERAL
This chapter describes how the VT101 terminal processes received
character codes. The character codes received by the terminal can
be either display characters or control functions. Characters
displayed by the terminal are determined by the character code
received and the character set selected. Control functions are
control characters or escape and control sequences that provide
control of character processing, transmission, and display. All
escape and control sequences described in this chapter are
transmitted from the computer to the terminal, unless otherwise
stated. All control functions used by the terminal are described
in this chapter.

RECEIVED CHARACTERS
The VT101 terminal processes characters in accordance with
American National Standards Institute (ANSI) standards X3.64-1979,
X3.4-1977, and X3.41-1974. ANSI standard X3.4 defines the American
Standard Code for Information Interchange (ASCII) chart shown in
Figure 4-1. Figure 4-1 shows each character with its binary,
octal, decimal, and hexadecimal values. The ASCII chart
corresponds to the International Standards Organization (ISO)
Standard 646 and International Telegraph and Telephone Consultive
Committee (CCITT) Alphabet no. 5.

The terminal processes a received character based on the type of
character as defined by ANSI. The ASCII chart is 8 columns wide
and 16 rows long. The control characters are in columns 0 and 1 of
the chart. All other characters are display characters, with the
exception of the SPace and DELete characters. The SPace character
is considered either an information separator control character or
a display character. The DELete character is a control character.

DISPLAY CHARACTERS
Display characters are received characters that can be displayed
on the screen. The actual character displayed on the screen
depends on the character code received and the character set
selected. The character set is selected using control functions.
Refer to the Character Sets and Selection section of this chapter
for more information about character sets.

BITS — B7 B6 B5 / B4 B3 B2 B1 ROW

B4 B3 B2 B1	ROW	COLUMN 0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)
0 0 0 0	0	NUL (SPACE) 0/0/0	DLE (P) 20/16/10	SP 40/32/20	0 60/48/30	@ 100/64/40	P 120/80/50	\` 140/96/60	p 160/112/70
0 0 0 1	1	SOH (A) 1/1/1	DC1 (XON)(Q) 21/17/11	! 41/33/21	1 61/49/31	A 101/65/41	Q 121/81/51	a 141/97/61	q 161/113/71
0 0 1 0	2	STX (B) 2/2/2	DC2 (R) 22/18/12	" 42/34/22	2 62/50/32	B 102/66/42	R 122/82/52	b 142/98/62	r 162/114/72
0 0 1 1	3	ETX (C) 3/3/3	DC3 (XOFF)(S) 23/19/13	# 43/35/23	3 63/51/33	C 103/67/43	S 123/83/53	c 143/99/63	s 163/115/73
0 1 0 0	4	EOT (D) 4/4/4	DC4 (T) 24/20/14	$ 44/36/24	4 64/52/34	D 104/68/44	T 124/84/54	d 144/100/64	t 164/116/74
0 1 0 1	5	ENQ (E) 5/5/5	NAK (U) 25/21/15	% 45/37/25	5 65/53/35	E 105/69/45	U 125/85/55	e 145/101/65	u 165/117/75
0 1 1 0	6	ACK (F) 6/6/6	SYN (V) 26/22/16	& 46/38/26	6 66/54/36	F 106/70/46	V 126/86/56	f 146/102/66	v 166/118/76
0 1 1 1	7	BEL (G) 7/7/7	ETB (W) 27/23/17	' 47/39/27	7 67/55/37	G 107/71/47	W 127/87/57	g 147/103/67	w 167/119/77
1 0 0 0	8	BS (H) 10/8/8	CAN (X) 30/24/18	(50/40/28	8 70/56/38	H 110/72/48	X 130/88/58	h 150/104/68	x 170/120/78
1 0 0 1	9	HT (I) 11/9/9	EM (Y) 31/25/19	) 51/41/29	9 71/57/39	I 111/73/49	Y 131/89/59	i 151/105/69	y 171/121/79
1 0 1 0	10	LF (J) 12/10/A	SUB (Z) 32/26/1A	* 52/42/2A	: 72/58/3A	J 112/74/4A	Z 132/90/5A	j 152/106/6A	z 172/122/7A
1 0 1 1	11	VT (K) 13/11/B	ESC ([) 33/27/1B	+ 53/43/2B	; 73/59/3B	K 113/75/4B	[133/91/5B	k 153/107/6B	{ 173/123/7B
1 1 0 0	12	FF (L) 14/12/C	FS (\) 34/28/1C	, 54/44/2C	< 74/60/3C	L 114/76/4C	\ 134/92/5C	l 154/108/6C	| 174/124/7C
1 1 0 1	13	CR (M) 15/13/D	GS (]) 35/29/1D	- 55/45/2D	= 75/61/3D	M 115/77/4D	] 135/93/5D	m 155/109/6D	} 175/125/7D
1 1 1 0	14	SO (N) 16/14/E	RS (~) 36/30/1E	. 56/46/2E	> 76/62/3E	N 116/78/4E	^ 136/94/5E	n 156/110/6E	~ 176/126/7E
1 1 1 1	15	SI (O) 17/15/F	US (?) 37/31/1F	/ 57/47/2F	? 77/63/3F	O 117/79/4F	_ 137/95/5F	o 157/111/6F	DEL 177/127/7F

KEY

ASCII CHARACTER	ESC	33	OCTAL
CTRL/KEY	[	27	DECIMAL
		1B	HEX

* NOTE· CTRL/KEY = WHILE PRESSING THE CONTROL KEY, PRESS THE [KEY.

MA-7246

Figure 4-1   ASCII Chart

CONTROL CHARACTERS

Control characters are single character control functions that start, modify, or stop control functions. Control characters are not displayed; instead, they control terminal operation. Control characters recognized by the terminal are described in Table 4-1. All other control characters are ignored.

NOTE: Control characters described in this chapter are assigned a mnemonic. The mnemonic is an abbreviation of the control character name.

Table 4-1   Control Characters Recognized by VT101 Terminal

Name	Mnemonic	Octal Code	Function
Null	NUL	000	Ignored when received (not stored in input buffer), used as a fill character.
Enquire	ENQ	005	Transmits answerback message.
Bell	BEL	007	Generates a bell tone.
Backspace	BS	010	Moves cursor to the left one column position, unless it is at the left margin in which case no action occurs.
Horizontal Tab	HT	011	Moves cursor to the next tab stop, or to the right margin if there are no more tab stops.
Line Feed	LF	012	Causes a line feed or a new line operation. (Refer to line feed/new line mode.)
Vertical Tab	VT	013	Processed as LF.
Form Feed	FF	014	Processed as LF.
Carriage Return	CR	015	Moves cursor to left margin on the current line.
Shift Out	SO	016	Select G1 character set, as designated by a select character set sequence.
Shift In	SI	017	Select G0 character set, as designated by a select character set sequence.

Table 4-1   Control Characters Recognized by VT101 Terminal (Cont)

Name	Mnemonic	Octal Code	Function
Device Control 1	DC1	021	Processed as XON. Causes terminal to continue transmitting characters.
Device Control 3	DC3	023	Processed as XOFF. Causes terminal to stop transmitting all characters except XOFF and XON.
Cancel	CAN	030	If received during an escape or control sequence, the sequence is cancelled and the substitution character (%) is displayed. Characters of the sequence received after cancel character are displayed.
Substitute	SUB	032	Processed as CAN.
Escape	ESC	033	Processed as a sequence introducer.
Delete	DEL	177	Ignored when received (not stored in input buffer).

ESCAPE AND CONTROL SEQUENCES
Escape and control sequences provide controls not provided by the control characters in the character set. These sequences are multiple character control functions that are not displayed, but instead control terminal operation. Escape and control sequences are defined by ANSI X3.41-1977 and X3.64-1979. Refer to Appendix E for more information about sequences and sequence formats.

The VT101 terminal is an upward and downward software compatible terminal. It can respond to control functions created to meet both private DIGITAL standards and present ANSI standards. Therefore, you can use existing software designed for previous terminals (such as the VT52) or new software designed according to ANSI standards. However, future video terminals will not necessarily be compatible with the private DIGITAL sequences. Therefore, all new software should be designed using ANSI compatible sequences.

The VT101 terminal can use the VT52 compatible mode to allow the terminal to respond to private DIGITAL sequences. In VT52 compatible mode, the VT101 terminal responds to private DIGITAL sequences like a VT52 terminal.

The VT101 terminal can use ANSI compatible mode to allow the terminal to respond to a subset of control functions specified by ANSI. All control functions used by the terminal that are not presently specified by ANSI are created to comply with the extensions permitted by ANSI standards. These sequences are considered ANSI private sequences.

The ANSI compatible control functions listed in this document have a mnemonic assigned by ANSI. If the control function is an ANSI private control function (a function defined by DIGITAL), the mnemonic begins with DEC. Characters in the escape and control sequences in this chapter use the ASCII character set. Upper- or lowercase of the characters in the sequences is significant and must be used as shown. The octal equivalent of each character in the sequences is presented as a second reference.

Sequences described in this chapter are divided by software compatibility, ANSI or VT52 compatible, and are arranged by function (Table 4-2). Appendix D is a summary of all control functions.

Error Recovery
Present standards do not specify what the terminal should do during an error in the received control function. The error may be incorrect parameters, invalid control functions, or control characters embedded in control function sequences. The terminal generally recovers from these errors by performing as much of the function as possible. The error recovery procedures of the VT101 terminal are listed below.

- A control function not recognized by the terminal is generally ignored.

- Control functions not supported by the terminal (valid control functions not listed in this document) are generally ignored but may produce unpredictable results.

- If a control character is received within a sequence, the terminal performs the function of the control character, followed by the function of the sequence.

- If the CANcel (octal 030) or SUBstitute (octal 032) characters are received during a sequence, the current sequence is aborted.

ANSI Compatible Sequences
The ANSI compatible sequences meet ANSI standards X3.64-1979 and X3.41-1974. The ANSI standards allow flexibility in using each function. This section describes the ANSI control functions used by the VT101 terminal. ANSI compatibility is selected from the keyboard in SET-UP (refer to Chapter 2) or by the computer using a sequence. (Refer to the VT52 compatible sequences described in this chapter.)

Table 4-2   Escape and Control Sequence Arrangement

Table 4-2 Escape and Control Sequence Arrangement (Cont)

SET-UP Feature and Mode Selection -- SET-UP features change how the VT101 terminal operates. These features can be selected from the VT101 keyboard while in SET-UP. Some SET-UP features can also be selected by the computer using control functions. However, features selected by the computer are stored in operating memory. The computer cannot perform a store procedure to move computer selected feature selections into user permanent memory. (Refer to Chapter 2 for more information about SET-UP feature memories.)

Some SET-UP features are modes. A mode is a feature of the terminal that affects operation. The mode is used by the terminal until the computer or operator changes the selection. Table 4-3 lists the terminal SET-UP features and modes. Modes may be changed by the computer using the set mode (SM) and reset mode (RM) sequences.

To set and reset the modes of the VT101 terminal, use the following sequences.

NOTE: The Ps character indicates a parameter selected from a list of parameters. Each parameter listed represents a mode. When setting several modes using a single SM or RM sequence, the parameters are separated by the semicolon (octal 073). The semicolon is not used when selecting only one mode.

Name	Mnemonic	Sequence						Definition
Reset mode	RM	ESC 033	[133	Ps ***	;...; 073	Ps 073	l *** 154	Resets one or more modes as specified by each selective parameter (Ps) in the parameter string. Each mode to be reset is specified by a separate parameter.
Set mode	SM	ESC 033	[133	Ps ***	;...; 073	Ps 073	h *** 150	Sets one or more modes as specified by each selective parameter (Ps) in the parameter string. Each mode to be set is specified by a separate parameter.

Table 4-4 lists the ANSI specified modes and their selective parameters (Ps). Table 4-5 lists the ANSI compatible private modes and their selective parameters. These modes are explained individually in the following pages. The sequence to set and reset each particular mode is shown.

NOTE: When changing ANSI compatible private mode parameters (listed in Table 4-5), the first character in the parameter string is the question mark (octal 077). All parameters contained in the sequence are interpreted as ANSI compatible private mode parameters.

The following example shows the use of the question mark (used with ANSI private parameters) and semicolon (used with multiple parameters) characters.

```
ESC   [   ?    3    ;    4    h
033   133 077  063  073  064  150
```

Table 4-3   SET-UP Features and Modes

Feature/Mode	Changed from Computer		Changed from Keyboard in SET-UP
ON/OFF Line	No		Yes
Screen brightness	No		Yes
Columns per line	Yes	(DECCOLM)	Yes
Tab stops	Yes	(HTS/TBC)*	Yes
Scroll	Yes	(DECSCLM)	Yes
Auto repeat	Yes	(DECARM)	Yes
Screen background	Yes	(DECSCNM)	Yes
Cursor	No		Yes
Margin bell	No		Yes
Keyclick	No		Yes
ANSI/VT52	Yes	(DECANM)	Yes
Auto XON/XOFF	No		Yes
US/UK character set	Yes	(SCS)*	Yes
Auto wrap	Yes	(DECAWM)	Yes
Line feed/new line	Yes	(LNM)	Yes
Interlace	Yes	(DECINLM)	Yes
Receive parity	No		Yes
WPS terminal	No		Yes
Local echo	No		Yes
Power	No		Yes
Data/Parity bits	No		Yes
Transmit speed	No		Yes
Receive speed	No		Yes
Alternate keypad mode	Yes	(DECKPAM/DECKPNM)*	No
Cursor key mode	Yes	(DECCKM)	No
Origin mode	Yes	(DECOM)	No

* These features are not changed using set mode (SM) and reset mode (RM) sequences.

Table 4-4   ANSI Specified Modes

Mode	Mnemonic	Parameter (Ps)
Error (ignored)	--	Ø
Line feed/new line	LNM	2Ø

Table 4-5   ANSI Compatible Private Modes

Mode	Mnemonic	Parameter (Ps)
Error (ignored)	--	Ø
Cursor key	DECCKM	1
ANSI/VT52	DECANM	2
Column	DECCOLM	3
Scroll	DECSCLM	4
Screen	DECSCNM	5
Origin	DECOM	6
Auto wrap	DECAWM	7
Auto repeat	DECARM	8
Interlace	DECINLM	9

NOTE: The alternate keypad and numeric keypad modes are selected using dedicated sequences. The set and reset mode sequences are not used to select these modes. Refer to the description of keypad character selection in this chapter for more information about these sequences.

The modes in Table 4-6 are specified in ANSI X3.64-1979 and are permanently set, permanently reset, or not applicable. Refer to the ANSI standard for more information about these modes.

ANSI/VT52 Compatibility -- The VT1Ø1 terminal is compatible with both ANSI and private DIGITAL standards. Therefore, new software which meets the ANSI standards and existing software designed for previous terminals (such as the VT52) can be used.

The ANSI compatible sequences meet ANSI standards X3.64-1979 and X3.41-1974. VT1Ø1 terminal ANSI compatibility is selected using the ANSI/VT52 mode sequence in VT52 mode. Refer to the VT52 compatible sequence section in this chapter for details on selecting ANSI sequence compatibility.

When the terminal is in ANSI mode, the following sequence selects compatibility with private DIGITAL sequences (VT52 mode).

Name	Mnemonic	Sequence	Function
VT52 mode	DECANM	ESC [? 2 1 Ø33 133 Ø77 Ø62 154	Reset selects private DIGITAL sequence compatibility while in ANSI mode. In VT52 mode, the terminal responds to sequences like a VT52 terminal.

Table 4-6   Permanently Selected Modes

Mode	Mnemonic	Selection	Function
Control representation	CRM	Reset	Control functions are performed without displaying a character to represent the contro function received.
Editing boundary	EBM	Reset	Characters moved outsid the margins are lost, and the erasing and cursor positioning functions are not performed outside the margins. This does not affect the horizontal and vertical position (HVP) and cursor position (CUP) sequences.
Erasure	ERM	Set	All characters displaye can be erased.
Format effector action	FEAM	Reset	Control functions that affect the screen display are performed immediately.
Format effector transfer	FETM	N/A	
Guarded area transfer	GATM	N/A	
Horizontal editing	HEM	N/A	
Insertion-replacement	IRM	Reset	Received characters replace characters at the cursor position.
Keyboard action	KAM	Reset	Typed characters are processed except durin the keyboard locked condition.
Multiple area transfer	MATM	N/A	

Table 4-6   Permanently Selected Modes (Cont)

Mode	Mnemonic	Selection	Function
Positioning unit	PUM	Reset	Horizontal and vertical positioning parameters in control functions are specified in units of character position.
Selected area transfer	SATM	N/A	
Status reporting transfer	SRTM	Reset	Status reports are transmitted by the VT101 using the device status report (DSR) sequence.
Tabulation stop	TSM	Reset	Tab stop selections apply to the corresponding column of all lines on the screen.
Transfer termination	TTM	N/A	
Vertical editing	VEM	N/A	

Auto Wrap -- Auto wrap mode selects where a received character is placed when the cursor is at the right margin. When set, any display characters received when the cursor is at the right margin are advanced to the next line. The display scrolls up if the cursor is at the end of the scrolling region and is not positioned outside the margins. When reset, received characters replace any previous characters displayed at the right margin. To select the auto wrap feature, use the following sequences.

Name	Mnemonic	Sequence					Function
Auto Wrap mode	DECAWM	ESC 033	[133	? 077	7 067	h 150	Set selects the auto wrap feature.
Auto Wrap mode	DECAWM	ESC 033	[133	? 077	7 067	l 154	Reset selects no auto wrap feature.

Screen Background -- This mode selects the type of display background on the screen. When set, the screen has a white background with black characters. When reset, the screen has a black background with white characters. To select the screen background, use the following sequences.

Name	Mnemonic	Sequence	Function
Screen mode	DECSCNM	ESC [? 5 h Ø33 133 Ø77 Ø65 15Ø	Set selects a white screen background with black characters (reverse screen).
Screen mode	DECSCNM	ESC [? 5 l Ø33 133 Ø77 Ø65 154	Reset selects a black screen background with white characters (normal screen).

Scrolling -- Scrolling is the upward or downward movement of existing lines on the screen. It makes room for more lines of characters at either the top or bottom of the screen. Scrolling can be performed in two ways: jump scroll, or smooth scroll. Jump scroll allows lines of characters to be added to the screen as fast as possible. Smooth scroll allows a maximum of six lines per second to be added to the screen.

NOTE: The auto XON/XOFF SET-UP B feature must be selected so that characters are not lost when using smooth scroll.

To select the type of scrolling, use the following sequences.

Name	Mnemonic	Sequence	Function
Scroll mode	DECSCLM	ESC [? 4 h Ø33 133 Ø77 Ø64 15Ø	Set selects smooth scrolling. Smooth scrolling limits scrolling to a maximum rate of six lines per second.
Scroll mode	DECSCLM	ESC [? 4 l Ø33 133 Ø77 Ø64 154	Reset selects jump scrolling. Jump scrolling causes scrolling to occur as fast as lines of characters are displayed.

Origin (Home Position) -- Origin mode determines if the cursor can be moved outside the scrolling region. (Refer to the Scrolling Region section in this chapter for more information.) When origin mode is set, the cursor cannot be moved outside the scrolling region. When origin mode is reset, the cursor can be moved outside the scrolling region.

Lines on the screen are numbered. Numbering is determined by the location of the origin (home position). The origin is always line 1, column 1.

When origin mode is set, the origin is always the first line and column of the scrolling region. The cursor <u>cannot</u> be moved outside the scrolling region using any sequence.

When origin mode is reset, the origin is the first character position of the screen. The cursor <u>can</u> be moved outside the scrolling region using only the cursor position (CUP) or horizontal and vertical position (HVP) sequences. To select the the origin mode, use the following sequences.

<u>NOTE: Power-up or reset causes origin mode to be reset.</u>

Name	Mnemonic	Sequence					Function
Origin mode	DECOM	ESC 033	[133	? 077	6 066	h 150	Set selects the origin to line 1, column 1 in the scrolling region. The line numbers are relative to the start of the scrolling region.
Origin mode	DECOM	ESC 033	[133	? 077	6 066	l 154	Reset selects the origin to be in the upper-left corner of screen. Line numbers are independent of the scrolling region (absolute).

<u>NOTE: The cursor is moved to the new origin position whenever the origin mode selection is changed.</u>

Columns Per Line -- This mode selects the number of columns in a display line to be either 80 or 132. With 80 columns per line selected, the screen can display 24 lines of characters with 80 columns per line. With 132 columns per line selected, the screen can display 14 lines of characters with 132 columns per line. To select the number of columns per line, use the following sequences.

Name	Mnemonic	Sequence					Function
Column mode	DECCOLM	ESC 033	[133	? 077	3 063	h 150	Set selects 132 columns per line (14 display lines on the screen).
Column mode	DECCOLM	ESC 033	[133	? 077	3 063	l 154	Reset selects 80 per line (24 display lines on the screen).

<u>NOTE: When switching between 80 and 132 columns per line, the screen is erased.</u>

4-14

Interlace -- Interlace selects the number of scan lines used to create characters on the screen. The terminal can use either 240 or 480 scan lines per screen. This feature does not add any new information to the screen. But it may improve images created by hard copy or video devices connected to the video output connector. Usually operators prefer interlace selected for 240 scans per screen. To select the number of scan lines per screen, use the following sequences.

Name	Mnemonic	Sequence					Function
Interlace mode	DECINLM	ESC 033	[133	? 077	9 071	h 150	Set selects 480 scan lines per screen.
Interlace mode	DECINLM	ESC 033	[133	? 077	9 071	l 154	Reset selects 240 scan lines per screen.

Line Feed/New Line -- This mode selects how the terminal uses the carriage return (CR, octal 015) and line feed (LF, octal 012) control characters. Table 4-7 provides a summary of the line feed/new line mode feature. When set, receiving a line feed character causes the cursor to move to the first position of the next line. RETURN transmits two control character codes: carriage return, and line feed. When reset, receiving a line feed character moves the cursor vertically to the next line in the current column position. RETURN transmits a carriage return control character code. To select the line feed/new line feature, use the following sequences.

Name	Mnemonic	Sequence					Function
Line feed/ New line mode	LNM	ESC 033	[133	2 062	0 060	h 150	Set causes a received line feed to move the cursor to first column of next line. RETURN transmits CR LF.
Line feed/ New line mode	LNM	ESC 033	[133	2 062	0 060	l 154	Reset causes a received line feed to move the cursor vertically in the current column. RETURN transmits CR.

Auto Repeat -- Auto repeat mode selects automatic key repeating. When set, a key pressed for more than one-half second automatically repeats the transmission of the character at about 30 times per second. Key repeating is not performed on the following keys: SET-UP, ESC, RETURN, ENTER, NO SCROLL, and the CTRL key pressed with any key.

Table 4-7   Line Feed/New Line Feature

Selection	Key Pressed	Character Sent
Off	RETURN	Carriage return (CR)
Off	LINE FEED	Line feed (LF)
On	RETURN	Carriage return line feed (CR LF)
On	LINE FEED	Line feed (LF)

Selection	Character Received	Function
Off	CR	Carriage return (cursor moves to left margin)
Off	LF	Line feed (cursor moves to the next line but stays in same column)
On	CR	Carriage return (cursor moves to left margin)
On	LF	Carriage return line feed (cursor moves to left margin of next line)

When reset, no keyboard keys automatically repeat. To select automatic key repeating, use the following sequences.

Name	Mnemonic	Sequence					Function
Auto repeat mode	DECARM	ESC 033	[133	? 077	8 070	h 150	Set selects the auto repeat feature.
Auto repeat mode	DECARM	ESC 033	[133	? 077	8 070	l 154	Reset selects no auto repeat feature.

Cursor Key Character Selection -- This mode selects the set of characters transmitted by the cursor keys. When set, the cursor control keys generate application control functions. When reset, the cursor control keys generate ANSI specified cursor control sequences. Refer to Table 4-8 for the codes transmitted by the cursor keys. To select cursor key mode, use following sequences.

NOTE: Power-up or reset causes cursor key mode mode to be reset.

Table 4-8   ANSI Cursor Control Key Codes

Cursor	Cursor Key Mode Reset (Cursor Control)	Cursor Key Mode Set (Application)
↑	ESC [A Ø33 133 1Ø1	ESC O A Ø33 117 1Ø1
↓	ESC [B Ø33 133 1Ø2	ESC O B Ø33 117 1Ø2
→	ESC [C Ø33 133 1Ø3	ESC O C Ø33 117 1Ø3
←	ESC [D Ø33 133 1Ø4	ESC O D Ø33 117 1Ø4

Name	Mnemonic	Sequence	Function
Cursor key mode	DECCKM	ESC [? 1 h Ø33 133 Ø77 Ø61 15Ø	Set selects cursor keys to generate application control functions.
Cursor key mode	DECCKM	ESC [? 1 l Ø33 133 Ø77 Ø61 154	Reset selects cursor keys to generate ANSI cursor control sequences.

Keypad Character Selection -- The auxiliary keypad can generate either numeric characters or control functions. When it is used for numeric character entry, numeric keypad mode is selected. The keys on the auxiliary keypad generate characters which correspond to the numeric, comma, period, and minus sign keys on the main keyboard. When the auxiliary keypad is used for control function entry, alternate keypad mode is selected. Refer to Table 4-9 for the characters generated by these keys. To select the characters generated by the auxiliary keypad keys, use the following sequences.

NOTE: Power-up or reset causes numeric keypad mode to be selected.

Name	Mnemonic	Sequence	Function
Alternate Keypad mode	DECKPAM	ESC = Ø33 Ø75	Selects alternate keypad mode.
Numeric Keypad mode	DECKPNM	ESC > Ø33 Ø76	Selects keypad numeric mode.

Table 4-9   ANSI Auxiliary Keypad Codes

Key	Numeric Keypad Mode	Alternate Keypad Mode
0	0 060	ESC O p 033 117 160
1	1 061	ESC O q 033 117 161
2	2 062	ESC O r 033 117 162
3	3 063	ESC O s 033 117 163
4	4 064	ESC O t 033 117 164
5	5 065	ESC O u 033 117 165
6	6 066	ESC O v 033 117 166
7	7 067	ESC O w 033 117 167
8	8 070	ESC O x 033 117 170
9	9 071	ESC O y 033 117 171
-(minus)	-(minus) 055	ESC O m 033 117 155
,(comma)	,(comma) 054	ESC O l 033 117 154
.(period)	.(period) 056	ESC O n 033 117 156
ENTER*	CR CR LF 015 or 015 012	ESC O M 033 117 115
PF1	ESC O P 033 117 120	ESC O P 033 117 120
PF2	ESC O Q 033 117 121	ESC O Q 033 117 121

Table 4-9   ANSI Auxiliary Keypad Codes (Cont)

Key	Numeric Keypad Mode			Alternate Keypad Mode		
PF3	ESC	O	R	ESC	O	R
	Ø33	117	122	Ø33	117	122
PF4	ESC	O	S	ESC	O	S
	Ø33	117	123	Ø33	117	123

* When numeric keypad mode is selected, ENTER generates the same characters as RETURN. The RETURN character code can be changed by the line feed/new line feature. When off, this feature causes the key to generate a single control character (CR, octal Ø15). When on, this feature causes the key to generate two characters (CR, octal Ø15, and LF, octal Ø12).

NOTE: In ANSI mode, if the codes are echoed back to the terminal, or if the terminal is off-line, the last character of the sequence is displayed on the screen. For example, PF4 is displayed as an S.

Character Sets and Selection -- The VT1Ø1 terminal can display up to 126 different characters. However, it can select from only 94 characters (one character set) at a time. Therefore, characters displayed by the terminal are held in three character sets, with some characters appearing in more than one character set. The VT1Ø1 character sets are the United States character set, the United Kingdom character set, and the special characters and line drawing character set.

NOTE: The United States and United Kingdom character sets meet the ISO international register of character sets to be used with escape sequences.

Figures 4-2 through 4-4 show the character sets. Notice that the control characters and the SPace and DELete characters are the same in all character sets.

Any two character sets can be considered active at any one time. The two active character sets are designated by the computer as GØ and G1 using the select character set (SCS) sequence. Once the character sets are designated by the computer, a single control character switches between the character sets. The shift in (SI, octal Ø17) control character invokes the GØ character set. The shift out (SO, octal Ø16) control character invokes the G1 character set.

BITS		COLUMN 0		1		2		3		4		5		6		7	
B7 B6 B5		0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
B4 B3 B2 B1	ROW																
0 0 0 0	0	NUL SPACE	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	`	140 96 60	p	160 112 70
0 0 0 1	1		1 1 1	DC1 (XON) Q	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	a	141 97 61	q	161 113 71
0 0 1 0	2		2 2 2		22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	b	142 98 62	r	162 114 72
0 0 1 1	3		3 3 3	DC3 (XOFF) S	23 19 13	£	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	c	143 99 63	s	163 115 73
0 1 0 0	4		4 4 4		24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	d	144 100 64	t	164 116 74
0 1 0 1	5	ENQ E	5 5 5		25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	e	145 101 65	u	165 117 75
0 1 1 0	6		6 6 6		26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	f	146 102 66	v	166 118 76
0 1 1 1	7	BEL G	7 7 7		27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	g	147 103 67	w	167 119 77
1 0 0 0	8	BS H	10 8 8	CAN X	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	h	150 104 68	x	170 120 78
1 0 0 1	9	HT I	11 9 9		31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	i	151 105 69	y	171 121 79
1 0 1 0	10	LF J	12 10 A	SUB Z	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	j	152 106 6A	z	172 122 7A
1 0 1 1	11	VT K	13 11 B	ESC [	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	k	153 107 6B	{	173 123 7B
1 1 0 0	12	FF L	14 12 C		34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	l	154 108 6C	|	174 124 7C
1 1 0 1	13	CR M	15 13 D		35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	m	155 109 6D	}	175 125 7D
1 1 1 0	14	SO N	16 14 E		36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	n	156 110 6E	~	176 126 7E
1 1 1 1	15	SI O	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F	DEL	177 127 7F

KEY

ASCII CHARACTER	ESC	33	OCTAL
		27	DECIMAL
CTRL/KEY	[	1B	HEX

MA-7248

* NOTE: CTRL/KEY = WHILE PRESSING THE CONTROL KEY, PRESS THE [KEY.

Figure 4-2   United Kingdom Character Set

Figure 4-3 United States Character Set

B4 B3 B2 B1	ROW	0	1	2	3	4	5	6	7
B7 B6 B5	COLUMN	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0 0 0 0	0	NUL (SPACE) 0/0/0	20/16/10	SP 40/32/20	0 60/48/30	@ 100/64/40	P 120/80/50	` 140/96/60	p 160/112/70
0 0 0 1	1	1/1/1	DC1 (XON) Q 21/17/11	! 41/33/21	1 61/49/31	A 101/65/41	Q 121/81/51	a 141/97/61	q 161/113/71
0 0 1 0	2	2/2/2	22/18/12	" 42/34/22	2 62/50/32	B 102/66/42	R 122/82/52	b 142/98/62	r 162/114/72
0 0 1 1	3	3/3/3	DC3 (XOFF) S 23/19/13	# 43/35/23	3 63/51/33	C 103/67/43	S 123/83/53	c 143/99/63	s 163/115/73
0 1 0 0	4	4/4/4	24/20/14	$ 44/36/24	4 64/52/34	D 104/68/44	T 124/84/54	d 144/100/64	t 164/116/74
0 1 0 1	5	ENQ E 5/5/5	25/21/15	% 45/37/25	5 65/53/35	E 105/69/45	U 125/85/55	e 145/101/65	u 165/117/75
0 1 1 0	6	6/6/6	26/22/16	& 46/38/26	6 66/54/36	F 106/70/46	V 126/86/56	f 146/102/66	v 166/118/76
0 1 1 1	7	BEL G 7/7/7	27/23/17	' 47/39/27	7 67/55/37	G 107/71/47	W 127/87/57	g 147/103/67	w 167/119/77
1 0 0 0	8	BS H 10/8/8	CAN X 30/24/18	(50/40/28	8 70/56/38	H 110/72/48	X 130/88/58	h 150/104/68	x 170/120/78
1 0 0 1	9	HT I 11/9/9	31/25/19	) 51/41/29	9 71/57/39	I 111/73/49	Y 131/89/59	i 151/105/69	y 171/121/79
1 0 1 0	10	LF J 12/10/A	SUB Z 32/26/1A	* 52/42/2A	: 72/58/3A	J 112/74/4A	Z 132/90/5A	j 152/106/6A	z 172/122/7A
1 0 1 1	11	VT K 13/11/B	ESC [33/27/1B	+ 53/43/2B	; 73/59/3B	K 113/75/4B	[133/91/5B	k 153/107/6B	{ 173/123/7B
1 1 0 0	12	FF L 14/12/C	34/28/1C	, 54/44/2C	< 74/60/3C	L 114/76/4C	\ 134/92/5C	l 154/108/6C	| 174/124/7C
1 1 0 1	13	CR M 15/13/D	35/29/1D	- 55/45/2D	= 75/61/3D	M 115/77/4D	] 135/93/5D	m 155/109/6D	} 175/125/7D
1 1 1 0	14	SO N 16/14/E	36/30/1E	. 56/46/2E	> 76/62/3E	N 116/78/4E	^ 136/94/5E	n 156/110/6E	~ 176/126/7E
1 1 1 1	15	SI O 17/15/F	37/31/1F	/ 57/47/2F	? 77/63/3F	O 117/79/4F	_ 137/95/5F	o 157/111/6F	DEL 177/127/7F

KEY

ASCII CHARACTER	ESC	33	OCTAL
		27	DECIMAL
CTRL/KEY	[	1B	HEX

MA-7247

* NOTE: CTRL/KEY = WHILE PRESSING THE CONTROL KEY, PRESS THE [KEY.

Figure 4-3 United States Character Set

B7 B6 B5 →	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
BITS B4 B3 B2 B1 / ROW	COLUMN **0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0 0 0 0 / 0	NUL SPACE 0/0/0	20/16/10	SP 40/32/20	0 60/48/30	@ 100/64/40	P 120/80/50	♦ 140/96/60	— SCAN 3 160/112/70
0 0 0 1 / 1	1/1/1	DC1 (XON) Q 21/17/11	! 41/33/21	1 61/49/31	A 101/65/41	Q 121/81/51	▓ 141/97/61	— SCAN 5 161/113/71
0 0 1 0 / 2	2/2/2	22/18/12	" 42/34/22	2 62/50/32	B 102/66/42	R 122/82/52	╫ 142/98/62	— SCAN 7 162/114/72
0 0 1 1 / 3	3/3/3	DC3 (XOFF) S 23/19/13	# 43/35/23	3 63/51/33	C 103/67/43	S 123/83/53	╟ 143/99/63	— SCAN 9 163/115/73
0 1 0 0 / 4	4/4/4	24/20/14	$ 44/36/24	4 64/52/34	D 104/68/44	T 124/84/54	╢ 144/100/64	├ 164/116/74
0 1 0 1 / 5	ENQ E 5/5/5	25/21/15	% 45/37/25	5 65/53/35	E 105/69/45	U 125/85/55	╞ 145/101/65	┤ 165/117/75
0 1 1 0 / 6	6/6/6	26/22/16	& 46/38/26	6 66/54/36	F 106/70/46	V 126/86/56	0 146/102/66	⊥ 166/118/76
0 1 1 1 / 7	BEL G 7/7/7	27/23/17	' 47/39/27	7 67/55/37	G 107/71/47	W 127/87/57	± 147/103/67	⊤ 167/119/77
1 0 0 0 / 8	BS H 10/8/8	CAN X 30/24/18	(50/40/28	8 70/56/38	H 110/72/48	X 130/88/58	╨ 150/104/68	| 170/120/78
1 0 0 1 / 9	HT I 11/9/9	31/25/19	) 51/41/29	9 71/57/39	I 111/73/49	Y 131/89/59	╥ 151/105/69	≤ 171/121/79
1 0 1 0 / 10	LF J 12/10/A	SUB Z 32/26/1A	* 52/42/2A	: 72/58/3A	J 112/74/4A	Z 132/90/5A	⌠ 152/106/6A	≥ 172/122/7A
1 0 1 1 / 11	VT K 13/11/B	ESC [33/27/1B	+ 53/43/2B	; 73/59/3B	K 113/75/4B	[133/91/5B	⌡ 153/107/6B	π 173/123/7B
1 1 0 0 / 12	FF L 14/12/C	34/28/1C	, 54/44/2C	< 74/60/3C	L 114/76/4C	\ 134/92/5C	⌈ 154/108/6C	≠ 174/124/7C
1 1 0 1 / 13	CR M 15/13/D	35/29/1D	- 55/45/2D	= 75/61/3D	M 115/77/4D	] 135/93/5D	⌊ 155/109/6D	£ 175/125/7D
1 1 1 0 / 14	SO N 16/14/E	36/30/1E	. 56/46/2E	> 76/62/3E	N 116/78/4E	^ 136/94/5E	┼ 156/110/6E	≈ 176/126/7E
1 1 1 1 / 15	SI O 17/15/F	37/31/1F	/ 57/47/2F	? 77/63/3F	O 117/79/4F	(BLANK) 137/95/5F	— SCAN 1 157/111/6F	DEL 177/127/7F

KEY

ASCII CHARACTER	**ESC** [	33 (OCTAL) / 27 (DECIMAL) / 1B (HEX)

MA-7249

Figure 4-4   Special Character and Line Drawing Character Set

The designated character sets are active until another SCS sequence is received. The G0 and G1 character sets can be redesignated by the computer as often as needed using the SCS sequence. The following sequences designate the G0 character set.

Name	Mnemonic	Sequence	Function
Select Character Set	SCS	ESC (A 033 050 101	Designates the UK character set as G0.
Select Character Set	SCS	ESC (B 033 050 102	Designates the US character set as G0.
Select Character Set	SCS	ESC (0 033 050 060	Designates the special character and line drawing character set as G0.

The following sequences designate the G1 character set.

Name	Mnemonic	Sequence	Function
Select Character Set	SCS	ESC) A 033 051 101	Designates the UK character set as G1.
Select Character Set	SCS	ESC) B 033 051 102	Designates the US character set as G1.
Select Character Set	SCS	ESC) 0 033 051 060	Designates the special character and line drawing character set as G1.

The VT101 also contains G2 and G3 character sets. However, these character sets are always the United States (7-bit ASCII character set). These character sets are selected for one character using the single shift 2 (SS2) and single shift 3 (SS3) sequences as follows.

Name	Mnemonic	Sequence	Function
Single Shift 2	SS2	ESC N 033 115	Selects G2 character set for next character. The G2 character set is always the ASCII character set.

Name	Mnemonic	Sequence	Function
Single Shift 3	SS3	ESC 0 033 117	Selects G3 character set for the next character. The G3 character set is always the ASCII character set.

Character Attributes -- The VT101 terminal can display a character attribute that changes the character display without changing the character. A displayed character can only have one attribute. The character attribute of the terminal is either underline or reverse (negative) video. Reverse video displays the character using a screen background opposite of the screen background SET-UP B feature selection. The terminal uses the attribute selected for the cursor by the cursor SET-UP B feature. Refer to Chapter 2 for more information on the cursor and screen background SET-UP B features.

After the character attribute is selected, all characters received by the terminal are displayed with the attribute, until the attribute selection is changed. To select the character attribute, use the following sequences.

Name	Mnemonic	Sequence	Function
Select Graphic Rendition	SGR	ESC [m 033 133 155	Turns off character attribute selection.
Select Graphic Rendition	SGR	ESC [0 m 033 133 060 155	Turns off character attribute selection.
Select Graphic Rendition	SGR	ESC [4 m 033 133 064 155	Selects character attribute (either underline or reverse video).
Select Graphic Rendition	SGR	ESC [7 m 033 133 067 155	Character attribute selected (either underline or reverse video).

Scrolling Region -- Scrolling is the upward and downward movement of existing lines on the screen to allow new lines of characters to be added to the screen. The scrolling region is the area between the top and bottom margins. The minimum size of the scrolling region is two lines. Therefore, the line number of the top margin must be at least one less than the number of the bottom margin.

Origin mode determines if the cursor can be moved outside the scrolling region. When origin mode is reset, the cursor can be moved outside the margins with the cursor position (CUP) and horizontal and vertical position (HVP) sequences. When origin mode is set, the cursor cannot be moved outside the scrolling region.

To select the top and bottom margins of the scrolling region, use the following sequence.

NOTE: Power-up or reset causes the scrolling region to be the complete screen.

NOTE: The Pt and Pb characters represent variable numeric parameters. The parameters are decimal numbers transmitted to the terminal using ASCII characters. The *** character represents a variable numeric parameter within the octal representation of the sequence.

Name	Mnemonic	Sequence	Function
Set top and bottom Margins	DECSTBM	ESC [Pt ; Pb r 033 133 *** 073 *** 162	Selects top and bottom margins, defining the scrolling region. Pt is the line number of the first line in the scrolling region. Pb is the line number of the bottom line in the scrolling region. If Pt and Pb are not selected, the complete screen is used.

NOTE: The cursor moves to the home position specified by origin mode when the margins are selected.

For example, to set the top margin at line 6 and the bottom margin at line 20, use the following sequence.

ESC [6 ; 2 0 r
033 133 066 073 062 060 162

Cursor Positioning -- The cursor indicates the location of the active position. This is where the next character is displayed. The cursor position moves in the following manner:

- One column to the right when a character is displayed

- One line down when a line feed (LF, octal 012) is received (line feed/new line may cause the cursor to also move to the left margin)

- To the left margin when a carriage return (CR, octal 015) is received

- One column to the left when a backspace (BS, octal 010) is received

- To the next tab stop to the right or right margin if no tabs are set and a horizontal tab character (HT, octal 011) is received

- To the origin (home position) when the top and bottom margins of the scrolling region or the origin mode selection is changed

The cursor is also moved using the following sequences.

NOTE: The Pn character represents a variable numeric parameter. This parameter is a decimal number transmitted to the terminal using ASCII characters. The *** character represents a variable numeric parameter within the octal representation of the sequence.

Name	Mnemonic	Sequence				Function
Cursor Up	CUU	ESC 033	[133	Pn ***	A 101	Moves cursor up Pn lines in same column. Cursor stops at top margin.
Cursor Down	CUD	ESC 033	[133	Pn ***	B 102	Moves cursor down Pn lines in same column. Cursor stops at bottom margin.
Cursor Forward	CUF	ESC 033	[133	Pn ***	C 103	Moves cursor right Pn columns. Cursor stops at right margin.
Cursor Backward	CUB	ESC 033	[133	Pn ***	D 104	Moves cursor left Pn columns. Cursor stops at left margin.

NOTE: The Pl and Pc characters represent variable numeric parameters. The parameters are decimal numbers transmitted to the terminal using ASCII characters. The *** character represents a variable numeric parameter within the octal representation of the sequence.

Name	Mnemonic	Sequence	Function
Cursor Position	CUP	ESC [Pl ; Pc H 033 133 *** 073 *** 110	Moves cursor to line Pl, column Pc. If either Pl or Pc are not selected or selected as 0, cursor moves to first line or column, respectively. Numbering of lines and ability to move cursor beyond margins depends on origin mode selection.
Cursor Position (Home)	CUP	ESC [H 033 133 110	Moves cursor to home position. Home position depends on origin mode selection.

NOTE: The cursor position (CUP) sequence operates the same as the Horizontal and Vertical Position (HVP) sequence.

Name	Mnemonic	Sequence	Function
Horizontal and Vertical Position	HVP	ESC [Pl ; Pc f 033 133 *** 073 *** 146	Moves cursor to line Pl, column Pc. If either Pl or Pc are not selected or selected as 0, cursor moves to first line or column, respectively. Numbering of lines and ability to move cursor beyond margins depends on origin mode selection.

NOTE: The cursor position (CUP) sequence operates the same as the horizontal and vertical position (HVP) sequence.

Name	Mnemonic	Sequence	Function
Horizontal and Vertical Position (Home)	HVP	ESC [f 033 133 146	Moves cursor to home position. Home position depends on origin mode selection.
Index	IND	ESC D 033 104	Moves cursor down one line in the same column. If cursor is at the bottom margin a scroll up is performed.

Name	Mnemonic	Sequence	Function
Reverse Index	RI	ESC M 033 115	Moves cursor up one line in the same column. If cursor is at the top margin, a scroll down is performed.
Next Line	NEL	ESC E 033 105	Moves cursor to first position on next line. If cursor is at the bottom margin, a scroll up is performed.
Save Cursor	DECSC	ESC 7 033 067	Saves cursor position, character attribute (graphic rendition), and character set in the terminal. (See next sequence.)
Restore Cursor	DECRC	ESC 8 033 070	Restores previously saved cursor position, character attribute (graphic rendition), and character set. If none were saved cursor moves to origin (home position).

Tab Stops -- Tab stops are positions selected on the horizontal lines of the screen. The cursor advances (tabs) to the tab stops when the terminal receives a horizontal tab (HT, octal 011) control character. Each control character advances the cursor to the next tab stop. If no tab stops are set, the horizontal tab character moves the cursor to the right margin. To set and clear the tab stops, use the following sequences.

Name	Mnemonic	Sequence	Function
Horizontal Tabulation Set	HTS	ESC H 033 110	Sets one horizontal tab stop at the cursor position.
Tabulation Clear	TBC	ESC [g 033 133 147	Clears horizontal tab stop at the cursor position.

Name	Mnemonic	Sequence				Function
Tabulation Clear	TBC	ESC 033	[133	Ø 060	g 147	Clears horizontal tab stop at the cursor position.
Tabulation Clear	TBC	ESC 033	[133	3 063	g 147	Clears all horizontal tab stops.

Line Attributes -- Line attributes are display features that affect a complete display line. The cursor selects the line affected by the attribute. It stays in the same character position unless moved to the right of the right margin, in which case it moves to the right margin. To select line attributes, use the following sequences.

Name	Mnemonic	Sequence	Function
Double Height line	DECDHL	Top half: ESC # 3 033 043 063 Bottom half: ESC # 4 033 043 064	Causes the line with the cursor to become top or bottom half of a double-height and double-width line. Sequences must be used in pairs on adjacent lines. The same character must be displayed on both lines to form full characters. If the line is single-width and single-height, all characters to the right of the center of the screen are lost.
Single Width line	DECSWL	ESC # 5 033 043 065	Causes the line with the cursor to become single-width and single-height. This is the line attribute for all new lines on the screen.
Double Width line	DECDWL	ESC # 6 033 043 066	Causes the line with the cursor to become double-width and single-height. If the line is single-width and single-height, all characters to the right of the center of the screen are lost.

Erasing -- Erasing removes characters from the screen. When characters are erased from the screen, they are lost. When a complete line is erased by the erase in display (ED) sequence, the line attribute becomes single-height and single-width. If a line is erased using the erase in line (EL) sequence, the line attribute is not affected. Erasing does not change the number of columns per line. To erase characters from the screen, use the following sequences.

Name	Mnemonic	Sequence	Function
Erase In Line	EL	ESC [K 033 133 113	Erases from cursor to the end of the line, including the cursor position.
Erase In Line	EL	ESC [Ø K 033 133 Ø6Ø 113	Erases from cursor to the end of the line, including the cursor position.
Erase In Line	EL	ESC [1 K 033 133 Ø61 113	Erases from beginning of the line to the cursor, including the cursor position.
Erase In Line	EL	ESC [2 K 033 133 Ø62 113	Erases all of the line.
Erase In Display	ED	ESC [J 033 133 112	Erases from cursor to the end of the screen, including the cursor position.
Erase In Display	ED	ESC [Ø J 033 133 Ø6Ø 112	Erases from cursor to the end of the screen, including the cursor position.
Erase In Display	ED	ESC [1 J 033 133 Ø61 112	Erases from beginning of the screen to the cursor including the cursor position.
Erase In Display	ED	ESC [2 J 033 133 Ø62 112	Erases all of the display. All lines are erased, changed to single-width, and the cursor does not move.

Reports -- Reports are transmitted by the terminal in response to requests from the computer. Reports determine the type of terminal, the operational status of the terminal, and the cursor position. The report requests and responses are as follows.

Name	Mnemonic	Sequence	Function
Device Status Report	DSR	ESC [5 n 033 133 065 156	Computer requests a status report (using a DSR sequence).
Device Status Report	DSR	ESC [0 n 033 133 060 156	Response from terminal: Ready, no malfunctions detected.
Device Status Report	DSR	ESC [3 n 033 133 063 156	Response from terminal: Malfunction, soft error. Reset and retry.
Device Status Report	DSR	ESC [6 n 033 133 066 156	Computer requests a cursor position report from terminal (using a cursor position report sequence)
Cursor Position Report	CPR	ESC [Pl ; Pc R 033 133 *** 073 *** 122	Terminal reports the cursor position with the CPR sequence. Pl indicates the line and Pc indicates the column. The default condition with no parameters present, or parameters of 0, indicates that the cursor is at the home position. Numbering of lines depends on origin mode selection.
Device Attributes	DA	ESC [c 033 133 143	Computer requests the terminal to send a device attributes sequence to identify itself.

Name	Mnemonic	Sequence							Function
Device Attributes	DA	ESC 033	[133	Ø 060	c 143				The computer requests the terminal to send a device attributes sequence to identify itself.
Device Attributes	DA	ESC 033	[133	? 077	1 061	; 073	Ø 060	c 143	VT1Ø1 response to a DA request for a DA report.
Identify Terminal	DECID	ESC 033	Z 132						This sequence causes the same response as device attributes. This sequence may not be supported in future DIGITAL terminals. Therefore, any new software should use device attributes.

Reset -- Reset causes the terminal to perform the internal self-test, and uses the SET-UP selections in user permanent SET-UP feature memory. To reset the terminal, use the following sequence.

NOTE: After a reset, keypad numeric mode is selected, cursor key mode and origin mode are reset, and the top and bottom margins (scrolling region) are selected for the complete screen.

Name	Mnemonic	Sequence		Function
Reset to Initial State	RIS	ESC 033	c 143	Resets the terminal to its initial state.

Tests and Adjustments -- The terminal has many tests used to verify that it is operating properly. Also, there is a pattern for screen alignment. All tests and adjustments are usually performed by a service representative. The tests provide error codes on the keyboard indicators or screen. (Refer to Chapter 8 for the meanings of displayed error codes.) All DECTST sequences cause the terminal to disconnect from the communication line and erase both the input and keyboard character buffers. To select terminal self-test, use the following sequences.

Name	Mnemonic	Sequence	Function
Screen Alignment Display	DECALN	ESC # 8 033 043 070	This command fills the complete screen area with uppercase Es for screen focus and alignment. It is used by DIGITAL manufacturing and Field Service personnel.
Invoke Confidence Test	DECTST	ESC [2 ; 1 y 033 133 062 073 061 171	Power-up test. Terminal resets and performs power-up test.
Invoke Confidence Test	DECTST	ESC [2 ; 2 y 033 133 062 073 062 171	Data loopback test. Uses test connector.
Invoke Confidence Test	DECTST	ESC [2 ; 9 y 033 133 062 073 071 171	Repeats power-up test continuously until failure or power off.
Invoke Confidence Test	DECTST	ESC [2 ; 1 0 y 033 133 062 073 061 060 171	Repeats data loopback test continuously until failure or power off. Uses test connector.

Keyboard Indicators -- The keyboard has seven indicators. The ON LINE and OFF LINE indicators show the communication status of the terminal. If the keyboard is connected and power is on, one of these two indicators is on.

The KBD LOCKED indicator is on to show the keyboard locked condition. In this condition, the keyboard transmit buffer is full and cannot accept characters from the keyboard.

Indicators L1 through L4 are programmable. They can be assigned particular meanings for specific applications. To turn the indicators on or off, use the following sequences.

NOTE: The Ps character represents a variable parameter selected from a list of parameters. When using more than one parameter in a sequence, the parameters are separated by a semicolon (octal 073). The *** character represents a variable numeric parameter within the octal representation of the sequence.

Name	Mnemonic	Sequence								Function
Load LEDs	DECLL	ESC 033	[133	Ps ***	; 073	Ps...Ps *** ***	q 161			Loads the four programmable keyboard indicators (LEDs) according to the following parameters:

Ps   Function

Ø   All are off
1   L1 is on
2   L2 is on
3   L3 is on
4   L4 is on.

Name	Mnemonic	Sequence			Function
Load LEDs	DECLL	ESC 033	[133	Ø q 060 161	Clears indicators L1--L4.
Load LEDs	DECLL	ESC 033	[133	1 q 061 161	L1 is on.
Load LEDs	DECLL	ESC 033	[133	2 q 062 161	L2 is on.
Load LEDs	DECLL	ESC 033	[133	3 q 063 161	L3 is on.
Load LEDs	DECLL	ESC 033	[133	4 q 064 161	L4 is on.

VT52 Compatible Sequences

The VT52 compatible sequences meet private DIGITAL standards. Therefore, the VT1Ø1 terminal can use existing software designed for previous terminals (such as the VT52). VT52 compatibility is selected from the keyboard in SET-UP (refer to Chapter 2) or by the computer using a sequence. (Refer to the ANSI compatible sequences described in this chapter.)

SET-UP Feature and Mode Selection -- While in VT52 mode, most terminal features cannot be selected by using sequences. However, the following three modes can be selected using sequences: ANSI mode, alternate keypad mode on, and alternate keypad mode off (numeric mode selected).

ANSI/VT52 Compatibility -- The VT1Ø1 terminal is compatible with both ANSI and private DIGITAL standards. Therefore, new software which meets the ANSI standards and existing software designed for previous terminals (such as the VT52) can be used. The ANSI compatible sequences meet standards X3.64-1979 and X3.41-1974. To select ANSI compatiblity, use the following sequence.

Name	Mnemonic	Sequence	Function
ANSI mode	DECANM	ESC < Ø33 Ø74	All sequences are interpreted according to ANSI standards X3.64-1979 and X3.41-1974. The VT52 escape sequences described in this section are not recognized.

Auxiliary Keypad Character Selection -- The auxiliary keypad can generate either numeric characters or control functions. To generate control functions, you must select alternate keypad mode. To generate numeric characters, you must remove the terminal from alternate keypad mode. Table 4-10 lists the characters generated by the keypad keys. To enter and exit alternate keypad mode, use the following sequences.

Table 4-10   VT52 Auxiliary Keypad Codes

Key	Numeric Keypad Mode	Alternate Keypad Mode
Ø	Ø Ø6Ø	ESC ? p Ø33 Ø77 16Ø
1	1 Ø61	ESC ? q Ø33 Ø77 161
2	2 Ø62	ESC ? r Ø33 Ø77 162
3	3 Ø63	ESC ? s Ø33 Ø77 163
4	4 Ø64	ESC ? t Ø33 Ø77 164
5	5 Ø65	ESC ? u Ø33 Ø77 165
6	6 Ø66	ESC ? v Ø33 Ø77 166
7	7 Ø67	ESC ? w Ø33 Ø77 167
8	8 Ø7Ø	ESC ? x Ø33 Ø77 17Ø

Table 4-10 VT52 Auxiliary Keypad Codes (Cont)

Key	Numeric Keypad Mode			Alternate Keypad Mode		
9	9 071			ESC 033	? 077	y 171
-(minus)	-(minus) 055			ESC 033	? 077	m 155
,(comma)	,(comma) 054			ESC 033	? 077	l 154
.(period)	.(period) 056			ESC 033	? 077	n 156
ENTER*	CR 015 or	CR 015	LF 012	ESC 033	? 077	M 115
PF1	ESC 033	P 120		ESC 033	P 120	
PF2	ESC 033	Q 121		ESC 033	Q 121	
PF3	ESC 033	R 122		ESC 033	R 122	
PF4	ESC 033	S 123		ESC 033	S 123	

* When numeric keypad mode is selected (alternate keypad mode off), **ENTER** generates the same characters as **RETURN**. The RETURN character code can be changed by the line feed/new line feature. When off, this feature causes the key to generate a single control character (CR, octal 015). When on, this feature causes the key to generate two characters (CR, octal 015, and LF, octal 012).

NOTE: Power-up or reset causes the terminal to exit alternate keypad mode.

Name	Sequence	Function
Enter Alternate Keypad mode	ESC = 033 075	The auxiliary keypad keys generate sequences by the applications program.

Name	Sequence	Function
Exit Alternate Keypad mode (numeric keypad mode)	ESC > 033 076	The auxiliary keypad generate characters corresponding to the numeric, comma, period, and minus sign keys on the main keyboard.

Character Sets and Selection -- In VT52 mode, the terminal can use either character set selected by the US/UK character set SET-UP B feature or the special character and line drawing character set. Figures 4-2 and 4-3 show the US and UK character sets. Figure 4-4 shows the special character and line drawing character set. Table 4-11 compares the VT101 special character and line drawing character set to the VT52 graphics mode (character set). To select the character set, use the following sequences.

Name	Sequence	Function
Enter Graphics mode	ESC F 033 106	Selects the special character and line drawing character set.
Exit Graphics mode	ESC G 033 107	Selects the character set selected in SET-UP B.

NOTE: The graphics mode characters in the VT101 are different from those in the VT52.

Cursor Positioning -- The cursor indicates the location of the active position. This is where the next character is displayed. The VT52 mode margins are always the top and bottom of the display screen. The cursor moves as follows:

- One column to the right when a character is displayed

- One line down when a line feed is received (line feed/new line may also move the cursor to the left margin),

- To the left margin when a carriage return is received,

- One column to the left when a backspace is received,

- To the next tab stop to the right, or right margin, if no tabs are set and a horizontal tab character (HT, octal 011) is received.

Table 4-11 Special Character and Line Drawing Set and Graphics
Mode Comparison

Octal Code	US/UK Set		Special Character and Line Drawing Set	VT52 In Graphics Mode*
137			Blank	Blank
140	∖	<>	Diamond	Reserved
141	a		Checkerboard (error indicator)	Solid rectangle
142	b	ht	Horizontal tab	¹⁄
143	c	ff	Form feed	³⁄
144	d	cr	Carriage return	⁵⁄
145	e	lf	Line feed	⁷⁄
146	f	°	Degree symbol	Degrees
147	g	+-	Plus/minus	Plus or minus
150	h	nl	New line	Right arrow
151	i	vt	Vertical tab	Ellipsis (dots)
152	j	_|	Lower-right corner	Divide by
153	k	~|	Upper-right corner	Down arrow
154	l	|~	Upper-left corner	Bar at scan 0
155	m	L	Lower-left corner	Bar at scan 1
156	n	+	Crossing lines	Bar at scan 2
157	o	_	Horizontal line - scan 1	Bar at scan 3
160	p	_	Horizontal line - scan 3	Bar at scan 4
161	q	_	Horizontal line - scan 5	Bar at scan 5
162	r	_	Horizontal line - scan 7	Bar at scan 6
163	s	_	Horizontal line - scan 9	Bar at scan 7
164	t	T-	Left "T"	Subscript 0
165	u	-|	Right "T"	Subscript 1
166	v	_|_	Bottom "T"	Subscript 2
167	w	T	Top "T"	Subscript 3
170	x			Vertical bar	Subscript 4
171	y	<=	Less than or equal to	Subscript 5
172	z	=>	Greater than or equal to	Subscript 6
173	{	i-i	Pi	Subscript 7
174			/=	Not equal to	Subscript 8
175	}	L-	UK pound sign	Subscript 9
176	~	.	Centered dot	Paragraph

* Not available in VT101.

4-38

The following sequences also move the cursor.

Name	Sequence	Function
Cursor Up	ESC A Ø33 1Ø1	Moves the cursor up one line in the same column. Cursor stops at the top of the screen.
Cursor Down	ESC B Ø33 1Ø2	Moves the cursor down line in the same column. Cursor stops at the bottom of the screen.
Cursor Right	ESC C Ø33 1Ø3	Moves the cursor one column to the right. Cursor stops at the right margin.
Cursor Left	ESC D Ø33 1Ø4	Moves the cursor one column to the left. Cursor stops at the left margin.
Cursor to Home	ESC H Ø33 11Ø	Moves the cursor to the home position at line 1, column 1.
Direct Cursor Address	ESC Y line column Ø33 131 *** ***	Moves the cursor to the specified line and column. The line and column numbers are sent as the ASCII characters whose codes are the octal number plus octal Ø37. For example, line 1 column 8 parameters are octal Ø4Ø (first line) and octal Ø5Ø (eighth column).
Reverse Line Feed	ESC I Ø33 111	Moves the cursor up one line in the same column. If the cursor is at the top margin, a scroll down is performed.

Erasing -- Erasing removes characters from the screen. When characters are erased, they are lost. To erase characters from the screen, use the following sequences.

Name	Sequence	Function
Erase to end of line	ESC K Ø33 113	Erases all characters from cursor to the end of the current line, including the cursor position. The cursor does not move.
Erase to end of screen	ESC J Ø33 112	Erases all characters from cursor to the end of the screen, including the cursor position. The cursor does not move.

Reports -- Reports are transmitted by the terminal in response to a request from the computer. The terminal generates only one report in VT52 mode. The following sequences are the request for a report and the response to the report request.

Name	Sequence	Function
Identify	ESC Z Ø33 132	Causes the terminal to send an identify sequence to the computer.
Identify	ESC / Z Ø33 Ø57 132	VT1Ø1 response to Identify.

GENERAL

This chapter describes how the VT1Ø1 terminal communicates with a computer using the standard Electronic Industry Association (EIA) interface. Descriptions of the communication features and methods used to prevent input buffer overflows of the terminal are also provided. The Break signal is defined in this chapter.

NOTE: The 2Ø mA current loop interface option (VT1XX-CA) is described in Chapter 7.

CONNECTING TO THE COMPUTER

The VT1Ø1 terminal is connected to a computer directly or through a common carrier facility (telephone line) (Figure 5-1). In both cases, either the EIA interface provided with the terminal or the 2Ø mA current loop interface option (VT1XX-CA) is used.

A modem or acoustic coupler is needed to connect the terminal to the computer through a telephone. The modem or acoustic coupler changes serial characters transmitted between the terminal and computer into signals that can be transmitted over the telephone line. Several types of modems can be used with the VT1Ø1 terminal. However, the modem used by the terminal must be compatible with the modem used by the computer.

SERIAL CHARACTER FORMAT

The VT1Ø1 terminal communicates using serial characters. Serial characters are transmitted using a start bit, seven or eight data bits, an optional parity bit, and one or two stop bits. Figure 5-2 shows an example of the serial character format used by the terminal.

The number of data bits per character and the parity are selected using the data/parity bits SET-UP B feature. If 8-bit characters are selected, the last data bit is forced to the space (Ø) condition, and the eighth data bit is ignored when receiving characters. The data bits are transmitted with the least significant bit first. (Refer to ANSI X3.15-1976 for details on the serial character format.)

COMPUTER

VT101 TERMINAL

COMPUTER

VT101 TERMINAL
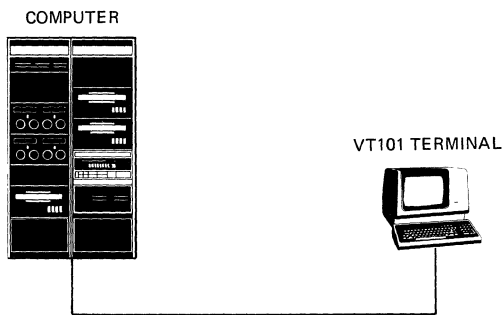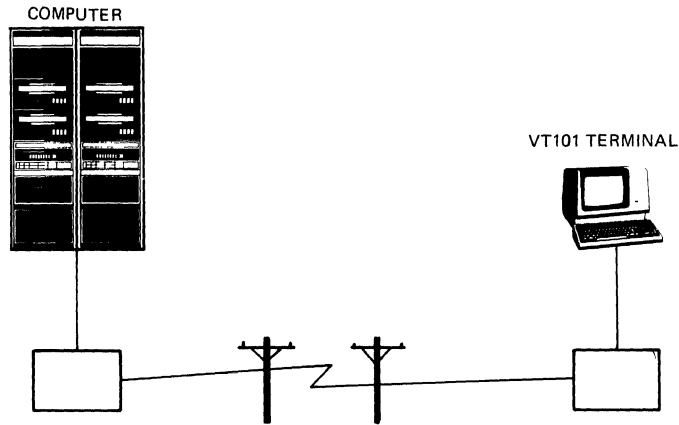
MA-7776

Figure 5-1   Connecting to the Computer

IDLE
STATE OF
LINE

7 OR 8
DATA BITS

START BIT OF
NEW CHARACTER

1 OR 2
BITS

"SPACE" +

00
LSB | 01 | 02 | 03 | 04 | 05 | 06 | 07
MSB

STOP | STOP
1 | 2

"MARK" –

START
BIT

ONE BIT
TIME =
ONE/
BAUD RATE

WHEN
8-BIT
CHARACTERS
ARE USED
8th BIT=0

OPTIONAL
PARITY
BIT

RETURN TO IDLE
STATE OF LINE
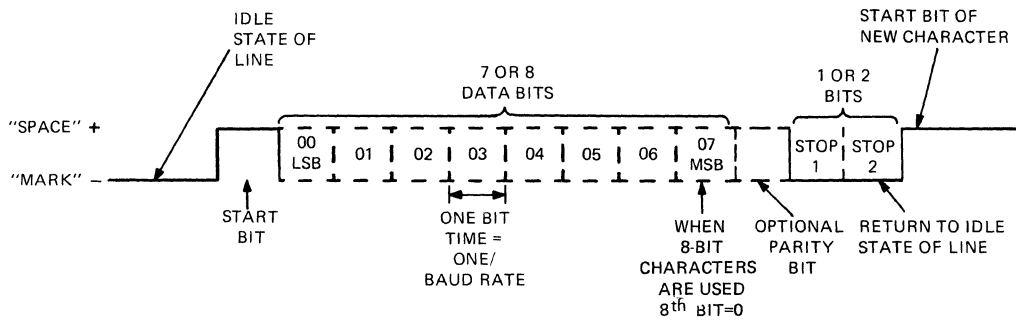
MR 1279
MA-7815

Figure 5-2   Serial Character Format

The parity bit detects character transmission errors of both transmitted and received characters. The data/parity bits SET-UP B feature selects the type of parity bit used when transmitting and receiving characters. If parity is not selected, the parity bit is not transmitted in the serial character and is ignored on received characters.

The receive parity SET-UP B feature determines whether the parity of received characters is checked or ignored. However, received character parity can only be checked for odd or even parity; mark and space parity cannot be checked on received characters.

The number of stop bits (one or two) in the serial character is determined by the transmit and receive speed SET-UP B features.

BREAK SIGNAL
A Break signal can be transmitted by the terminal. The Break signal is a transmitted space condition of 0.275 seconds ± 10 percent. The computer response to the Break signal depends on the computer and software used. A Long Break Disconnect is a transmitted space condition of 3.5 seconds ± 10 percent, and then the Data Terminal Ready interface signal is turned off.

NOTE: When using properly configured modems, the Long Break Disconnect causes the modem(s) to perform a communication line disconnect.

FULL-DUPLEX COMMUNICATION
The VT101 terminal uses full-duplex data leads only (no EIA modem control). Full-duplex communication allows the terminal to transmit and receive characters at the same time. Data leads only means that a minimum of EIA signals are used to connect the terminal to the computer or modem.

Connection Conditions
When the terminal is on-line, and a disconnect is not being performed, the terminal is always assumed to be connected to the computer. Therefore, the terminal transmits and receives data regardless of the condition of the EIA signals.

Disconnect Conditions
The terminal performs a disconnect by turning off the Data Terminal Ready signal. The transfer of characters is not performed during a disconnect. A disconnect is performed when the terminal is placed off-line, a Long Break Disconnect is performed, or the received line signal detector is turned off by loss of carrier detect from the modem.

EIA Interface
The VT101 terminal communication interface is a DB-25 (EIA RS-232-C type) male connector mounted on the back of the terminal (Figure 5-3). This connector meets EIA standard RS-423, EIA standard RS-232-C, and International Telegraph and Telephone Consultive Committee (CCITT) recommendation V.28. When connecting
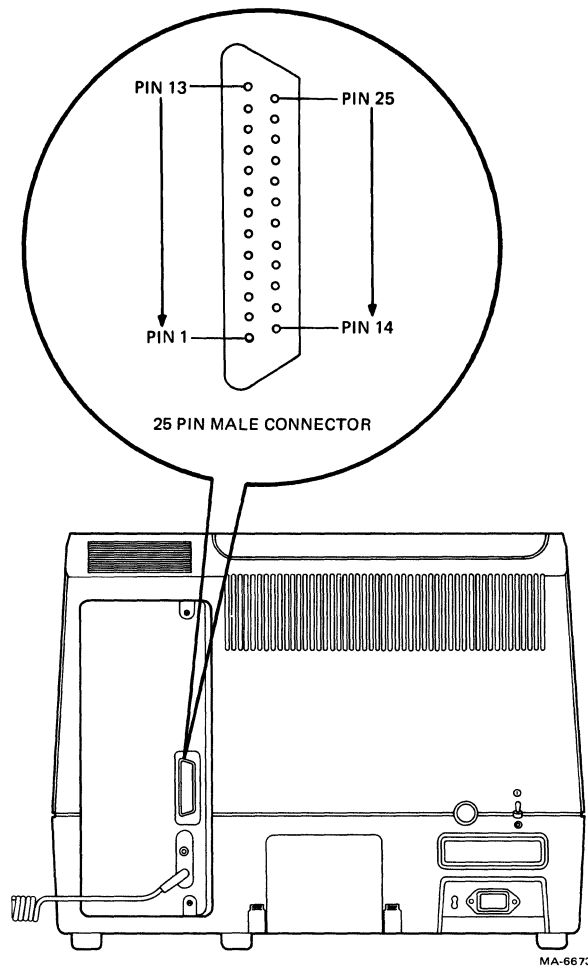
Figure 5-3   EIA Connector and Pin Locations

to a device which meets EIA standard RS-423, the terminal can
operate at speeds up to 19200 baud using communication cables up
to 61 m (200 ft) long. When connecting to a device which meets EIA
standard RS-232-C, the terminal can operate at speeds up to 19200
baud, using communication cables up to 15.2 m (50 ft) long. Table
5-1 describes the EIA signals. Signals not described are not used
by the terminal.

COMMUNICATION CABLES
Communication cables for both the EIA and 20 mA current loop
interfaces of the terminal can be ordered from the DIGITAL
Accessories and Supplies Group. Part numbers and ordering
information for these cables is supplied in Chapter 9. Table 5-2
describes each communication cable used and Figure 5-4 shows
connection examples for each cable.

Table 5-1   EIA Connector Signals

Pin	Name	Mnemonic	CCITT/EIA Designation	Description
1	Protective Ground	PGND	101/AA	Connected to the VT101 chassis and to external ground through the ac power cord. Use of this conductor for reference potential purposes is not allowed.
2	Transmitted Data	TXD	103/BA	From VT101. The VT101 transmits serial characters and Break signals on this circuit. This conductor is in the mark state when characters or Break signals are not being transmitted.
3	Received Data	RXD	104/BB	To VT101. The VT101 receives serial characters from the computer.
4	Request to Send	RTS	105/CA	From VT101. This signal is on whenever the VT101 is on. The signal turns off during a reset.
6	Data Set Ready	DSR	107/CC	To VT101. Ignored at all times.
7	Signal Ground	SGND	102/AB	This conductor is the common ground reference potential for all connector signals. Also, it is connected to the VT101 chassis.
8	Receive Line Signal Detector	RLSD	109/CF	To VT101. Also called Carrier Detect, the condition is not needed to transmit data. However, when this signal is turned

Table 5-1   EIA Connector Signals (Cont)

Pin	Name	Mnemonic	CCITT/EIA Designation	Description
				off by loss of carrier detect from the modem, the VT101 performs a disconnect.
12	Speed Indicator	SPDI	112/CI	To VT101. Also called Secondary Carrier Detect, this signal is ignored at all times.
20	Data Terminal Ready	DTR	108.2/CD	From VT101. This signal is on except when the following conditions exist: ^ VT101 is not on ^ VT101 is off-line ^ During a reset ^ 3.5 seconds during a Long Break Disconnect.
23	Speed Select	SPDSEL	111/CH	From VT101. Also called Secondary Request to Send, this signal is off at all times.

INPUT BUFFER OVERFLOW PREVENTION
When the terminal receives a character (other than the NUL and DEL characters), it is placed in a 128-character input buffer. The input buffer holds the received character until processed. When processed, the character is removed from the input buffer.

If characters are received in the input buffer faster than they are processed, the input buffer begins to fill with characters. When it is full, all newly received characters are lost and the substitute character (※) is displayed. There are three methods of input buffer overflow prevention:

1.   XON/XOFF control characters
2.   Fill characters
3.   Low speed operation.

Table 5-2   Interface Cables

Number	Length	Connector Types	Function
BC22A-10	10 ft	RS-232 (female) to RS-232 (female)	Null modem. Direct connection between VT101 and computer (6-conductor cable).
BC22A-25	25 ft	RS-232 (female) to RS-232 (female)	Null modem. Direct connection between VT101 and computer (6-conductor cable).
BC22B-10	10 ft	RS-232 (male) to RS-232 (female)	Extension. Connects VT101 to a modem (14-conductor cable).
BC22B-25	25 ft	RS-232 (male) to RS-232 (female)	Extension. Connects VT101 to a modem (14-conductor cable).
BC03M-xx	Variable	RS-232 (female) to RS-232 (female)	Null modem. Direct connection between VT101 and computer.
BC05D-xx	Variable	RS-232 (male) To RS-232 (female)	Extension. Connects VT101 to a modem.
BC05F-xx	Variable	Mate-N-Lok (male) to Mate-N-Lok (male)	20 mA. Direct connection between VT101 with a 20 mA option installed and a computer. (Supplied with 20 mA option.)
BC05X-xx	Variable	Mate-N-Lok (male) to Mate-N-Lok (male)	20 mA extension cable.
30-10958-02	EIA: 18 in. 20 mA: 8 ft	RS-232 (male) to RS-232 (female) and 20 mA (male)	Connection between DF01-A acoustic coupler and VT101 EIA or 20 mA.
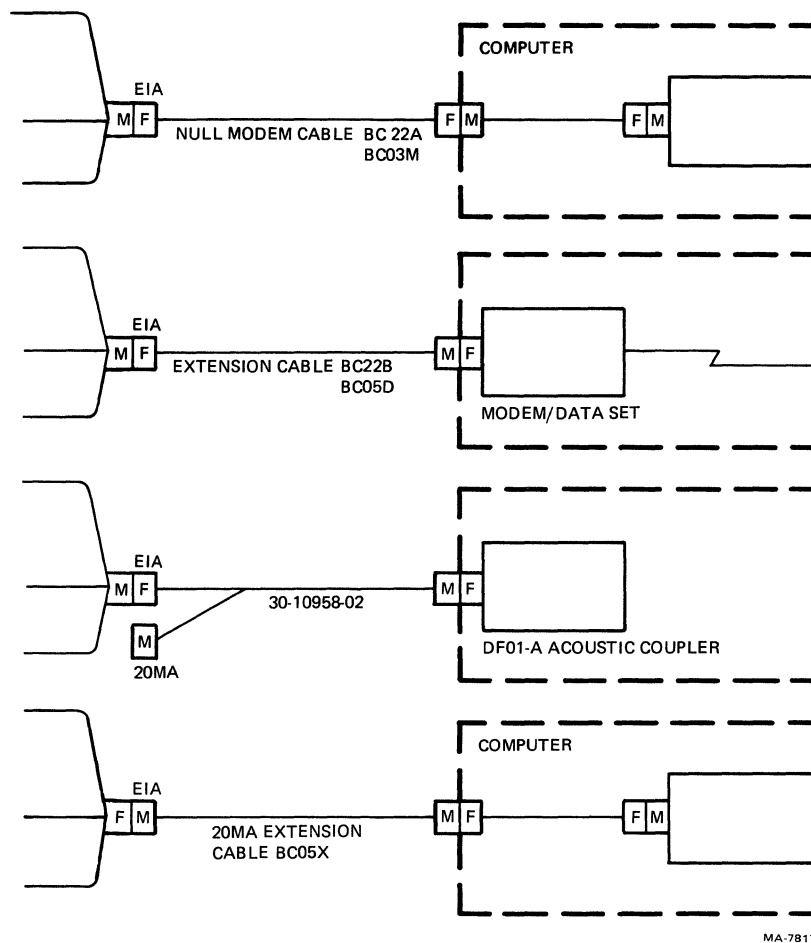
Figure 5-4   Cable Summary

XON/XOFF Control Characters

Input buffer overflows can be prevented by using the XON and XOFF control characters. This is the recommended method. When using the auto XON/XOFF SET-UP B feature, the XON and XOFF control characters indicate the number of characters in the input buffer. When the 128-character input buffer of the terminal contains 32 characters, the terminal transmits XOFF (DC3, octal 023). The computer should stop transmitting characters.

The terminal continues to remove characters from the input buffer. When the input buffer contains 16 characters, the terminal transmits XON (DC1, octal 021), requesting the computer to continue transmission.

If the computer fails to respond to the XOFF character transmitted by the terminal, the input buffer continues to fill. The terminal transmits a second XOFF when the input buffer contains 112 characters. This second XOFF is a last request to the computer to stop transmitting characters.

5-8

To determine how fast the computer must respond to the first XOFF character in order to avoid input buffer overflow, use the following formulas:

No. of characters to overflow = 96 - [3 X (receiver speed/ transmit speed)]

Time to respond to XOFF = No. of characters to overflow X (bits per character + parity bit + number of stop bits + 1)/receiver speed.

Example 1 -- The terminal is transmitting 8-bit characters with no parity at 1200 baud and receiving at 1200 baud. After the terminal transmits the first XOFF, the computer must stop transmitting within 0.775 seconds or the input buffer will overflow.

No. of characters to overflow = 96 - [3 X 1200/1200)] = 93 characters

Time to respond to XOFF = 93 X (8+0+1+1)/1200 = 0.775 seconds

Example 2 -- The terminal is transmitting 7-bit characters with parity at 300 baud and receiving at 300 baud. After the terminal transmits the first XOFF, the computer must stop transmitting within 3.1 seconds or the input buffer will overflow.

No. of characters to overflow = 96 - [3 X 300/300]= 93 characters

Time to respond to XOFF = 93 X (7+1+1+1)/300 = 3.1 seconds

NOTE: If the input buffer overflows, received characters are ignored and the substitute character (※) is displayed.

Fill Characters
The computer can prevent input buffer overflows using fill characters during communication. The computer can use the null character (octal 000) as a fill character in order to prevent input buffer overflows. When received by the terminal, the null character is not placed in the input buffer. Since the null character is not processed, the terminal can process characters already received while null characters are being transmitted.

Fill characters must be transmitted to the terminal after each control function or display character. Therefore, the terminal can process a control function or character before receiving more characters. The number of fill characters transmitted by the computer after a control function or character depends on the control function and the receive speed of the terminal. Table 5-3 lists the number of fill characters used when transmitting to the terminal. If no number is listed in a column of Table 5-3, no fill characters are needed.

Table 5-3 VT101 Fill Characters

Baud Rate	Parameter IND,LF, NEL,RI (smooth scroll)	DECCOLM	DECALN	ED (132 col)	ED (80 col)	IND,LF, NEL,RI (jump scroll)	EL (132 col)	EL (80 col)	DECINLM	All others and DECTST except RIS
19200	384	243	243	132	97	60	5	4	2	2
9600	192	122	122	66	48	30	2	2	1	1
4800	96	61	61	33	24	15	1	1	1	0
3600	72	46	46	25	18	12	1	0	0	0
2400	48	30	30	16	12	7	1	0	0	0
2000	40	25	25	14	10	6	0	0	0	0
1800	36	23	23	12	9	6	0	0	0	0
1200	24	15	15	8	6	4	0	0	0	0
600	12	8	8	4	3	2	0	0	0	0
300	6	4	4	2	2	1	0	0	0	0
200	4	3	3	1	1	1	0	0	0	0
150	3	2	2	1	1	0	0	0	0	0
134.5	3	2	2	1	1	0	0	0	0	0
110	2	1	1	1	1	0	0	0	0	0
75	2	1	1	1	0	0	0	0	0	0
50	1	1	1	0	0	0	0	0	0	0

Low Speed Operation

Input buffer overflows can be prevented if the terminal processes characters at a speed faster than the characters are received. Therefore, the terminal can remove characters from the input buffer faster than the characters can be received from the computer. When the terminal uses a low receive speed (baud rate) to prevent input buffer overflows, use the following rules:

* The computer never sends the ESC code to the terminal.

* The receive speed of the terminal is 4800 baud or less.

* The smooth scroll feature cannot be used.

EFFECTS OF RESET AND TESTS

Two control sequences, reset and invoke confidence test, initialize the terminal and erase the input buffer. Characters received while these two functions are processed are lost. The computer may act in one of two ways.

1. If the auto XON/XOFF feature is used, immediately after sending the reset or invoke confidence test sequences, the computer may assume an XOFF from terminal. The computer sends no more characters until it receives XON. The terminal transmits XON only after it completes the specified function.

2. If the first method cannot be used, a delay of no less than 10 seconds may be used to allow the terminal to complete the function. This method, however, does not guarantee against loss of characters when a function has detected an error.

NOTE: The reset and invoke confidence test sequences may cause the terminal to disconnect from the communication line.

KEYBOARD TRANSMIT BUFFER

The keyboard transmit buffer holds characters generated by the terminal before they are transmitted to the computer. The computer can use the XON (DC1, octal 021) and XOFF (DC3, octal 023) characters to control the transmission of characters from the terminal.

NOTE: Only the XON and XOFF characters can be used to control the transmission of characters from the terminal to the computer. The keyboard buffer responds to these characters regardless of the auto XON/XOFF SET-UP B feature selection.

Receipt of XOFF stops the terminal from transmitting any characters except XOFF and XON. Keystrokes are stored in a keyboard buffer. If the keyboard buffer overflows, the KBD LOCKED indicator is on and keyclicks stop (if the keyclick SET-UP B feature is on).

When XON is received, the transmission of characters continues. Also, entering and exiting SET-UP turns off the KBD LOCKED indicator and allows the terminal to transmit characters. However, characters transmitted after entering and exiting SET-UP may be lost if the computer is not ready to receive characters. When the keyboard buffer is empty, the KBD LOCKED indicator is turned off and keyclicks continue (if the keyclick SET-UP B feature is on).

GENERAL
This chapter contains the information needed to unpack, pack, and install the VT101 terminal. The installation procedure describes how to select the proper input voltage selection and fuse for either 115 Vac or 220--240 Vac operation. A step-by-step power-up and checkout procedure is provided.

SITE CONSIDERATIONS
The VT101 terminal consists of a video monitor and detachable keyboard. Their dimensions are shown in Figure 6-1. Table 6-1 lists the environmental and power specifications of the terminal.

NOTE: When installing the terminal, make sure that all power and signal cables are free from any stress, sharp bends, or obstructions. Also, be sure to provide access to the monitor controls on the back of the terminal.

Do not block the air flow around the terminal. Several ventilation openings prevent the terminal from overheating. Do not block these openings by placing objects on top of or under the terminal. Also, do not allow liquids, coins, paper clips, and other objects to enter these ventilation openings. These objects may damage the terminal. For this reason, do not put drinks or metal objects on the top of terminal.

The terminal can be placed on a desk or tabletop. However, people usually prefer the keyboard at standard typewriter-table height rather than desk height. Terminal tables and stands are available from the DIGITAL Accessories and Supplies Group. (Refer to Chapter 9 for more information on accessories.)

Position the terminal so that it avoids reflected light. The terminal should be facing away from light sources that reflect off the screen. However, if reflected light is a problem, nonreflective and antiglare screens are available from the DIGITAL Accessories and Supplies Group. Also, static mats are available for installations with static electricity problems.

36.8 CM
(14 1/2 IN)

8.9 CM
(3 1/2 IN)

4.8 CM
(1 7/8 IN)

.11 1 CM
(4 3/8 IN)

20 32 CM (8 IN)

24.5 CM (9 5/8 IN.)

30.5 CM (12 IN.)

36.2 CM (14 1/4 IN)

51.4 ·CM (20 1/4 IN.*)

41.3 CM (16 1/4 IN)

45 7 CM (18 IN)
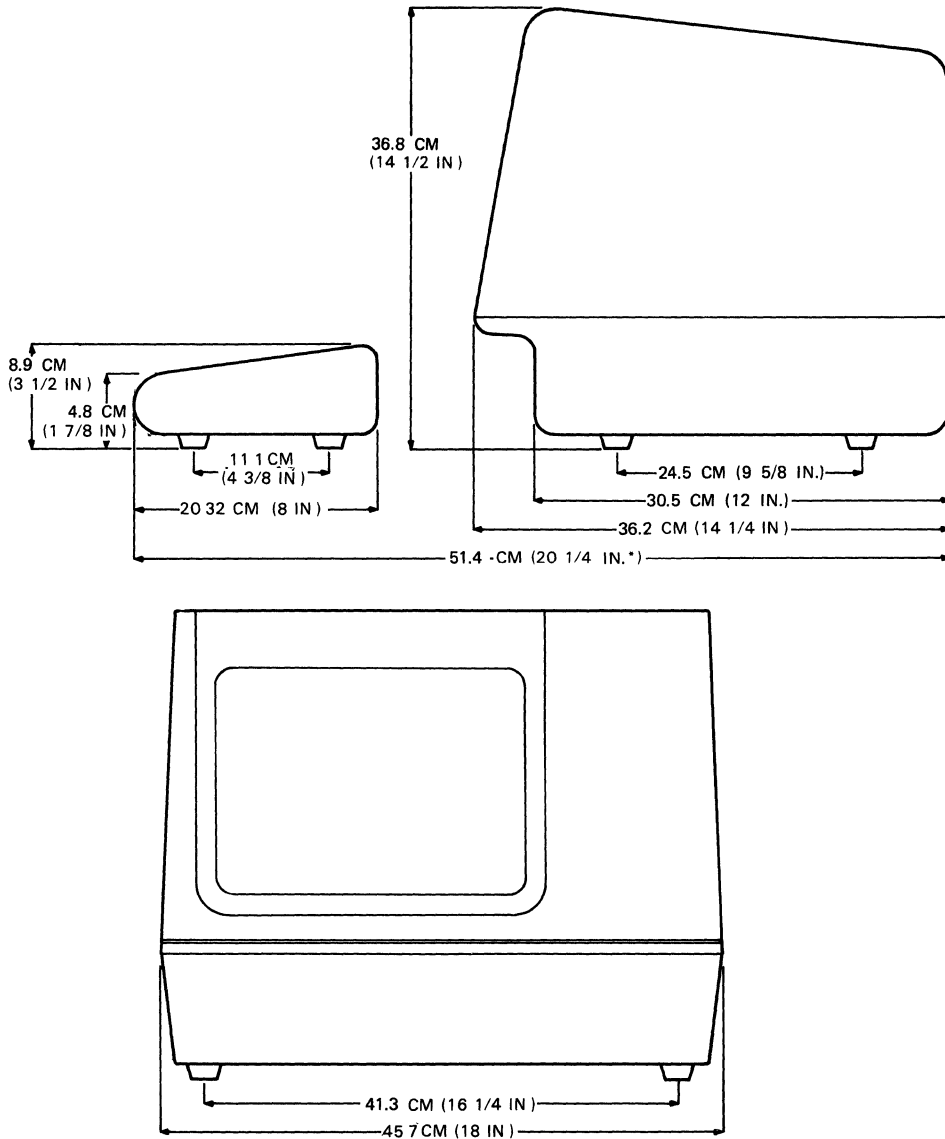
*MEASUREMENT TAKEN WITH THE KEYBOARD PLACED FLUSH TO FRONT OF TERMINAL UNDER UNDERCUT

MA-1991

Figure 6-1   VT1Ø1 Terminal Dimensions

UNPACKING AND INSPECTION PROCEDURE

The VT1Ø1 terminal is packed in a reinforced carton containing the following items:

    Monitor
    Keyboard
    AC power cord(s)
    SET-UP label
    User Guide
    Programming Reference Card.

Table 6-1   Site Considerations

Temperature	10° C to 40° C (50° F to 104° F)
Relative humidity	10% to 90% with a maximum wet bulb temperature of 28° C (82° F) and a maximum dew point of 2° C (36° F) noncondensing
Input voltage	90--128 Vac with a 1.25 fuse (PN 9000020-01) 180--256 Vac with a 0.75 slow blow fuse (PN 12112337-00) (switch-selectable)
Power consumption	70 W
Power receptacle	Nonswitched, grounded
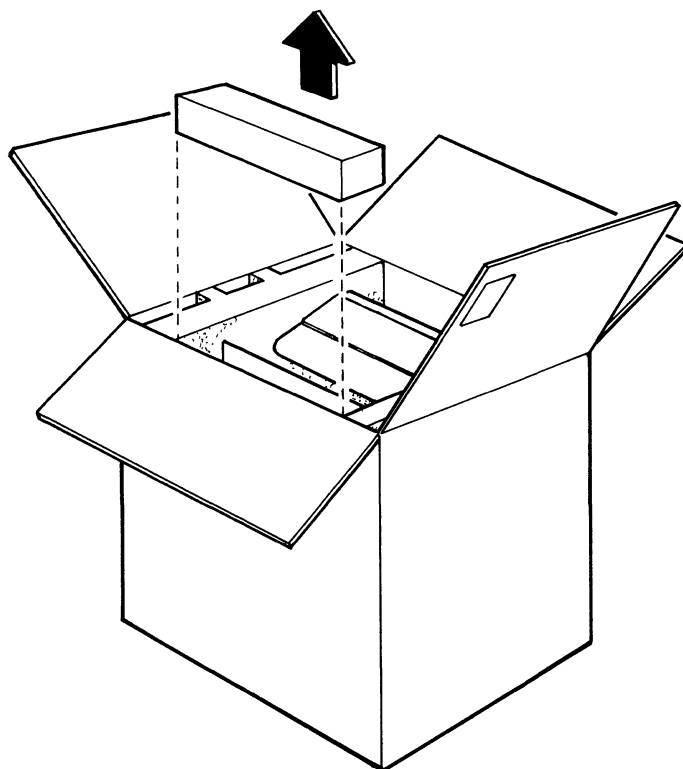
MA-7728

Figure 6-2   Terminal Packing

Figure 6-2 shows the packaging used with the VT101 terminal. To unpack the terminal from the shipping carton, perform the following procedure.

1. Cut the carton sealing tape and open the carton flaps.

2. Lift the power cord carton (if installed).

3. Lift the terminal out of the carton using the handles provided in the packing material. Place the terminal and packing material on the left side (when facing the front of the terminal) on a flat work surface.

4. Remove the packing material on the right side.

5. Remove the keyboard cover and keyboard and then the monitor from the remaining packing material.

6. Remove the plastic bags covering the monitor and keyboard.

7. Inspect the terminal for damage.

    NOTE: Notify the carrier and your local DIGITAL sales office of any damage.

8. Install the terminal using the installation procedure given in this chapter.

PACKING PROCEDURE
When packing the VT101 terminal for reshipment, perform the following procedure. (Refer to Figure 6-3 for switch and cable locations.)

1. Turn the power switch OFF.

2. Disconnect all cables at the back of the terminal.

3. Place the packing material of the left side (when facing the front of the terminal) on a flat work surface with the cutouts facing up. Place the monitor into the large cutout (Figure 6-2).

4. Route the keyboard cable behind and to the left side of the keyboard. Lay the connector in the small cutout and then place the keyboard into the small cutout.

5. Place the packing material of the right side over the monitor and keyboard.

6. Put the packaged terminal into the shipping carton. Fold the carton flaps and tape the carton closed with sealing tape.
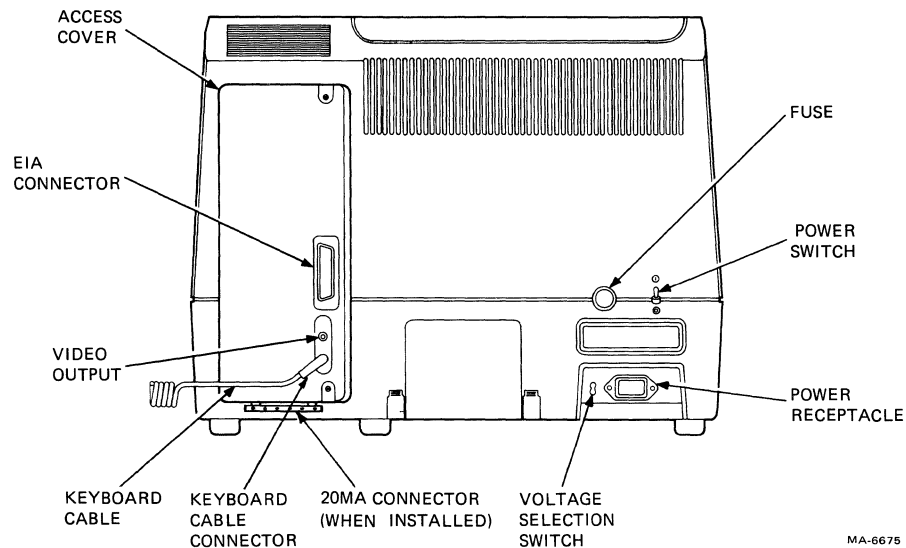
Figure 6-3   Monitor Controls and Connector Locations

INSTALLATION PROCEDURE

The VT101 terminal can be installed using a 3 mm (1/8 in) blade screwdriver. More tools may be necessary when installing any accessories or options. To install the VT101 terminal, perform the following procedure. (Refer to Figure 6-3 for switch and cable locations).

1. Perform the unpacking and inspection procedure described in this chapter.

2. Check the terminal for the proper voltage range selection. The terminal can operate with either 115 Vac or 220--240 Vac input power.

    CAUTION: Failure to select the proper voltage range will damage the terminal.

    A label over the power receptacle indicates the factory selected input voltage range. Check this label, the voltage selection switch, and fuse in order to be sure that the voltage range of the terminal is the same as your local ac power source. The procedures below describe how to select the proper input voltage range.

    To use the terminal with 120 V, perform the following procedure.

    a. Set the voltage selection switch to 115 (operating range 99--128 V rms)

6-5

b. Remove the fuse holder cap by pressing it in and turning it counterclockwise. Check the fuse for a 1.25 A fast blow (PN 9000020-01). Replace the fuse and the fuse holder cap by pressing it in and turning it clockwise.

To use the terminal with 220--240 V, perform the following procedure.

a. Set the voltage selection switch to 240 (operating range 198--256 V rms).

b. Remove the fuse holder cap by pressing it in and turning it counterclockwise. Check the fuse for a 0.75 A (PN 1211237-00). Replace the fuse and the fuse holder cap by pressing it in and turning it clockwise.

3. Attach the SET-UP label to the bottom of the keyboard. Remove the backing paper in order to use the self-sticking SET-UP label.

4. Place the keyboard in front of the terminal. Plug the keyboard into the keyboard connector located at the back of the terminal.

5. Connect the ac power cable to a nonswitched, grounded ac power receptacle.

NOTE: Check that the power switch is in the off position before connecting the power cord.

6. Perform the power-up and checkout procedure described in this chapter.

7. If necessary, install the 20 mA current loop option (VT1XX-CA). Perform the option installation and checkout procedures described in Chapter 7. These procedures complete the installation of the terminal.

8. Connect the communication cable to the appropriate connector at the back of the terminal. If using the EIA interface, fasten the connector to the terminal with the captive screws using a 3 mm (1/8 in) blade screwdriver. (Refer to Chapter 5 for information about connector use and signal/pin definitions.)

9. In addition to the communication interface, the terminal can also interface with an external device, such as a video monitor, using the video output connector. The video output connector is the BNC connector located at the back of the terminal. Use a 75 ohm video cable to connect the terminal to the external device. Detailed specifications for this output are listed in Appendix A.

POWER-UP AND CHECKOUT PROCEDURE

A power-up self-test verifies proper operation of the VT101 terminal each time it is powered up. Perform the following procedure to power-up and check out the terminal.

1. Turn the power switch to the on position. (Refer to Figure 6-3 for the switch location.) The terminal automatically runs the power-up self-test. The test ends with the following indications:

   * Keyboard and screen flash on and off.

   * All keyboard indicators turn on and off, and either the ON LINE or OFF LINE indicator turns on.

   * A bell tone is generated.

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

   Any error found by the power-up self-test is indicated by: a character on the screen, keyboard indicators L1 through L4, or several bell tones. If a failure is indicated, refer to Chapter 8 for more information about self-test and self-test failures.

2. If the terminal powers up correctly, select the desired SET-UP features as described in Chapter 2.

3. When the SET-UP features are selected, record the selections on the SET-UP label attached to the keyboard.

GENERAL
The VT101 terminal has only one option, the 20 mA current loop
interface option (VT1XX-CA). This chapter describes the option,
its installation, and checkout. Refer to Chapter 9 for ordering
information.

20 mA CURRENT LOOP INTERFACE OPTION (VT1XX-CA)
The 20 mA current loop interface option is an optional interface
that connects the VT101 terminal to a computer. The 20 mA option
consists of a board installed within the VT101 terminal and an
interface connector. Figure 7-1 shows the 20 mA current loop
interface connector and pin assignments.
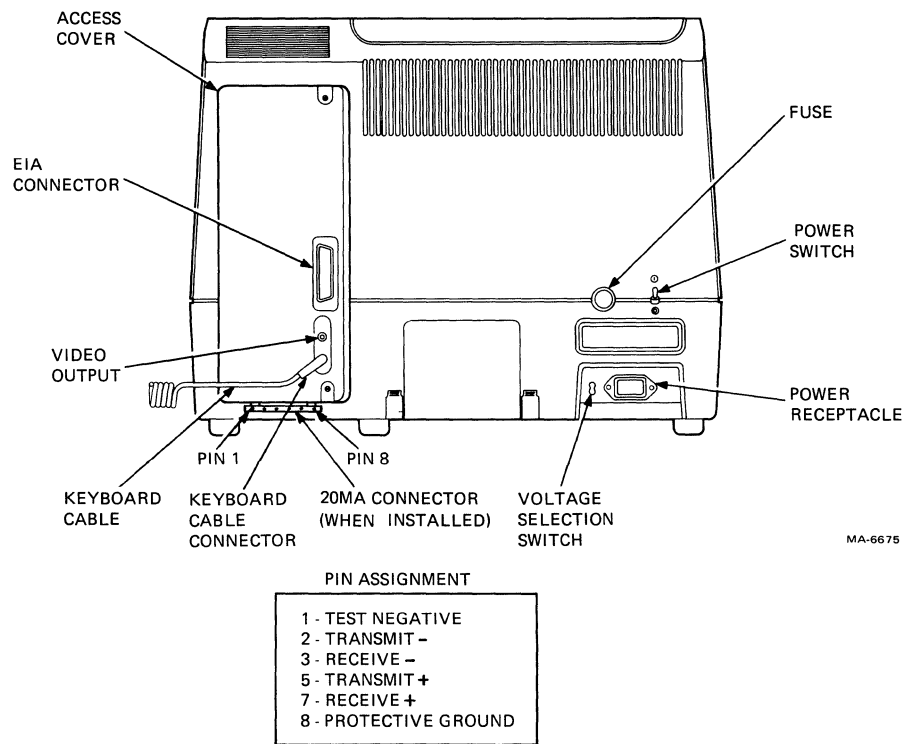
Figure 7-1   20 mA Connector and Pin Locations

NOTE: The VT101 terminal uses either 20 mA or EIA communications. If EIA is used on a terminal containing a 20 mA option, the cable connecting the 20 mA option board to the terminal controller board must be disconnected.

Both the transmitter and receiver of the 20 mA interface board can be selected for active and normal (passive) operation. Usually, the terminal is connected for normal (passive) operation.

Passive operation indicates that the terminal does not supply the 20 mA current needed during communication. The transmitter goes to the mark condition when power is turned off.

Active operation indicates that the terminal supplies the 20 mA current used when communicating. In an active configuration, there is no isolation. The transmitter goes to the space condition when power is turned off.

OPTION INSTALLATION

The 20 mA current loop interface option (VT1XX-CA) is installed using a 5 mm (3/16 in) blade screwdriver and a no. 2 Phillips screwdriver. Perform the following procedure to install the 20 mA current loop option.

1. Turn power switch to the off position. Disconnect the power cord. (Refer to Figure 7-1).

2. Unplug the keyboard.

3. If installed, unplug any connector from the composite video output connector.

4. If installed, disconnect the communications cable.

5. Use a 5 mm (3/16 in) blade screwdriver to loosen the two captive screws holding the access cover in place (Figure 7-2).

6. Pull the access cover straight out the back of the terminal. When the access cover is loose, move it to the left to avoid the studs in the terminal. Then continue to pull the access cover straight out (Figure 7-3).

7. Install the 20 mA current loop interface option board onto the access cover. Use the three Phillips head screws provided with the option and a no. 2 Phillips screwdriver (Figure 7-4).

8. Install the 20 mA connector on the bottom of the access cover using the two hex-head screws provided with the option and use a 5mm (3/16 in) blade screwdriver.

9. Set the transmit and receive switches to the proper configuration (Figure 7-5).
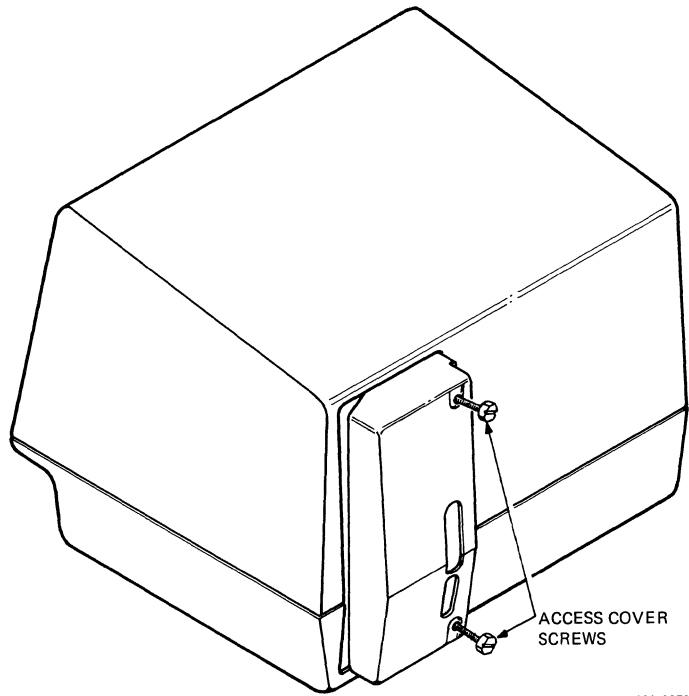
Figure 7-2   Access Cover Screw Locations

NOTE: These switches must be set for normal (passive) operation to perform the data loopback self-test. The test verifies proper operation of the option after installation.

10.   Connect the adapter cable provided with the option to the 20 mA board (Figure 7-5). Place the access cover next to the opening in the back of the terminal. Connect the other end of the cable to the connector on the terminal controller board.

11.   Hold the access cover straight up and move it to the right side of the opening in the terminal. Push the access cover into the back of the terminal and feel for the studs in the terminal. Push the access cover onto the studs until the cover is in place. Figure 7-3 shows how the access cover fits on the studs as seen inside the terminal.

12.   When the access cover is installed on the back of the terminal, tighten the two captive screws that secure it to the terminal (Figure 7-2).

CAUTION: Do not overtighten the captive screws.

13.   Perform the data loopback self-test.

VIEW FROM ABOVE AS SEEN
FROM WITHIN TERMINAL

PULL OUT
THEN MOVE
TO LEFT
THEN OUT

MA-6668
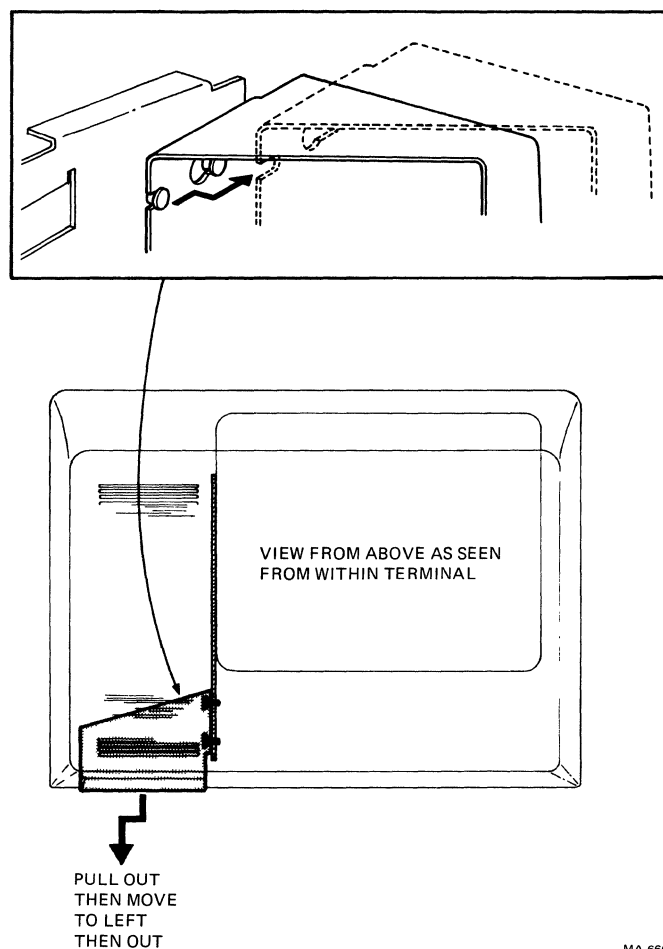
Figure 7-3   Access Cover Removal

OPTION CHECKOUT

The data loopback self-test verifies that the 20 mA current loop interface option can transmit and receive characters. In the data loopback self-test, the transmit and receive lines are connected to each other with an external loopback connector. The terminal transmits characters on the transmit line and receives the characters on the receive line.

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

    1.   Turn the power switch to the off position and disconnect the communication cable (if installed). Install the loopback connector on the 20 mA connector (Figure 7-6). The 20 mA loopback connector part number is 70-15503-00. It is supplied with the option.

    2.   Remove the access cover by loosening the two captive screws holding the access cover in place (Figure 7-2).
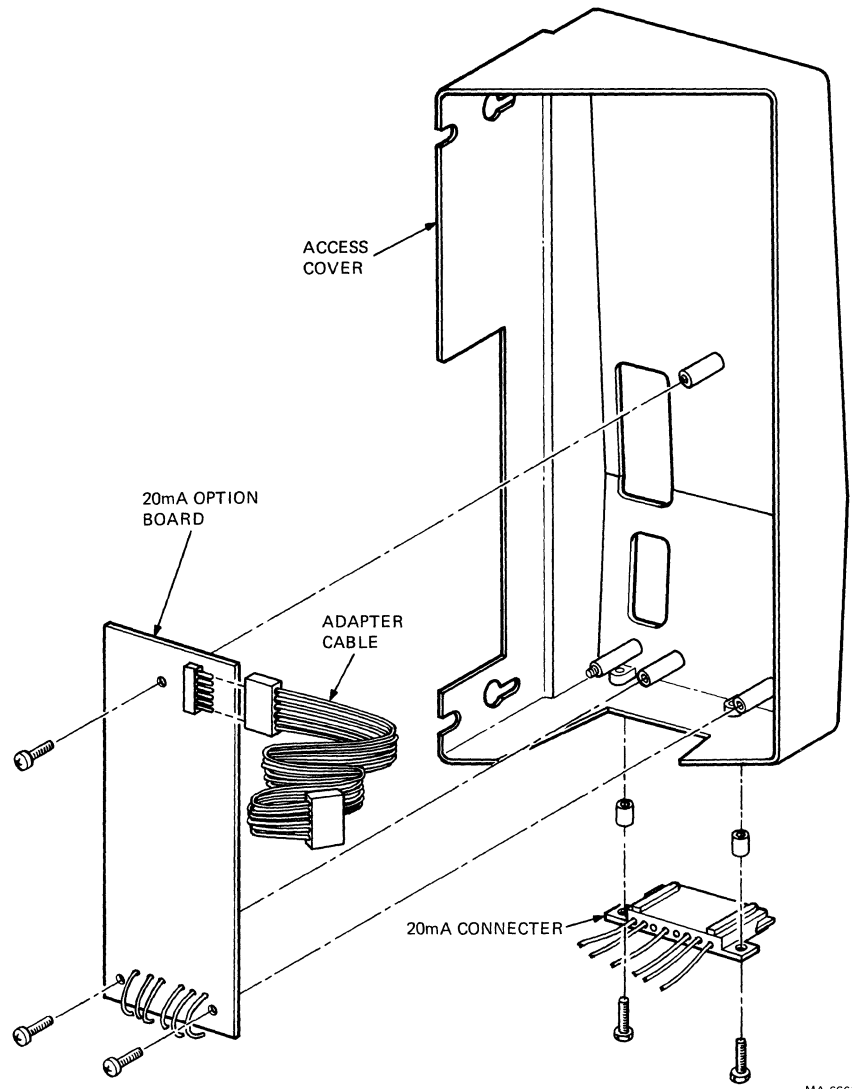
Figure 7-4   20 mA Board Installation

NOTE: The access cover is not removed if the transmit and receive switches of the 20 mA option are set to normal.

3. Pull the access cover straight out the back of the terminal. When it is loose, move the access cover to the left to avoid the studs in the terminal. Then continue to pull the access cover straight out (Figure 7-3).

4. Set both 20 mA option switches to the normal position (Figure 7-5) and install the access cover (Figure 7-3).

5. Power up the terminal. The terminal performs the power-up self-test.

CAPTIVE SCREWS (2)   ACCESS COVER

20mA CURRENT
LOOP BOARD

ADAPTOR
CABLE

ADAPTER
CABLE

TRANSMIT
LINE
SWITCH

TRANS REC
ACT

NOR
MAL

20mA OPTION
BOARD

RECEIVE
LINE
SWITCH

87 5 321

TERMINAL
CONTROLLER
BOARD

20mA
COMMUNICATIONS
CONNECTOR
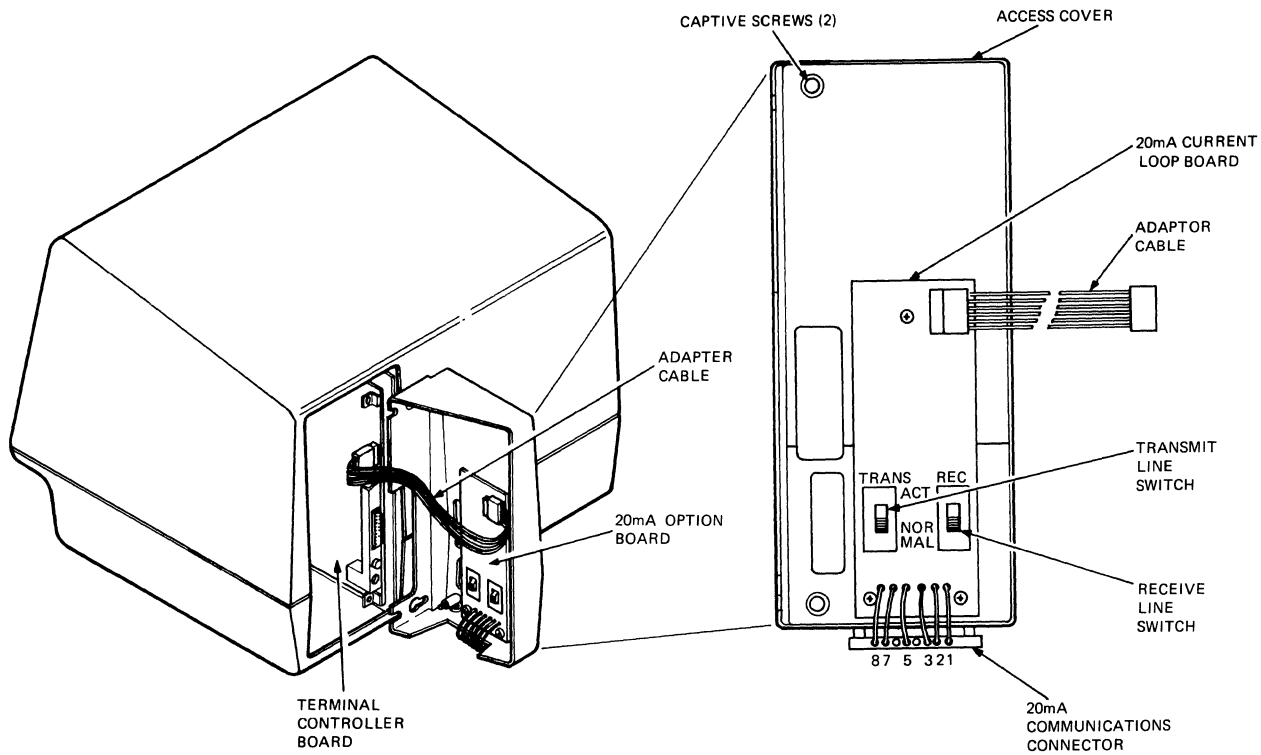
MA-6666

Figure 7-5   20 mA Board Configuration

6.   Enter SET-UP and select the following:

   •   OFF LINE

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

7.   Start the data loopback self-test by using one of the
     following sequences.

   ESC [2 ; 2 y   Performs data loopback self-test
                            once.

   ESC [2 ; 10 y   Performs data loopback self-test
                            continuously.

   NOTE: The continuously running tests end only if an error
   is found or if power is turned off.

POWER SWITCH

FROM PIN	TO PIN
1	3
2	7
5	8

8
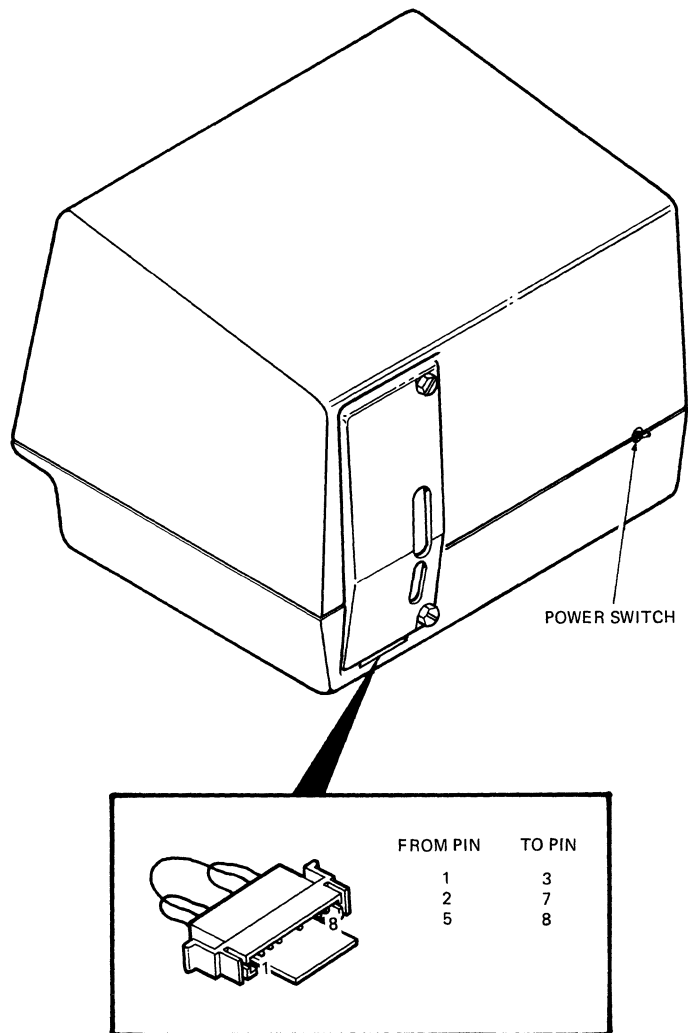
MA-7867

Figure 7-6   20 mA Loopback Connector

The test ends with the following indications:

- Either the ON LINE or OFF LINE indicator is on.

- The wait message is displayed on the screen and then erased.

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

Any error found by the data loopback self-test displays an error code on the screen. Refer to Chapter 8 for more information about error indications.

8.   Turn the power switch to the off position and remove the loopback connector.

9. If 20 mA switches were changed in step 4, remove the access cover and select the proper 20 mA current loop interface option switch selections. Install the access cover.

GENERAL
This chapter describes maintenance procedures, troubleshooting
(what to do in the event of a problem) and self-tests used with
the VT101 terminal. Troubleshooting should be performed before
requesting service.

MAINTENANCE
The VT101 terminal needs no preventive maintenance. However, the
surfaces may be cleaned with any mild detergent that does not use
solvents. To clean the surfaces of terminal or the screen, apply
the detergent to a cloth or tissue and then clean. To clean the
keys, rub with a dry or moist cloth.

CAUTION: Do not use too much detergent when cleaning the terminal.
If liquids get inside the terminal, they can cause damage.

Do not remove the keycaps when cleaning. The keyswitch contacts
can be damaged if the keycaps are replaced incorrectly.

TROUBLESHOOTING
If the terminal appears to have a problem, first refer to Table
8-1 to see if the symptoms are listed there. If the problem is not
listed in Table 8-1, perform the following procedure.

1.   Turn the power switch to the off position and check the
      following.

      a.   Power cord -- Make sure the cord is connected
            securely at both the terminal and the wall outlet.
            Check the wall outlet with another device, such as a
            lamp, to be sure that it is providing ac power.

      b.   Voltage selection switch and fuse -- Make sure the
            switch is in the correct position. To use the
            terminal with 115 V, perform the following steps.

Table 8-1   Problem Checklist

Symptom	Possible Cause	Remedy
ON LINE or OFF LINE indicator is on with no cursor on screen.	Screen brightness too low	Enter SET-UP and increase screen brightness.
ON LINE or OFF LINE is not on with no keyboard response. Cursor on screen.	Keyboard cable not connected to terminal	Turn off terminal and connect keyboard cable.
KBD LOCKED is on.	Keyboard buffer full, keyboard cannot accept more characters, terminal received XOFF	Entering and exiting SET-UP clears this condition. Be careful that characters are not lost during this procedure.
Terminal does not respond to typed characters.	Screen cannot be updated by the computer, terminal transmitted XOFF	Press NO SCROLL.
Keyclicks generated and keyboard indicators are on.		Enter and exit SET-UP.
Wrong characters or substitute (≋) characters, or no characters appear on the screen.	Incorrect SET-UP feature selection	Correct the SET-UP features. These SET-UP features may be in error: ANSI/VT52 mode, auto XON/XOFF, data/parity bits, receive parity, receive speed, and transmit speed.
	Computer error	Check computer system.
Two characters appear on screen for each character typed.	Local echo feature on	Turn off feature.
Several bell tones during power-up, reset, or recall.	Read or write problem with user permanent memory	Check the SET-UP feature settings and try the save operation.

- Unplug the ac power cord.

- Set the voltage selection switch to 115 (operating range 99 V rms -- 128 V rms).

- Remove the fuse holder cap by pressing it in and turning it counterclockwise. Check the fuse for a 1.25 A fast blow (PN 9000020-01). Replace the fuse holder cap by pressing it in and turning it clockwise.

- Plug in ac power cord.

To use the terminal with 220 V -- 240 V, perform the following steps.

- Unplug the ac power cord.

- Set the voltage selection switch to 220 (operating range 198 V rms -- 256 V rms).

- Remove the fuse holder cap by pressing it in and turning it counterclockwise. Check the fuse for a 0.75 A (PN 1211237-00). Replace the fuse holder cap by pressing it in and turning it clockwise.

- Plug in the ac power cord.

    c.   Keyboard coiled cord -- Check that the cord is securely plugged into the keyboard connector at the back of the terminal.

2. Turn the power switch to the on position. The terminal performs the power-up self-test. (Refer to the power-up self-test description in this chapter for more information.) If the terminal does not power up correctly, call your local DIGITAL service office.

3. Perform the data loopback self-test if desired. (Refer to the data loopback self-test description in this chapter for more information.)

VT101 SELF-TESTS
The VT101 terminal uses two self-tests to verify proper operation: a power-up self-test and a data loopback self-test. The power-up self-test is performed each time the terminal is powered up. The data loopback self-test may be performed after the power-up self-test is completed. To perform the data loopback self-test, the terminal must be disconnected from the communication line and an external loopback connector must be installed.

Power-Up Self-Test
A power-up self-test is built into the VT101 terminal. The test checks the general terminal operation, user permanent SET-UP feature memory, and the keyboard.

To perform the power-up self-test, use the following procedure.

1. Start the power-up self-test in any one of the following ways:

    *   Turn the power switch to the on position.

    *   If power is on, enter SET-UP and press the **RESET** key.

    *   If power is on, type one of the following sequences. The terminal is off-line with the ANSI/VT52 SET-UP B feature selected to ANSI (SET-UP B switch 2-3 = 1).

        ESC [2 ; 1 y   Performs the data loopback self-test once.

        ESC [2 ; 9 y   Performs the data loopback self-test continuously.

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

    The test ends with the following indications.

    *   Keyboard indicators and screen flash on and off.

    *   All keyboard indicators turn on and off, and either ON LINE or OFF LINE is on.

    *   A bell tone is generated.

    *   The wait message is displayed on the screen and then erased. (The wait message is not displayed if the terminal has not warmed up.)

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

    Any error found by the power-up self-test is indicated by: a character on the screen, keyboard indicators L1 through L4, or several bell tones. Refer to the description of self-test error codes in this chapter for more information about the error indications.

Data Loopback Self-Test
The data loopback self-test verifies that the VT101 terminal can transmit and receive characters. In this self-test, the transmit and receive lines are connected to each other with an external loopback connector. The terminal transmits characters on the transmit line and receives characters on the receive line.

8-4

POWER SWITCH

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

MA-7868
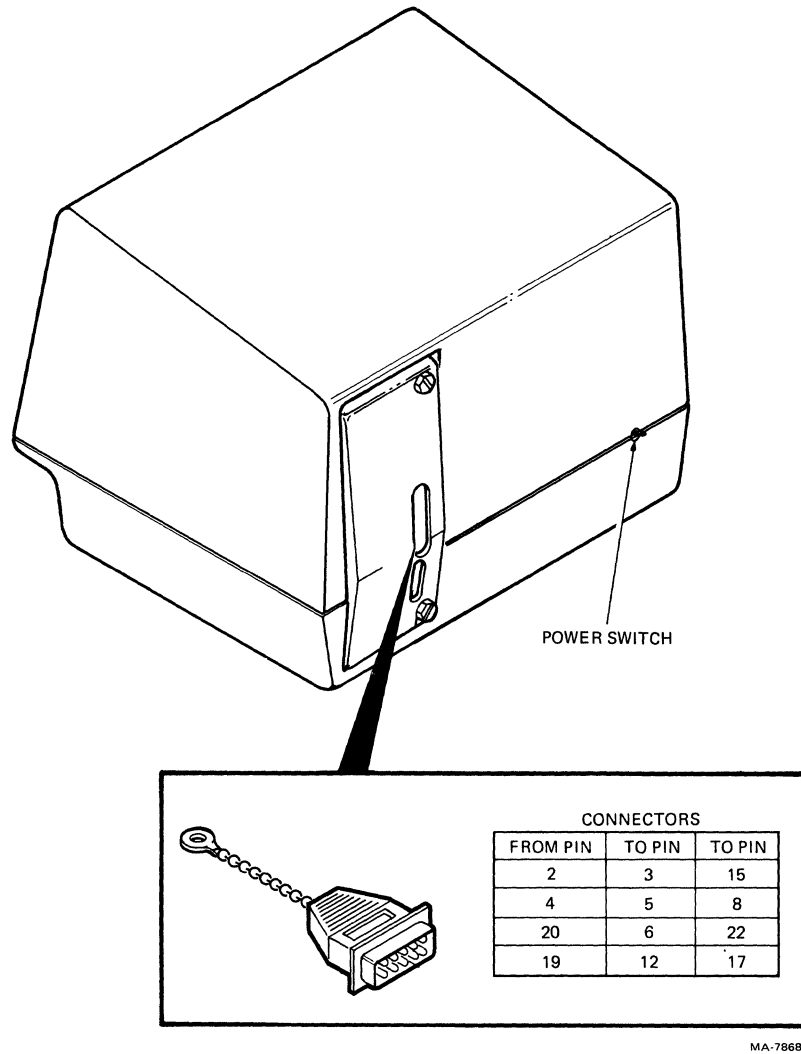
Figure 8-1   EIA Loopback Connector

NOTE: To perform the data loopback self-test with the 20 mA current loop interface option (VT1XX-CA) installed, refer to Chapter 7.

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

1.   Turn the power switch to the off position. Disconnect the communication cable and install the loopback connector on the EIA connector (Figure 8-1). The EIA loopback connector part number is 12-15336. It is available from the DIGITAL Accessories and Supplies Group (refer to Chapter 9) or it can be manufactured locally.

2.   Power up the terminal. The terminal performs the power-up self-test.

3. When power is on, type one of the following sequences to perform the test. The terminal is off-line with the ANSI/VT52 SET-UP B feature selected to ANSI (SET-UP B switch 2-3 = 1).

    ESC [2 ; 2 y   Performs the data loopback self-test once.

    ESC [2 ; 10 y   Performs the data loopback self-test continuously.

    <u>NOTE: The continuously running test ends only if an error is found or if power is turned off.</u>

    The test ends with the following indications:

    •   Either the ON LINE or OFF LINE indicator is on.

    •   The wait message is displayed on the screen and then erased.

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

    Any error found by the data loopback self-test displays an error code on the screen. Refer to the description of self-test error codes in this chapter for more information about the error indications.

4. Turn the power switch to the off position. Remove the loopback connector and connect the communication cable.

SELF-TEST ERROR CODES
If any of keyboard indicators L1 through L4 are on at the end of the power-up self-test, request service for the terminal.

If a character appears under the blinking cursor at the top left corner of the screen, or the screen background is flashing with a character displayed on the screen, refer to Table 8-2 for the meaning of the error code character. The displayed character can indicate that more than one error has been detected. To clear the error condition, reset or power up the terminal.

Three kinds of errors are indicated by the self-test code characters.

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

Table 8-2   Displayed Error Codes

Faults Detected

Character Displayed	Memory	Keyboard	Data	Typed Sequence Incorrrect
2	X*			
4		X**		
6	X	X		
8			X	
:	X		X	
<		X	X	
>	X	X	X	
@				X
B				X
D				X
F				X
H				X
J				X
L				X
N				X

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

** Be sure keyboard is properly connected.

Keyboard missing or malfunction (keyboard)	If only the keyboard fails, the terminal ends the test on-line so that it may operate as a receive-only terminal. The SET-UP feature selections cannot be changed.
Data loopback self-test error	If the data loopback self-test fails, the terminal cannot be used except off-line.

NOTE: The data loopback self-test is not performed on power-up. It must be run separately with a test connector and the proper procedure.

Table 8-2 shows the possible error characters displayed on the screen and the failure indicated by each. Notice that the character displayed could indicate more than one error.

GENERAL
This chapter describes the accessories and supplies offered by DIGITAL for the VT101 terminal. Part numbers and ordering information are included.
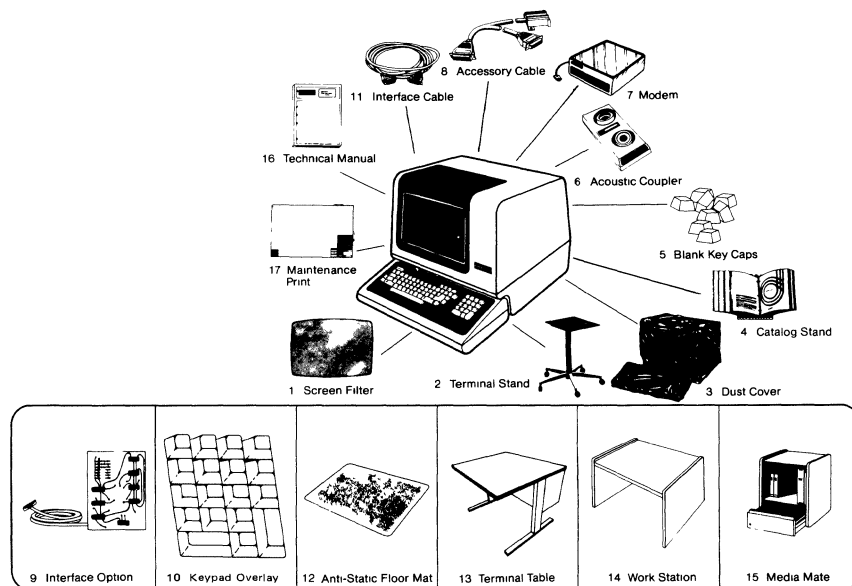
MA-8074

ACCESSORIES

Part No		Description
1	VT1XX-AE	VT101 formed plastic screen filter, Gray, antiglare coating
1	VT1XX-AW	VT101 formed plastic screen filter, Green (AW), antiglare coating
1	VT1XX-AX	VT101 formed plastic screen filter, Yellow (AX), antiglare coating
1	VT1XX-AR	VT101 formed plastic screen filter, Amber (AY), antiglare coating
1	VT1XX-AR	VT101 nonreflective filter screen

9-1

2	VT1XX-ST	VT101 terminal stand with casters
2	VT1XX-SU	VT101 terminal stand with casters (Lots of 25)
2	VT1XX-SV	VT101 terminal stand with casters (Lots of 50)
3	H9850-HK	Heavy guage vinyl dust cover, charcoal brown (2 cover set)
5	LA12X-UA	Blank keycap kit of 50, Row 4*
5	LA12X-UB	Blank keycap kit of 50, Row 1*
5	LA12X-UC	Blank keycap kit of 50, Row 2*
5	LA12X-UD	Blank keycap kit of 50, F&J type
5	LA12X-UE	Blank keycap kit of 50, SET-UP
5	LA12X-UF	Blank keycap kit of 50, TAB
5	LA12X-UH	Blank keycap kit of 50, CAPS LOCK
5	LA12X-UJ	Blank keycap kit of 50, SHIFT
5	LA12X-UL	Main array blank keycap set
5	LA12X-UM	Blank keycap kit of 50, CR
5	LA12X-UN	Blank keycap kit of 50, ENTER
5	LA12X-UP	Blank keycap kit of 50, Num Pad 0
5	LA12X-UR	Blank keycap kit of 50, Row 3*
5	LA12X-US	Blank keycap kit of 50, Row 5*
5	LA12X-UT	Numeric pad blank keycap set
6	DF01-A	Acoustic telephone coupler, 300 baud
7	DF02-AA	Direct connect, Bell 103J equivalent, 300 bps full duplex modem with EIA RS-232-C interface
8	30-10958-02	Cable interface DF01-A couplers to VT101 terminals
9	VT1XX-CA	VT101 20 mA current loop interface option with BC05F-15 cable
10	VT1XX-KA	KED/EDT Keypad overlay

10	VT1XX-KB	FMS-FED (form editor) Keypad overlay
10	VT1XX-KC	FMS-FDV (form driver) Keypad overlay
11	BC22A-10	EIA RS-232 female-female null modem cable shielded 3.0 m (10 ft)
11	BC22A-25	EIA RS-232 female-female null modem cable shielded 7.6 m (25 ft)
11	BC22B-10	EIA RS-232 male-female extension cable shielded 3.0 m (10 ft)
11	BC22B-25	EIA RS-232 male-female extension cable shielded 7.6 m (25 ft)
11	BC23A-10	Kit of 5 BC22A-10
11	BC23A-25	Kit of 5 BC22A-25
11	BC23B-10	Kit of 5 BC22B-10
11	BC23B-25	KIT OF 5 BC22B-25

NOTE: EIA RS-232-C specifies a maximum cable length of 15 m (50 ft). EIA RS-423 specifies a maximum cable length of 61 m (200 ft).

11	BC03M-AO	Female-female null modem cable 30.5 m (100 ft)
11	BC03M-B5	Female-female null modem cable 76.2 m (200 ft)
11	BC03M-EO	Female-female null modem cable 152.4 m (500 ft)
11	BC03M-LO	Female-female null modem cable 304.8 m (1000 ft)
11	BC05X-15	20 mA current loop extension cable 4.6 m (15 ft)
11	BC05X-25	20 mA current loop extension cable 7.6 m (25 ft)
11	BC05X-50	20 mA current loop extension cable 15.2 m (50 ft)
12	H9850-DA	Antistatic floor mat, DECmat, 122 cm X 183 cm (4 ft X 6 ft), driftwood color (brownish gray)
12	H9850-DB	Antistatic floor mat, DECmat, 122 cm X 183 cm (4 ft X 6 ft), summer earth color (brown/gold)
12	H9850-DC	Antistatic floor mat, DECmat, 91 cm X 305 cm (3 ft X 10 ft), silver birch color (silvergray/brown)
12	H9850-DD	Antistatic floor mat, DECmat, 91 cm X 305 cm (3 ft X 10 ft), autumn bronze color (orange/brown)

12	H9850-DE	Antistatic floor mat, DECmat, 91 cm X 305 cm (3 ft X 10 ft), driftwood color (brownish gray)
12	H9850-DF	Antistatic floor mat, DECmat, 122 cm X 183 cm (4 ft X 6 ft), silver birch color (silvergray/brown)
12	H9850-DH	Antistatic floor mat, DECmat, 122 cm X 183 cm (4 ft X 6 ft), autumn bronze color (orange/brown)
13	H970-EB	Terminal table, 68.6 cm high X 91.4 cm wide X 76.2 cm deep (27 in X 36 in X 30 in), with levelers
13	H970-HB	Terminal table, 68.6 cm high X 61.0 cm wide X 76.2 cm deep (27 in X 24 in X 30 in), with levelers
14	H9532-AA	Workstation with blue front panel and gray side panels, levelers, 122 cm wide X 76.2 cm high X 76.2 cm deep (48 in X 30 in X 30 in)
14	H9532-AB	Workstation with brown front panel and brown side panels, levelers, 122 cm wide X 76.2 cm high X 76.2 cm deep (48 in X 30 in X 30 in)
15	H9850-AP	Media mate, file or shelf storage cart with casters and locking drawer, 64.1 cm high X 38.1 cm deep X 47.0 cm wide (25.25 in X 15 in X 18.5 in)

RELATED DIGITAL DOCUMENTATION

Part No	Description
16 EK-VT101-UG	VT101 User Guide. Describes the installation, operation, and programming of the VT101 terminal. This document is shipped with the terminal.
16 EK-VT101-PS	VT101 Series Pocket Service Guide. Describes procedures used to troubleshoot and repair the VT101 terminal to the field replacable unit.
16 EK-VT101-TM	VT101 Series Technical Manual. Describes VT101 terminal to a detailed block level. Provides troubleshooting information for the terminal. This manual does not contain detailed schematic drawings. The VT101 Family Field Maintenance Print Set has detailed schematic drawings. It is ordered separately.

16 EK-VT101-IP   VT101 Video Terminal IPB. Provides a detailed
                   parts breakdown of the VT101 field replacable
                   units. This document does not contain part
                   numbers for components on the printed circuit
                   boards. However, components are listed in the
                   the VT101 Family Field Maintenance Print Set. It
                   is ordered separately.

16 EK-VT101-RC   VT101 Terminal Programming Reference Card.
                   Provides a summary of the VT101 escape and
                   control sequences on a pocket size reference
                   card.

17 MP-01066   VT101 Family Field Maintenance Print Set.
                   Provides a complete set of electrical and
                   mechanical schematic diagrams for the VT101
                   terminal.

POWER CORDS

Part No   Description

17-00083-09   United States (115 V)

17-00083-10   United States (220 V)

BN03A-2E   United Kingdom

BN02A-2E   Continental Europe (SCHUKO)

BN04A-2E   Switzerland

BN05A-2E   Australia

ALIGNMENT TEMPLATES

Part No   Description

94-03220-3   Screen alignment template

94-03246-3A   Character width template

94-03246-3B   Character height template

DATA LOOPBACK TEST CONNECTORS

Part No   Description

12-15336-00   EIA loopback connector

70-15503-00   Current loop connector

SPARES KIT

4A-VT101-00   VT101 spares kit.

ORDERING INFORMATION

Continental USA

Call 800-258-1720 or mail order to:

Digital Equipment Corporation
P.O. Box CS2008
Nashua, NH 03061

New Hampshire

Call 602-884-6660 or mail order to:

Digital Equipment Corporation
P.O. Box CS2008
Nashua, NH 03061

Alaska or Hawaii

Call 408-734-4915 or mail order to:

Digital Equipment Corporation
632 Caribbean Drive
Sunnyvale, CA 94086

Canada

Call 800-267-6146 or mail order to:

Digital Equipment Corporation
P.O. Box 13000
Kanata, Ontario Canada K2K 2A6
Att: A&SG Business Manager
Telex: 610-562-8732

GENERAL
This appendix lists the specifications of the VT101 terminal and
provides X-ray emission statements, loopback connector wiring, and
related documentation not provided by DIGITAL.

VT101 SPECIFICATIONS

Dimensions

Monitor	Height: 36.83 cm (14.5 in)
	Width: 45.72 cm (18 in)
	Depth: 36.20 cm (14.25 in)
Keyboard	Height: 8.89 cm (3.5 in)
	Width: 45.72 cm (18 in)
	Depth: 20.32 cm (8 in)
	Minimum table depth: 51.4 cm (20.25 in)

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° C to 40° C
(50° F to 104° F)
Relative humidity: 10% to 90%
Maximum wet bulb: 28° C (82° F)
Minimum dew point: 2° C(36° F)
Altitude: 2.4 km (8000 ft)

Nonoperating
Temperature: -40° C to 66° C
(-40° F to 151° F)
Relative humidity: 0% to 95%
Altitude: 9.1 km (30000 ft)

Power

Line voltage
99 V--128 V rms single phase, 2-wire
198 V--256 V rms single phase, 2-wire
(selected by switch)

Line frequency
47 Hz--63 Hz

Current	0.70 A rms maximum at 120 V rms 0.40 A rms maximum at 240 V rms
Input power	70 W rms or 85 VA apparent
Current limiting	1.25 A fast blow fuse (120 V) 0.75 A slow blow fuse (240 V)
Power cord	Detachable, 3-conductor grounded
Power cord receptacle	EIA specified CEE22-6A

Display

CRT	12 in. diagonal measure, P4 phosphor
Format	24 lines X 80 characters or 14 lines X 132 characters (selected from keyboard or computer)
Character	7 X 10 dot matrix with descenders
Character size	80-column mode 3.35 mm X 2.0 mm (0.132 in. X 0.078 in.) 132-column mode 3.35 mm X 1.3 mm (0.132 in. X 0.051 in.)
Active display size	202 mm X 115 mm (8 in. X 4.5 in.)
Character set	ASCII and UK displays 94 characters (with upper- and lowercase, numeric, and punctuation), 32-character special graphics set
Cursor type	Blinking block character or blinking underline (selected from keyboard)

Keyboard

General	83-key detachable unit with 1.9 m (6 ft) coiled cord attached
Key layout	65 keys arranged similar to standard typewriter with 18-key auxiliary keypad
Auxiliary keypad	18 keys with period, comma, minus, enter, and four general purpose function keys
Visual indicators	Seven: ON LINE, OFF LINE, KBD LOCKED, and four programmable.

Audible indicators   Audible keyclick for each keystroke
                                (selected from keyboard)

                                Bell sounds when BEL character
                                received, and 2) sounds eight
                                characters from right margin (selected
                                from keyboard)

                                Multiple bell sounds on error in SET-UP
                                save or recall operation

Communication
Type   Full-duplex EIA

Speeds   50, 75, 110 (two stop bits), 134.5,
                                150, 200, 300, 600, 1200, 1800, 2000,
                                2400, 3600, 4800, 9600, 19,200 baud
                                (selected from keyboard)

Code   ASCII (ISO 646 and CCITT Alphabet 5)

Character format   Asynchronous

Character size   7 or 8 bits (selected from keyboard)

Parity   Even, odd, mark, space, or none
                                (selected from keyboard)

Buffer overflow   Automatic generation of XON and XOFF
prevention   control codes (selected from keyboard)

Echo   Local echo available (selected from
                                keyboard)

Composite Video Output (J9)

                                Composite video output provides RS170
                                output with the following nominal
                                characteristics (Figure A-1).

                                Output impedance = 75 ohms, dc coupled
                                sync level = 0 V

                                Black level = approximately 0.3 V when
                                loaded with 75 ohms

                                White level = approximately 1.0 V with
                                a 75 ohm load

                                Composite sync waveform meets EIA RS170
                                standards.
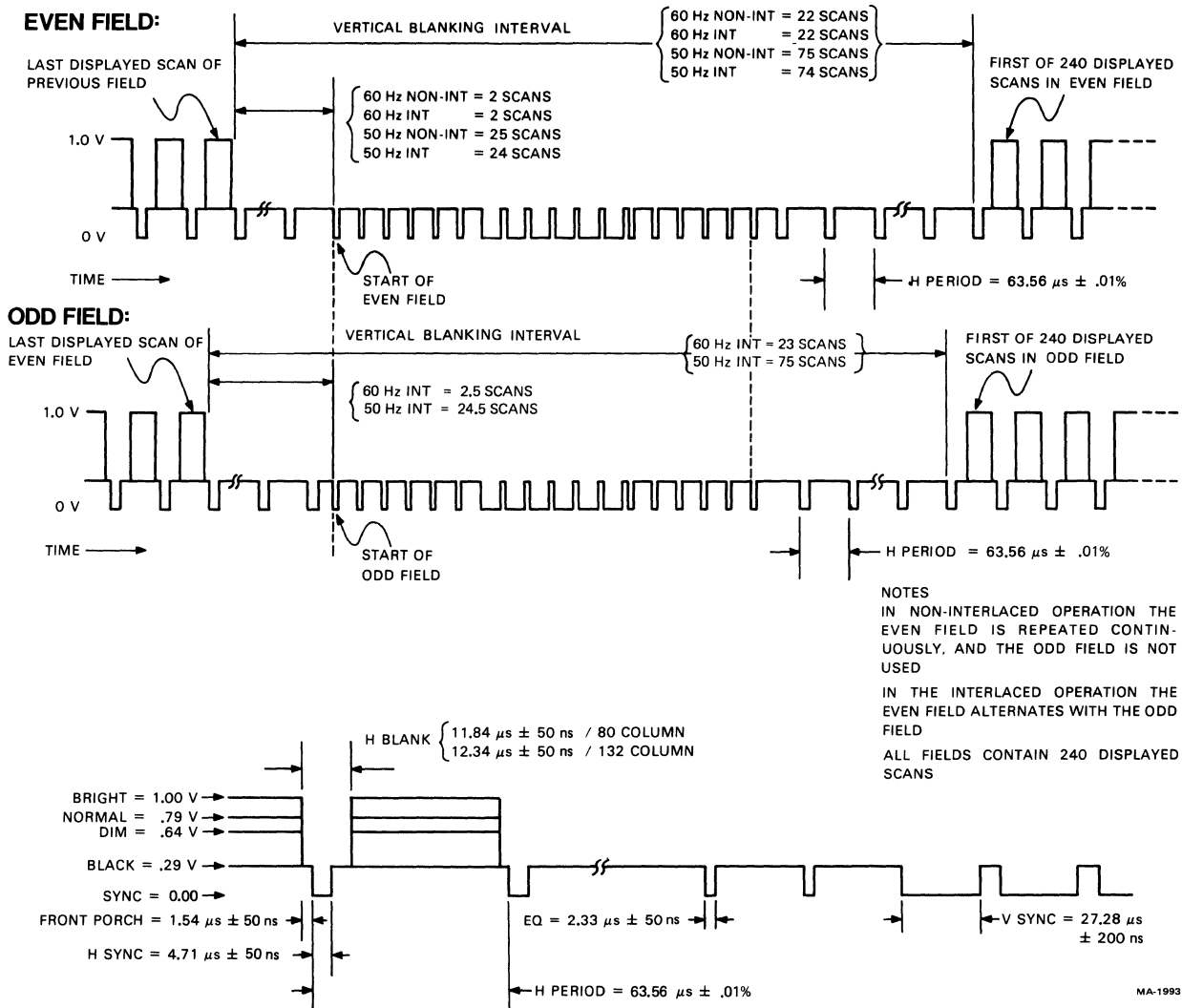
Figure A-1   Composite Video Output

Vertical interval is six equalizing
pulses, six vertical sync pulses, and
six more equalizing pulses. Timing is
as follows:

Equalizing pulse width
    2.33 ~s +50 ns
Vertical pulse width
    27.28 ~s +200 ns
Horizontal pulse width
    4.71 ~s +50 ns

A-4

Horizontal blank width
11.84 ~s +50 ns/80-column mode
12.34 ~s +50 ns/132-column mode
Front porch
1.54 ~s +50 ns

X-RAY Emission Data

Rated anode voltage	12 kV (fixed)
Dose rate	Less than 1.43 pA/kg (20 ~R/h)*
Compliance with	• Paragraph 5, clause 2 of German X-Ray ordinance (1973)
	• CSA 22.2 no. 154-1975 Paragraph 4.1.4
	• VDE 0804/5.72, Paragraph 23
	• VDE 0730 part 2P/6.76, Paragraph 33
	• VDE 0860 part 1/11.76, Paragraph 6
	• IEC 65 public 1/1972, Paragraph 6
	• CSA no. 65
	• UL 478
	• ECMA 57
Workstation exposure	Does not expose operator to dangerous X-ray radiation

---

* Measured at a distance of 5 cm (1.96 in) at any accessible point from outer surface.

LOOPBACK CONNECTOR WIRING

From	To
EIA	
Pin 2	Pins 3 and 15
Pin 4	Pins 5 and 8
Pin 20	Pins 6 and 22
Pin 19	Pins 12 and 17
20 mA	
Pin 1	Pin 3
Pin 2	Pin 7
Pin 5	Pin 8

RELATED DOCUMENTATION

ANSI specifications can be ordered at the following address.

Sales Department
American National Standards Institute
1430 Broadway
New York, NY 10018

EIA specifications can be ordered at the following address.

        Electronic Industries Association
        Engineering Department
        2001 Eye St. NW
        Washington, DC 20006

International standards can be ordered at the following address.

        CCITT
        UN Book Store
        United Nations Building
        N.Y., N.Y. 10017

GENERAL
This appendix provides a summary of the VT101 terminal SET-UP
features. Table B-1 lists the SET-UP features. Figure B-1 shows
the screen displays. Figure B-2 is a summary of the SET-UP B
features.

Table B-1   SET-UP Features

Feature	SET-UP Display Used to Change
ON/OFF Line	A or B
Screen brightness	A or B
Columns per line	A
Tab stops	A
Scroll	B
Auto repeat	B
Screen background	B
Cursor	B
Margin bell	B
Keyclick	B
ANSI/VT52	B
Auto XON/XOFF	B
US/UK character set	B
Auto wrap	B
Line feed/new line	B
Interlace	B
Receive parity	B
WPS terminal	B
Local echo	B
Power	B
Data/Parity bits	B
Transmit speed	B
Receive speed	B
Answerback	B

SET-UP A
TO EXIT PRESS "SET-UP"

1234567890123456789012345678901234567890123456789012345678901234567890123456789

SET-UP B
TO EXIT PRESS "SET-UP"

1 1101 2 0111 3 0001 4 1000   P=7S T= 9600 R= 9600
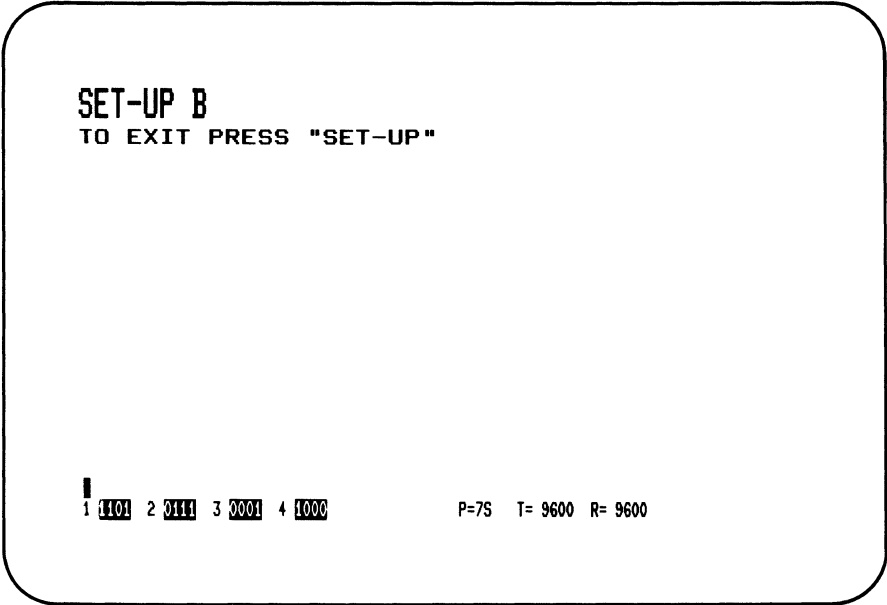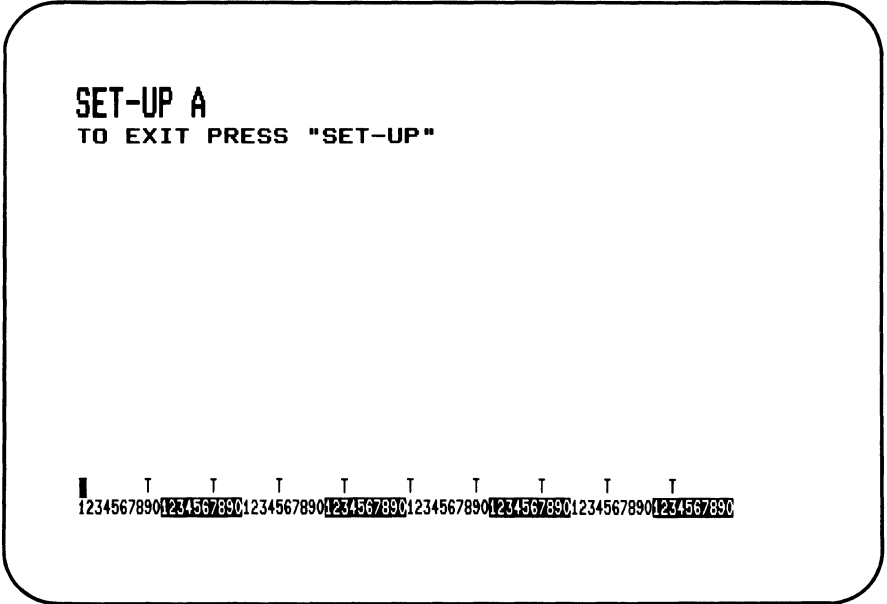
MA-7814

Figure B-1   SET-UP Displays

SCROLL $\begin{cases} 0 = \text{JUMP} \\ 1 = \text{SMOOTH} \end{cases}$

AUTO REPEAT $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

SCREEN $\begin{cases} 0 = \text{DARK BACKGRND} \\ 1 = \text{LIGHT BACKGRND} \end{cases}$

CURSOR $\begin{cases} 0 = \text{UNDERLINE} \\ 1 = \text{BLOCK} \end{cases}$

U.S./ U.K. CHARACTER SET $\begin{cases} 0 = \text{U.S.} \\ 1 = \text{U.K.} \end{cases}$

AUTO WRAP $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

LINE FEED/ NEW LINE $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

INTERLACE $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

DATA BITS 7 OR 8

PARITY E=EVEN
O=ODD
N=NO
S=SPACE
M=MARK

1   2   3   4   P =   T =   R =

MARGIN BELL $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

KEY CLICK $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

ANSI/VT52 $\begin{cases} 0 = \text{VT52} \\ 1 = \text{ANSI} \end{cases}$

AUTO XON XOFF $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

RECEIVE PARITY $\begin{cases} 0 = \text{IGNORE} \\ 1 = \text{CHECK} \end{cases}$

WPS TERMINAL $\begin{cases} 0 = \text{OFF} \\ 1 - \text{ON} \end{cases}$

LOCAL ECHO $\begin{cases} 0 = \text{OFF} \\ 1 = \text{ON} \end{cases}$

POWER $\begin{cases} 0 = 60 \text{ Hz} \\ 1 = 50 \text{ Hz} \end{cases}$

MA-6652

Figure B-2   SET-UP B Summary

GENERAL
This appendix lists the character codes generated by the VT101 terminal.

STANDARD KEYS
Figure C-1 shows the codes generated by the standard keys. Table C-1 lists these codes.
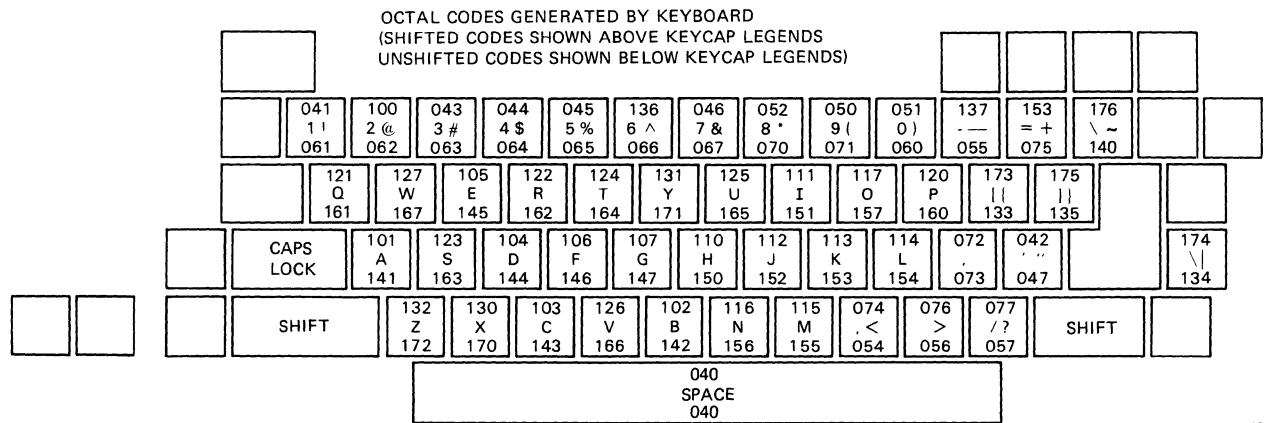
Figure C-1   Standard Key Codes

Table C-1   Standard Key Character Codes

Lowercase Character	Neither SHIFT Pressed (Lowercase Octal Code)	Uppercase Character	SHIFT Pressed (Uppercase Octal Code)
a	141	A	101
b	142	B	102
c	143	C	103
d	144	D	104
e	145	E	105

Table C-1 Standard Key Character Codes (Cont)

Lowercase Character	Neither SHIFT Pressed (Lowercase Octal Code)	Uppercase Character	SHIFT Pressed (Uppercase Octal Code)
f	146	F	106
g	147	G	107
h	150	H	110
i	151	I	111
j	152	J	112
k	153	K	113
l	154	L	114
m	155	M	115
n	156	N	116
o	157	O	117
p	160	P	120
q	161	Q	121
r	162	R	122
s	163	S	123
t	164	T	124
u	165	U	125
v	166	V	126
w	167	W	127
x	170	X	130
y	171	Y	131
z	172	Z	132
1	061	!	041
2	062	@	100
3	063	# or £	043
4	064	$	044
5	065	%	045
6	066	^ (circumflex)	136
7	067	&	046
8	070	*	052
9	071	(	050
0	060	)	051
- (minus)	055	_	137
=	075	+	053
` (grave accent)	140	~ (tilde)	176
[	133	{	173
]	135	}	175
;	073	:	072
' (apostrophe)	047	"	042
\	134	|	174
, (comma)	054	<	074
. (period)	056	>	076
/	057	?	077

FUNCTION KEYS
Table C-2 lists the cursor key codes. Figure C-2 shows the control codes generated by the function keys. For the shaded keys, CTRL does not need to be pressed in order to generate the control character. Table C-3 lists the control codes generated.

Table C-2   Cursor Control Key Codes

| Cursor Key | ANSI Mode | | VT52 Mode |
	Cursor Key Mode Reset	Cursor Key Mode Set	
↑	ESC [A 033 133 101	ESC O A 033 117 101	ESC A 033 101
↓	ESC [B 033 133 102	ESC O B 033 117 102	ESC B 033 102
→	ESC [C 033 133 103	ESC O C 033 117 103	ESC C 033 103
←	ESC [D 033 133 104	ESC O D 033 117 104	ESC D 033 104

Figure C-2   Function Key Control Codes

NOTE: The following control characters are generated differently from previous DIGITAL terminals.

Code	VT101 Keys	Previous Terminal Keys
NUL	CTRL - Space bar	CTRL - @
RS	CTRL - ~	CTRL - ^
US	CTRL - ?	CTRL - ___

Table C-3 Control Codes Generated

Control Character	Character Mnemonic	Code (Octal) Sent	Key Pressed with CTRL	Dedicated Key
Null	NUL	000	Space Bar	
Start of heading	SOH	001	A	
Start of text	STX	002	B	
End of text	ETX	003	C	
End of transmission	EOT	004	D	
Enquire	ENQ	005	E	
Acknowledge	ACK	006	F	
Bell	BEL	007	G	
Backspace	BS	010	H	BACK SPACE
Horizontal Tabulation	HT	011	I	TAB
Line feed	LF	012	J	LINE FEED
Vertical tab	VT	013	K	
Form feed	FF	014	L	
Carriage return	CR	015	M	RETURN (ENTER)*
Carriage return Line feed	CR LF	015 012		RETURN (ENTER)*
Shift out	SO	016	N	
Shift in	SI	017	O	
Data Link Escape	DLE	020	P	
Device control 1	DC1 (XON)	021	Q	
Device control 2	DC2	022	R	
Device control 3	DC3 (XOFF)	023	S	
Device control 4	DC4	024	T	
Negative acknowledge	NAK	025	U	
Synchronous idle	SYN	026	V	
End of transmission Block	ETB	027	W	
Cancel previous word or character	CAN	030	X	
End of medium	EM	031	Y	
Substitute	SUB	032	Z	
Escape	ESC	033	[	
File separator	FS	034	\	
Group separator	GS	035	]	
Record separator	RS	036	~	
Unit separator	US	037	?	
Delete	DEL	177		DELETE

* The RETURN character code can be changed by the line feed/new line feature. When off, this feature causes RETURN to generate a single control character (CR). When on, this feature causes RETURN to generate two characters (CR, LF). Also, depending on the keypad mode selected, RETURN and ENTER may generate the same control codes.

AUXILIARY KEYPAD KEYS
Table C-4 lists the codes generated by these keys.

Table C-4   Auxiliary Keypad Codes

| | ANSI Mode | | VT52 Mode | |
| | Numeric
Keypad | Alternate
Keypad | (Numeric
Keypad | Alternate
Keypad Mode |
Key	Mode	Mode	(Mode)	Mode
Ø	Ø Ø6Ø	ESC O p Ø33 117 16Ø	Ø Ø6Ø	ESC ? p Ø33 Ø77 16Ø
1	1 Ø61	ESC O q Ø33 117 161	1 Ø6Ø	ESC ? q Ø33 Ø77 161
2	2 Ø62	ESC O r Ø33 117 162	2 Ø62	ESC ? r Ø33 Ø77 162
3	3 Ø63	ESC O s Ø33 117 163	3 Ø63	ESC ? s Ø33 Ø77 163
4	4 Ø64	ESC O t Ø33 117 164	4 Ø64	ESC ? t Ø33 Ø77 164
5	5 Ø65	ESC O u Ø33 117 165	5 Ø65	ESC ? u Ø33 Ø77 165
6	6 Ø66	ESC O v Ø33 117 166	6 Ø66	ESC ? v Ø33 Ø77 166
7	7 Ø67	ESC O w Ø33 117 167	7 Ø67	ESC ? w Ø33 Ø77 167
8	8 Ø7Ø	ESC O x Ø33 117 17Ø	8 Ø7Ø	ESC ? x Ø33 Ø77 17Ø
9	9 Ø71	ESC O y Ø33 117 171	9 Ø71	ESC ? y Ø33 Ø77 171
-	-(minus) Ø55	ESC O m Ø33 117 155	-(minus) Ø55	ESC ? m Ø33 Ø77 155
,	,(comma) Ø54	ESC O l Ø33 117 154	,(comma) Ø54	ESC ? l Ø33 Ø77 Ø54
.	.(period) Ø56	ESC O n Ø33 117 156	.(period) Ø56	ESC ? n Ø33 Ø77 156

Table C-4   Auxiliary Keypad Codes (Cont)

| | ANSI Mode | | | | VT52 Mode | | | |
Key	Numeric Keypad Mode			Alternate Keypad Mode	Numeric Keypad Mode			Alternate Keypad Mode
ENTER*	CR or Ø15	CR Ø15	LF Ø12	ESC O M Ø33 117 115	CR or Ø15	CR Ø15	LF Ø12	ESC ? M Ø33 Ø77 115
PF1		ESC O P Ø33 117 120		ESC O P Ø33 117 120		ESC P Ø33 120		ESC ? P Ø33 Ø77 120
PF2		ESC O Q Ø33 117 121		ESC O Q Ø33 117 121		ESC Q Ø33 121		ESC ? Q Ø33 Ø77 121
PF3		ESC O R Ø33 117 122		ESC O R Ø33 117 122		ESC R Ø33 122		ESC ? R Ø33 Ø77 122
PF4		ESC O S Ø33 117 123		ESC O S Ø33 117 123		ESC S Ø33 123		ESC ? S Ø33 Ø77 123

* When numeric keypad mode is selected (alternate keypad mode is off), the ENTER character code can be changed by the line feed/new line feature. When off, this feature causes ENTER to generate a single control character (CR, octal Ø15). When on, this feature causes ENTER to generate two characters (CR, octal Ø15, and LF, octal Ø12).

GENERAL

This appendix provides a summary of the VT101 escape and control sequences.

CONTROL CHARACTERS

Name	Character Mnemonic	Octal Code	Function
Null	NUL	000	Ignored when received (not stored in input buffer), used as a fill character.
Enquire	ENQ	005	Transmits answerback message.
Bell	BEL	007	Generates a bell tone.
Backspace	BS	010	Moves cursor to the left one character position, unless it is at the left margin, in which case no action occurs.
Horizontal Tab	HT	011	Moves cursor to the next tab stop, or to the right margin if there are no more tab stops.
Line Feed	LF	012	Causes a line feed or a new line operation. (Refer to line feed/new line mode.)
Vertical Tab	VT	013	Processed as LF.
Form Feed	FF	014	Processed as LF.
Carriage Return	CR	015	Moves cursor to left margin on the current line.
Shift Out	SO	016	Selects G1 character set, as designated by a select character set sequence.

Shift IN	SI	017	Selects G0 character set, as designated by a select character set sequence.
Device Control 1	DC1	021	Processed as XON. Causes terminal to continue transmitting characters.
Device Control 3	DC3	023	Processed as XOFF. Causes terminal to stop transmitting all characters except XOFF and XON.
Cancel	CAN	030	If received during an escape or control sequence, sequence is cancelled and the substitution character (⅀) is displayed.
Substitute	SUB	032	Processed as CAN.
Escape	ESC	033	Processed as a sequence introducer.
Delete	DEL	177	Ignored when received (not stored in input buffer).

ANSI COMPATIBLE SEQUENCES

Set Mode

Name	Mnemonic	Mode	Sequence
Line feed/new line	LMN	New line	ESC [20h
Cursor key	DECCKM	Application	ESC [?1h
ANSI/VT52	DECANM	ANSI	N/A
Column	DECCOLM	132 column	ESC [?3h
Scrolling	DECSCLM	Smooth	ESC [?4h
Screen	DECSCNM	Reverse	ESC [?5h
Origin	DECOM	Relative	ESC [?6h
Auto wrap	DECAWM	On	ESC [?7h
Auto repeat	DECARM	On	ESC [?8h
Interlace	DECINLM	On	ESC [?9h

Reset Mode

Name	Mnemonic	Mode	Sequence
Line feed/new line	LMN	Line feed	ESC [20l*
Cursor key	DECCKM	Cursor	ESC [?1l*
ANSI/VT52	DECANM	VT52	ESC [?2l*
Column	DECCOLM	80 column	ESC [?3l*
Scrolling	DECSCLM	Jump	ESC [?4l*
Screen	DECSCNM	Normal	ESC [?5l*
Origin	DECOM	Absolute	ESC [?6l*
Auto wrap	DECAWM	Off	ESC [?7l*
Auto repeat	DECARM	Off	ESC [?8l*
Interlace	DECINLM	Off	ESC [?9hl*

* The last character of the sequence is lowercase L (154_8).

Cursor Key Codes Generated

Cursor	ANSI Characters Generated Reset (Cursor)	Set (Application)
Up	ESC [A	ESC O A
Down	ESC [B	ESC O B
Right	ESC [C	ESC O C
Left	ESC [D	ESC O D

Keypad Character Selection

Name	Mnemonic	Sequence
Alternate	DECKPAM	ESC =
Numeric	DECKPNM	ESC >

Auxiliary Keypad Codes Generated

Key	VT52 Alternate Keypad Mode Off (Numeric Mode)	VT52 Alternate Keypad Mode On	ANSI Numeric Keypad Mode	ANSI Alternate Keypad Mode
0	0	ESC ? p	0	ESC O p
1	1	ESC ? q	1	ESC O q
2	2	ESC ? r	2	ESC O r
3	3	ESC ? s	3	ESC O s
4	4	ESC ? t	4	ESC O t
5	5	ESC ? u	5	ESC O u
6	6	ESC ? v	6	ESC O v
7	7	ESC ? w	7	ESC O w
8	8	ESC ? x	8	ESC O x
9	9	ESC ? y	9	ESC O y
− (minus)	− (minus)	ESC ? m	− (minus)	ESC O m
, (comma)	, (comma)	ESC ? l *	, (comma)	ESC O l *
. (period)	. (period)	ESC ? n	. (period)	ESC O n
ENTER	Same as RETURN	ESC ? M	Same as RETURN	ESC O M
PF1	ESC P	ESC P	ESC O P	ESC O P
PF2	ESC Q	ESC Q	ESC O Q	ESC O Q
PF3	ESC R	ESC R	ESC O R	ESC O R
PF4	ESC S	ESC S	ESC O S	ESC O S

* The last character of the sequence is lowercase L (154_8).

Select Character Sets (SCS)

Character Set	G0 Designator	G1 Designator
United Kingdom (UK)	ESC (A	ESC) A
United States (USASCII)	ESC (B	ESC) B
Special characters and line drawing set	ESC (0	ESC) 0

Name	Mnemonic	Sequence
Single Shift 2	SS2	ESC N
Single Shift 3	SS3	ESC O

Character Attributes

Name	Mnemonic	Sequence
Select graphic rendition (no attributes)	SGR	ESC [m
Select graphic rendition (no attributes)	SGR	ESC [Ø m
Select graphic rendition (select attributes, reverse video, or underline as determined by cursor SET-UP feature)	SGR	ESC [4 m
Select graphic rendition (select attribute, reverse video or underline as determined by cursor SET-UP feature)	SGR	ESC [7 m

Scrolling Region

Name	Mnemonic	Sequence
Set top and bottom margins	DECSTBM	ESC [Pt; Pb r

Cursor Movement Commands

Name	Mnemonic	Sequence
Cursor up	CUU	ESC [Pn A
Cursor down	CUD	ESC [Pn B
Cursor forward (right)	CUF	ESC [Pn C
Cursor backward (left)	CUB	ESC [Pn D
Cursor position	CUP	ESC [Pl; Pc H
Cursor position (home)	CUP	ESC [H
Horizontal and vertical position	HVP	ESC [Pl; Pc f
Horizontal and vertical position (home)	HVP	ESC [f
Index	IND	ESC D
Reverse index	RI	ESC M
Next line	NEL	ESC E
Save cursor (and attributes)	DECSC	ESC 7
Restore cursor (and attributes)	DECRC	ESC 8

Tab Stops

Name	Mnemonic	Sequence
Horizontal tab set (at current column)	HTS	ESC H
Tabulation clear (at current column)	TBC	ESC [g
Tabulation clear (at current column)	TBC	ESC [0 g
Tabulation clear (all tabs)	TBC	ESC [3 g

Line Attributes

Name	Mnemonic	Sequence
Double-height top half	DECDHL	ESC # 3
Double-height bottom half	DECDHL	ESC # 4
Single-width single-height	DECSWL	ESC # 5
Double-width single-height	DECDWL	ESC # 6

Erasing

Name	Mnemonic	Sequence
Erase in line (cursor to end of line)	EL	ESC [K
Erase in line (cursor to end of line)	EL	ESC [Ø K
Erase in line (beginning of line to cursor)	EL	ESC [1 K
Erase in line (entire line containing cursor)	EL	ESC [2 K
Erase in display (cursor to end of screen)	ED	ESC [J
Erase in display (cursor to end of screen)	ED	ESC [Ø J
Erase in display (beginning of screen to cursor)	ED	ESC [1 J
Erase in display (entire screen)	ED	ESC [2 J

Reports

Name	Mnemonic	Sequence
Device status report (request status of VT1Ø1) Response:	DSR	ESC [5n
Terminal OK	DSR	ESC [Øn
Terminal not OK	DSR	ESC [3n
Device status report (report cursor position)	DSR	ESC [6n
Report cursor position	CPR	ESC [Pl; Pc R
Device attributes (what are you)	DA	ESC [c
Device attributes (what are you)	DA	ESC [Øc
Identify terminal (what are you)	DECID	ESC Z (not recommended)
Device attributes Response: VT1Ø1	DA	ESC [?1; Øc

Reset

Name	Mnemonic	Sequence
Reset to initial state	RIS	ESC c

Test and Adjustments

Name	Mnemonic	Sequence
Screen alignment display (Fill screen with "Es")	DECALN	ESC # 8
Invoke confidence test (power-up test)	DECTST	ESC [2 ; 1 y
Invoke confidence test (Data loopback test, requires test connector)	DECTST	ESC [2 ; 2 y
Invoke confidence test (repeat power-up test continuously until failure or power-off)	DECTST	ESC [2 ; 9 y
Invoke confidence test (repeat data loopback test continuously until failure or power-off, requires test connector)	DECTST	ESC [2 ; 10 y

Keyboard LEDs (Indicators)

Name	Mnemonic	Sequence
Load LEDs (all off)	DECLL	ESC [Ø
Load LEDs (L1 on)	DECLL	ESC [1 q
Load LEDs (L2 on)	DECLL	ESC [2 q
Load LEDs (L3 on)	DECLL	ESC [3 q
Load LEDs (L4 on)	DECLL	ESC [4 q

VT52 COMPATIBLE MODE

Set and Reset Modes	Sequence
Enter ANSI mode	ESC <

Keypad Character Selection

Name	Sequence
Enter alternate keypad mode	ESC =
Exit alternate keypad mode	ESC >

Character Sets

Name	Sequence
Special graphics character set	ESC F*
Select US/UK character set (as determined by US/UK character SET-UP feature)	ESC G

Cursor Position

Name	Sequence
Cursor up+	ESC A
Cursor down+	ESC B
Cursor right+	ESC C
Cursor left+	ESC D
Cursor to home	ESC H
Direct cursor address	ESC Pl Pc‡
Reverse line feed	ESC I

Erasing

Name	Sequence
Erase to end of line	ESC K
Erase to end of screen	ESC J

Reports

Name	Sequence
Identify (what are you)	ESC Z
Response: VT101	ESC / Z

* Same as special character and line drawing set in ANSI mode.

+ Same when sent from the terminal.

‡ Line and column numbers for direct cursor address are single
character codes whose values are the desired number plus $37_{(8)}$.
Line and column numbers start at one.

GENERAL
This appendix describes the ANSI code extension techniques as defined in standards X3.41-1974 and X3.64-1979. Many special cases and details in the specifications are not covered here.

CONTROL FUNCTIONS
The ANSI standards define types of characters used for specific purposes. The character type is determined by the position of the character in the ASCII chart. The character chart is divided into two general categories: display characters (columns 2 through 7) and control characters (columns 0 and 1). This chart and the ANSI system can work for either a 7-bit or 8-bit character environment. The VT101 uses only 7-bit characters.

NOTE: The ASCII 7-bit chart corresponds to International Standards Organization (ISO) standard 646 and International Telegraph and Telephone Consultive Committee (CCITT) alphabet no. 5.

All control characters and character groups (sequences) not intended for display on the screen are part of the system called control functions. Not all control functions perform an action in every ANSI device, but each device can recognize all control functions and discard any that do not apply. Therefore, each device performs a subset of the ANSI functions.

Because different devices use different subsets, compliance with ANSI does not mean compatibility between devices. Compliance only means that a particular function, if defined in the ANSI standard, is invoked by the same control function in all devices. If an ANSI device does not perform an action that has a control function defined in the ANSI standard, it cannot use that control function for any other purpose.

ESCAPE AND CONTROL SEQUENCES
Escape and control sequences provide more controls than the control characters of the ASCII 7-bit chart. These sequences are multiple character control functions. They are not displayed but are used to control display, processing, and transmission of characters. At the end of the multiple character control sequence or during an error condition, the terminal continues to display received characters. (Error conditions are defined in Chapter 4.)

Escape Sequences
The format for an escape sequence is as follows.

```
ESC            I....I          F
033            040--057        060--176

Escape         Intermediate    Final
Sequence       Characters      Character
Introducer     (0 or more      (1 character)
               characters)
```

Escape Sequence Introducer -- The escape sequence introducer is the ESC character (octal 033) defined by ANSI X3.4-1977. After the ESC character is received, all characters received in the proper range are not displayed but are stored to be used as control functions.

Intermediate Characters -- If the characters received after the ESC character are in the octal range of 040--057 (column 2 of the ASCII chart), they are intermediate characters. These characters are stored as part of the control function.

Final Character -- If the character received after the ESC character is in the octal range of 060--176 (columns 3--7 of the ASCII chart), it is a final character. The final character indicates the end of the control function. The intermediate and final characters together define the function of the sequence. The terminal performs the action specified by the control function and continues to display received characters. ANSI standard control functions have a final character in the octal range of 100--176 (columns 4--7 of the ASCII chart). Private sequences have a final character in the octal range of 060--077 (column 3 of the ASCII chart).

Example

Action: Designate ASCII character set as G0.

Sequence:

```
ESC    (    B
033   050  102
 |     |    |
 |     |    --------- Final character
 |     ------------- Intermediate character
 ------------------- Escape sequence introducer
```

Control Sequence Format
The format of a control sequence is as follows.

CSI	P.....P	I.....I	F
Ø33 133	Ø6Ø--Ø77	Ø4Ø--Ø57	1ØØ--176
Control Sequence Introducer	Parameter Characters (Ø or more characters)	Intermediate Characters (Ø or more characters)	Final Character (1 character)

Control Sequence Introducer - The control sequence introducter (CSI) is the ESC (octal Ø33) and [(octal 133) characters defined by ANSI X3.41-1977. These characters are used to gain 8-bit control functions using 7-bit characters. The VT1Ø1 terminal supports only 7-bit characters. After the CSI characters are received, all characters received in the proper range are not displayed but are stored to be used as control functions.

Parameter Characters - If the characters received after the CSI characters are in the octal range of Ø6Ø--Ø77 (column 3 of the ASCII chart), the characters are parameter characters. Parameter characters modify the action or interpretation of the control function. The parameters characters are interpreted as private when the < = > ? characters (octal Ø74--Ø77) are transmitted at the beginning of the parameter string. [The : character (octal Ø72) is reserved.] This means that a control sequence can be specified by ANSI but the parameter function can have a private interpretation.

The terminal uses two types of parameter characters: numeric and selective. A numeric parameter represents a decimal number, designated by Pn. The decimal characters have a range of Ø (octal Ø6Ø) to 9 (octal Ø71). A selective is a parameter selected from a list of specified parameters, designated by Ps.

If more than one parameter is transmitted in the control sequence, the parameters are separated by a delimiter character, the ; character (octal Ø73).

Intermediate Characters - If characters received after the CSI characters are in the octal range of Ø4Ø--Ø57 (column 2 of the ASCII chart), they are intermediate characters. These characters are stored as part of the control function.

NOTE: The VT1Ø1 does not use intermediate characters in control functions.

Final Character -- If the character received after the CSI characters is in the octal range of 100--176 (columns 4--7 of the ASCII chart), it is a final character. The final character indicates the end of the control function. The intermediate and final characters together define the function of the sequence. The VT101 performs the action specified by the control function and continues to display received characters. ANSI standard control functions are assigned a final character in the octal range of 100--157 (columns 4--6 of the ASCII chart). Private sequences have a final character in the octal range of 160--176 (column 7 of the ASCII chart).

Example

Action: Clear all horizontal tabs.

Sequence:

```
ESC    [    3    g
033  133  063  147
 |     |    |    |
 |     |    |    ------ Final character
 |     |    |--------- Parameter character
 -------------------- Control sequence introducer
```

Examples
These examples show the use of multiple functions selected in one sequence, private parameters, and private sequences.

```
ESC  [   ?    4    h      Set smooth scroll mode (? = ANSI private
033 133 077  064  150     parameter)

ESC  [   2    ;    1    y    Invoke self-test (y = ANSI private
033 133 062  073  061  171   sequence)
```

ANSI GLOSSARY

Active position	The character position on the visual display that will display the next graphic character.
ANSI mode	A VT101 mode that recognizes and responds only to escape sequences whose syntax and semantics comply with ANSI specifications.
Character position	Part of the visual display that can display a graphic symbol.
Control	A control character, escape sequence, or control sequence that performs a control function.
Control character	A character that can initiate, modify, or stop a control function.
Control function	An action that affects the recording, processing, transmission, or interpretation of data.
Control sequence	A sequence of characters used to perform a control function that begins with the control sequence introducer (CSI) control and may contain a parameter string.
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.
Control string	A string of characters that performs a control function and is delimited by an opening and closing delimiter control.
Cursor represents the active	A blinking reverse-video or underline that position.
Cursor control	A function that moves the active position.
Default	A function-dependent value assumed when no value, or a value of 0, is specified.
Display	The active area of the screen inside the scrolling region, or the entire screen, depending on the origin mode.

|	
Escape character (ESC)	A control character that provides supplementary characters (code extension) and 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 of which is the escape (ESC) control character.
Final character	A character whose bit combination terminates an escape or control sequence designated by F.
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 or Ps.
Parameter	(1) A string of one or more characters that represents a single value, or (2) the value so represented.
Parameter string	A string of characters that represents 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. For example, CSI Psa; Psb; Psc F is identical to CSI Psa F CSI Psb F CSI Psc F.
VT52 mode	A VT101 mode which recognizes and responds only to escape sequences which DEC VT52 type terminals use.

GENERAL

This appendix describes the differences between the VT101 and VT100 video terminals. The VT101 is a bounded video terminal with no expansion or upgrade capabilities. Therefore, the VT101 differs from the VT100 because of the following restrictions.

- There are no advanced video option (AVO) functions. (added character attributes, added screen memory, and ROM sockets).

- EIA loopback tests cannot be performed.

  NOTE: Both the VT100 and VT101 terminals can perform data loopback self-tests.

- There are no standard terminal port connector functions or features, such as the printer interface option.

- There is no video input connector.

- There is no graphics connector. (This is an internal connector of the VT100.)

- EIA connector pin 23 is not connected to pins 11 and 19.

digital