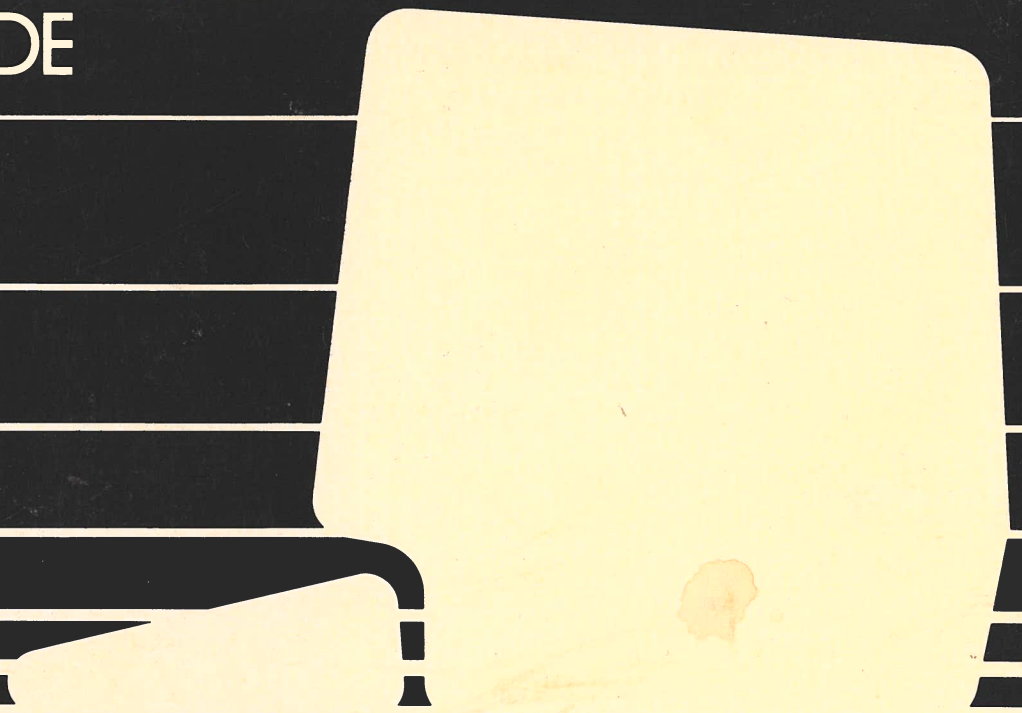


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VT102

VIDEO TERMINAL
USER GUIDE



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USER GUIDE

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INTRODUCTION

PRODUCT INTRODUCTION

The VT102 video terminal is an input and output device of a computer. The terminal uses a keyboard and video screen to communicate with a computer.

As an input device, the terminal transmits keyboard entries to the computer.

As an output device, the terminal displays characters received from the computer on the screen (using advanced video features) or prints them on an optional printer. The optional printer connects to a serial printer interface included with the terminal. The printer provides printed copy without the need for a separate communication line and interface to the computer.

HOW TO USE THIS MANUAL

This user guide describes general operating information, interface information, control function descriptions, and specific installation and check-out procedures. The main audiences for this guide are the operator, application programmer, and terminal installer. However, the operator should use this guide only as a reference when operating the terminal. The primary reference for the operator is the document that describes how to use the application software. The application software (program) determines how the computer and terminal operate.

The information in this user guide is divided by function. This allows you to reference a specific chapter when you want to perform a given function. Chapters are arranged by frequency of use. For example, operating information is frequently used, so it appears in Chapter 1; however, installation is usually performed only once, so it appears in Chapter 7.

Chapter 1 provides a general description of terminal controls and indicators. It also describes general operating procedures. Detailed operating procedures depend on the computer and software.

Chapter 2 describes how to print with the optional serial printer. It also describes the keyboard procedures that select printing operations.

Chapter 3 describes each SET-UP feature in detail and how to select each feature. Many SET-UP features change the way the terminal communicates with the computer. Chapter 6 provides detailed information on communication and related SET-UP features.

Chapter 4 shows the characters transmitted by each terminal key.

Chapter 5 describes how the terminal processes received characters. It also describes the use of control functions. Control functions control the display, processing, and transmission, of characters received by the terminal. The application programmer uses this chapter when creating applications software for the terminal.

Chapter 6 describes how the terminal communicates with the computer and printer. It includes descriptions of the communication features.

Chapter 7 describes unpacking and installation procedures, including environmental conditions to consider before installation. The chapter also describes step-by-step procedures to turn on (power up) and check out (verify the proper operation of) the terminal.

Chapter 8 describes the 20 mA current loop interface option, including installation and checkout procedures.

Chapter 9 describes all maintenance and troubleshooting procedures to use before requesting service. The troubleshooting information covers the terminal's self-tests.

Chapter 10 lists each accessory and supply, including part number and ordering information.

Appendix A provides VT102 specifications.

Appendix B summarizes the SET-UP feature displays.

Appendix C summarizes the character codes and control functions used to program the terminal.

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

Appendix E describes the differences between the VT102 and VT100 terminals.

Warnings, Cautions, and Notes

Warnings, cautions, and notes have specific meanings in this user guide. Warnings contain information to prevent personal injury. Cautions contain information to prevent damage to the terminal. Notes contain important general information.

Operating Information

1

OPERATING INFORMATION

GENERAL

This chapter provides an overview of how the VT102 video terminal operates. The text describes all controls, indicators, and general operating procedures. Detailed operating information depends on the computer and its application software.

TERMINAL OPERATION

The terminal operates either on-line, off-line, or in SET-UP. You select on-line and off-line in SET-UP. Chapter 3 describes SET-UP and provides information about selecting on-line and off-line.

When the ON LINE indicator is on, the terminal can communicate with the computer. When on-line, the terminal serves as both an input and output device of the computer. Figure 1-1 shows a general block diagram of the terminal while on-line.

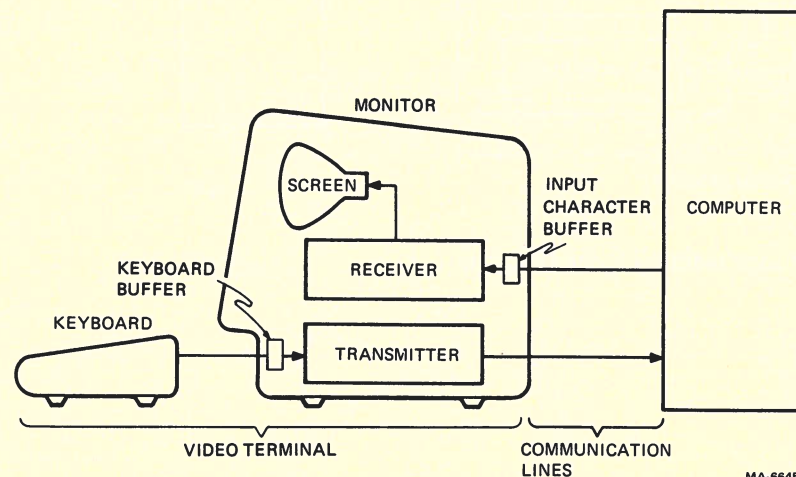


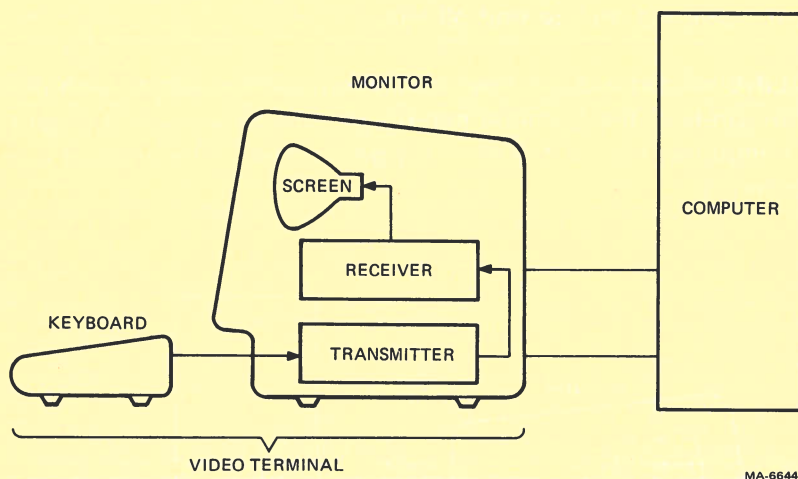
Figure 1-1 On-Line General Block Diagram

As an input device, the terminal places keyboard-generated characters in a keyboard character buffer. The characters are then taken from the buffer and transmitted to the computer.

As an output device, the terminal places received characters in the input character buffer for processing. When processing, the terminal removes the received characters from the buffer and either displays or prints them.

When the OFF LINE indicator is on, the terminal cannot communicate with the computer. Characters typed on the keyboard appear on the screen. Figure 1-2 shows a general block diagram of the terminal while off-line.

An optional serial printer connects to the terminal's printer interface. Therefore, you can produce printed copy without a separate communication line and interface to the computer. The printer can print when the terminal is on- or off-line.



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Figure 1-2 Off-Line General Block Diagram

CONTROLS AND INDICATORS

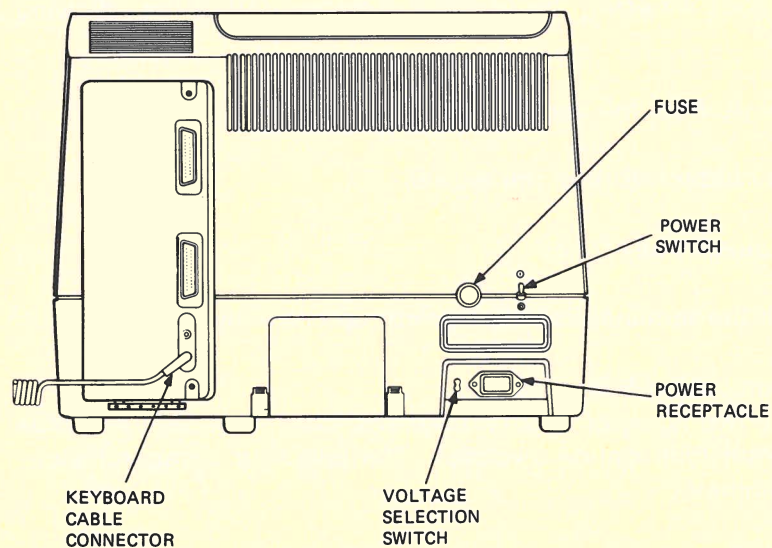
The terminal has five groups of controls and indicators: monitor controls, communication switches, keyboard controls, visual indicators, and audible indicators.

Monitor Controls

The terminal has two controls on the monitor backpanel, the voltage selection switch and the power switch (Figure 1-3). The following paragraphs describe these monitor controls.

Voltage Selection Switch – This switch allows the terminal to operate with available ac input voltage range. If you change the switch position, you must also change the fuse. The switch position and fuse are selected when the terminal is installed. See Chapter 7 for more information about installing the terminal.

CAUTION: *You may damage the terminal if you set the voltage selection switch to the wrong position and use the wrong fuse.*



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Figure 1-3 Monitor Controls

Power Switch – This switch controls ac power to the terminal. When ac power is on, either the ON LINE or OFF LINE indicator is on. See Keyboard Indicators in this chapter for more information.

Turn the terminal on (power up) by using the following procedure.

1. Turn the power switch to the on (1) position (Figure 1-3). The terminal automatically runs a power-up self-test to verify terminal operation. The test provides the following indications.

- All indicators come on and go off; either the ON LINE or OFF LINE indicator stays on.

NOTE: The on or off state of other indicators depends on the communication signals received and terminal features selected.

- A bell tone sounds.
- The cursor appears in the upper-left corner of the screen.

If the test finds an error, the terminal provides one of the following indications.

- Does not perform the above sequence
- Displays character(s) on the screen
- Sounds several bell tones

See Chapter 9 if the terminal does not power up correctly.

Internal Communication Switches

The terminal has two types of internal switches, communication switches and 20 mA current loop option switches. The following paragraphs describe these switches.

Communication Switches – These ten switches select the communication lines used by the modem connector. The switches are set during installation. See Chapter 7 for the selection procedure.

20 mA Current Loop Option Switches – The 20 mA current loop option (VT1XX-CA) has two switches that select active or normal (passive) operation for the transmitter and receiver. See Chapter 8 for more information about the 20 mA current loop option.

Keyboard Controls

The terminal keyboard has a main keyboard and numeric keypad (Figure 1-4). The main keyboard looks and operates like a standard typewriter. The numeric keypad allows rapid entry of numeric data or function characters (used with some application software). The keys are divided into four groups: standard keys, function keys, printing keys, and SET-UP keys.

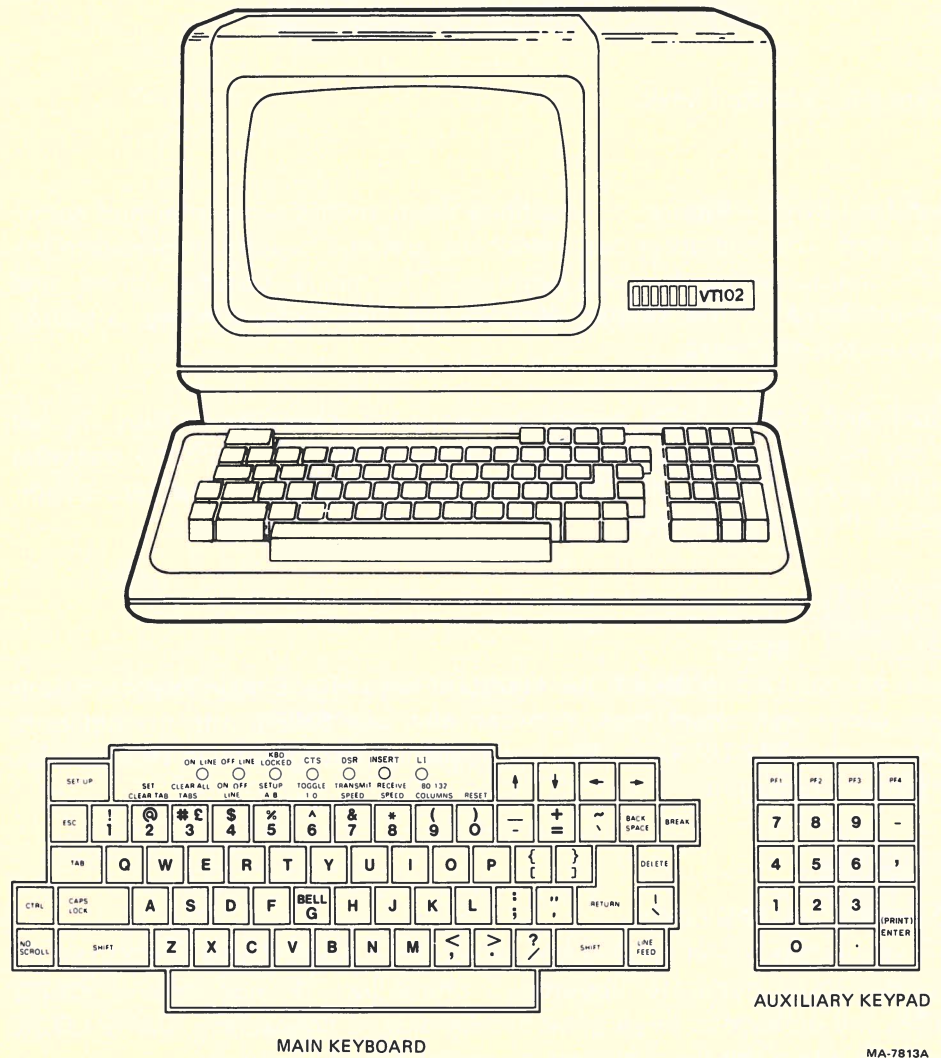
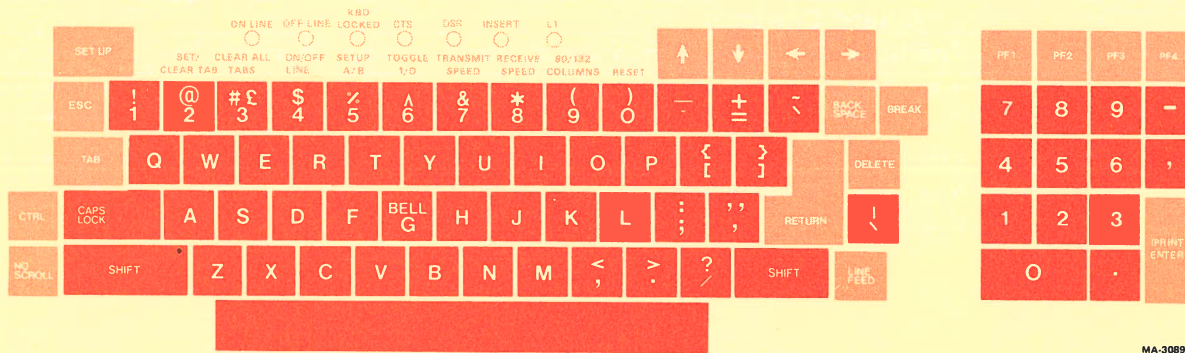


Figure 1-4 VT102 Keyboard



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Figure 1-5 Standard Keys

Standard Keys – Figure 1-5 identifies the standard typewriter and calculator keys. The computer can select the numeric keypad to generate the same characters as the main keyboard. The minus, comma, period, and numeric keys on the keypad operate like the corresponding unshifted keys on the keyboard.

SHIFT and **CAPS LOCK** modify standard key characters. They do not modify numeric keypad characters. The following paragraphs describe **SHIFT** and **CAPS LOCK**. Chapter 4 describes all the characters generated by the standard keys.

SHIFT

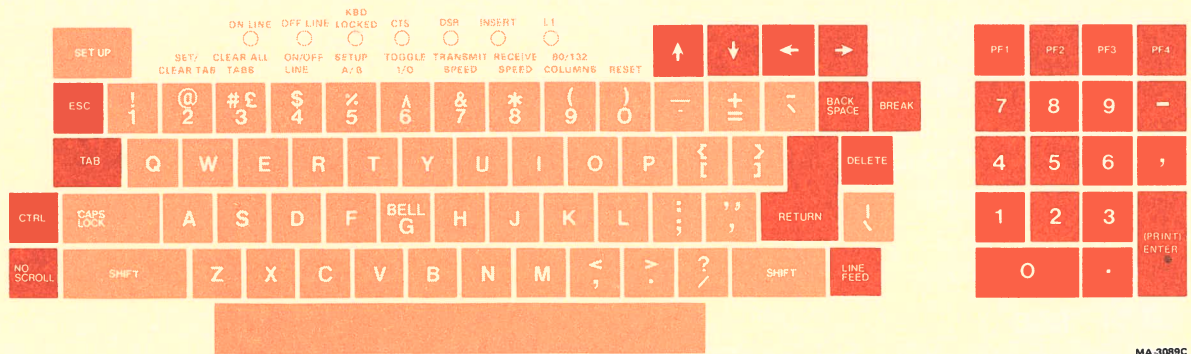
SHIFT

When you hold down **SHIFT**, the standard keys on the main keyboard generate uppercase characters. You can also use **SHIFT** with the function, printing, and SET-UP keys. See the following paragraphs in this chapter for more information.

CAPS
LOCK**CAPS LOCK**

This is a two-position locking key. If you lock down **CAPS LOCK**, the alphabetic keys generate uppercase characters. If you release **CAPS LOCK**, the alphabetic keys generate lowercase characters. **CAPS LOCK** does not affect the function and numeric keypad keys.

NOTE: **CAPS LOCK** does not affect the numeric and special symbol keys. Therefore, **CAPS LOCK** does not operate like the **SHIFT LOCK** of a typewriter.



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Figure 1-6 Function Keys

Function Keys – Figure 1-6 identifies the function keys. The computer can also select the numeric keypad to generate function characters. The application software or communication system define the use of function keys. Chapter 4 describes all the characters generated by the function keys. The following paragraphs provide a general description of each function key.



NO SCROLL

This key controls scrolling on the screen. Scrolling is the upward or downward movement of existing lines on the screen to allow new lines to appear. When you first press this key, scrolling stops and new characters cannot appear. When pressed again, scrolling continues and new characters can appear.

NOTE: **NO SCROLL** operates only in full-duplex communication with the auto XON/XOFF SET-UP feature on. This key does not operate with the auto XON/XOFF feature off or with half-duplex communication.



BREAK/HERE IS

This key generates a break when the break enable SET-UP feature is on. See Chapter 3 for more information about SET-UP features and Chapter 6 for more information about break.

When you hold down **SHIFT**, **BREAK** generates a long break disconnect. With some modems, a long break disconnect causes a communication (phone) line disconnect. See Break in Chapter 6 for more information about long break disconnects.

When you hold down **CTRL**, **HERE IS** transmits the answerback message. The answerback message identifies the terminal to the computer. You enter the answerback message in SET-UP. See Chapter 3 for more information about the answerback SET-UP feature.



Cursor Control Keys

These keys are defined by the application software. However, they usually generate cursor control commands. The cursor is a screen indicator showing the line and column where the next character will appear.

ESC

ESC

This key generates the escape (ESC) control character, defined by the application software.

TAB

TAB

This key generates the tab (TAB) control character, defined by the application software.

CTRL

CTRL

When you hold down **CTRL**, pressing another key may generate a control character defined by the application software. Chapter 4 describes the control characters.

You can also use **CTRL** with the **HERE IS** and printing keys. See the description of these keys in this chapter for more information.

BACK
SPACE

BACK SPACE

This key generates the back space (BS) control character, defined by the application software.

DELETE

DELETE

This key generates the delete (DEL) control character, defined by the application software.

RETURN

RETURN

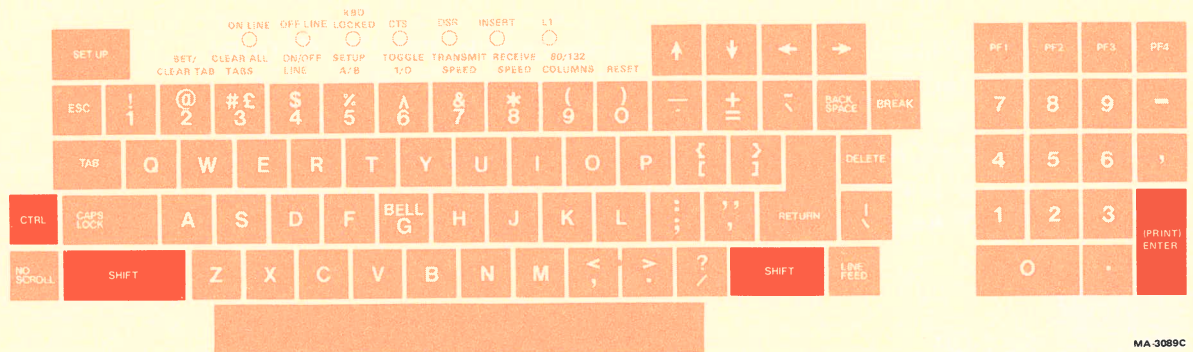
This key generates either a carriage return, or carriage return and linefeed. The linefeed/new line SET-UP feature selects the characters generated. See Chapter 3 for more information about this feature.

When using half-duplex coded control (HDX B), **RETURN** may also automatically generate a line turnaround character. Setting the auto turnaround SET-UP feature selects automatic generation. Setting the turnaround/disconnect character SET-UP feature selects the turnaround character. See Chapter 3 for more information about these features.

LINE
FEED

LINE FEED

This key generates the linefeed (LF) control character, defined by the application software.



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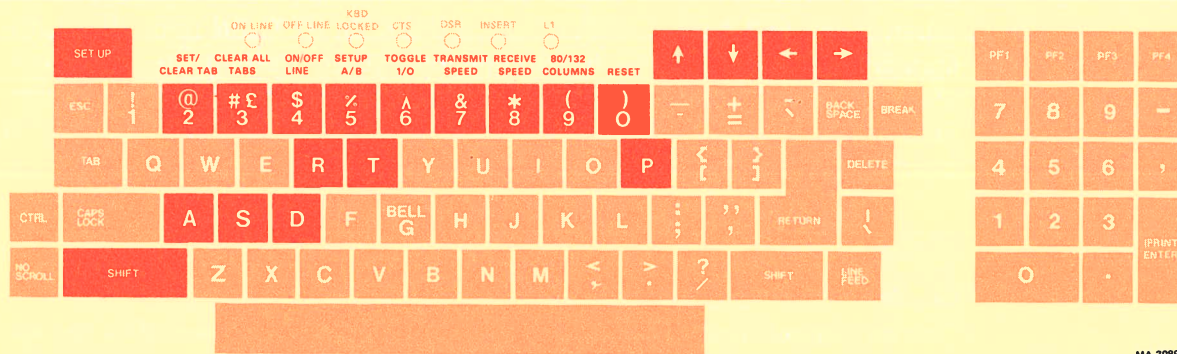
Figure 1-7 Printing Keys

Printing Keys – Figure 1-7 identifies the keys that control printing. The optional serial printer can print when the terminal is on- or off-line. The following paragraph describes the **(PRINT)** key. See Chapter 2 for more information about printing operations.

(PRINT)
ENTER

(PRINT)/ENTER

This key works with **CTRL** and **SHIFT** to control printing. When you hold down **CTRL**, **(PRINT)** turns the auto print (line-at-a-time printing) operation on and off. When you hold down **SHIFT**, **(PRINT)** causes a print screen operation.



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Figure 1-8 SET-UP Keys

SET-UP Keys – Figure 1-8 identifies the keys used in SET-UP. SET-UP lets you select terminal features from the keyboard. SET-UP is divided into SET-UP A and SET-UP B displays. Both displays show a summary of feature selections. Chapter 3 provides both SET-UP feature descriptions and step-by-step feature selection procedures. Read Chapter 3 before using the SET-UP keys. The following paragraphs describe these keys.

SET UP

SET-UP

This key places the terminal in SET-UP. In SET-UP, you can change the terminal SET-UP features.

@
2**SET/CLEAR TAB**

In SET-UP A, this key sets or clears individual horizontal tab stops. **SET/CLEAR TAB** does not operate in SET-UP B.

£
3**CLEAR ALL TABS**

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

\$
4**ON/OFF LINE**

In any SET-UP display, this key switches the terminal between on-line and off-line. While on-line, the terminal can communicate with the computer. While off-line, the terminal cannot communicate with the computer; keyboard entries appear on the screen. The optional serial printer can print when the terminal is on- or off-line.

**SETUP A/B**

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

**TOGGLE 1/0**

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

**TRANSMIT SPEED**

In SET-UP B, this key selects the transmit speed (baud rate) for either the modem or printer interface. **TRANSMIT SPEED** does not operate in SET-UP A.

**RECEIVE SPEED**

In SET-UP B, this key selects the receive speed (baud rate) for either the modem or printer interface. **RECEIVE SPEED** does not operate in SET-UP A.

**80/132 COLUMNS**

In SET-UP A, this key selects the display line size (80 or 132 columns per line). **80/132 COLUMNS** does not operate in SET-UP B.

**RESET**

In any SET-UP display, this key starts the reset sequence. Pressing **RESET** is the same as turning the power switch off and on.

**Screen Brightness Keys**

In any SET-UP display, ↑ increases and ↓ decreases the screen brightness.

**Modem/Printer Select Keys**

In any SET-UP display, ← and → move the cursor left and right. In SET-UP B, the arrow keys and **SHIFT** select either the modem or printer interface features. When you hold down **SHIFT**, ← selects modem features and → selects printer features.

A**Answerback**

In SET-UP B, **SHIFT** and **A** let you create the answerback message. Hold down **SHIFT** and press **A**; then type the answerback message. You can use any keyboard key. The terminal stores this identifying message for transmission to the computer.

C**Turnaround/Disconnect**

In SET-UP B, **SHIFT** and **C** select the turnaround/disconnect characters. Hold down **SHIFT** and press **C** to select the turnaround character. This character works in half-duplex communication with coded control turnaround (HDX B). The disconnect character indicates the end of communication. You must select the disconnect character enable SET-UP feature to use the disconnect character.

D**Default**

In any SET-UP display, **SHIFT** and **D** select the default SET-UP feature settings. Hold down **SHIFT** and press **D** to select the default SET-UP feature setting. Each SET-UP feature has a default feature setting. Chapter 3 lists the actual default feature settings.

M**Modem Control**

In SET-UP B, **SHIFT** and **M** select the type of communication used. Hold down **SHIFT** and press **M** to select one of five types of communication. There are three types of full-duplex and two types of half-duplex communication.

P**Data/Parity Bits**

In SET-UP B, **SHIFT** and **P** select the data/parity bits feature for either the modem or printer interface. Hold down **SHIFT** and press **P** to change the number of data bits per character and type of parity selected.

R**Recall**

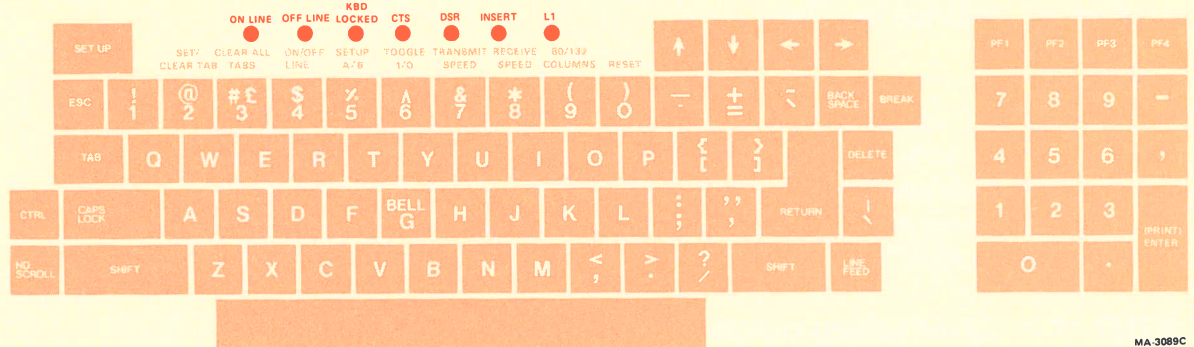
In any SET-UP display, **SHIFT** and **R** perform a SET-UP feature recall. Hold down **SHIFT** and press **R** to recall the SET-UP features stored in user memory.

S**Store**

In any SET-UP display, **SHIFT** and **S** perform a SET-UP feature store. Hold down **SHIFT** and press **S** to store the SET-UP features in operating memory into user memory.

T**Tab Default**

In SET-UP A, **SHIFT** and **T** select a tab default. Hold down **SHIFT** and press **T** to select a tab default. this clears all tab stops and sets a tab stop every eighth character position.



MA 3089C

Figure 1-9 Keyboard Indicators

Keyboard Indicators

The following paragraphs describe the function of each indicator shown in Figure 1-9.

ON LINE

This indicator is on when the terminal is on-line and can communicate with the computer. Either ON LINE or OFF LINE is on when power is on.

NOTE: Depending on the type of communication selected, the terminal may not communicate with the computer until a communication line connection exists. See Chapter 6 for more information about communication types.

OFF LINE

This indicator is on when the terminal is off-line and cannot communicate with the computer. When off-line, the terminal displays keyboard characters on the screen. Either ON LINE or OFF LINE is on when the power is on.

KBD LOCKED

This indicator is on during a keyboard locked condition. This means the keyboard character buffer is full and cannot accept more keyboard characters. The keyboard character buffer holds keyboard characters until the terminal transmits them to the computer (Figure 1-1). If KBD LOCKED is on, keyboard characters are lost. If the keyclick SET-UP feature is on, keys will not generate keyclicks.

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

There are several causes for the keyboard locked condition (Table 1-1). Each cause has a method to clear the keyboard locked condition. When the condition clears, the terminal can transmit characters to the computer and the KBD LOCKED indicator goes off. If the keyclick SET-UP feature is on, keys will generate keyclicks.

CTS

This indicator shows the on and off condition of the clear to send (CTS) or secondary clear to send (SCTS) modem connector signals. The internal communication switches select the connector signal used. See Chapter 6 for more information about the communication signals and internal communication switches.

NOTE: *If the 20 mA current loop option (VT1XX-CA) is installed, the CTS signal is not used.*

Table 1-1 Keyboard Locked Condition

Cause	Method of Clearing
Terminal not connected to computer. Communication line signals are not correct for communication.	Cleared when a connection exists between computer and terminal. Check CTS and DSR indicators to determine if a connection exists.
Half-duplex communication is selected (by modem control SET-UP feature) and terminal is receiving characters. Terminal cannot transmit characters when receiving characters in half-duplex.	Cleared when line turns around and terminal can transmit characters.
Characters are typed into terminal faster than they can be transmitted.	Cleared when terminal transmits characters in keyboard character buffer to computer.
A print operation selected while off-line.	Cleared when print operation ends.
Computer turns off keyboard.	Computer turns on keyboard.
NOTE: <i>Entering and exiting SET-UP with KBD LOCKED on erases the keyboard character buffer and cancels printing or print operation requests.</i>	

DSR

This indicator shows the on and off state of the data set ready (DSR) modem connector signal. This signal is on when the local modem (connected to the terminal) is ready to communicate. If the signal is off, the modem cannot communicate.

NOTE: If the 20 mA current loop option (VT1XX-CA) is installed, the DSR signal is not used.

INSERT

This indicator shows when the terminal is in insert or replace mode. The computer selects these modes. In insert mode, INSERT is on. The terminal inserts new characters at the cursor position. Characters displayed to the right of the cursor move to the right. Characters moved past the right margin are lost.

In replace mode, INSERT is off. The terminal writes new characters over the current display characters at the cursor position.

L1

This indicator is turned on and off by the computer. Therefore, the application software defines the meaning of L1.

Audible Indicators

There are three audible indicators: a keyclick, a bell tone, and a series of bell tones. The following paragraphs describe these indicators.

Keyclick – A keyclick sounds when you press a key, with the following exceptions.

- You press **SHIFT** or **CTRL**. These keys do not generate a keyclick because they do not generate characters. They modify the characters generated by other keys.
- KBD LOCKED is on; characters from the keyboard are lost.
- The keyclick SET-UP feature is off.

Bell Tone – A bell tone sounds in each of the following cases.

- The terminal receives a bell character from the computer.
- The cursor is eight characters away from the right margin and the margin SET-UP feature is on.

Series of Bell Tones – A series of bell tones sounds to indicate a problem in storing or recalling the SET-UP features in user memory. If the terminal has a problem, it automatically uses the default SET-UP feature selections. See Chapter 3 for more information about the SET-UP feature memories.

Printing

PRINTING 2

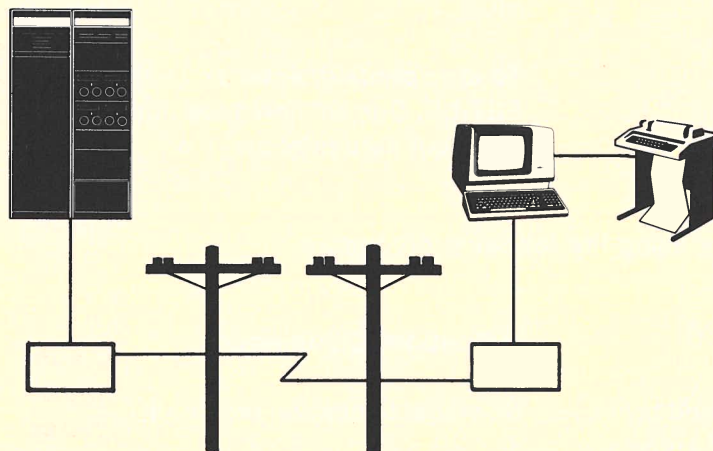
GENERAL

The VT102 has a built-in serial printer interface that connects to an optional serial printer. The terminal performs several print operations selected from the keyboard and computer. This chapter describes the print operations and how to select them from the keyboard. Chapter 5 describes how the computer selects print operations.

PRINT OPERATIONS

The optional serial printer connects to the terminal printer interface (Figure 2-1). The terminal uses the printer interface signals to determine if a printer is connected and ready to print. If a printer is not connected, the terminal ignores requests for printing. If a printer is connected but unable to print, print requests cause the terminal to wait for the print operation to end. While the terminal is waiting, it cannot display new characters on the screen. After the print operation ends, the terminal can display new characters.

NOTE: You can cancel print operations by entering and exiting SET-UP. If you stop printing by entering and exiting SET-UP, you must move the printhead to the left margin.



MA-5765

Figure 2-1 Local Printing Configuration

Printing uses four print operations: auto print (line at a time), print screen, printer controller, and print cursor line. The computer can select all print operations while the terminal is on-line. You can only select the auto print and print screen operations from the keyboard; however, you can select them while the terminal is on- or off-line. If the terminal is off-line, KBD LOCKED comes on until printing ends.

A line of double-height, double-width characters prints as the same line twice, using single-height, single-width characters. Double-width characters print as single-width characters.

Auto Print (Line at a Time)

Auto print operation prints the current display line before the cursor moves to the next line. The cursor moves when the terminal receives a linefeed, form feed, or vertical tab character. (The terminal also transmits this character to the printer at the end of the printed line.)

If the auto wrap SET-UP feature is on, characters received when the cursor is at the right margin automatically wrap to the next line. Before the cursor moves to the next line, the current line prints. The auto wrapped line ends with the carriage return and linefeed characters. Select auto print by using the following procedure.

Procedure	Indication/Comments
Hold down CTRL and press (PRINT) to turn on auto print.	No visual indication provided. However, current line prints before cursor moves to next line. When selected, auto print operation continues until turned off. To stop printing, enter and exit SET-UP. Current line does not print, but auto print stays on.

Turn off auto print by using the following procedure.

Procedure	Indication/Comments
Hold down CTRL and press (PRINT) to turn off auto print.	No visual indication provided.

Print Screen

Print screen prints a copy of the screen. The print extent SET-UP feature selects the scrolling region or complete screen to print. The scrolling region is the area of the screen between the top and bottom margins. The computer selects the top and bottom margins. Select print screen by using the following procedure.

Procedure	Indication/Comments
Hold down SHIFT and press (PRINT) to select print screen.	The printer prints characters displayed on screen.

Printer Controller

Printer controller gives the computer direct control of the printer. Characters received from the computer do not appear on the screen; they go directly to the printer.

NOTE: If you select print screen from the keyboard while printer controller is selected, the screen display prints immediately.

Print Cursor Line

Print cursor line prints the current display line. The cursor position on the screen does not change.

SET-UP Features

SET-UP FEATURES

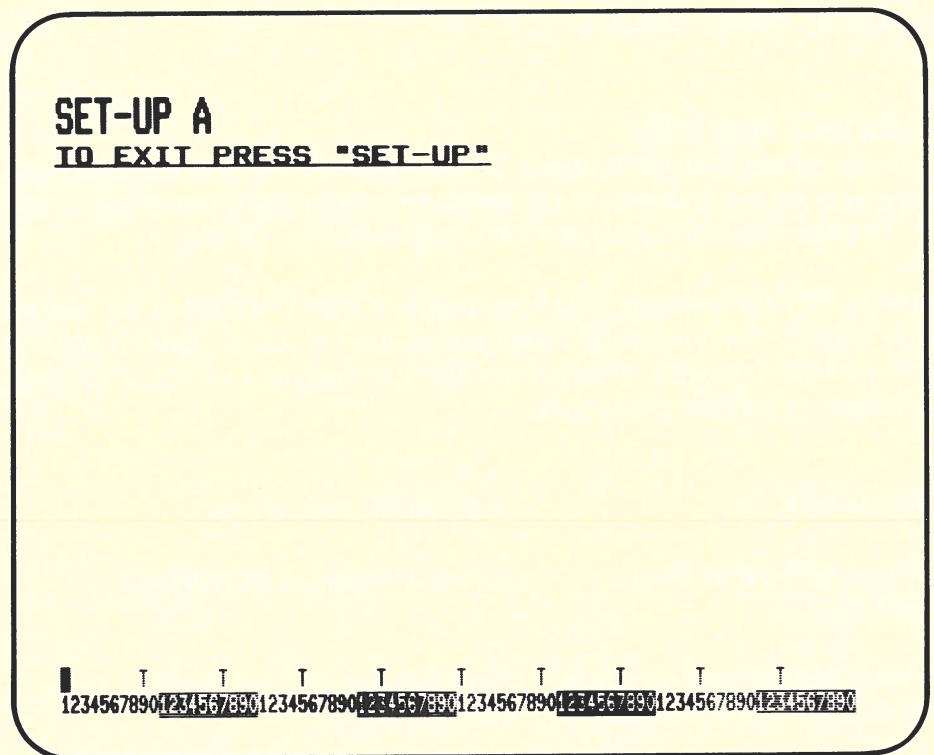
3

GENERAL

SET-UP lets you select many VT102 features to configure the terminal for specific applications. This chapter describes SET-UP and each of the SET-UP features.

SET-UP

In SET-UP, you can select features at the keyboard. Current feature selections appear on the screen. Two SET-UP displays show the feature selections - SET-UP A and SET-UP B (Figure 3-1). The first display (SET-UP A) shows the location of the tab stops selected. A visual ruler numbers each column. The second display (SET-UP B) shows the other SET-UP features.



MA-9363

Figure 3-1a SET-UP A Display

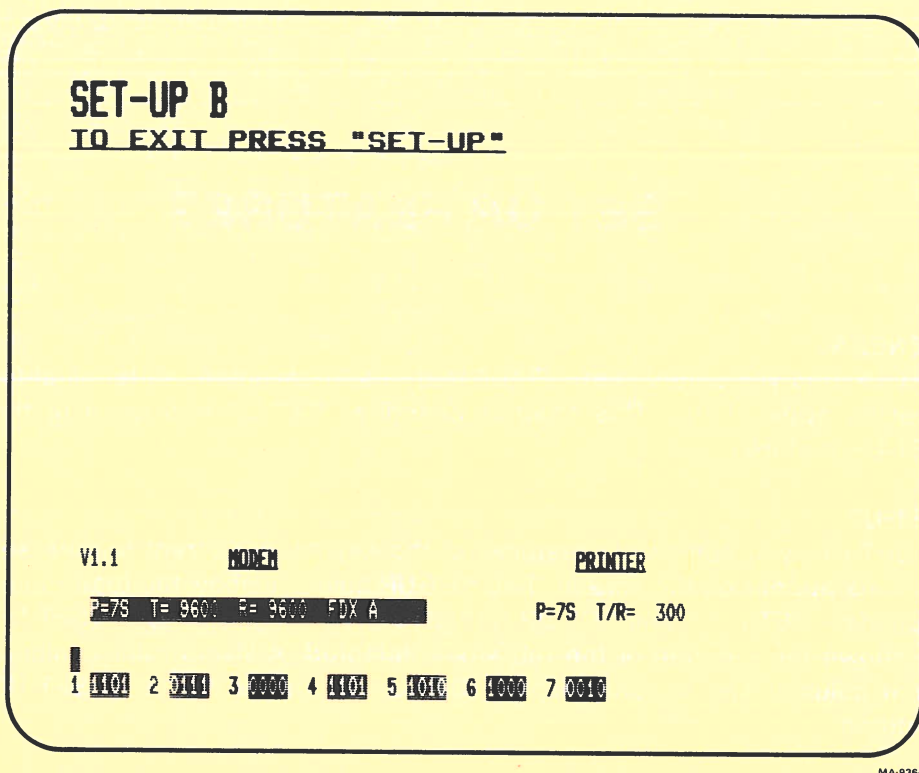


Figure 3-1b SET-UP B Display

SELECTING FEATURES

You can select SET-UP features at the keyboard or with the computer. When you select features at the keyboard, the terminal must be in SET-UP. The terminal can enter SET-UP while on-line or off-line.

Entering SET-UP cancels print operations. If KBD LOCKED is on, the terminal erases the keyboard buffer before transmission. Exiting SET-UP turns off KBD LOCKED. Change the SET-UP feature selections by using the following general procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to select the correct SET-UP display.	Terminal displays selected SET-UP display.
Change the SET-UP feature selection.	SET-UP display shows feature selection.

Procedure	Indication/Comments
Store the SET-UP features if desired.	Terminal displays "Wait" and then SET-UP A.
Press SET-UP to exit SET-UP.	Usually, characters displayed on screen before entering SET-UP are not lost. These characters reappear on screen after exiting SET-UP.

Table 3-1 lists the SET-UP features that the computer can change. See Chapter 5 for more information about how the computer selects features.

Table 3-1 SET-UP Features The Computer Can Change

SET-UP Feature	Changes	SET-UP Feature	Changes
On/off line	-	Break enable	-
Screen brightness	-	Disconnect character enable	-
Columns per line	X	Disconnect delay	-
Tab stops	X	Auto answerback enable	-
Scroll	X	Initial direction	-
Auto repeat	X	Auto turnaround	-
Screen background	X	Power	-
Cursor	-	WPS terminal	-
Margin bell	-	Clock	-
Keyclick	-	Modem data/parity bits	-
ANSI/VT52	X	Transmit speed	-
Auto XON/XOFF	-	Receive speed	-
US/UK character set	X	Modem control	-
Auto wrap	X	Turnaround/disconnect character	-
Linefeed/new line	X	Answerback	-
Local echo	X	Printer data/parity bits	-
Print termination	X	Transmit/receive speed	-
Print extent	X		
One or two stop bits	-		
Receive parity	-		

FEATURE MEMORIES

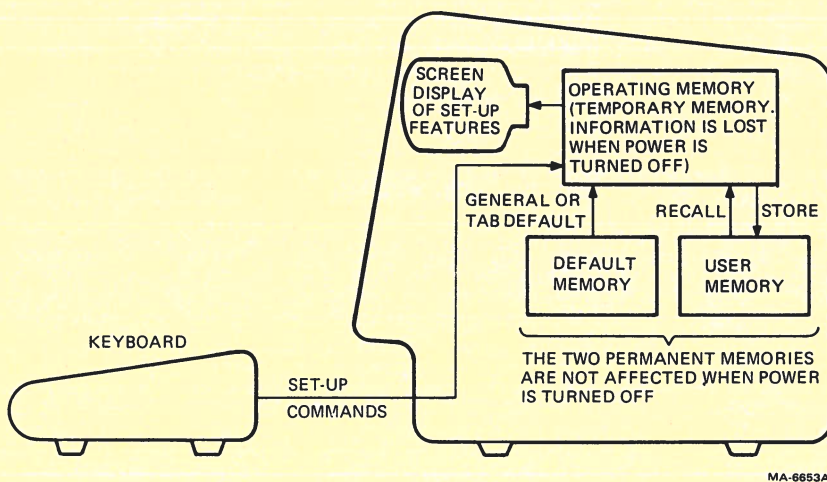
The terminal stores SET-UP feature selections in three SET-UP feature memories: operating (temporary), user, and default (Figure 3-2).

Operating Memory

This memory holds SET-UP feature selections that guide terminal operation. You can select these features from either the keyboard or computer. The SET-UP displays show the feature selections in this memory.

Operating memory features are replaced by user memory features during a recall, reset, or power-up (terminal is first turned on). Change the feature selections in operating memory by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to select the correct SET-UP display.	Terminal displays selected SET-UP display.
Change the SET-UP feature selection.	SET-UP display shows feature selection.
Press SET-UP to exit SET-UP.	Terminal operates according to new SET-UP feature selections in operating memory.



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Figure 3-2 SET-UP Feature Memories

User Memory

This memory holds SET-UP feature selections that replace operating memory features during a store, recall, reset, or power-up. User memory is nonvolatile, so turning off the power does not affect SET-UP features. When the terminal is on, you can move SET-UP features between operating memory and user memory by using store, recall, and reset procedures.

Store – This procedure enters operating memory SET-UP feature selections into user memory. You perform a store at the keyboard; the computer does not have a store procedure. Store the SET-UP feature selections in user memory by using the following procedure.

NOTE: *The terminal does not check the modem interface during a store; therefore received characters may be lost.*

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Hold down SHIFT and press S to store features in user memory.	Terminal displays Wait while storing feature selections in user memory, then displays SET-UP A.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.

NOTE: *Storing the SET-UP features in user memory, also stores the insertion-replacement mode selection. However, you cannot select this mode at the keyboard.*

Recall – This procedure enters user memory SET-UP feature selections into operating memory. This erases previous features in operating memory. Recall the SET-UP features from user memory into operating memory by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	The terminal displays SET-UP A.
Hold down SHIFT and press R to recall the features.	Terminal erases screen and displays Wait while recalling feature selections from user memory. When features are recalled, the terminal <ul style="list-style-type: none"> • Disconnects from communication line • Erases input and keyboard character buffers • Displays SET-UP A.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP are lost. When exiting SET-UP, the screen is blank.

Reset – This procedure causes the terminal to perform a self-test and recall the user memory feature selections. This erases previous feature selections in operating memory. Reset the terminal by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press RESET to reset the terminal.	When a reset is performed, the terminal <ul style="list-style-type: none"> • Disconnects from communication line • Erases input and keyboard character buffers • Performs power-up self-test

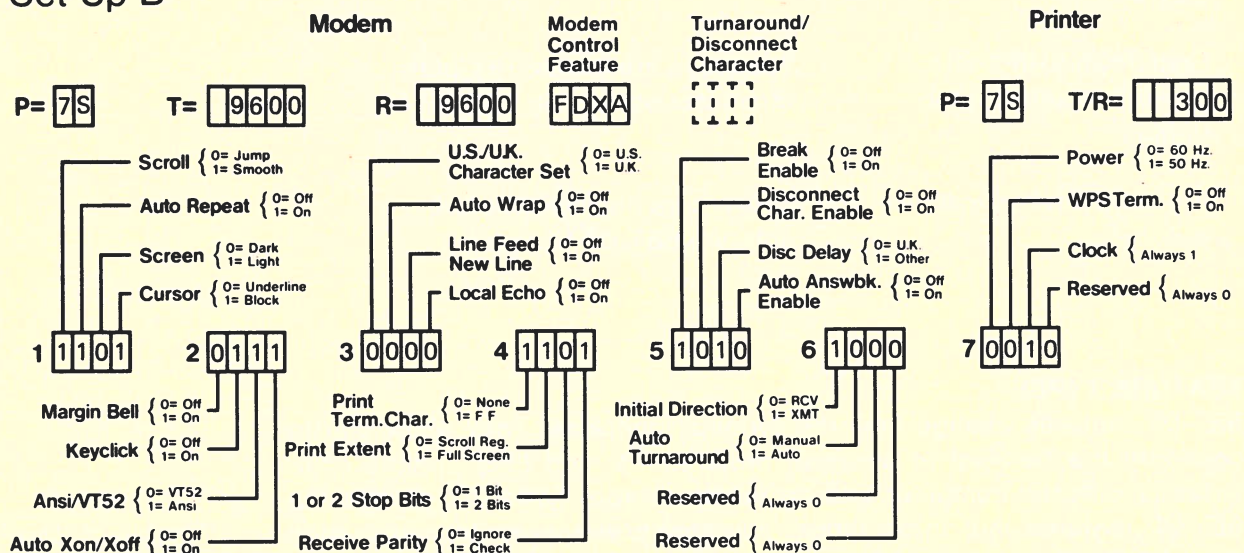
Procedure	Indication/Comments
	<ul style="list-style-type: none"> Performs an automatic recall and operates according to SET-UP feature selections in user memory Automatically exits SET-UP. Characters displayed before entering SET-UP are lost; the screen is blank.

Default Memory

This memory holds default SET-UP feature selections for all SET-UP features. Default SET-UP feature selections are typical feature selections you cannot change. When a default occurs, operating memory SET-UP feature selections change to default selections. There are two types of default selections, general and tab default. A default does not change SET-UP features in user memory. A default occurs when you select it or when the terminal cannot read user memory.

General Default – This changes all SET-UP features in operating memory to default memory selections. SET-UP A features are set to 80 columns per line, with a tab stop every eighth column. SET-UP B default features are shown in Figure 3-3. The terminal switches off-line and erases the answerback message from operating memory. Select a general default by using the following procedure.

Set-Up B



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Figure 3-3 Default SET-UP Features

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Hold down SHIFT and press D to select a general default.	<p>When a general default is selected, the terminal</p> <ul style="list-style-type: none"> • Disconnects from communication line • Erases input and keyboard character buffers • Displays SET-UP A • Operates according to SET-UP feature selections in default memory.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP are lost; the screen is blank.

Tab Default – This clears all terminal tab stop settings and sets a new tab stop at every eighth column. Select a tab default by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to exit SET-UP.	Terminal displays SET-UP A.
Hold down SHIFT and press T to select a tab default.	Tab stops are set every eighth character position in SET-UP A.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.

FEATURE TYPES

SET-UP features change how the terminal operates. They allow you to configure the terminal to operator preferences, and they provide compatibility with the computer and ac power source. Table 3-2 divides the SET-UP features into three types: operator preference, communication compatibility, and installation.

Table 3-2 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	-
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	-
Linefeed/new line	-	X	-
Local echo	-	X	-
Print termination	-	X	-
Print extent	-	X	-
One or two stop bits	-	X	-
Receive parity	-	X	-
Break enable	-	X	-
Disconnect character enable	-	X	-
Disconnect delay	-	X	-
Auto answerback enable	-	X	-
Initial direction	-	X	-
Auto turnaround	-	X	-
Power	-	-	X
WPS terminal	-	-	X
Clock	-	-	X
Modem data/parity bits	-	X	-
Transmit speed	-	X	-
Receive speed	-	X	-
Modem control	-	X	-
Turnaround/disconnect character	-	X	-
Answerback	-	X	-
Printer data/parity bits	-	X	-
Transmit/receive speed	-	X	-

Operator Preference Features

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

Communication Compatibility Features

These features configure the terminal for compatibility with a computer and optional serial printer. There are many combinations of SET-UP features used when communicating. An error in these selections may stop communication or transfer incorrect information between the terminal, computer, and printer.

NOTE: This chapter describes the SET-UP features used to provide compatibility. See Chapter 6 for more information about using these SET-UP features.

Installation Features

These features configure the terminal for operation in different installations. If the terminal location changes, you must verify these feature selections.

FEATURE DESCRIPTIONS

The following descriptions group SET-UP features by the SET-UP display in which they appear. There are three types: general SET-UP features (in any SET-UP display), SET-UP A features, and SET-UP B features.

Each section begins with a general procedure for changing each SET-UP feature in that SET-UP display. Where needed, the SET-UP feature descriptions provide more detail.

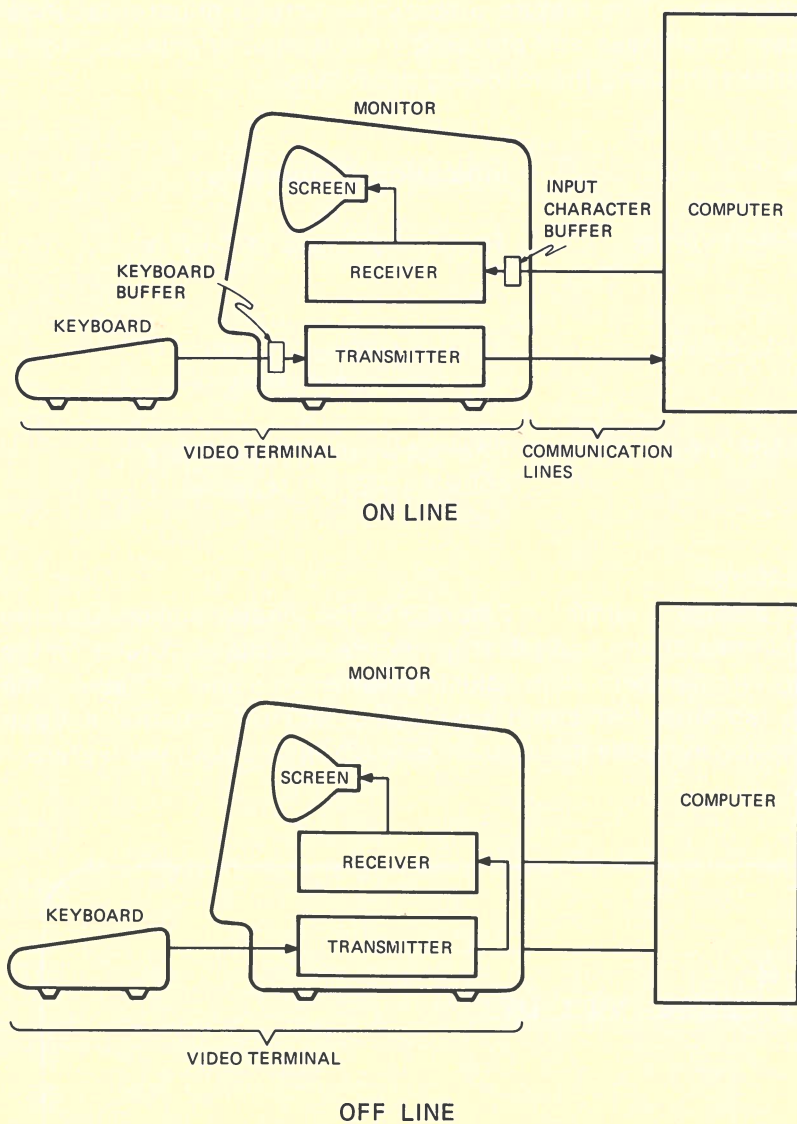
General SET-UP Features

You can change the on/off line and screen brightness SET-UP features in any SET-UP display. Dedicated keys 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 3-4). While on-line, ON LINE is on and the terminal can communicate with the computer. The terminal transmits keyboard entries to the computer and displays characters received from the computer on the screen.

When switched off-line, the terminal disconnects from the communication line and erases both the input and keyboard character buffers. While off-line, OFF LINE is on and the terminal cannot communicate with the computer. The terminal does not transmit keyboard entries, but displays them on the screen. Select on-line or off-line by using the following procedure.

NOTE: When the disconnect character enable SET-UP feature is on, perform a long break disconnect before switching the terminal off-line. See Chapter 6 for more information about the long break disconnect.



MA-7816A

Figure 3-4 On/Off Line General Block Diagram

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press ON/OFF LINE to select on-line or off-line.	ON LINE or OFF LINE comes on to show feature selection.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.

Screen Brightness – This feature adjusts the screen brightness. Pressing ↑ increases brightness and pressing ↓ decreases brightness. Adjust screen brightness by using the following procedure.

Procedure	Indication / Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press ↑ or ↓ to adjust brightness.	SET-UP display increases or decreases brightness.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.

SET-UP A Features

The SET-UP A display is similar to Figure 3-5. The display summarizes the number of columns per line and tab stop feature selections. A ruler on the bottom display line numbers each column position on a line. A T above the ruler shows a tab stop. Dedicated keys select SET-UP A features. Each feature description includes the specific procedure to select the feature.

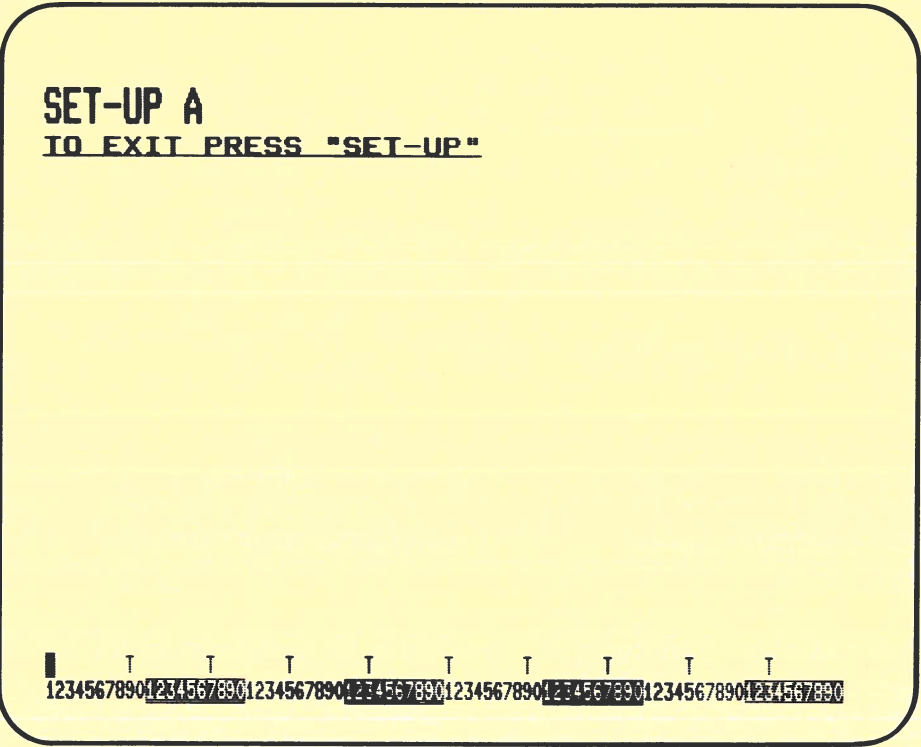


Figure 3-5 SET-UP A Display

Columns Per Line – This feature selects a display of either 80 or 132 columns per line. The screen uses 24 display lines regardless of the columns per line selection. The displayed lines are the same width, but the columns are closer together when using 132 columns per line (Figure 3-6). Select the number of columns per line by using the following procedure.

NOTE: When printing characters displayed on the screen, you must set the horizontal margins of the printer wider than this feature selection.

Procedure	Indication / Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press 80 / 132 COLUMNS to select the number of columns per line.	The ruler on the bottom display shows feature selection.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP are lost; the screen is blank.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.

These are characters displayed using 80 columns.

These are characters displayed using 132 columns.

MA-8391

Figure 3-6 80- and 132-Column Displays

Tab Stops – Tab stops are column positions selected on screen lines. The cursor can tab (advance) to the column with the tab stop. You can change tab stops one at a time, or clear all tabs stops and set them one at a time.

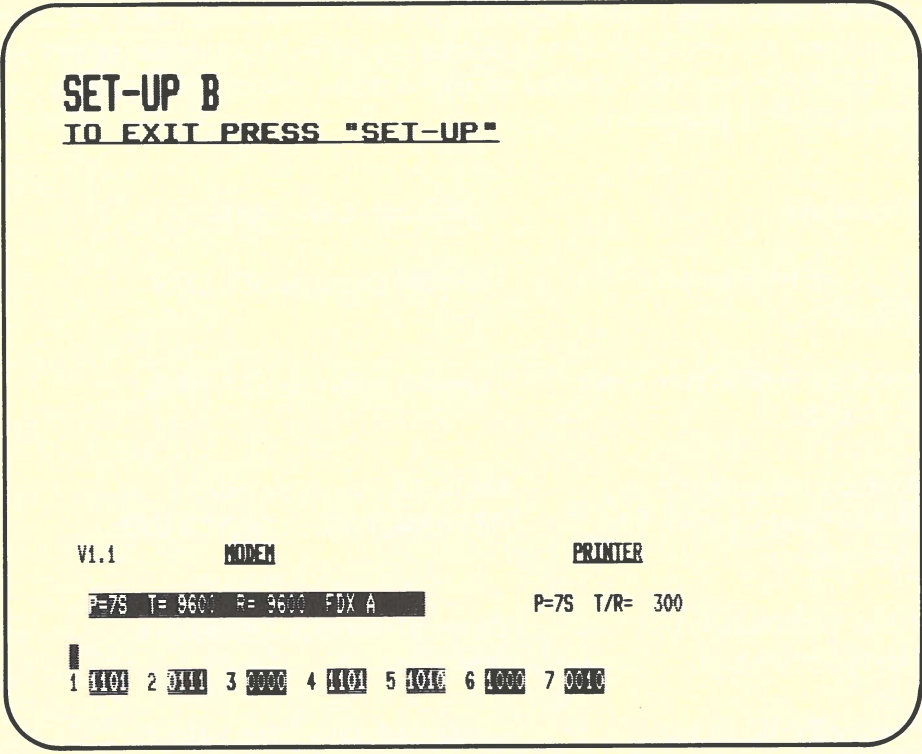
SET/CLEAR TAB sets and clears each tab stop one at a time. **CLEAR ALL TABS** clears all tab stops. A tab default sets a tab stop every eighth column position. (See SET-UP Feature Memories in this chapter for more information about tab default.) Select the tab stops by using the following procedure.

NOTE: When printing characters displayed on the screen, terminal and printer tab stops are ignored. When using printer controller operation, printer horizontal tab stops must match the computer.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press CLEAR ALL TABS . or Press SET/CLEAR TAB to select tab stops.	This clears all tabs. This sets or clears the tab at the cursor position. You can move the cursor by using ←, →, RETURN , TAB , or SPACE BAR .
Press SET-UP to exit SET-UP. or Press SETUP A/B to enter SET-UP B.	Characters displayed on the screen before entering SET-UP appear. Terminal displays SET-UP B.

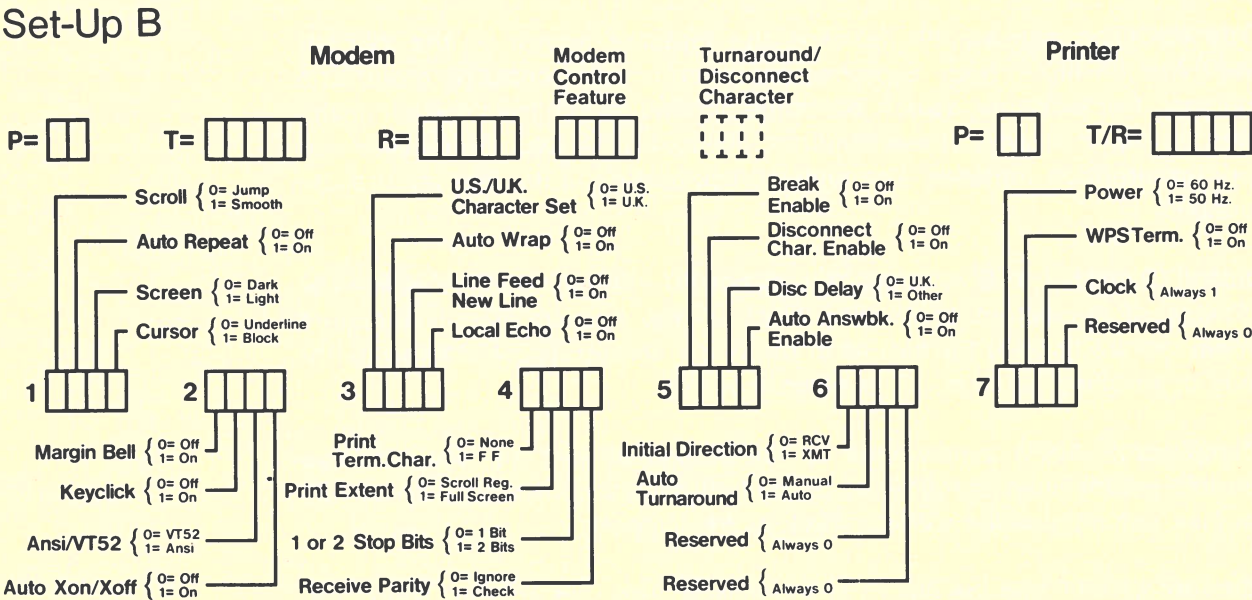
SET-UP B Features

You can only enter SET-UP B from SET-UP A. The SET-UP B display is similar to Figure 3-7. Figure 3-8 summarizes the SET-UP B display features. The bottom display line shows groups of switches indicating the features selected. Modem interface and printer interface features appear above the switches.



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Figure 3-7 SET-UP B Display



MA-9499

Figure 3-8 SET-UP B Summary

Dedicated keys select the modem and printer interface features. Feature descriptions provide selection procedures. SET-UP switches select all other SET-UP B features. Change SET-UP feature switch selections by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
Position the cursor over SET-UP feature switch to be changed.	Move the cursor by using ←, →, RETURN , TAB , or SPACE BAR .
Press TOGGLE 1/0 to select the feature.	Terminal displays the feature selection.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP reappear.
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

The following paragraphs describe the features shown by the SET-UP switches on the screen. Switches are referenced in order by group and number. For example, switch 3-2 is the second switch from the left in the third group. Following these features, the text describes the modem and printer interface features. The answerback feature is the last feature described.

Scroll (Switch 1-1: 0 = Jump, 1 = Smooth) – Scrolling is the upward or downward movement of existing lines on the screen. Scrolling makes room for new lines at the bottom or top of the screen. There are two methods of scrolling, jump scroll or smooth scroll.

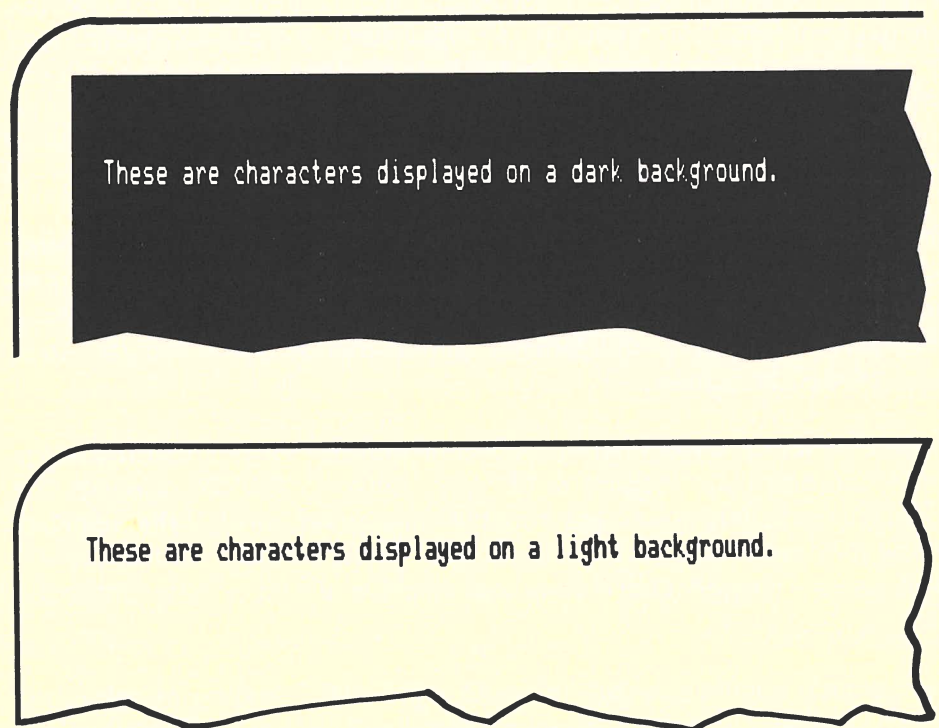
Jump scroll displays new lines on the screen as fast as received. You should select jump scroll when using half-duplex communication or full-duplex communication without XON/XOFF support.

Smooth scroll limits the speed at which new lines can appear. Therefore, the movement of lines occurs at a smooth, steady rate. This makes the lines displayed on the screen easier to read.

Auto Repeat (Switch 1-2: 0 = Off, 1 = On) – This feature repeats a key automatically, when you hold it down for more than one-half second. Keys auto repeat at the rate of about 30 times per second. Auto repeat affects all keyboard keys except **SET-UP**, **ESC**, **RETURN**, **ENTER**, **NO SCROLL**, and **CTRL** with another key. When this feature is off, keys do not auto repeat.

Screen Background (Switch 1-3: 0 = Dark, 1 = Light) – This feature determines the screen background (Figure 3-9). The dark setting selects light characters on a dark background. The light setting (reverse screen) selects dark characters on a light background.

Cursor (Switch 1-4: 0 = Underline, 1 = Block) – This feature provides a choice between two cursor displays. The cursor indicates the active screen position (where the next character will appear). The cursor is either a blinking underline (—) or blinking block (■).



MA-8390

Figure 3-9 Screen Background

Margin Bell (Switch 2-1: 0 = Off, 1 = On) – This feature generates a bell tone when the cursor moves past the eighth character position from the end of the line. The margin bell can turn on or off. Margin bell volume is not adjustable.

NOTE: This feature works when typing text, as in a typewriter. It may give unexpected results when performing other functions.

Keyclick (Switch 2-2: 0 = Off, 1 = On) – Keyclick is the sound generated each time you press a key, except for **SHIFT** and **CTRL**. Keyclick can turn on or off; however, operators usually prefer this feature on. Keyclick volume is not adjustable.

Keyclicks do not sound during a keyboard locked condition (indicated by KBD LOCKED). See Chapter 1 for more information about KBD LOCKED.

ANSI/VT52 (Switch 2-3: 0 = VT52, 1 = ANSI) – The terminal follows two different standards for processing control functions, American National Standards Institute (ANSI) and VT52 compatible. With ANSI, the terminal generates and responds to control functions per ANSI standards X3.41-1974 and X3.64-1979. With VT52 compatible, the terminal can operate with previous DIGITAL software using the VT52 video terminal. See Chapter 5 for more information about received characters and control functions.

Auto XON/XOFF (FDX) (Switch 2-4: 0 = Off, 1 = On) – The terminal places received characters (other than NUL) in an input character buffer. The input buffer holds received characters until the terminal processes them. After processing, the terminal sends the characters to the computer, printer, or screen.

If the terminal receives characters faster than it can process them, the input character buffer begins to fill. Also, entering SET-UP prevents the terminal from taking characters from the input buffer; this fills the input buffer and may cause the loss of characters. When the buffer is full, the terminal loses received characters and displays the substitute character (⌘).

In full-duplex communication, the auto XON/XOFF feature prevents the loss of received characters. When the feature is on, the terminal transmits XON and XOFF to indicate that the input character buffer is almost full or empty. When this buffer is almost full, the terminal transmits XOFF (DC3). The computer should stop transmitting characters.

As the terminal processes (removes) 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) to allow the computer to continue transmitting characters.

When this feature is off, the terminal ignores XON and XOFF when received. **NO SCROLL** (which uses XON and XOFF) does not function.

NOTE: The printer interface uses XON and XOFF regardless of the auto XON/XOFF selection.

When this feature is on, XON and XOFF control the keyboard character buffer. After receiving XOFF, the terminal stops transmitting characters to the computer. After receiving XON the terminal can transmit characters to the computer.

US/UK Character Set (Switch 3-1: 0 = #, 1 = £) – This feature selects either the United States or United Kingdom character set. The difference between the two character sets is one character, the US # (number) or UK £ (pound) symbol.

Auto Wrap (Switch 3-2: 0 = Off, 1 = On) – This feature selects where the next received character will appear when the cursor is at the right margin. When the feature is off, the terminal writes the character and all following characters into the last column of the current line. When the feature is on, the terminal automatically displays the character on the next line.

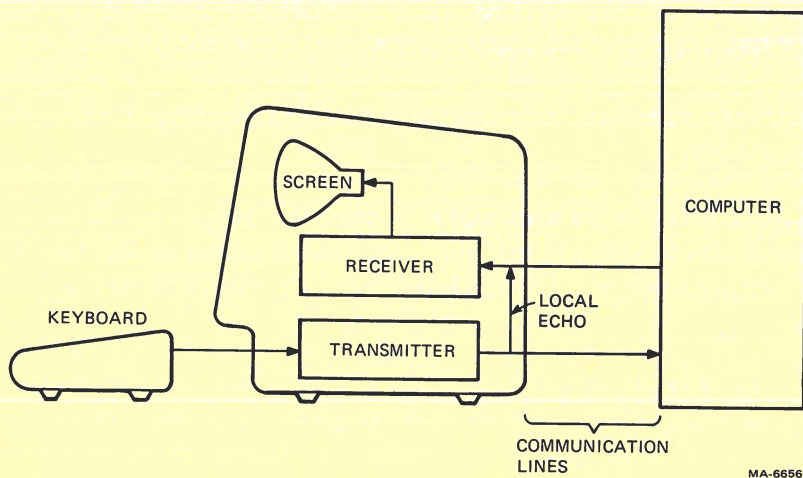
Linefeed/New Line (Switch 3-3: 0 = Off, 1 = On) – This feature selects the character(s) transmitted by **RETURN** and determines the action taken by the terminal when receiving a linefeed.

When the feature is off, pressing **RETURN** generates a carriage return (CR). A linefeed (LF) moves the cursor to the next line, maintaining the current column position.

When the feature is on, pressing **RETURN** generates a carriage return (CR) and linefeed (LF). A linefeed (LF) moves the cursor to the left margin of the next line.

NOTE: The terminal processes form feed (FF) and vertical tab (VT) as linefeed (LF).

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



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Figure 3-10 Local Echo

Print Termination Character (Switch 4-1: 0 = None, 1 = Form Feed) –

When this feature is set to form feed, the terminal transmits a form feed (FF) to the printer after a print screen operation. When the feature is set to none, the terminal does not transmit the print termination character. However, carriage return (CR) and linefeed (LF) are always transmitted when printing ends.

Print Extent (Switch 4-2: 0 = S Reg, 1 = F Screen) –

This feature selects the characters printed during a print screen operation. When the feature is set for full screen (F Screen), all characters on the screen print. When the feature is set for scrolling region (S Reg), only the characters located in the scrolling region print. The scrolling region is the screen area between the top and bottom margins. The computer selects the margins. If margins are not selected, all characters on the screen print.

One or Two Stop Bits (Switch 4-3: 0 = one, 1 = two) –

This feature selects the number of stop bits (one or two) used by the modem interface. The number of stop bits used by the computer and terminal must be the same. See Modem Serial Characters in Chapter 6 for more information about asynchronous character format and the use of stop bits.

NOTE: This feature does not select the number of stop bits used by the printer interface. The printer transmit/receive speed SET-UP feature does.

Receive Parity (Switch 4-4: 0 = Ignore, 1 = Check) –

This feature either checks or ignores the parity bit of received characters. If the feature is set to check, the terminal checks the parity bit selected by the parity feature.

NOTE: The terminal can check received characters for odd or even parity, but not for mark and space parity.

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, the terminal ignores any parity bit received.

Break Enable (Switch 5-1: 0 = Off, 1 = On) – When this feature is on, pressing **BREAK** transmits a break. When this feature is off, **BREAK** does not operate when pressed alone. All other key sequences using **BREAK** are not affected. See Break in Chapter 6 for more information.

Disconnect Character Enable (Switch 5-2: 0 = Off, 1 = On) – When this feature is on, the terminal disconnects from the communication line after receiving a disconnect character. The terminal also automatically transmits a disconnect character after a long break disconnect. When the feature is off, received control characters do not cause communication line disconnects.

The turnaround/disconnect feature selects the disconnect character. See Turnaround/Disconnect Character for more information about turnaround characters.

Disconnect Delay (FDX) (Switch 5-3: 0 = UK, 1 = Other) – This feature is only used when the modem control feature is set to full-duplex with modem control (FDX B and FDX C). In these modes, the terminal disconnects from the communication line after receive line signal detection (RLSD) turns off. This feature selects the time period between loss of signal and disconnection.

In the United Kingdom, the telephone system transmits a dial tone 0.06 seconds after RLSD is lost. For most other installations, the system transmits a dial tone after 2 seconds.

NOTE: In the United States, always set this feature for other (1).

Auto Answerback Enable (Switch 5-4: 0 = Off, 1 = On) – This feature causes the terminal to automatically transmit the answerback message after a communication line connection. In half-duplex communication with the initial direction feature set to receive, the terminal cannot transmit the answerback message until the line turns around. This feature does not affect the transmission of the answerback message when using **CTRL** and **BREAK**. See Answerback in this chapter for more information.

Initial Direction (HDX) (Switch 6-1: 0 = RCV, 1 = XMIT) – This feature is only used when the modem control feature is set to half-duplex (HDX A or HDX B). The feature determines if the terminal begins half-duplex communication by receiving (RCV) or transmitting (XMIT).

Auto Turnaround (HDX) (Switch 6-2: 0 = Manual, 1 = Auto) – This feature is only used when the modem control feature is set to half-duplex coded control (HDX B). The feature causes the terminal to automatically transmit the turnaround character (selected by the turnaround/disconnect character feature) after:

- The characters transmitted by **RETURN**
- The end of the answerback message.

*NOTE: If the turnaround character is carriage return (CR), **RETURN** does not generate two carriage returns.*

When this feature is set for manual, you must use a **CTRL** key combination to generate the turnaround character. See Chapter 4 when using **CTRL** to generate control characters.

Reserved (Switch 6-3: Always = 0) – This feature is reserved for future use. Do not change.

Reserved (Switch 6-4: Always = 0) – This feature is reserved for future use. Do not change.

Power (Switch 7-1: 0 = 60 Hz, 1 = 50 Hz) – This feature is set to match the power line frequency. You should set the feature to reduce screen flicker.

WPS Terminal Keyboard (Switch 7-2: 0 = Off, 1 = On) – This feature changes the position of the **LINE FEED** and \ (backslash) keys when the VT102 operates as a word processing terminal. Otherwise, this feature is off (0).

Clock (Switch 7-3: Always = 1) – This feature selects the modem clock. Do not change this selection, or the terminal cannot communicate with the computer.

Reserved (Switch 7-4: Always = 0) – This feature is reserved for future use. Do not change.

Modem Data/Parity Bits – This feature selects two separate but related communication features, data bits per character and parity. You can set data bits per character to seven or eight bits. When you select eight bits, the terminal sets the eighth data bit to a space (or 0) for transmitted characters and ignores the eighth data bit of received characters.

Parity selects the type of parity bit the terminal generates when transmitting or receiving characters. To check the parity of received characters, set the receive parity feature to check. When you use received parity, set the parity feature to odd or even. The terminal cannot check mark and space parity.

If you select no parity, the terminal omits the parity bit in transmitted characters and ignores it in received characters. Table 3-3 lists the possible data bits per character/parity combinations. Set the modem data/parity bits feature by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B. Entering SET-UP B automatically selects the modem features.
If the modem features are not selected, hold down SHIFT and press ←.	Modem features appear in reverse video when selected.
Hold down SHIFT and press P to select the feature.	Each time you press this key combination, the terminal selects another data bits per character/parity combination.
Press SET-UP to exit SET-UP. or Press SETUP A/B to enter SET-UP A.	Characters displayed before entering SET-UP reappear. Terminal displays SET-UP A.

Table 3-3 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

Modem Transmit Speed – This feature selects the terminal speed (baud rate) for characters transmitted to the computer. Set the feature to match the computer receive speed. The terminal transmits characters at any one of the following speeds: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19,200 baud. The terminal's transmit and receive speeds are not unrelated. It can transmit characters at one speed and receive characters at a different speed. Select the modem transmit speed by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
If the modem features are not selected, hold down SHIFT and press ←.	Modem features appear in reverse video when selected.
Press TRANSMIT SPEED to select the transmit speed.	The terminal displays the current feature selection.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP reappear.
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

Modem Receive Speed – This feature selects the terminal speed (baud rate) for received characters. Set the feature to match the computer transmit speed. The terminal receives characters at any one of the following speeds: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19,200 baud. The terminal's receive and transmit speeds are unrelated. It can receive characters at one speed and transmit characters at a different speed. Select the modem receive speed by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
If the modem features are not selected, hold down SHIFT and press ← .	Modem features appear in reverse video when selected.
Press RECEIVE SPEED to select the receive speed.	Terminal displays current feature selection.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP reappear.
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

Modem Control – This feature selects half- or full-duplex communication with the computer. Set the feature to match the computer's communication type. The modem control feature selections are as follows. See Chapter 6 for more information.

FDX A	Full-duplex with no EIA modem control (data leads only)
FDX B	Full-duplex with EIA modem control
FDX C	Asymmetric full-duplex with EIA modem control
HDX A	Half-duplex supervisory control
HDX B	Half-duplex coded control

Select the modem control feature by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
If the modem features are not selected, hold down SHIFT and press ←.	Modem features appear in reverse video when selected.
Hold down SHIFT and press M to select the feature.	Each time you press this key combination, the terminal displays another modem protocol selection.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.
or	
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

Turnaround/Disconnect Character – This feature selects both a turnaround and disconnect character. When you set the modem control feature, to half-duplex coded control (HDX B), you must select a turnaround character. This feature also selects a disconnect character used with all half- or full-duplex modem control feature selections. Table 3-4 lists the possible turnaround/disconnect character combinations. Select the turnaround/disconnect character by using the following procedure.

NOTE: The CR and DC3 control characters are not recommended as turnaround characters. You cannot use these characters as turnaround characters in ANSI X3.4-1977. Also, you should only select DC3 when the auto XON/XOFF feature is off.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
If the modem features are not selected, hold down SHIFT and press ←.	Modem features appear in reverse video when selected.
Hold down SHIFT and press C to select the feature.	Each time you press this key combination, the terminal selects another turnaround and disconnect character selection.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP reappear.
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

Table 3-4 Turnaround/Disconnect Character Selections

Turnaround Characters (HDX B only)		Disconnect Characters	
Name	Mnemonic	Name	Mnemonic
Form feed	FF	End of transmission	EOT
End of text	EXT	End of transmission	EOT
End of transmission	EOT	Data link escape – end of transmission	DLE EOT
Carriage return	CR	End of transmission	EOT
Device control 3	DC3	End of transmission	EOT

Printer Data/Parity Bits – This feature selects two separate but related communication features, data bits per character and parity. The feature operates the same as the modem data/parity bits feature, but uses the printer interface.

NOTE: The serial printer should not transmit characters to the terminal. However, the terminal can use XON and XOFF from the printer to prevent printer input buffer overflows.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B. Entering SET-UP B automatically selects the modem features.
If the printer features are not selected, hold down SHIFT and press →.	The printer features appear in reverse video when selected.
Hold down SHIFT and press P to select the feature.	Each time you press this key combination, the terminal selects another data bits per character/parity combination.
Press SET-UP to exit SET-UP. or	Characters displayed before entering SET-UP reappear.
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

Printer Transmit/Receive Speed – This feature selects the terminal speed (baud rate) for transmitting and receiving characters from the printer. The receive and transmit speeds of the printer interface are always the same (different receive and transmit speeds are not provided). Set feature to match the printer transmit and receive speeds. The printer interface uses one of the following receive/transmit speeds: 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, and 19,200 baud. The printer interface uses one stop bit per character for speeds greater than 110, and two stop bits per character for 110 or less. Select the printer interface receive/transmit speeds by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B. Entering SET-UP B automatically selects the modem features.
If the printer features are not selected, hold down SHIFT and press →.	Printer features appear in reverse video when selected.
Press either TRANSMIT or RECEIVE SPEED to select the speed.	SET-UP display shows feature selection. You can use either key to select baud rate.
Press SET-UP to exit SET-UP.	Characters displayed before when entering SET-UP reappear.
or	
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.

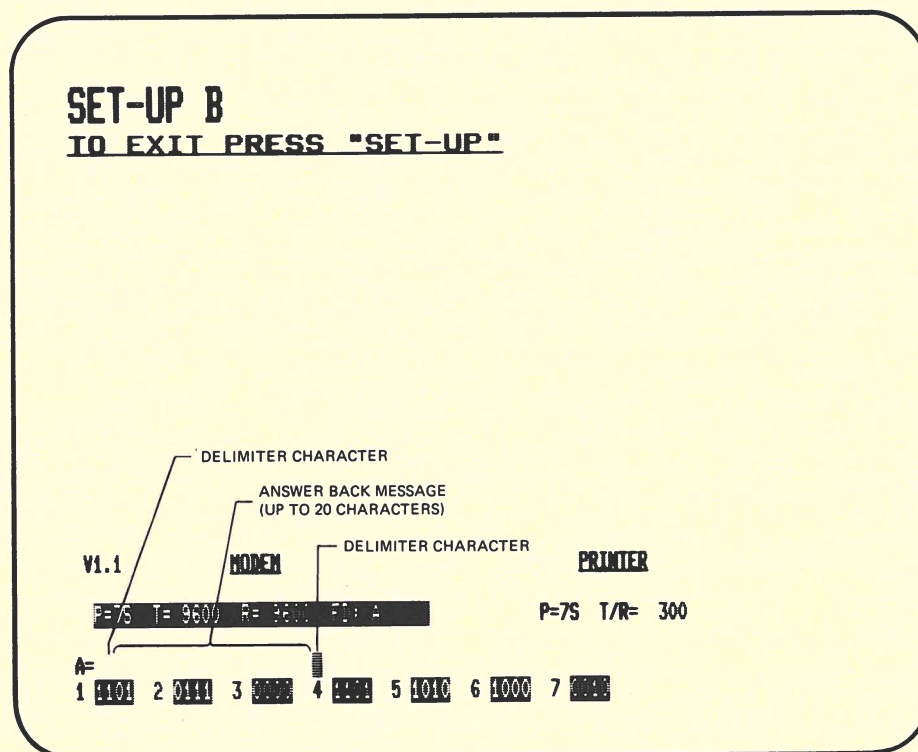
Answerback – This feature lets you store a 20-character identifying message that the terminal transmits to the computer under the following conditions.

- The computer transmits a direct request for identification. The computer transmits enquire (ENQ) and the terminal responds with the answerback message. The entire sequence takes place automatically, without affecting the screen or needing operator action.
- You transmit the answerback message from the keyboard. Hold down **CTRL** and press **BREAK** to transmit the answerback message.
- You set the auto answerback enable feature, and the terminal connects to the communication line. In half-duplex, the terminal transmits the answerback message when first allowed to transmit.

Enter the answerback message by using the following procedure.

Procedure	Indication/Comments
Press SET-UP to enter SET-UP.	Terminal displays SET-UP A.
Press SETUP A/B to enter SET-UP B.	Terminal displays SET-UP B.
Hold down SHIFT and press A .	Terminal displays A = (Figure 3-11).
Type the message delimiter character.	This can be any character not used in the answerback message. The terminal does not transmit the message delimiter character as part of the answerback message.
Type the answerback message.	<p>The answerback message can include up to 20 characters. If you use control characters, they appear as (♦) character.</p> <p>If you make a mistake while typing the message, type the delimiter character already used and return to the third step of this procedure. This is the only way to correct errors in the answerback message.</p>

Procedure	Indication/Comments
If the message is less than 20 characters, type the delimiter character.	If you type 20 characters, the message automatically enters operating memory. Otherwise, type the delimiter character to enter the message into operating memory.
	You can enter the answerback message into user memory by performing a store.
Press SET-UP to exit SET-UP.	Characters displayed before entering SET-UP reappear.
or	
Press SETUP A/B to enter SET-UP A.	Terminal displays SET-UP A.



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Figure 3-11 Answerback Message Summary

Transmitted Characters

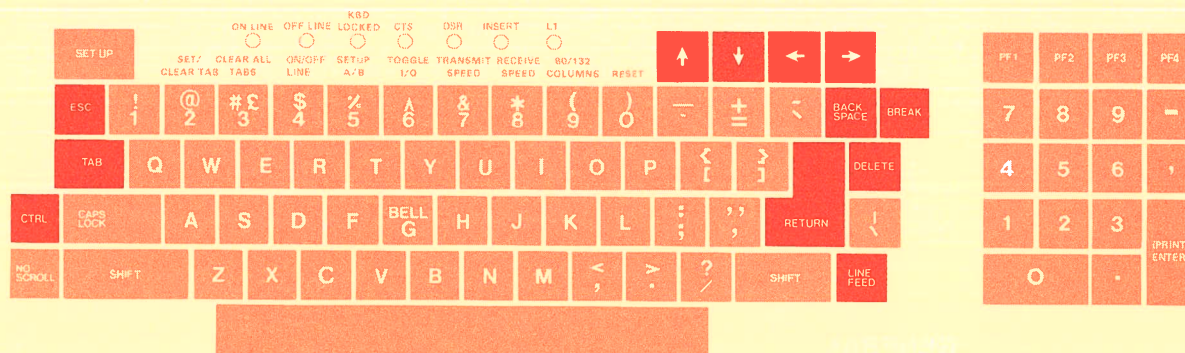


Figure 4-2 Function Keys

FUNCTION KEYS

The function keys (Figure 4-2) generate characters defined by the computer software or communication system. The following paragraphs describe the function keys.

BREAK/HERE IS

This key generates a break defined by the computer system when the break enable feature is on. This feature does not affect other key sequences using **BREAK**.

Hold down **SHIFT** and press **BREAK** to generate a long break disconnect. A long break disconnect usually disconnects the terminal from the communication line. See Break in Chapter 6 for more information about breaks and long break disconnects.

Hold down **CTRL** and press **HERE IS** to transmit the answerback message. See Chapter 3 for more information about the answerback feature.

Cursor Control Keys

In ANSI mode, with alternate (application) keypad mode selected, the cursor keys generate either application or cursor control sequences. Cursor key mode selects the type of sequence.

With numeric keypad mode selected, the cursor keys generate ANSI cursor commands. The computer selects both cursor key mode and keypad mode. See Cursor Key Character Selection in Chapter 5 for more information.

In VT52 mode, the cursor keys only generate VT52 cursor control sequences. Table 4-1 lists the ANSI and VT52 compatible cursor key characters.

Table 4-2 Control Codes Generated

Control Character	Mnemonic	Transmitted Code (Octal)	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	-
Back space	BS	010	H	BACK SPACE
Horizontal tabulation	HT	011	I	TAB
Linefeed	LF	012	J	LINE FEED
Vertical tabulation	VT	013	K	-
Form feed	FF	014	L	-
Carriage return	CR	015	M	RETURN*
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 numeric keypad mode determines whether **RETURN** and **ENTER** generate the same control codes. The codes generated by **RETURN** are changed by two feature selections.

The auto turnaround SET-UP feature when using half-duplex coded control (HDX B). The turnaround/disconnect SET-UP feature selects the turnaround character. If the turnaround character is carriage return (CR), the terminal transmits only one CR when you press **RETURN**.

The line feed/new line feature. When this feature is on, **RETURN** generates two characters (CR, LF). When this feature is off, **RETURN** generates a CR.

Table 4-3 VT102 Key Changes

Control Code	VT102	Previous Terminals
NUL (octal 000)	CTRL Space Bar	CTRL @
RS (octal 036)	CTRL ~	CTRL ^
US (octal 037)	CTRL ?	CTRL _

NUMERIC KEYPAD KEYS

These keys generate characters selected by the ANSI/VT52 feature and alternate (application) keypad mode. The computer selects application keypad mode. See Keypad Character Selection in Chapter 5 for more information.

In numeric keypad mode, the numeric keypad generates the numeric, comma, period, and minus sign characters used by the main keyboard. In application keypad mode, the numeric keypad generates control functions. Table 4-4 lists the characters generated by the numeric keypad.

Table 4-4 Keypad Codes

Key	ANSI Mode					VT52 Mode				
	Numeric Keypad Mode		Application Keypad Mode			Numeric Keypad Mode		Application Keypad Mode		
0	0 060		ESC 033	O 117	p 160	0 060		ESC 033	? 077	p 160
1	1 061		ESC 033	O 117	q 161	1 060		ESC 033	? 077	q 161
2	2 062		ESC 033	O 117	r 162	2 062		ESC 033	? 077	r 162
3	3 063		ESC 033	O 117	s 163	3 063		ESC 033	? 077	s 163
4	4 064		ESC 033	O 117	t 164	4 064		ESC 033	? 077	t 164
5	5 065		ESC 033	O 117	u 165	5 065		ESC 033	? 077	u 165
6	6 066		ESC 033	O 117	v 166	6 066		ESC 033	? 077	v 166
7	7 067		ESC 033	O 117	w 167	7 067		ESC 033	? 077	w 167
8	8 070		ESC 033	O 117	x 170	8 070		ESC 033	? 077	x 170

Table 4-4 Keypad Codes (Cont)

Key	ANSI Mode						VT52 Mode					
	Numeric Keypad Mode			Application Keypad Mode			Numeric Keypad Mode			Application Keypad Mode		
9	9 071			ESC 033	O 117	y 171	9 071			ESC 033	? 077	y 171
—	— (minus) 055			ESC 033	O 117	m 155	— (minus) 055			ESC 033	? 077	m 155*
,	, (comma) 054			ESC 033	O 117	l 154	, (comma) 054			ESC 033	? 077	l 054*
.	. (period) 056			ESC 033	O 117	n 156	. (period) 056			ESC 033	? 077	n 156
ENTER†	CR or CR LF 015 015 012			ESC 033	O 117	M 115	CR or CR LF 015 015 012			ESC 033	? 077	M 115
PF1	ESC O P 033 117 120			ESC O P 033 117 120			ESC P 033 120			ESC P 033 120		
PF2	ESC O Q 033 117 121			ESC O Q 033 117 121			ESC Q 033 121			ESC Q 033 121		
PF3	ESC O R 033 117 122			ESC O R 033 117 122			ESC R 033 122			ESC R 033 122		
PF4	ESC O S 033 117 123			ESC O S 033 117 123			ESC S 033 123			ESC S 033 123*		

* These sequences are not generated by the VT52 terminal.

† In numeric keypad mode (application keypad mode off), you can change the **ENTER** character code with the linefeed/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).



Received Character Processing

RECEIVED CHARACTER PROCESSING

5

GENERAL

This chapter describes how the VT102 processes received characters. There are two types of received characters, display characters and control functions. The chapter covers all display characters and control functions used by the terminal.

RECEIVED CHARACTERS

The terminal processes characters according to 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). Table 5-1 shows each ASCII character with its binary, octal, decimal, and hexadecimal values. ASCII corresponds to the International Standards Organization (ISO) Standard 646 and International Telegraph and Telephone Consultative Committee (CCITT) Alphabet 5.

The terminal processes a received character based on character types defined by ANSI. Position in the ASCII table tells you whether a character is a control function or display character. The ASCII table is 8 columns wide and 16 rows long. The control functions are in columns 0 and 1. The display characters are in columns 2 through 7. However, the terminal uses space (SP) as either an information separator control function or display character. Delete (DEL) is always a control function.

Table 5-1 ASCII Table

BITS B7 B6 B5 B4 B3 B2 B1				0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1		
				COLUMN																
ROW				0		1		2		3		4		5		6		7		
0 0 0 0				0	NUL	0 0 0	DLE	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	1 1 1	DC1 (XON)	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	2 2 2	DC2	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	3 3 3	DC3 (XOFF)	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	4 4 4	DC4	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	5 5 5	NAK	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	6 6 6	SYN	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	7 7 7	ETB	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	10 8 8	CAN	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	11 9 9	EM	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	12 10 A	SUB	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	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	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	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	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	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

27

1B

OCTAL

DECIMAL

HEX

DISPLAY CHARACTERS

Display characters are received characters displayed on the screen. The actual character displayed depends on the character set selected. You select the character set by using control functions. See Character Sets and Selection in this chapter for more information.

CONTROL CHARACTERS

These single-character control functions start, modify, or stop terminal operations; the control functions are not displayed. Table 5-2 defines the control characters recognized by the terminal. All other control characters are ignored.

Each control character in this chapter has a mnemonic, listed in Table 5-2. The mnemonic is an abbreviation of the control character name.

Table 5-2 Control Characters Recognized by VT102

Character	Mnemonic	Octal Code	Function
Null	NUL	000	Ignored when received (not stored in input buffer) and used as a fill character.
End of text	ETX	003	Can be selected as a half-duplex turnaround character.
End of transmission	EOT	004	Can be selected as a disconnect character or half-duplex turnaround character. When used as a turnaround character, the disconnect character is DLE-EOT.
Enquire	ENQ	005	Transmits answerback message.
Bell	BEL	007	Generates bell tone.
Backspace	BS	010	Moves cursor to the left one character position; if cursor is at left margin, no action occurs.
Horizontal tab	HT	011	Moves cursor to next tab stop, or to right margin if there are no more tab stops.
Linefeed	LF	012	Causes a linefeed or a new line operation. (See Linefeed/New Line). Also causes printing if auto print operation is selected.
Vertical tab	VT	013	Processed as LF.

Table 5-2 Control Characters Recognized by VT102 (Cont)

Character	Mnemonic	Octal Code	Function
Form feed	FF	014	Processed as LF. FF can also be selected as a half-duplex turn-around character.
Carriage return	CR	015	Moves cursor to left margin on current line. CR can also be selected as a half-duplex turn-around character.
Shift out	SO	016	Selects G1 character set designated by a select character set sequence.
Shift in	SI	017	Selects G0 character set designated by a select character set sequence.
Device control 1	DC1	021	Processed as XON. DC1 causes terminal to continue transmitting characters.
Device control 3	DC3	023	Processed as XOFF. DC3 causes terminal to stop transmitting all characters except XOFF and XON. DC3 can also be selected as a half-duplex turnaround character.
Cancel	CAN	030	If received during an escape or control sequence, cancels the sequence and displays substitution character (§).
Substitute	SUB	032	Processed as CAN.
Escape	ESC	033	Processed as a sequence introducer.

ESCAPE AND CONTROL SEQUENCES

Escape and control sequences provide additional control functions not provided by the single-character controls of the character set. These multiple-character sequences are not displayed; instead, they control terminal operation. Escape and control sequences are defined by ANSI X3.41-1977 and X3.64-1979. See Appendix D for more information about sequences and sequence formats.

The terminal provides upward and downward software compatibility. It can respond to control functions created to meet 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 for ANSI standards. However, future video terminals may not accept private DIGITAL sequences. Therefore, all new software should use ANSI-compatible sequences.

The terminal uses VT52 mode to respond to private DIGITAL sequences like a VT52 terminal.

The terminal uses ANSI mode to respond to a subset of control functions specified by ANSI. All control functions 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 in this user guide have a mnemonic assigned by ANSI. If the control function is an ANSI private control function (defined by DIGITAL), the mnemonic begins with DEC. The escape and control sequences shown here use ASCII characters. You must type the characters in the sequences exactly as shown (upper or lowercase). The text provides the octal equivalent of each character in the sequence as a second reference. See Table 5-1 for decimal and hexadecimal representations.

The following section groups sequences by software compatibility (ANSI or VT52) and function (Table 5-3). Appendix C summarizes of all control functions.

Error Recovery

Current standards do not specify the action performed when the terminal receives a control function with an error. Errors are incorrect parameters, invalid control functions, or control characters embedded in control function sequences. The terminal usually recovers from these errors by performing as much of the function as possible. The specific error recovery procedures are as follows.

- Unrecognized control functions are usually ignored.
- Unsupported control functions (valid control functions not listed in this user guide) are usually ignored, but may produce unexpected 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 cancel (CAN, octal 030) or substitute (SUB octal 032) is received during a sequence, the current sequence is aborted. The terminal displays the substitute character, followed by characters in the sequence received after CAN or SUB.

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ANSI-Compatible Sequences

ANSI-compatible sequences meet ANSI standards X3.64-1979 and X3.41-1974. This section describes the ANSI control functions used by the terminal. You can select ANSI compatibility from the keyboard in SET-UP (Chapter 3) or have the computer use a sequence. (See VT52-Compatible Sequences in this chapter).

SET-UP Feature and Mode Selection

SET-UP Feature and Mode Selection – SET-UP features change how the terminal operates. You can select these features from the keyboard in SET-UP. The computer can select some SET-UP features by using control functions. However, features selected by the computer are stored in operating memory. The computer cannot store feature selections in user memory. (See Chapter 3 for more information about SET-UP feature memories.)

Some SET-UP features are modes. A mode affects terminal operation. The terminal uses the selected mode until you or the computer change the selection. Table 5-4 lists SET-UP features and modes. The computer changes modes by using set mode (SM) and reset mode (RM) sequences. Set and reset the terminal modes by using the following sequences.

*NOTE: Ps represents a variable parameter selected from a list of parameters. A series of asterisks (***) represent the parameter in the octal sequence. The parameter is transmitted using ASCII characters. When you set several modes with a single SM or RM sequence, a semicolon (;, octal 073) separates parameters.*

Set Mode (SM)

ESC	[	Ps	;	...	;	Ps	h
033	133	***	073	073	***	150	

Sets one or more modes specified by selective parameters (Ps) in the parameter string.

Reset Mode (RM)

ESC	[	Ps	;	...	;	Ps	I
033	133	***	073	073	***	154	

Resets one or more modes specified by selective parameters (Ps) in the parameter string.

Table 5-4 SET-UP Features and Modes

SET-UP Feature or Mode	Change from Computer	Change 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
Linefeed/new line	Yes (LNM)	Yes
Local echo	Yes (SRM)	Yes
Print termination character	Yes (DECPFF)	Yes
Printer extent	Yes (DECPEX)	Yes
One or two stop bits	No	Yes
Receive parity	No	Yes
Break enable	No	Yes
Disconnect character enable	No	Yes
Disconnect delay	No	Yes
Auto answerback enable	No	Yes
Initial direction	No	Yes
Auto turnaround	No	Yes
Power	No	Yes
WPS terminal	No	Yes
Clock	No	Yes
Modem data/parity bits	No	Yes
Transmit speed	No	Yes
Receive speed	No	Yes
Modem control	No	Yes
Turnaround/disconnect character	No	Yes
Printer data/parity bits	No	Yes
Transmit/receive speed	No	Yes
Application keypad mode/ numeric keypad mode	Yes (DECKPAM/DECKPNM)*	No
Cursor key mode	Yes (DECCKM)	No
Origin mode	Yes (DECOM)	No
Insertion-replacement mode	Yes (IRM)	No

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

Table 5-5 lists the ANSI-specified modes and their selective parameters (Ps). Table 5-6 lists the ANSI-compatible private modes and their selective parameters. When you change ANSI-compatible private modes, the first character in the parameter string is a question mark (? , octal 077). All parameters in the sequence are interpreted as ANSI compatible private parameters. This chapter explains each mode in detail and provides the sequences to set and reset each mode.

The following example shows the use of the question mark (used with ANSI private parameters) and semicolon (used with multiple parameters). The sequence sets both column and scroll modes.

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

Table 5-7 describes modes specified in ANSI X3.64-1979 that are permanently set, permanently reset, or not applicable. See the ANSI standard for more information about these modes.

Table 5-5 ANSI-Specified Modes

Name	Mnemonic	Parameter (Ps)
Error (ignored)	–	0
Keyboard action	KAM	2
Insertion-replacement	IRM	4
Linefeed/new line	LMN	20

Table 5-6 ANSI-Compatible Private Modes

Name	Mnemonic	Parameter (Ps)
Error (ignored)	–	0
Cursor key	DECKM	1
ANSI/VT52	DECANM	2
Column	DECCOLM	3
Scroll	DECSCLM	4
Screen	DECSNM	5
Origin	DECOM	6
Auto wrap	DECAWN	7
Auto repeat	DECARM	8
Printer form feed	DECPFF	18
Printer extent	DECPEX	19

NOTE: The application keypad and numeric keypad modes are selected using dedicated sequences, not set and reset mode sequences. See Keypad Character Selection in this chapter for more information.

Table 5-7 Permanently Selected Modes

Name	Mnemonic	Selection	Function
Control representation	CRM	Reset	Terminal performs control functions without displaying a character to represent control function received.
Editing boundary	EBM	Reset	Characters moved outside the margins are lost; terminal does not perform erasing and cursor positioning functions outside the margins. This does not affect horizontal and vertical position (HVP) and cursor position (CUP) sequences.
Erasure	ERM	Set	All characters displayed can be erased.
Format effector action	FEAM	Reset	Terminal immediately performs control functions that affect the screen display.
Format effector transfer	FETM	N/A	—
Guarded area transfer	GATM	N/A	—
Horizontal editing	HEM	N/A	—
Multiple area transfer	MATM	N/A	—
Positioning unit	PUM	Reset	Terminal specifies horizontal and vertical positioning parameters in control functions in units of character position.
Selected area transfer	SATM	N/A	—
Status reporting transfer	SRTM	Reset	Terminal transmits status reports by using device status report (DSR) sequence.
Tabulation stop	TSM	Reset	Tab stop selections apply to corresponding screen columns for all lines.
Transfer termination	TTM	N/A	—
Vertical editing	VEM	N/A	—

ANSI/VT52 Compatibility

ANSI/VT52 Compatibility – The terminal is compatible with both ANSI and private DIGITAL standards. Therefore, you can use new software that meets both ANSI standards, and existing software designed for previous terminals (such as the VT52).

ANSI-compatible sequences meet ANSI standards X3.64-1979 and X3.41-1974. You select ANSI compatibility by using the ANSI/VT52 mode (DECANM) sequence in VT52 mode. See VT52-Compatible Sequences in this chapter for details on selecting ANSI sequence compatibility. In ANSI mode, the following sequence selects compatibility with private DIGITAL sequences (VT52 mode).

Features and modes selected in ANSI mode are also used in VT52 mode. However, these features and modes usually cannot change in VT52 mode.

VT52 Mode (DECANM)

```
ESC [ ? 2 I
033 133 077 062 154
```

In ANSI mode, reset selects private DIGITAL sequence compatibility. In VT52 mode, the terminal responds like a VT52 to private DIGITAL sequences.

Scrolling

Scrolling – Scrolling is the upward or downward movement of existing lines on the screen. This makes room for more display lines at either the top or bottom of the scrolling region. There are two methods of scrolling, jump scroll and smooth scroll. Select the type of scrolling by using the following sequences.

NOTE: In full-duplex communication, the auto XON/XOFF SET-UP feature prevents the loss of received characters when using smooth scroll. If auto XON/XOFF is not used, fill characters are needed.

Scroll Mode (DECSCLM)

```
ESC [ ? 4 h
033 133 077 064 150
```

Set selects smooth scroll. Smooth scroll lets the terminal add 6 lines per second to screen (power feature = 60 Hz), or 5 lines per second (power feature = 50 Hz).

```
ESC [ ? 4 I
033 133 077 064 154
```

Reset selects jump scroll. Jump scroll lets the terminal add lines to the screen as fast as possible.

Scrolling Region

Scrolling Region – This region is the area of the screen between the top and bottom margins. The margins determine which screen lines move during scrolling. Characters added outside the scrolling region do not cause the screen to scroll. The minimum size of the scrolling region is two lines. Therefore, the line number of the top margin must be less than the number of the bottom margin. The origin mode selects line numbers.

After the margins are selected, the cursor moves to the home position. The origin mode feature also selects the home position. Select the top and bottom margins of the scrolling region by using the following sequence.

NOTES: When you power up or use the Reset command, the scrolling region becomes the full screen.

*Pt and Pb represent variable numeric parameters. The parameters are decimal numbers transmitted to the terminal as ASCII characters. Asterisks (***) represent one or more variable numeric parameters in the octal sequence.*

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 line number of first line in the scrolling region. Pb is line number of bottom line. If Pt and Pb are not selected, the complete screen is used (no margins).

Origin

Origin – This mode determines if the cursor can move outside the scrolling region (the area between the top and bottom margins). You can move the cursor outside the margins with the cursor position (CUP) and horizontal and vertical position (HVP) sequences.

Lines on the screen are numbered according to the location of the home position. Home position is always line 1, column 1. The cursor moves to the new home position whenever origin mode is selected. Select origin mode by using the following sequences.

NOTE: When you power up or use the Reset command, origin mode resets.

Origin Mode (DECOM)

ESC	[	?	6	h
033	133	077	066	150

Set selects home position in scrolling region. Line numbers start at top margin of scrolling region. The cursor cannot move out of scrolling region.

ESC	[	?	6	I
033	133	077	066	154

Reset selects home position in upper-left corner of screen. Line numbers are independent of the scrolling region (absolute). Use CUP and HVP sequences to move cursor out of scrolling region.

Cursor Positioning

Cursor Positioning – The cursor indicates the active screen position where the next character will appear. The cursor moves:

- One column to the right when a character appears
- One line down after a linefeed (LF, octal 012), form feed (FF, octal 014) or vertical tab (VT, octal 013) (Linefeed/new line may also move the cursor to the left margin)
- To the left margin after a carriage return (CR, octal 015)
- One column to the left after a backspace (BS, octal 010)
- To the next tab stop (or right margin if no tabs are set) after a horizontal tab character (HT, octal 011)
- To the home position when the top and bottom margins of the scrolling region (DECSTBM) or origin mode (DECOM) selection changes.

You can also move the cursor by using the following sequences.

NOTE: *P_n represents a variable numeric parameter. The parameter is a decimal number transmitted to the terminal by using ASCII characters. If you select no parameter or 0, the terminal assumes the parameter equals 1. Asterisks (***) represent one or more characters in the octal sequence.*

Cursor Up (CUU)

ESC	[	P_n	A
033	133	***	101

Moves cursor up P_n lines in same column. Cursor stops at top margin.

Cursor Down (CUD)

ESC	[	P_n	B
033	133	***	102

Moves cursor down P_n lines in same column. Cursor stops at bottom margin.

Cursor Forward (CUF)

ESC	[	P_n	C
033	133	***	103

Moves cursor right P_n columns. Cursor stops at right margin.

Cursor Backward (CUB)

ESC	[	P_n	D
033	133	***	104

Moves cursor left P_n columns. Cursor stops at left margin.

NOTE: *P_I and P_C represent variable numeric parameters. The parameter is a decimal number that represents one or more characters transmitted to the terminal as ASCII characters. Asterisks (***) represent the variable parameter in the octal sequence.*

Cursor Position (CUP)

ESC	[	PI	;	Pc	H
033	133	***	073	***	110

Moves cursor to line PI, column Pc. If PI or Pc are not selected or selected as 0, the cursor moves to first line or column, respectively. Origin mode (DECOM) selects line numbering and ability to move cursor into margins.

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

Cursor Position (Home) (CUP)

ESC	[	H
033	133	110

Moves cursor to home position, selected by origin mode (DECOM).

Horizontal and Vertical Position (HVP)

ESC	[	PI	;	Pc	f
033	133	***	073	***	146

Moves cursor to line PI, column Pc. If PI or Pc are not selected or selected as 0, the cursor moves to first line or column, respectively. Origin mode (DECOM) selects line numbering and ability to move the cursor into margins.

NOTE: HVP operates the same as the cursor position (CUP) sequence.

Horizontal and Vertical Position (Home) (HVP)

ESC	[	f
033	133	146

Cursor moves to home position selected by origin mode (DECOM).

Index (IND)

ESC	D
033	104

Moves cursor down one line in same column. If cursor is at bottom margin, screen performs a scroll-up.

Reverse Index (RI)

ESC M
033 115

Moves cursor up one line in same column. If cursor is at top margin, screen performs a scroll-down.

Next Line (NEL)

ESC E
033 105

Moves cursor to first position on next line. If cursor is at bottom margin, screen performs a scroll-up.

Save Cursor (DECSC)

ESC 7
033 067

Saves cursor position, character attribute (graphic rendition), character set, and origin mode selection. (See restore cursor.)

Restore Cursor (DECRC)

ESC 8
033 070

Restores previously saved cursor position, character attribute (graphic rendition), character set, and origin mode selection. If none were saved, the cursor moves to home position.

Columns Per Line

Columns Per Line – This mode selects the number of columns in a display line, 80 or 132. With either selection, the screen can display 24 lines. Select the number of columns per line by using the following sequences.

NOTE: When you change the number of columns per line, the screen is erased. This also sets the scrolling region for full screen (24 lines).

Column Mode (DECCOLM)

ESC	[	?	3	h
033	133	077	063	150

Set selects 132 columns per line.

ESC	[	?	3	I
033	133	077	063	154

Reset selects 80 columns per line.

Auto Wrap

Auto Wrap – This mode selects where a received character will appear when the cursor is at the right margin. Select auto wrap by using the following sequences.

NOTE: Regardless of the auto wrap SET-UP feature selection, the tab character never moves the cursor to the next line.

Auto Wrap Mode (DECAWM)

ESC	[	?	7	h
033	133	077	067	150

Set selects auto wrap. Any display characters received when cursor is at right margin appear on next line. The display scrolls up if cursor is at end of scrolling region.

ESC	[	?	7	I
033	133	077	067	154

Reset turns auto wrap off. Display characters received when cursor is at right margin replace previously displayed character.

Screen Background

Screen Background – This mode selects either light (reverse) or dark display background on the screen. Select screen made by using the following sequences.

Screen Mode (DECSCNM)

ESC	[	?	5	h
033	133	077	065	150

Set selects reverse screen, a white screen background with black characters.

ESC	[	?	5	I
033	133	077	065	154

Reset selects normal screen, a black screen background with white characters.

Linefeed/New Line

Linefeed/New Line – This mode selects the control character(s) transmitted by **RETURN**. Linefeed/new line also selects the action taken by the terminal when receiving linefeed, form feed, and vertical tab. Table 5-8 provides a summary of the feature. Select linefeed/new line made by using the following sequences.

Linefeed/New Line Mode (LNM)

ESC	[	2	0	h
033	133	062	060	150

Set causes a received linefeed, form feed, or vertical tab to move cursor to first column of next line. **RETURN** transmits both a carriage return and linefeed. This selection is also called new line option.

ESC	[	2	0	I
033	133	062	060	154

Reset causes a received linefeed, form feed, or vertical tab to move cursor to next line in current column. **RETURN** transmits a carriage return.

Table 5-8 Linefeed/New Line Feature

Feature Selection	Key Pressed – Character Sent	Character Received – Function
Off	RETURN – CR	CR – Cursor moves to left margin.
Off	LINE FEED – LF	LF, FF, VT – Cursor moves to next line but stays in same column.
On	RETURN – CR LF	CR – Cursor moves to left margin.
On	LINE FEED – LF	LF, FF, VT – Cursor moves to left margin of next line.

Keyboard Action (FDX)

Keyboard Action (FDX) – This mode is only used during full-duplex, not half-duplex communication. Keyboard action lets the computer turn the keyboard on or off. This mode always resets when you enter SET-UP. Select keyboard action mode by using the following sequences.

Keyboard Action Mode (KAM)

ESC [2 h
033 133 062 150

Set turns off keyboard and turns on KBD LOCKED.

ESC [2 I
033 133 062 154

Reset turns on keyboard and turns off KBD LOCKED.

Auto Repeat

Auto Repeat – This mode selects automatic key repeating. A key pressed for more than one-half second automatically repeats the transmission of the character. Key repeating does not affect **SET-UP**, **ESC**, **RETURN**, **ENTER**, **NO SCROLL**, and **CTRL**. Select auto repeat mode by using the following sequences.

Auto Repeat Mode (DECARM)

```
ESC [ ? 8 h
033 133 077 070 150
```

Set selects auto repeat. A key pressed for more than one-half second automatically repeats.

```
ESC [ ? 8 I
033 133 077 070 154
```

Reset turns off auto repeat. Keys do not automatically repeat.

Local Echo (Keyboard Send-Receive)

Local Echo (Keyboard Send-Receive) – This mode selects local echo, which causes every character transmitted by the terminal to automatically appear on the screen. Therefore, the computer does not have to transmit (echo) the character back to the terminal for display. When local echo is off, the terminal only transmits characters to the computer. The computer must echo the characters back to the terminal for display. Select send-receive mode by using the following sequences.

Send-Receive Mode (SRM)

```
ESC [ 1 2 h
033 133 061 062 150
```

Set turns off local echo. The terminal transmits characters to the computer, which must echo characters for display on screen.

```
ESC [ 1 2 I
033 133 061 062 154
```

Reset selects local echo. Characters transmitted to the computer automatically appear on the screen.

Cursor Key Character Selection

Cursor Key Character Selection – In application keypad mode (DECKPAM), cursor key mode selects the set of characters transmitted by the cursor keys. In numeric keypad mode (DECKPNM), cursor key mode resets and cannot change. See Table 5-9 for the codes transmitted by the cursor keys. Select cursor key mode by using the following sequences.

NOTE: When you power up or use a Reset command, cursor key mode resets. This mode also resets during a communication line connection in all communication except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication.

Cursor Key Mode (DECCKM)

ESC [? 1 h
033 133 077 061 150

Set selects cursor keys to generate control (application) functions.

ESC [? 1 I
033 133 077 061 154

Reset selects cursor keys to generate ANSI cursor control sequences.

Table 5-9 ANSI Cursor Control Key Codes		
Cursor Key	Cursor Key Mode Reset	Cursor Key Mode Set
↑	ESC [A 033 133 101	ESC O A 033 117 101
↓	ESC [B 033 133 102	ESC O B 033 117 102
←	ESC [C 033 133 103	ESC O C 033 117 103
→	ESC [D 033 133 104	ESC O D 033 117 104

Keypad Character Selection

Keypad Character Selection – The numeric keypad generates either numeric characters or control functions. Selecting application or numeric keypad mode determines the type of characters. The keypad mode also affects the cursor keys. See Cursor Key Character Selection in this chapter for more information. The program function (PF) keys generate the same characters regardless of the keypad character selection. See Table 5-10 for the characters generated by the keypad. Select the keypad mode by using the following sequences.

NOTE: When you power up or use a Reset command, the terminal selects numeric keypad mode. This mode is also selected during communication line connections, except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication line connections.

Application Keypad Mode (DECKPAM)

```
ESC  =  
033 075
```

Selects application keypad mode. Keypad generates control functions. Cursor key mode (DECCKM) selects type of characters generated by cursor keys.

Numeric Keypad Mode (DECKPNM)

```
ESC  >  
033 076
```

Selects numeric keypad mode. Keypad generates characters that match the numeric, comma, period, and minus sign keys on main keyboard. Cursor keys generate ANSI cursor control sequences.

Table 5-10 ANSI Keypad Codes		
Key	Numeric Keypad Mode	Application 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

Table 5-10 ANSI Keypad Codes (Cont)

Key	Numeric Keypad Mode	Application Keypad Mode
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 or CR LF 015 015 012	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
PF3	ESC O R 033 117 122	ESC O R 033 117 122
PF4	ESC O S 033 117 123	ESC O S 033 117 123

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 appears on the screen; for example, PF4 appears as an "S".

* In numeric keypad mode, **ENTER** generates the same characters as **RETURN**. You can change the **RETURN** key character code with 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).

Character Sets and Selection

Character Sets and Selection – The terminal can display up to 254 different characters; however, the terminal only holds 127 display characters in basic read only memory (ROM). You must install an alternate character set ROM for the remaining 127 display characters.

The terminal can select only 94 characters (one character set) at a time. Therefore, the terminal uses the following five character sets, with some characters appearing in more than one set.

- United States
- United Kingdom
- Special characters and line drawing (VT100 compatible)
- Alternate ROM
- Alternate ROM special characters

Tables 5-11 through 5-13 show the character sets. The United States and United Kingdom character sets meet the standard of the “ISO international register of character sets to be used with escape sequences.” The space (SP) and control characters are the same in all sets.

The terminal uses two active character sets at any one time. The computer designates these sets as G0 and G1, using the select character set (SCS) sequence. Then a single control character can switch between sets. Shift in (SI, octal 017) invokes the G0 character set; shift out (SO, octal 016) invokes the G1 character set.

Table 5-11 United Kingdom Character Set

BITS					0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
					COLUMN		1		2		3		4		5		6		7	
B4	B3	B2	B1	ROW	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL	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)	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	ETX	3 3 3	DC3 (XOFF)	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	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	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	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	10 8 8	CAN	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	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	12 10 A	SUB	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	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	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	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	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	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F		177 127 7F

KEY

ASCII CHARACTER

ESC

33

OCTAL

27

DECIMAL

1B

HEX

Table 5-12 United States Character Set

BITS B7 B6 B5 B4 B3 B2 B1				0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1		
				COLUMN																
				0		1		2		3		4		5		6		7		
0	0	0	0	0	NUL	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)	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	ETX	3 3 3	DC3 (XOFF)	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	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	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	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	10 8 8	CAN	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	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	12 10 A	SUB	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	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	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	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	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	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F		177 127 7F

KEY

ASCII CHARACTER

ESC

33

OCTAL

27

DECIMAL

1B

HEX

Table 5-13 Special Characters and Line Drawing Character Set

BITS B7 B6 B5 B4 B3 B2 B1				0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1		
				COLUMN																
ROW				0		1		2		3		4		5		6		7		
0 0 0 0 0				0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	↕	140 96 60	—	160 112 70
0 0 0 1 1				1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	⌘	141 97 61	—	161 113 71
0 0 1 0 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	—	162 114 72
0 0 1 1 1				3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	£	143 99 63	—	163 115 73
0 1 0 0 0				4	EOT	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 1				5	ENQ	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 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 1				7	BEL	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 0				8	BS	8 8 8	CAN	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 0 1				9	HT	9 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 0				10	LF	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	J	152 106 6A	>	172 122 7A
1 0 1 0 1				11	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	⌘	153 107 6B	⌘	173 123 7B
1 1 0 0 0				12	FF	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 0 1				13	CR	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 0				14	SO	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 1				15	SI	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	(BLANK)	137 95 5F	—	157 111 6F		177 127 7F

KEY

ASCII CHARACTER	ESC	33	OCTAL
		27	DECIMAL
		1B	HEX

The designated character sets are active until the terminal receives another SCS sequence. You can use the SCS sequence as often as needed to designate G0 and G1. Designate G0 by using the following sequences.

NOTE: The terminal uses the character set selected in SET-UP after all communication line connections, except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication line connections.

Select Character Set (SCS)

ESC (A
033 050 101

Designates the UK character set as G0.

ESC (B
033 050 102

Designates the US character set as G0.

ESC (0
033 050 060

Designates the special characters and line drawing character set as G0.

ESC (1
033 050 061

Designates the alternate ROM character set as G0.

ESC (2
033 050 062

Designates the alternate ROM special characters character set as G0.

Designate G1 by using the following sequences.

Select Character Set (SCS)

ESC) A
033 051 101

Designates the UK character set as G1.

ESC) B
033 051 102

Designates the US character set as G1.

ESC) 0
033 051 060

Designates the special characters and line drawing character set as G1.

ESC) 1
033 051 061

Designates the alternate ROM character set as G1.

ESC) 2
033 051 062

Designates the alternate ROM special characters character set as G1.

The terminal also has G2 and G3 character sets. However, these are always the default (selected in SET-UP) character sets. You select G2 and G3 for only one character at a time. The terminal returns to the previous character set after displaying a single character. Select G2 and G3 for one character by using the following sequences.

Single Shift 2 (SS2)

ESC N
033 115

Selects G2 (default) character set for one character. You select G2 in SET-UP.

Single Shift 3 (SS3)

ESC O
033 117

Selects G3 (default) character set for one character. You select G3 in SET-UP.

The terminal can transmit characters displayed on the screen to the optional serial printer. When transmitting characters to the printer, the terminal attempts to select the correct character set. If the printer does not support multiple character sets, using multiple character sets causes unexpected characters to print. Remember the following rules when the terminal transmits characters from more than one character set.

- When starting a print operation, make sure the G0 character sets in the terminal and printer are the same.
- During printing, the terminal checks that the next character to transmit belongs to the presently selected G0 character set. If not, the terminal transmits a G0 designator to the printer to select the correct character set. The G1 designator is never used.
- At the end of printing, the terminal checks that the printer's G0 character set is the same as when printing started. If not, the terminal transmits a G0 designator to the printer to select the original G0 character set. The designator is transmitted before the print termination character.

Before transmitting characters to the printer, the terminal must determine the character set selected. If the character is not in the currently selected G0 character set, the character sets are searched as follows.

1. US/UK (selected in SET-UP)
2. US/UK (not selected in SET-UP)
3. Special characters and line drawing
4. Alternate ROM
5. Alternate ROM special characters

NOTE: The substitute character appears on the screen when the terminal receives a parity error, the SUB or CAN control characters, and the M (octal 141) character in the special character and line drawing character set. The terminal always transmits the substitute character to the printer as the SUB (octal 032) character.

Character Attributes

Character Attributes – The terminal can display the following character attributes that change the character display without changing the character.

- Underline
- Reverse video (character background opposite of the screen background feature)
- Blink
- Bold (increased intensity)
- Any combination of these attributes

You can select one or more character attributes at one time. Selecting an attribute does not turn off other attributes already selected. After you select an attribute, all characters received by the terminal appear with that attribute. If you move the characters by scrolling, the attribute moves with the characters. Select the character attributes by using the following sequences.

Select Graphic Rendition (SGR)

ESC [**m** or **ESC** [**0** **m**
 033 133 155 033 133 060 155

Turns off character attributes.

ESC [**1** **m**
 033 133 061 155

Selects bold (increased intensity).

ESC [**4** **m**
 033 133 064 155

Selects underline.

ESC [**5** **m**
 033 133 065 155

Selects blink.

ESC [**7** **m**
 033 133 067 155

Selects reverse video.

Tab Stops

Tab Stops – You select tab stop positions on the horizontal lines of the screen. The cursor advances (tabs) to the next tab stop when the terminal receives a horizontal tab (HT, octal 011). If no tab stops are set, horizontal tab moves the cursor to the right margin. Set and clear the tab stops by using the following sequences.

Horizontal Tabulation Set (HTS)

ESC **H**
 033 110

Sets a horizontal tab stop at cursor position.

Tabulation Clear (TBC)

ESC	[	g	or	ESC	[	0	g
033	133	147		033	133	060	147

Clears a horizontal tab stop at cursor position.

ESC	[	3	g
033	133	063	147

Clears all horizontal tab stops.

Line Attributes

Line Attributes – These are display features that affect a complete display line. The cursor selects the line affected by the attribute. The cursor stays in the same character position when the attribute changes. However, if the attribute would move the cursor past the right margin, the cursor stops at the right margin. When you move lines on the screen by scrolling, the attribute moves with the line. Select line attributes by using the following sequences.

NOTE: If you erase an entire line by using the erase in display (ED) sequence, the line attribute changes to single-height and single-width.

Double-Height Line (DECDHL)

Top Half:	Bottom Half:
ESC # 3	ESC # 4
033 043 063	033 043 064

Makes the line with the cursor the top or bottom half of a double-height, double-width line. Sequences work in pairs on adjacent lines. The same character must be used on both lines to form full characters. If the line was single-width, single-height, all characters to the right of center are lost.

Single-Width Line (DECSWL)

ESC # 5
033 043 065

Makes the line with the cursor single-width, single-height. This is line attribute for all new lines on screen.

Double-Width Line (DECDWL)

ESC # 6
 033 043 066

Makes the line with the cursor double-width, single-height. If the line was single-width, single-height, all characters to the right of center screen are lost.

Erasing

Erasing – Erasing removes characters from the screen without affecting other characters on the screen. Erased characters are lost. The cursor position does not change when erasing characters or lines.

If you erase a line by using the erase in display (ED) sequence, the line attribute becomes single-height, single-width. If you erase a line by using the erase in line (EL) sequence, the line attribute is not affected.

Erasing a character also erases any character attribute of the character. Erase characters by using the following sequences.

Erase In Line (EL)

ESC [K or ESC [0 K
 033 133 113 033 133 060 113

Erases from cursor to end of line, including cursor position.

ESC [1 K
 033 133 061 113

Erases from beginning of line to cursor, including cursor position.

ESC [2 K
 033 133 062 113

Erases complete line.

Erase In Display (ED)

ESC [**J** or **ESC** [**O** **J**
 033 133 112 033 133 060 112

Erases from cursor to end of screen, including cursor position.

ESC [**1** **J**
 033 133 061 112

Erases from beginning of screen to cursor, including cursor position.

ESC [**2** **J**
 033 133 062 112

Erases complete display. All lines are erased and changed to single-width. Cursor does not move.

Computer Editing

Computer Editing – Editing allows the computer to insert or delete characters and lines of characters at the cursor position. The cursor position does not change when inserting or deleting lines. Delete characters or insert and delete lines by using the following sequences.

NOTE: Insertion-replacement mode (IRM) selects how characters are added to the screen. See Inserting and Replacing Characters in this chapter for more information.

Delete Character (DCH)

ESC [**Pn** **P**
 033 133 *** 120

Deletes Pn characters, starting with character at cursor position. When a character is deleted, all characters to the right of cursor move left. This creates a space character at right margin. This character has same character attribute as the last character moved left.

Insert Line (IL)

ESC	[	Pn	L
033	133	***	114

Inserts Pn lines at line with cursor. Lines displayed below cursor move down. Lines moved past the bottom margin are lost. This sequence is ignored when cursor is outside scrolling region.

Delete Line (DL)

ESC	[	Pn	M
033	133	***	115

Deletes Pn lines, starting at line with cursor. As lines are deleted, lines displayed below cursor move up. Lines added to bottom of screen have spaces with same character attributes as last line moved up. This sequence is ignored when cursor is outside scrolling region.

Inserting and Replacing Characters

Inserting and Replacing Characters – The terminal displays received characters at the cursor position. This mode determines how the terminal adds characters to the screen. Insert mode displays the character and moves previously displayed characters to the right. Replace mode adds characters by replacing the character at the cursor position. Select insertion-replacement mode by using the following sequences.

NOTE: This mode resets after a communication line connection in all communication except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication line connections.

Insertion-Replacement Mode (IRM)

ESC	[	4	h
033	133	064	150

Set selects insert mode and turns INSERT on. New display characters move old display characters to the right. Characters moved past the right margin are lost.

```
ESC [ 4 I
033 133 064 154
```

Reset selects replace mode and turns INSERT off. New display characters replace old display characters at cursor position. The old character is erased.

Printing

Printing – The terminal has a serial printer interface for local printing. The computer can select all print operations by using sequences. You can only select two of the print operations from the keyboard, auto print and print screen.

When you print characters from the screen, terminal and printer tab stops are ignored. Print characters are spaced with the space (SP, octal 040) character. The terminal transmits a carriage return (CR, octal 015) and linefeed (LF, octal 012) after the last printable character of a line – but not a space character.

A line of double-height characters print as two identical lines of single-width characters. Double-width characters print as single-width characters on a single line.

Before selecting a print operation, check the printer status by using the printer status report (DSR) in ANSI mode. Do not select a print operation if the serial printer is not ready to print. Select print operations by using the following sequences.

Media Copy (Auto Print On) (MC)

```
ESC [ ? 5 i
033 133 077 065 151
```

Turns on auto print. A display line prints after you move cursor off the line, using a linefeed, form feed, or vertical tab (also transmitted to printer).

The line also prints during an auto wrap. Auto wrap lines end with a CR,LF.

Media Copy (Auto Print Off) (MC)

```
ESC [ ? 4 i
033 133 077 064 151
```

Turns off auto print.

NOTE: Printer controller has a higher priority than auto print. Therefore, you can select printer controller and print characters during auto print.

Media Copy (Printer Controller On) (MC)

```
ESC [ 5 i
033 133 065 151
```

Turns on printer controller. The terminal transmits received characters to printer without displaying them. The terminal does not insert or delete spaces, provide line delimiters, or select the correct printer character set.

Media Copy (Printer Controller Off) (MC)

```
ESC [ 4 i
033 133 064 151
```

Turns off printer controller. Always move printhead to left margin before turning off printer controller.

Media Copy (Print Cursor Line) (MC)

```
ESC [ ? 1 i
033 133 077 061 151
```

Prints display line with cursor. Cursor position does not change. Print cursor line ends when line prints.

Media Copy (Print Screen) (MC)

```
ESC [ i or ESC [ 0 i
033 133 151 033 133 060 151
```

Prints the screen. Printer extent (DECEXT) selects full screen or scrolling region to print. Select scrolling region by using set top and bottom margins (DECSTBM) sequence. Print screen ends when screen prints.

Printer Extent

Printer Extent – This mode selects the full screen or the scrolling region to print during a print screen. Select printer extent mode by using the following sequences.

Printer Extent Mode (DECPEX)

ESC	[	?	1	9	h
033	133	077	061	071	150

Set selects the full screen to print during a print screen.

ESC	[	?	1	9	I
033	133	077	061	071	154

Reset selects the scrolling region to print during a print screen.

Print Termination Character

Print Termination Character – This mode determines if the terminal should transmit a print termination character after a print screen. The form feed (octal, 014) control character serves as the print termination character. Select printer form feed mode by using the following sequence.

Printer Form Feed Mode (DECPFF)

ESC	[	?	1	8	h
033	133	077	061	070	150

Set selects form feed as print termination character. The terminal transmits this character to printer after each print screen.

ESC	[	?	1	8	I
033	133	077	061	070	154

Reset selects no termination character.

Reports

Reports – The terminal transmits reports in response to computer requests. Reports determine terminal type and status, and cursor position. The report requests and responses are as follows.

NOTE: The terminal does not respond to the DSR, DA, or DECID sequences during printer controller operation.

Device Status Report (DSR)

```
ESC [ 5 n
033 133 065 156
```

Computer requests a status report (using a DSR sequence).

```
ESC [ 0 n
033 133 060 156
```

Terminal response: Ready, no malfunctions detected.

```
ESC [ 3 n
033 133 063 156
```

Terminal response: Malfunction, error in self-test. Reset and retry.

```
ESC [ ? 1 5 n
033 133 077 061 065 156
```

Computer requests a printer status report. Terminal checks status of printer. This report should be requested before any print operation.

```
ESC [ ? 1 3 n
033 133 077 061 063 156
```

Printer not connected to terminal. Data terminal ready (DTR) signal of the printer has not been on since terminal turned on.

```
ESC [ ? 1 1 n
033 133 077 061 061 156
```

Printer not ready to print. Printer DTR was on, but is now off.

ESC	[	?	1	0	n
033	133	077	061	060	156

Printer ready to print. Printer DTR is on.

ESC	[	6	n
033	133	066	156

Computer requests a cursor position report from terminal.

Cursor Position Report (CPR)

ESC	[	Pl	;	Pc	R
033	133	***	073	***	122

Terminal reports cursor position in response to DSR sequence request from computer. Pl indicates line and Pc indicates column. No parameters, or parameters of 0, indicate cursor is at home position. Origin mode (DECOM) selects line numbering.

Device Attributes (DA)

ESC	[	c	or	ESC	[	0	c
033	133	143		033	133	060	143

Computer requests terminal identify itself.

Identify Terminal (DECID)

ESC	Z
033	132

Computer requests terminal to identify itself. Terminal uses device attributes (DA) to respond. Future DIGITAL terminals may not support this sequence. Therefore, new software should use device attributes.

Device Attributes (DA)

ESC	[	?	6	c
033	133	077	066	143

Terminal response: VT102.

Reset

Reset – Reset initializes the terminal and causes it to perform the internal power-up self-test, erase the input buffer, and use the SET-UP selections in user memory. Characters received during a reset are lost. To prevent this, the computer may act in one of two ways.

1. (With auto XON/XOFF) Immediately after sending the reset sequence, the computer should assume an XOFF from terminal. The computer stops sending characters until it receives XON. The terminal transmits XON only after it completes the reset.
2. (Without auto XON/XOFF) Use a delay of no less than 10 seconds to allow the terminal to complete the function. This method, however, does not guarantee against loss of characters when a reset error is detected.

The terminal disconnects from the communication line during a reset. After a reset, the terminal selects keypad numeric mode (DECKPNM) and resets origin mode (DECOM). The terminal also selects the top and bottom margins (scrolling region) for the full screen (DECSTBM). Reset the terminal by using the following sequence.

Reset to Initial State (RIS)

```
ESC  c
033 143
```

Resets the terminal to its initial state.

Tests

Tests – DECTST selects the self-tests used to verify terminal operation. Self-tests provide error indications on the keyboard indicators or screen. See Chapter 9 for the meaning of the displayed errors. The terminal reports the test results (pass or fail) to the computer by using a device status report (DSR) sequence.

The terminal loses received characters while performing the test. To prevent this, the computer may act in one of two ways.

1. (With auto XON/XOFF) Immediately after sending the invoke confidence test sequence, the computer should assume an XOFF from terminal. The computer stops sending characters until it receives XON. The terminal transmits XON only after it completes the test.

2. (Without auto XON/XOFF) Use a delay of no less than 10 seconds to allow the terminal to complete the test. This method, however, does not guarantee against loss of characters when an error is detected.

Select terminal self-tests by using the following sequences.

Invoke Confidence Test (DECTST)

```
ESC [ 2 ; 1 y
033 133 062 073 061 171
```

Power-up test. Terminal resets and performs power-up test.

```
ESC [ 2 ; 2 y
033 133 062 073 062 171
```

Data loopback test. Uses test connector on modem interface connector.

```
ESC [ 2 ; 4 y
033 133 062 073 064 171
```

EIA loopback test. Uses test connector on modem interface connector.

```
ESC [ 2 ; 1 6 y
033 133 062 073 061 066 171
```

Printer loopback test. Uses test connector on printer interface connector.

```
ESC [ 2 ; 9 y
033 133 062 073 071 171
```

Repeats power-up test continuously until failure or power turned off.

```
ESC [ 2 ; 1 0 y
033 133 062 073 061 060 171
```

Repeats data loopback test continuously until failure or power turned off. Uses test connector on the modem interface connector.

```
ESC [ 2 ; 1 2 y
033 133 062 073 061 062 171
```

Repeats EIA loopback test continuously until failure or power turned off.
Uses test connector on modem interface connector.

```
ESC [ 2 ; 2 4 y
033 133 062 073 062 064 171
```

Repeats printer loopback test continuously until failure or power turned off. Uses test connector on printer interface.

Adjustments

Adjustments – The terminal has a screen alignment pattern that lets Field Service personnel adjust the screen. Display the screen alignment pattern by using the following sequence.

Screen Alignment Display (DECALN)

```
ESC # 8
033 043 070
```

Fills screen with uppercase E's for screen focus and alignment. This command is used by DIGITAL Manufacturing and Field Service personnel.

Keyboard Indicator

Keyboard Indicator – You can program the L1 indicator (LED) for specific applications. Turn L1 on or off by using the following sequences.

Load LED (DECLL)

```
ESC [ 0 q
033 133 060 161
```

Turns L1 off.

```
ESC [ 1 q
033 133 061 161
```

Turns L1 on.

VT52-Compatible Sequences

VT52-compatible sequences meet private DIGITAL standards. Therefore, the terminal can use existing software designed for previous terminals (such as the VT52). You can select VT52 compatibility from the keyboard in SET-UP (Chapter 3), or the computer can use a sequence. (See ANSI-Compatible Sequences in this chapter).

Modes

Modes – In VT52 mode, you cannot select most terminal features by using sequences. You can, however, select the following three modes by using sequences: ANSI mode, application keypad mode on, and application keypad mode off (numeric keypad mode on).

ANSI/VT52 Compatibility

ANSI/VT52 Compatibility – The terminal is compatible with both ANSI and private DIGITAL standards. Therefore, the terminal can use new software that meets ANSI standards and existing software designed for previous terminals (such as the VT52). ANSI-compatible sequences meet standards X3.64-1979 and X3.41-1974. You use ANSI mode to select most terminal features; the terminal uses the same features when it switches to VT52 mode. You cannot, however, change most of these features in VT52 mode. Select ANSI compatibility by using the following sequence.

ANSI Mode (DECANM)

```
ESC  <
033 074
```

The terminal interprets all sequences according to ANSI standards X3.64-1979 and X3.41-1974. The VT52 escape sequences described in this chapter are not recognized.

Cursor Positioning

Cursor Positioning – The cursor indicates the active screen position where the next character will appear. You must select the margins for VT52 mode in ANSI mode. If you do not select margins, the terminal uses the complete screen. The cursor moves:

- One column to the right when a character appears
- One line down after a linefeed, form feed, or vertical tab (Linefeed/new line may also move the cursor to left margin.)
- To the left margin after a carriage return
- One column to the left after a backspace
- To the next tab stop (or right margin if no tabs are set) after a horizontal tab character.

You can also move the cursor by using the following sequences.

Cursor Up

ESC A
033 101

Moves cursor up one line in same column. Cursor stops at top margin.

Cursor Down

ESC B
033 102

Moves cursor down one line in same column. Cursor stops at bottom margin.

Cursor Right

ESC C
033 103

Moves cursor one column to right. Cursor stops at right margin.

Cursor Left

ESC D
033 104

Moves cursor one column to left. Cursor stops at left margin.

Cursor to Home

ESC H
033 110

Moves cursor to home position.

Direct Cursor Address

ESC Y line column
033 131 *** **

Moves cursor to specified line and column. Line and column numbers are ASCII characters whose codes are their octal value plus octal 037. For example, line 1 column 8 parameters are octal 040 (first line) and octal 050 (eighth column).

Reverse Linefeed

ESC I
033 111

Moves cursor up one line in same column. If cursor is at top margin, screen performs scroll-down.

Keypad Character Selection

Keypad Character Selection – The numeric keypad generates either numeric characters or control functions. Select application keypad mode to generate control functions. Exit application keypad mode (select numeric keypad mode) to generate numeric characters. See Table 5-14 for the characters generated by the keypad. Enter and exit application keypad mode by using the following sequences.

NOTE: When you power up or use a Reset command, the terminal exits application keypad mode (selects numeric keypad mode). This mode is also selected during communication line connections, except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication line disconnects.

Enter Application Keypad Mode

ESC =
033 075

Keypad generates sequences used by the applications program.

Exit Application Keypad Mode (Numeric Keypad Mode)

ESC >
033 076

Keypad generates characters that match the numeric, comma, period, and minus sign keys on main keyboard.

Table 5-14 VT52 Keypad Codes		
Key	Application Keypad Mode Off (Numeric Keypad Mode)	Application Keypad Mode On
0	0 060	ESC ? p 033 077 160
1	1 061	ESC ? q 033 077 161
2	2 062	ESC ? r 033 077 162
3	3 063	ESC ? s 033 077 163

Table 5-14 VT52 Keypad Codes (Cont)

Key	Application Keypad Mode Off (Numeric Keypad Mode)	Application Keypad Mode On
4	4 064	ESC ? t 033 077 164
5	5 065	ESC ? u 033 077 165
6	6 066	ESC ? v 033 077 166
7	7 067	ESC ? w 033 077 167
8	8 070	ESC ? x 033 077 170
9	9 071	ESC ? y 033 077 171
-(minus)	-(minus) 055	ESC ? m 033 077 155*
, (comma)	, (comma) 054	ESC ? l 033 077 154*
.(period)	.(period) 056	ESC ? n 033 077 156
ENTER†	CR or CR LF 015 015 012	ESC ? M 033 077 115
PF1	ESC P 033 120	ESC P 033 120
PF2	ESC Q 033 121	ESC Q 033 121
PF3	ESC R 033 122	ESC R 033 122
PF4	ESC S 033 123	ESC S 033 123*

* These sequences are not generated by the VT52.

† In numeric keypad mode, (application keypad mode off), **ENTER** generates the same characters as **RETURN**. You can change the **RETURN** key character code with 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).

Character Sets and Selection

Character Sets and Selection – In VT52 mode, the terminal uses either the US/UK character set selected in SET-UP or the special characters and line drawing character set. Tables 5-11 and 5-12 show the United Kingdom and United States character sets. Table 5-13 shows the special characters and line drawing character set. Table 5-15 compares the special characters and line drawing character set to VT52 graphics mode (character set). Select the character sets by using the following sequences.

NOTE: The character set selected in SET-UP is used after all communication line connections, except full-duplex no modem control (FDX A). See Chapter 6 for more information about communication.

Enter Graphics Mode

ESC F
033 106

Selects the special characters and line drawing character set.

Exit Graphics Mode

ESC G
033 107

Selects the character set selected in SET-UP.

Table 5-15 Special Characters and Line Drawing Set and VT52 Graphics Mode Comparison

Octal Code	US or UK Set	Special Characters and Line Drawing Set	VT52 Graphics Mode (Not Available in VT102)
137	-	Blank	Blank
140	/	◆	Reserved
141	a	▨	Solid rectangle
142	b	␣	1/
143	c	␣	3/
144	d	␣	5/
145	e	␣	7/
146	f	°	Degrees
147	g	±	Plus or minus
150	h	␣	Right arrow
151	i	␣	Ellipsis (dots)
152	j	␣	Divide by
153	k	␣	Down arrow
154	l	␣	Bar at scan 0
155	m	␣	Bar at scan 1
156	n	␣	Bar at scan 2
157	o	—	Bar at scan 3
160	p	—	Bar at scan 4
161	q	—	Bar at scan 5
162	r	—	Bar at scan 6
163	s	—	Bar at scan 7
164	t	␣	Subscript 0
165	u	␣	Subscript 1
166	v	␣	Subscript 2
167	w	␣	Subscript 3
170	x	|	Subscript 4
171	y	≤	Subscript 5
172	z	≥	Subscript 6
173	{	π	Subscript 7
174	|	≠	Subscript 8
175	}	£	Subscript 9
176	~	•	Paragraph

Erasing

Erasing – Erasing removes characters from the screen. Erased characters are lost. Erase characters by using the following sequences.

Erase to End of Line

```
ESC  K
033 113
```

Erases all characters from cursor to end of current line, including cursor position. Cursor does not move.

Erase to End of Screen

```
ESC  J
033 112
```

Erases all characters from cursor to end of screen, including cursor to end of position. Cursor does not move.

Printing

Printing – The terminal has a serial printer interface for local printing. The computer can select all print operations by using sequences. You can only select two print operations from the keyboard, auto print and print screen.

When you print characters from the screen, terminal and printer tab stops are ignored. Characters printed are spaced with the space (SP, octal 040) character. The terminal transmits a carriage return and linefeed – but not a space character – after the last printable character of a line.

A line of double-height characters print as two identical lines of single-width characters. Double-width characters print as single-width characters on a single line.

Before selecting a print operation, check the printer status by using the printer status report (DSR) in ANSI mode. Do not select a print operation if the serial printer is not ready to print. Select print operations by using the following sequences.

Auto Print

ESC ^
 033 136

Turns on auto print. A display line prints after you move cursor off the line, using a linefeed, form feed, or vertical tab (also transmitted to printer).

The line also prints during an auto wrap. Auto wrap lines end with CR, LF.

ESC _
 033 137

Turns off auto print.

NOTE: Printer controller has a higher priority than auto print. Therefore, you can select printer controller and print characters during auto print.

Print Controller

ESC W
 033 127

Turns on printer controller. The terminal transmits received characters to printer without displaying them. The terminal does not insert or delete spaces, provide line delimiters, or select printer character set.

ESC X
 033 130

Turns off printer controller. Always move printhead to left margin before turning off printer controller.

Print Cursor Line

ESC V
 033 135

Prints display line with cursor. Cursor position does not change. Print cursor line ends when the line prints.

Print Screen

ESC]
 033 126

Prints the screen. Printer extent (DECPEX) selects full screen or scrolling region to print. Select scrolling region by using DECSTBM sequence. Print screen ends when screen prints.

Reports

Reports – The terminal transmits reports in response to computer requests. The terminal generates only one report in VT52 mode. The report requests and responses are as follows.

Identify

ESC Z
 033 132

Terminal sends an identify sequence to computer.

ESC / Z
 033 057 132

VT102 response to identify sequence. (Same as VT52.)

Communication

6

COMMUNICATION

GENERAL

This chapter describes how the VT102 communicates with a computer and optional serial printer. The chapter's main sections cover the two interfaces used, modem and printer. The text provides a detailed description of each connector and its signals. This chapter also describes the terminal's communication features.

NOTE: See Chapter 8 for a description of the 20 mA current loop interface.

CONNECTING TO THE COMPUTER

The VT102 communication (modem) interface is a DB-25 male connector mounted on the back of the terminal (Figure 6-1). This interface meets Electronic Industry Association (EIA) standards RS-423 and RS-232-C, and International Telegraph and Telephone Consultive Committee (CCITT) recommendations V.24 and V.28.

The terminal connects to a computer through a common carrier facility (telephone line) or directly (Figure 6-2). Using a telephone line requires modems. Modems change characters transmitted between the terminal

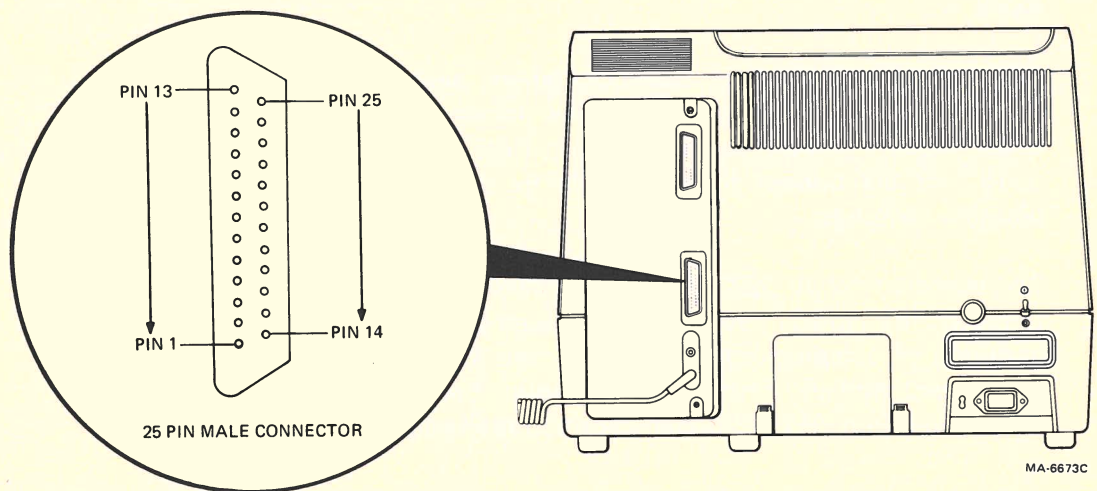
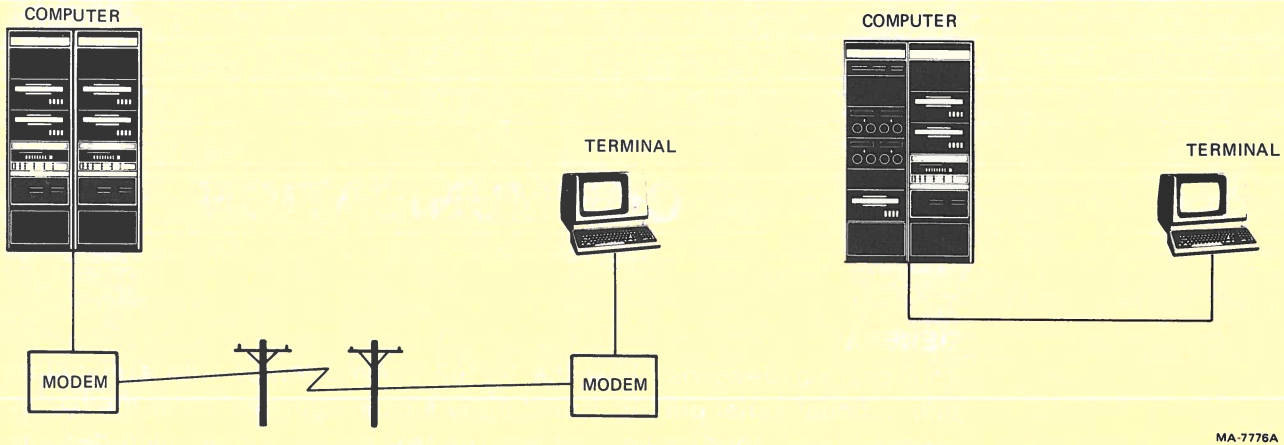


Figure 6-1 Modem Connector Location and Pin Numbering



MA-7776A

Figure 6-2 Connecting to the Computer

and computer into signals transmitted over the telephone line. There are several types of modems available. When using modems to connect the terminal to the computer, you must select the following items.

A modem. The terminal modem must be compatible with the computer modem. Table 6-1 lists the possible modems for public switched telephone lines. Table 6-2 lists the possible modem configurations for dedicated telephone lines.

NOTE: *These tables list examples of possible modem configurations. You can use equivalent modems supplied by other manufacturers.*

DIGITAL DF02-AA and DF03-AA modems are equivalent to Bell 103J and 212A. DF02 operates at 300 baud; DF03 operates at 300 or 1200 baud.

The terminal's internal communication switches. Compare the modem's interface information to the interface information provided under Modem Control in this chapter. Determine which lines are not used and disconnect these signals by using the internal communication switches.

The communication SET-UP features. You must select these features to match the type of communication used by the computer. For a description of communication features, see Modem Serial Characters, Break, and Modem Control in this chapter. See Chapter 3 for more information about SET-UP communication features.

Table 6-1 Possible Bell Modem Configurations (Public Switched)

Communication Parameters	Manual Originate Only	Manual Answer Only	Manual Originate/ Answer	Auto Answer	Reverse Channel
300 baud	113A	113D	103A	103A	No
Full-duplex	113C		103J	103J	No
2-wire			212A	113B	No
				113D	No
				212A	No
1200 baud			202S	202S	Yes
Half-duplex					
2-wire					
1200 baud			212A	212A	No
Full-duplex					
2-wire					

Table 6-2 Possible Bell Modem Configurations (Dedicated Line)

Communication Parameters	Modem	Line Conditioning	Reverse Channel
300 baud Full-duplex 2-wire	103F	Unconditioned 3002 channel	No
1200 baud Half-duplex 2-wire	202T	With reverse channel, up to 1200 baud on unconditioned or C2 conditioned 3002 channel. Without reverse channel, up to 1200 baud on unconditioned 3002 channel and 1200 to 1800 baud on C2 conditioned channel.	Yes
1200 baud Full-duplex 4-wire	202T	Without reverse channel, up to 1200 baud on unconditioned 3002 channel and 1200 to 1800 baud on C2 conditioned channel.	No

Communication Switch Settings

The terminal has a set of ten internal communication switches. These switches allow some communication signals to disconnect from the modem connector.

These switch settings usually stay at their factory settings. However, you must configure these switches for some modems. Figure 6-3 shows the communication signals which have switches.

NOTE: The internal communication switches are ignored when using 20 mA current loop communication.

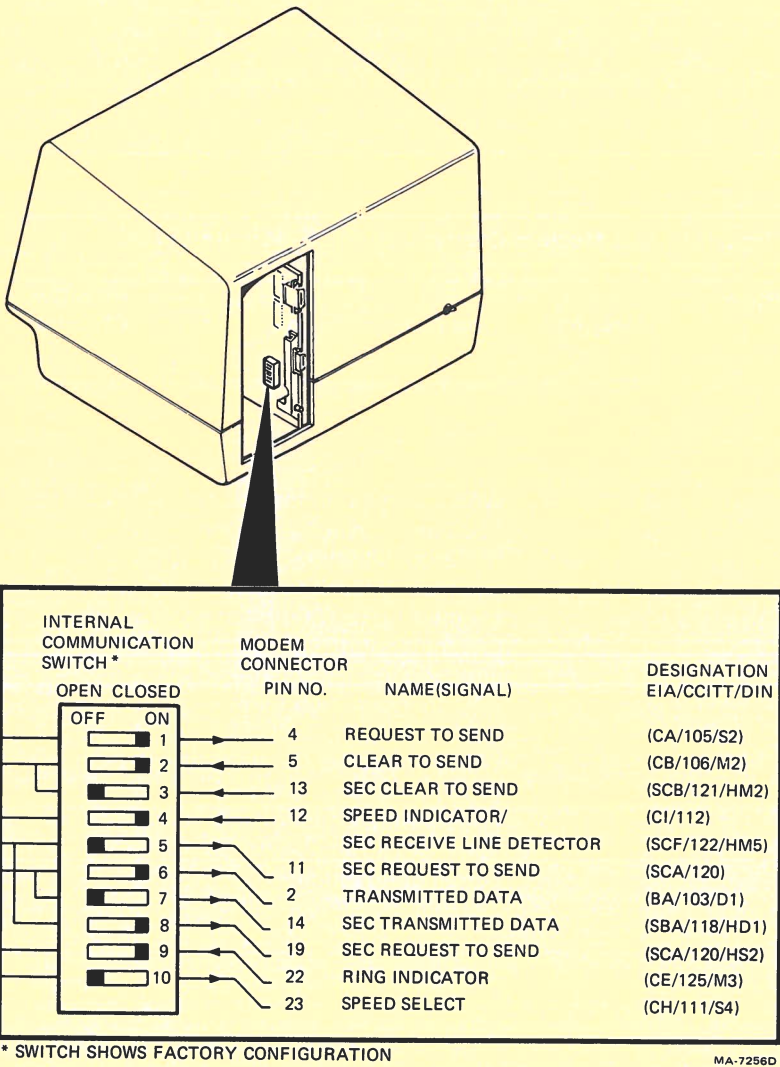


Figure 6-3 Communication Switch Summary

Modem Serial Characters

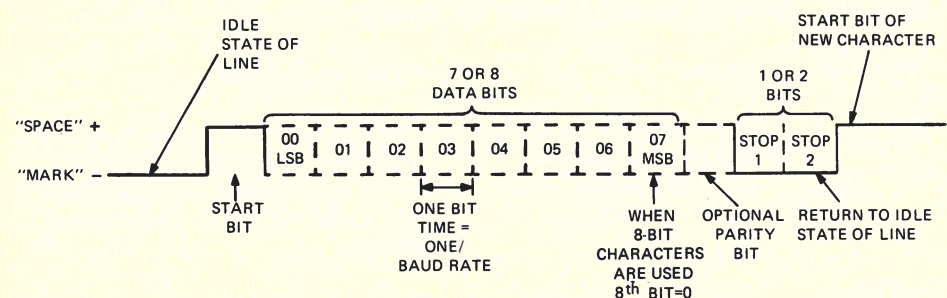
The terminal communicates with the computer by transmitting serial characters. Serial characters have a start bit, seven or eight data bits, an optional parity bit, and one or two stop bits. Figure 6-4 shows the serial character format.

The modem data/parity bits SET-UP feature selects the number of data bits per character and type of parity. With 8-bit characters, the terminal forces the last data bit to the space (0) condition, and ignores the last data bit when received. Data bits are transmitted with the least significant bit first. (See ANSI X3.15-1976 for details on serial character format.)

The terminal uses the parity bit to detect transmission errors in both transmitted and received characters. If you do not select parity, the terminal cannot transmit or check parity bits.

If you select parity, the receive parity SET-UP feature determines if the terminal checks or ignores the parity of received characters. However, the terminal only checks received characters for odd or even parity, not mark and space parity.

The stop bits SET-UP feature selects the number of stop bits (one or two) in a character.



MR-1279
MA-7815

Figure 6-4 Serial Character Format

Break

Break is a space condition transmitted for 0.275 seconds \pm 10 percent. The break enable SET-UP feature enables or disables a break. When receiving in half-duplex with supervisory control (HDX A), the terminal performs a break by turning secondary request to send (SRTS) off for 0.275 seconds \pm 10 percent. The computer response to the break depends on the computer and software.

If you hold down **SHIFT** and press **BREAK**, the terminal generates a disconnect. This causes the terminal to turn off the data terminal ready (DTR) and request to send (RTS) signals. The transmit data line (TXD) is held in a mark condition. After 0.22 seconds, the terminal tests the condition of data set ready (DSR). When DSR turns off or after 1.8 seconds, the disconnect is complete. When the disconnect character enable SET-UP feature is on, the terminal transmits the disconnect character before the DTR and RTS signals turn off. The disconnect character is selected by the turnaround/disconnect SET-UP feature.

Modem Control

The terminal can communicate in full- or half-duplex, selected by the modem control SET-UP feature. This feature has five selections, three for full-duplex and two for half-duplex. Table 6-3 describes these selections and their usual applications.

Table 6-3 Modem Control Feature Selections

Selection	Description	Usual Application
FDX A	Full-duplex with no EIA modem control (data leads only)	Full-duplex communication with a null modem (direct) connection to the computer or with a modem that does not use modem control signals.
FDX B	Full-duplex with EIA modem control	Full-duplex communication with a modem that uses modem control signals.
FDX C	Asymmetric full-duplex with EIA modem control	Full-duplex communication with a half-duplex modem using the secondary channel.
HDX A	Half-duplex supervisory mode	Half-duplex communication with the secondary channel control lines indicating when to perform line turnarounds.
HDX B	Half-duplex coded control	Half-duplex communication with control characters indicating when to perform line turnarounds.

The modem control feature must be compatible with the computer and modem. Table 6-4 matches feature selections and possible modems. You can use equivalent modems supplied by other manufacturers.

NOTE: In several countries outside North America, communications equipment must be certified before being connected to modems provided by the local telecommunications authority (for example, German FTZ, Sweden PTT, and England BT). In those countries, contact your local Field Service office for more information about certification. In many cases, DIGITAL has already provided the needed information to the local telecommunication authority.

Full-Duplex Communication

Full-duplex communication lets you transmit and receive characters in both directions at the same time. The terminal has three types of full-duplex communication available: without modem control, with modem control, and asymmetric full-duplex. All modem control selections except full-duplex with no modem control (FDX A) use modem control signals during communication. Modem control signals verify that the terminal and computer are connected before communicating.

Table 6-4 Possible Modem Control Feature and Modem Configurations

FDX A		FDX B	FDX C	HDX A	HDX B
DF01-A Acoustic-coupler 300 baud	Bell 103 300 baud 2-wire	D200/D300S V.21 200/300 baud 2-wire	D1200S with reverse channel V.23 REC 1200 baud TRANS 75 baud 2-wire	Bell 202 1200 baud 2-wire	Bell 202 1200 baud 2-wire
Bell 103 300 baud 2-wire	Bell 113 300 Baud 2-wire	D1200SDX V.22 1200 baud 2-wire	Datel 600 Modem 4 V.23 REC 600/1200 baud TRANS 75 baud 2-wire	D1200S V.23 1200 baud 2-wire	D1200S V.23 1200 baud 2-wire
DF02 300 baud 2-wire	DF02 300 baud 2-wire	DFG300 V.20 bis, V.24 300 baud 2-wire 2 stop bits			
Bell 113 300 baud 2-wire	Bell 212A 1200 baud 2-wire dual-speed option	DAG1200M V.23 1200 baud 4-wire			
Bell 212A 1200 baud 2-wire	DF03 300/1200 baud 2-wire				
DF03 300/1200 baud 2-wire	Datel 200 V.21 200/300 baud 2-wire	Datel 600 Modem 5 V.23 1200 baud 4-wire			

Full-Duplex with No Modem Control (FDX A) – This selection lets the terminal communicate with the computer regardless of the received modem control signals. The terminal assumes it is connected to the computer. Table 6-5 lists the signals used in FDX A. The terminal uses only the connector signals listed.

NOTE: *FDX A is used with the 20 mA current loop option (VT1XX-CA).*

FDX A Connection – The terminal assumes it is connected to the computer when the DTR signal is on. Communication is allowed regardless of the condition of other modem control lines. DTR is on at all times except when the terminal is off-line or performing a long break disconnect.

The terminal prepares to connect to the computer immediately after DTR turns off. The terminal prepares to communicate by:

- Erasing the keyboard buffer and turning off KBD LOCKED (if a keyboard locked condition occurred)
- Stopping print operations and ignoring new print operation requests
- Using the character set selected by the US/UK character set SET-UP feature (Computer-selected character sets are not used.)
- Assuming XON if you selected auto XON/XOFF. (Transmission is allowed in both directions.)

Table 6-5 Full-Duplex with Data Leads Only (FDX A) Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
1	Protective ground (PGND)	101/AA	–	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
2	Transmit data (TXD)	103/BA	S6	From VT102: When switch S6 is on (closed), TXD transmits serial characters and breaks generated by terminal. TXD is in mark state when no characters are transmitted.
NOTE: <i>When S6 is on (closed), switch S7 must be off (open).</i>				
3	Received data (RXD)	104/BB	–	To VT102: RXD receives serial characters from the computer.

Table 6-5 Full-Duplex with Data Leads Only (FDX A) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
4	Request to send (RTS)	105/CA	S1	From VT102: When switch S1 is on (closed), RTS is on if terminal is on-line and off if terminal is off-line.
5	Clear to send (CTS)	106/CB	S2	To VT102: When switch S2 is on (closed), CTS is only used to turn CTS indicator on or off. The on condition of CTS signal turns CTS indicator on; the off condition turns CTS indicator off.
<i>NOTE: When S2 is on (closed), switch S3 must be off (open).</i>				
6	Data set ready (DSR)	107/CC	—	To VT102: DSR turns DSR indicator on or off. The on condition of DSR signal turns DSR indicator on; the off condition turns DSR indicator off.
7	Signal ground (SGND)	102/AB	—	SGND is common ground reference potential for all connector signals except protective ground. SGND connects to protective ground conductor.
20	Data terminal ready (DTR)	108.2/CD	—	From VT102: DTR is on when the terminal is on-line and off when the terminal is off-line or performing a line disconnect. When on, the modem can usually answer calls (modem auto answer option). When off, the modem usually disconnects and does not answer calls.
23	Speed select (SPSD)	111/CH	S10	From VT102: SPSD is on when the receive speed SET-UP feature selection is greater than 600 baud. SPSP is off when the speed is 600 baud or less.

FDX A Disconnection – The terminal disconnects (hangs up) the communication (phone) line by turning DTR off. A disconnect occurs when the terminal:

- Switches off-line
- Performs a recall, reset, or general default
- Transmits a long break disconnect using **SHIFT** and **BREAK**. (Transmits a disconnect character if the disconnect character enable SET-UP feature is on.)
- Receives a disconnect character with the disconnect character enable SET-UP feature on.

Full-Duplex with Modem Controls (FDX B) – This selection allows communication when the terminal receives the correct modem control signals. These signals verify the connection between the terminal and computer before and during communication. The terminal cannot communicate without this connection. Table 6-6 lists the signals used in FDX B. The terminal uses only the connector signals listed.

Table 6-6 Full-Duplex with Modem Control (FDX B) Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
1	Protective ground (PGND)	101/AA	–	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
2	Transmit data (TXD)	103/BA	S6	From VT102: When switch S6 is on (closed), TXD transmits serial characters and breaks generated by the terminal. TXD is in mark state when no characters are transmitted.
<i>NOTE: When S6 is on (closed), switch S7 must be off (open).</i>				
3	Received data (RXD)	104/BB	–	To VT102: RXD receives serial characters from the computer.
4	Request to send (RTS)	105/CA	S1	From VT102: When switch S1 is on (closed), RTS is on if terminal is on-line and off if terminal is off-line.

Table 6-6 Full-Duplex with Modem Control (FDX B) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
5	Clear to send (CTS)	106/CB	S2	To VT102: When switch S2 is on (closed), CTS indicates when modem is ready to transmit data. When on, modem is ready to transmit data and CTS indicator is on. When off, modem is not ready to transmit data and CTS indicator is off.
<i>NOTE: When S2 is on (closed), switch S3 must be off (open).</i>				
6	Data set ready (DSR)	107/CC	–	To VT102: When DSR is on: <ul style="list-style-type: none"> • DSR indicator is on • Modem is connected to a communication line • Modem is ready to use modem control signals. When DSR is off: <ul style="list-style-type: none"> • DSR indicator is off • Terminal performs a disconnect.
7	Signal ground (SGND)	102/AB	–	SGND is common ground reference potential for all connector signals except protective ground. SGND connects to protective ground conductor.
8	Receive line signal detector (RLSD)	109/CF	–	To VT102: Also called carrier detect, RLSD is on when communi- cation line signals are good enough to transfer data. When off, the communica- tion line signals are not good enough to transfer data; data received is ignored.

Table 6-6 Full-Duplex with Modem Control (FDX B) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
12	Speed indicator (SI)	112/CI	S4	To VT102: When switch S4 is on (closed), SI controls termi- nal transmit and receive speeds. When on, transmit and receive speeds are 1200 baud regardless of modem transmit and receive speed SET-UP feature selections. When off, trans- mit and receive speeds are modem transmit and receive speed SET-UP feature selections.
20	Data terminal ready (DTR)	108.2/CD	-	From VT102: DTR is on when terminal is on-line and off when termi- nal is off-line or performing a disconnect. When on, modem usually can answer calls (modem auto answer option). When off, modem usually disconnects and does not answer calls.
23	Speed select (SPSD)	111/CH	S10	From VT102: SPSD is on when receive speed SET-UP feature se- lection is greater than 600 baud. SPSP is off when speed is 600 baud or less.

FDX B Connection – Before communicating, the terminal verifies the connection to the computer by using modem control signals. The clear to send (CTS), receive line signal detector (RLSD) and data set ready (DSR) signals must be on, or communication is not permitted.

The terminal prepares to connect to the computer when DSR turns on. The terminal prepares to communicate by:

- Erasing the keyboard buffer and turning off KBD LOCKED (if a keyboard locked condition occurred)
- Stopping print operations and ignoring new print operation requests
- Using the character set selected by the US/UK character set SET-UP feature (Computer-selected character sets are not used.)
- Selecting numeric keypad mode (The keypad generates numeric characters. The cursor keys transmit cursor movement commands.)
- Selecting replace mode (Turning off insert mode. INSERT is off and received characters appear at cursor position, replacing old display character.)
- Assuming XON if you selected auto XON/XOFF. (Transmission is allowed in both directions.)

FDX B Disconnection – The terminal hangs up the communication phone line by turning DTR off. A disconnect occurs when the terminal:

- Switches off-line
- Performs a recall, reset, or general default
- Receives a disconnect character with the disconnect character enable SET-UP feature on
- Transmits a long break disconnect using **SHIFT** and **BREAK**. (Transmits a disconnect character if the disconnect character enable SET-UP feature is on.)
- Loses DSR during communication
- During a connection, does not receive RLSD within 30 seconds after DSR
- After a connection, loses RLSD for a greater time than allowed by the disconnect delay SET-UP feature.

Asymmetric Full-Duplex (FDX C) – This is full-duplex communication using a half-duplex modem with a secondary channel. The terminal receives characters on the primary channel at 600 or 1200 baud. It transmits characters on the secondary channel at 75 baud. You use the internal communication switches to configure the terminal to use a secondary channel. Table 6-7 lists the signals used in FDX C. The terminal uses only the connector signals listed.

Table 6-7 Asymmetric Full-Duplex with Modem Control (FDX C) Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
1	Protective ground (PGND)	101/AA	–	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
3	Received data (RXD)	104/BB	–	To VT102: RXD receives serial characters from the computer.
6	Data set ready (DSR)	107/CC	–	From VT102: When DSR is on: <ul style="list-style-type: none"> • DSR indicator is on • Modem connects to a communication line • Modem is ready to use modem control signals. When DSR is off: <ul style="list-style-type: none"> • DSR indicator is off • Terminal performs a disconnect.
7	Signal ground (SGND)	102/AB	–	SGND is common ground reference potential for all connector signals except protective ground. SGND connects to protective ground conductor.
8	Receive line signal detector (RLSD)	109/CF	–	To VT102: Also called carrier detect, RLSD is on when communication line signals are good enough to transfer data. When off, data received is ignored.

Table 6-7 Asymmetric Full-Duplex with Modem Control (FDX C) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
13	Secondary clear to send (SCTS)	121/SCB	S3	To VT102: When switch S3 is on (closed), SCTS indicates when modem is ready to transmit data. When on, modem is ready to transmit data and CTS indicator is on. When off, modem is not ready to transmit data and CTS indicator is off.
<i>NOTE: When S3 is on (closed), switch S2 must be off (open).</i>				
14	Secondary transmit data (STXD)	118/SBA	S7	When switch S7 is closed, STXD transmits serial characters and breaks generated by terminal. STXD is in mark state when no characters are transmitted.
<i>NOTE: When S7 is on (closed), switch S6 must be off (open).</i>				
19	Secondary request to send (SRTS)	120/SCA	S8	To VT102: When switch S8 is closed, SRTS is on if terminal is on- line and off if terminal is off- line.
<i>NOTE: Switch S5 must be off (open).</i>				
20	Data terminal ready (DTR)	108.2/CD	—	From VT102: DTR is on when terminal is on-line and off when termi- nal is off-line or performing a disconnect. When on, modem can usually answer calls (modem auto answer option). When off, modem disconnects and does not answer calls.
23	Speed select (SPSD)	111/CH	S10	From VT102: SPSD is on when receive speed SET-UP feature selection is greater than 600 baud. SPSP is off when speed is 600 baud or less.

FDX C Connection – Before communicating, the terminal verifies the connection to the computer by using modem control signals. The secondary clear to send (SCTS), RLSD, and DSR signals must be on, or communication is not permitted.

The terminal prepares to connect to the computer when DSR turns on. The terminal prepares to communicate by:

- Erasing the keyboard buffer and turning off KBD LOCKED (if a keyboard locked condition occurred)
- Stopping print operations and ignoring new print operation requests
- Using the character set selected by the US/UK character set SET-UP feature (Computer-selected character sets are not used.)
- Selecting numeric keypad mode (The keypad generates numeric characters. The cursor keys transmit cursor movement commands.)
- Selecting replace mode (Turning off insert mode. INSERT is off and all received characters appear at cursor position, replacing old display character.)
- Assuming XON if you selected auto XON/XOFF. (Transmission is allowed in both directions.)

FDX C Disconnection – The terminal hangs up phone line by turning DTR off. A disconnect occurs when the terminal:

- Switches off-line
- Performs a recall, reset, or general default
- Receives a disconnect character with the disconnect character enable SET-UP feature on
- Transmits a long break disconnect using **SHIFT** and **BREAK**. (Transmits a disconnect character if the disconnect character enable SET-UP feature is on.)
- Loses DSR during communication
- During a connection, does not receive RLSD within 30 seconds after DSR
- After a connection, loses RLSD for a greater time than allowed by the disconnect delay SET-UP feature.

Half-Duplex Communication

Half-duplex lets you transmit and receive communication characters in both directions, one direction at a time. Therefore, you need a method to control the direction of the communication line. The line direction determines whether the terminal transmits or receives characters. Every time the transmitting device wants to receive, the line must be turned around. The terminal uses two types of half-duplex communication to control line direction, supervisory control or coded control.

NOTE: *In half-duplex, characters typed on the keyboard do not appear immediately on the screen unless you selected local echo.*

Half-Duplex with Supervisory Control (HDX A) – This selection lets the computer control line turnarounds by using the secondary channel control signals. The secondary channel does not transfer data. Table 6-8 lists the signals used in HDX A. The terminal uses only the connector signals listed.

Table 6-8 Half-Duplex with Supervisory Control (HDX A) Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
1	Protective ground (PGND)	101/AA	–	Connects to terminal chassis. Also connects to external ground through third wire of power cord.
2	Transmit data (TXD)	103/BA	S6	From VT102: When switch S6 is on (closed), signals on TXD are serial characters and breaks generated by the terminal. TXD is in mark state when no characters are transmitted.
NOTE: <i>When S6 is on (closed), switch S7 must be off (open).</i>				
3	Received data (RXD)	104/BB	–	To VT102: RXD receives serial characters from the computer.
4	Request to send (RTS)	105/CA	S1	From VT102: When switch S1 is on (closed), RTS is on if terminal is ready to transmit characters and off if terminal is receiving characters.

Table 6-8 Half-Duplex with Supervisory Control (HDX A) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
5	Clear to send (CTS)	106/CB	S2	<p>To VT102:</p> <p>When switch S2 is on (closed), CTS indicates when modem is ready to transmit data to the computer. When on, modem is ready to transmit data and CTS indicator is on. When off, modem is not ready to transmit data and CTS indicator is off.</p>
<p>NOTE: When S2 is on (closed), switch S3 must be off (open).</p>				
6	Data set ready (DSR)	107/CC	—	<p>From VT102:</p> <p>When DSR is on:</p> <ul style="list-style-type: none"> • DSR indicator is on • Modem connects to a communication line • Modem is ready to use modem control signals. <p>When DSR is off:</p> <ul style="list-style-type: none"> • DSR indicator is off • Terminal performs a disconnect.
7	Signal ground (SGND)	102/AB	—	<p>SGND is common ground reference potential for all connector signals except protective ground. SGND connects to protective ground conductor.</p>
8	Receive line signal detector (RLSD)	109/CF	—	<p>To VT102:</p> <p>Also called carrier detect, RLSD is on when communication line signals are good enough to receive data from computer. When off, terminal is transmitting data to computer or modem is disconnected from communication line; data received is ignored.</p>

Table 6-8 Half-Duplex with Supervisory Control (HDX A) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
12	Secondary receive line signal detector (SRLSD)	122/SCF	S4	To VT102: Also called secondary carrier detect, SRLSD is on when transmitting to computer. When off, terminal is receiving data from computer or modem is dis- connected from communi- cation line.
19	Secondary request to send (SRTS)	120/SCA	S8	From VT102: When switch S8 is on (closed), SRTS is on if ter- minal is ready to receive characters and off if terminal is transmitting characters.
<i>NOTE: Switch S5 must be off (open).</i>				
20	Data terminal ready (DTR)	108.2/CD	—	From VT102: DTR is on when terminal is on-line and off when termi- nal is off-line or performing a line disconnect. When on, modem can usually answer calls (modem auto answer option). When off, modem usually disconnects and does not answer calls.
23	Speed select (SPSD)	111/CH	S10	From VT102: SPSD is on when receive speed SET-UP feature se- lection is greater than 600 baud. SPSP is off when speed is 600 baud or less.

HDX A Connection – Before communicating, the terminal verifies the connection to the computer by using DSR. The terminal prepares to connect to the computer when DSR turns on. The terminal prepares to communicate by:

- Erasing the keyboard buffer and turning off KBD LOCKED (if a keyboard locked condition occurred)
- Stopping print operations and ignoring new print operation requests
- Using the character set selected by the US/UK character set SET-UP feature (Computer-selected character sets are not used.)
- Selecting numeric keypad mode (The keypad generates numeric characters. The cursor keys transmit cursor movement commands.)
- Selecting replace mode (Turning off insert mode. INSERT is off and all received characters appear at the cursor position, replacing old display character.)
- Selecting the initial direction of transmission by using the initial direction SET-UP feature.

HDX A Character Transmission and Reception – After the terminal connects to the computer, the secondary channel modem control signals control line turnaround. The terminal receives data as follows.

Computer

Terminal

Computer turns secondary request to send (SRTS) off.

This turns secondary receive line signal detector (SRLSD) off at terminal.
Terminal turns request to send (RTS) off. (CTS turns off.)

This turns RLSD off at computer.
Computer turns RTS on.

This turns RLSD on at terminal.
Terminal turns SRTS on.

This turns SRLSD on at computer.

Terminal receives characters transmitted by computer.

The terminal transmits data as follows.

Computer

Computer turns RTS off and SRTS on.

This turns SRLSD off and RLSD on at computer.

Terminal

This turns RLSD off and turns SRLSD on at terminal. Terminal then turns SRTS off and RTS on.

Terminal waits for CTS to turn on, allowing transmission of characters to computer.

Table 6-9 summarizes the modem control signal conditions when transmitting and receiving characters.

Table 6-9 HDX A Modem Control Signal Summary			
Signal	Source	Receive	Transmit
Data terminal ready	From VT102	On	On
Data set ready	To VT102	On	On
Request to send	From VT102	Off	On
Clear to send	To VT102	Off	On
Receive line signal detector	To VT102	On	Off
Secondary request to send	From VT102	On	Off
Secondary receive signal detector	To VT102	Off	On

HDX A Disconnection – The terminal hangs up the phone line by turning DTR off. A disconnect occurs when the terminal:

- Switches off-line
- Performs a recall, reset, or general default
- Receives a disconnect character with the disconnect character enable SET-UP feature on
- Transmits a long break disconnect using **SHIFT** and **BREAK** (Transmits a disconnect character if the disconnect character enable SET-UP feature is on.)
- Loses DSR during communication
- Line turnaround does not complete within 5 seconds.

Half-Duplex with Coded Control (HDX B) – This selection lets the transmitting device control line turnarounds with a turnaround character specified by the turnaround/disconnect character SET-UP feature. The turnaround character indicates that a line should turn around. The transmitting device uses modem control lines to perform line turnarounds. Table 6-10 lists the signals used in HDX B. The terminal uses only the connector signals listed.

The terminal uses ETX and EOT for turnaround characters. You can also select DC3, FF, and CR; however, these characters do not comply with ANSI X3.4-1977. If you set the line turnaround SET-UP feature for auto, the line automatically turns around when the terminal transmits:

- The answerback message
- A cursor position report
- A device status report
- A device attributes

or

- You press **RETURN**. If the turnaround character is CR, only one CR character is transmitted.

If you set the line turnaround SET-UP feature for manual, you must select the turnaround character manually.

Table 6-10 Half-Duplex Using Coded Control (HDX B) Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
1	Protective ground (PGND)	101/AA	–	Connected to terminal chassis. Also connected to external ground through third wire of power cord.
2	Transmit data (TXD)	103/BA	S6	From VT102: When switch S6 is on (closed), signals on TXD are serial characters and breaks generated by terminal. TXD is in mark state when no characters are transmitted.
<i>NOTE: When S6 is on (closed), switch S7 must be off (open).</i>				
3	Received data (RXD)	104/BB	–	To VT102: RXD receives serial characters from computer.
4	Request to send (RTS)	105/CA	S1	From VT102: When switch S1 is on (closed), RTS is on if terminal is ready to transmit characters and off if terminal is receiving characters.
5	Clear to send (CTS)	106/CB	S2	To VT102: When switch S2 is on (closed), CTS indicates when modem is ready to transmit data to the computer. When on, modem is ready to transmit data and CTS indicator is on. When off, modem is not ready to transmit data and CTS indicator is off.
<i>NOTE: When S2 is on (closed), switch S3 must be off (open).</i>				
6	Data set ready (DSR)	107/CC	–	From VT102: When DSR is on: <ul style="list-style-type: none"> • DSR indicator is on • Modem connects to a communication line • Modem is ready to use modem control signals. When DSR is off: <ul style="list-style-type: none"> • DSR indicator is off • Terminal performs a disconnect.

Table 6-10 Half-Duplex Using Coded Control (HDX B) Signals (Cont)

Pin	Name (Mnemonic)	CCITT/ EIA	Switch	Description
7	Signal ground (SGND)	102/AB	–	SGND is common ground reference potential for all connector signals except protective ground. SGND connects to the protective ground conductor.
8	Receive line signal detector (RLSD)	109/CF	–	To VT102: Also called carrier detect, RLSD is on when communication line signals are good enough to receive data from computer. When off, terminal is transmitting data to computer or modem is disconnected from communication line; data received is ignored.
20	Data terminal ready (DTR)	108.2/CD	–	From VT102: DTR is on when terminal is on-line and off when terminal is off-line or performing a line disconnect. When on, modem can usually answer calls (modem auto answer option). When off, modem usually disconnects and does not answer calls.
23	Speed select (SPSD)	111/CH	S10	From VT102: SPSD is on when receive speed SET-UP feature selection is greater than 600 baud. SPSP is off when speed is 600 baud or less.

HDX B Connection – Before communicating, the terminal verifies the connection to the computer by using DSR. The terminal prepares to connect to the computer when DSR turns on. The terminal prepares to communicate by:

- Erasing the keyboard buffer and turning off KBD LOCKED (if a keyboard locked condition occurred)
- Stopping print operations and ignoring new print operation requests
- Using the character set selected by the US/UK character set SET-UP feature (Computer-selected character sets are not used.)

- Selecting numeric keypad mode (The keypad generates numeric characters. The cursor keys transmit cursor movement commands.)
- Selecting replace mode (Turning off insert mode. INSERT is off and all received characters appear at the cursor position, replacing old display character.)
- Selecting the initial direction of transmission by using the initial direction SET-UP feature.

HDX B Character Transmission and Reception – During a communication line connection, the initial direction SET-UP feature selects which device transmits. The transmitting device determines when the communication line turns around. Line turnarounds begin with the transmitting device sending a turnaround character. Both devices then change the condition of RTS. This causes a line turnaround.

The terminal receives data as follows.

Computer

Terminal

Computer turns RTS on.

This turns RLSD on at terminal.

Terminal's RTS is off;
therefore, CTS to terminal is
off. Terminal receives
characters from computer.

The terminal transmits characters as follows.

Computer

Terminal

Terminal turns RTS on.

This turns RLSD on at computer.

This turns CTS on at terminal.
Terminal can transmit
characters.

Table 6-11 summarizes the modem control signal conditions when transmitting and receiving characters.

Table 6-11 HDX B Modem Control Signal Summary

Signal	Source	Receive	Transmit
Data terminal ready	From VT102	On	On
Data set ready	To VT102	On	On
Request to send	From VT102	Off	On
Clear to send	To VT102	Off	On
Receive line signal detector	To VT102	On	Off

HDX B Disconnection – The terminal hangs up the phone line by turning DTR off. A disconnect occurs when the terminal:

- Switches off-line
- Performs a recall, reset, or general default
- Receives a disconnect character with the disconnect character enable SET-UP feature on
- Transmits the long break disconnect using **SHIFT** and **BREAK**. (Transmits a disconnect character if the disconnect character enable SET-UP feature is on.)
- Loses DSR during communication
- Loses RLSD for more than 5 seconds without receiving a turnaround character
- Line turnaround does not complete within 5 seconds.

Input Buffer Overflow Prevention

The terminal places all received characters (other than NUL), in a 128-character input buffer. The input buffer holds received characters until processed. After processing, the terminal removes characters from the input buffer and transmits or displays them.

The input buffer fills when it receives characters faster than the terminal can process them. When the buffer is full, the terminal loses received characters and displays the substitute character (⌘). There are three methods of input buffer overflow prevention:

- XON/XOFF characters
(Recommended with full-duplex communication.)

- Fill characters
- Low-speed operation.

NOTE: In applications using continuous 19,200 baud communication, occasional data errors may occur. When the terminal detects errors, it replaces the characters in error with the substitute character (§). In these cases, use a lower baud rate.

XON and XOFF Characters – When you select the auto XON/XOFF, the XON and XOFF control characters prevent input buffer overflows. These characters indicate when this 128-character buffer is almost empty or full. When the input buffer holds 32 characters, the terminal automatically transmits XOFF (DC3, octal 023). The computer should stop transmitting characters to prevent an input buffer overflow.

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

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

Use the following formulas to determine how fast the computer must respond to the first XOFF character to avoid input buffer overflow.

$$C = 96 - [3 \times (\text{receive speed} / \text{transmit speed})]$$

$$R = C \times (\text{bits per char.} + \text{parity bit} + \text{no. of stop bits} + 1) / \text{receive speed}$$

where

C = number of characters to overflow

R = response time to XOFF (seconds)

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

$$C = 96 - [3 \times (1200 / 1200)] = 93 \text{ characters}$$

$$R = 93 \times (8 + 0 + 1 + 1) / 1200 = 0.775 \text{ seconds}$$

Low-Speed Operation – A slow terminal receive speed prevents input buffer overflows. Low-speed operation lets the terminal process a character before receiving the next character. Therefore, the input buffer is always ready to receive characters. Use the following rules during low-speed operation to prevent input buffer overflows.

- Do not send the ESC code to the terminal.
- Use terminal receive speed of 4800 baud or less.
- Do not use the smooth scroll feature.
- Immediately after sending the reset or invoke confidence test sequences, use a delay of no less than 10 seconds to allow the terminal to complete the function. This does not guarantee against loss of characters when a test error is detected.

Keyboard Transmit Buffer

The keyboard transmit buffer holds characters generated by the terminal before they are transmitted to the computer. When using auto XON/XOFF in full-duplex, the computer can use XON (DC1, octal 021) and XOFF (DC3, octal 023) characters to control character transmission from the terminal.

After receiving XOFF, the terminal stops transmitting any characters except XOFF and XON. A keyboard buffer stores keystrokes. If the keyboard buffer overflows, KBD LOCKED turns on; keyclicks also stop if the keyclick SET-UP feature is on.

When the terminal receives XON, the character transmission continues. Also, entering and exiting SET-UP turns off KBD LOCKED 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, KBD LOCKED turns off; keyclicks return if the keyclick feature is on.

CONNECTING TO THE PRINTER

The terminal connects to a local serial printer via a printer interface. The printer interface is full-duplex and uses the XON and XOFF control characters to prevent input buffer overflows. Table 6-13 lists recommended DIGITAL printers, printer options, and cables.

When you use a serial printer, select full-duplex communication between the terminal and computer. Also, select auto XON/XOFF to prevent input buffer overflows. Without full-duplex communication and auto XON/XOFF, it is impossible to guarantee correct system operation. However, a large printer input buffer and fast printer interface speed (baud rate) decrease the chance of problems.

Table 6-13 Recommended DIGITAL Serial Printers

Printer	Options/Cables	Option Description
LA34	LAX34-LL	Paper low detection for roll paper
	LAX34-PL	Paper out detection for fanfold or single-sheet paper
	BC22A	Null modem cable
LA35	LAXX-KG LAXX-LZ*	EIA interface with BC03M cable Paper fault detection
LA36	LAXX-KG LAXX-LZ*	EIA interface with BC03M cable Paper fault detection
LA38	–	No options required. BC22A cable provided.
LA120	BC22A	Null modem cable
* Standard on CE and CJ models. Recommended on all other models. Order from Accessories and Supplies Group or Terminal Products Group dealers.		

Serial Printer Interface

The VT102's printer interface is a DB-25 male connector mounted on the back of the terminal (Figure 6-5). This interface meets Electronic Industry Association (EIA) standards RS-423 and RS-232-C, and International Telegraph and Telephone Consultative Committee (CCITT) recommendation V.28. Table 6-14 lists pin assignments for printer interface signals. The terminal uses only the connector signals listed.

The printer interface uses full-duplex communication with auto XON/XOFF to prevent buffer overflows. If possible, the printer should turn off DTR when not ready to print. DTR has a higher priority than XON/XOFF. If DTR is off, the terminal will not transmit to the printer after receiving XON. If DTR is on, the terminal assumes XON.

Printer Serial Characters

The terminal communicates with the printer by using serial characters. These characters have a start bit, seven or eight data bits, an optional parity bit, and one or two stop bits. Data bits are transmitted with the least significant bit first. See ANSI X3.15-1976 for further details on the character format. Figure 6-4 shows the serial character format.

SET-UP features select the number of data bits and stop bits per character, the parity, and the transmission speed. The printer data/parity bits feature selects the number of data bits and type of parity. With 8-bit characters, the terminal forces the last data bit to the space (0) condition and ignores the last data bit when received. If you do not select parity, the terminal cannot transmit the parity bit. The transmit/receive speed SET-UP feature selects the number of stop bits (one or two) and speed (baud rate).

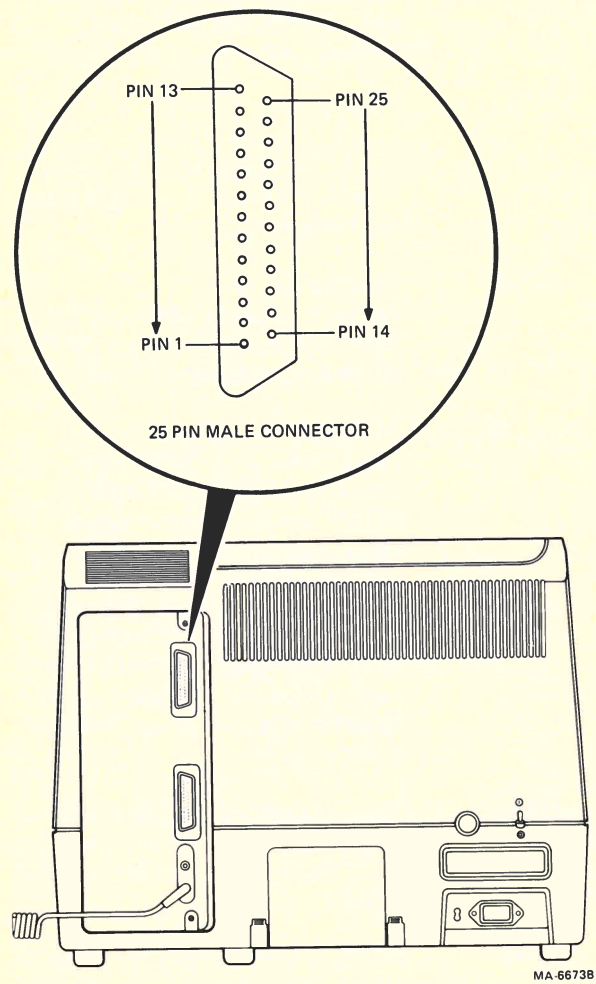


Figure 6-5 Printer Connector Location and Pin Numbering

Table 6-14 Printer Interface Signals

Pin	Name (Mnemonic)	CCITT/ EIA	Description
1	Protective ground (PGND)	101/AA	Connects to terminal chassis. Also, connects to external ground lead of ac power cord.
2	Transmit data (TXD)	103/BA	From VT102: Terminal transmits serial characters on TXD to printer. TXD held in mark state when characters are not transmitted.
3	Receive data (RXD)	104/BB	To VT102: Terminal receives XON and XOFF control characters on RXD. All other characters ignored.
6	Data set ready (DSR)	107/CC	To VT102: Terminal receives DTR from printer on DSR. If DTR from printer has not been on since power up or reset, terminal ignores all print requests. When DTR from printer is on, DSR indicates printer status. If DTR turns off, terminal assumes that printer cannot receive characters. If DTR turns on again, print operation completes.
<p>NOTE: The printer's DTR has a higher priority than XON/XOFF control characters. When the printer's DTR is off, data transmission stops even if the printer interface option receives XON. When the printer's DTR goes from off to on, the terminal assumes that the XON condition is indicated.</p>			
7	Signal ground (SGND)	102/AB	SGND is common ground reference for all voltages on interface.
20	Data terminal ready (DTR)	108.2/CD	From VT102: DTR is on when terminal is on. Printer usually receives DTR as DSR. Printer usually needs DTR before operation can begin.

Installation

7

INSTALLATION

GENERAL

This chapter provides information used to unpack, pack, and install the VT102. The installation procedure describes how to select the input voltage switch and fuse. The chapter also provides a step-by-step power-up and checkout procedure.

SITE CONSIDERATIONS

The terminal consists of a video monitor and a detached keyboard. Figure 7-1 shows their dimensions. The following list covers the terminal's environmental and power specifications.

Temperature	10° to 40° C (50° to 104° F)
Relative humidity	10 to 90 percent with a maximum wet bulb temperature of 28° C (82° F) and a maximum dew point of 2° C (36° F) noncondensing
Input voltage	99 to 128 Vac (115 V setting) 198 to 256 Vac (230 V setting) or 87 to 107 Vac (100 V setting) 222 to 268 Vac (250 V setting)
Power consumption	70 W
Power receptacle	Nonswitched, grounded

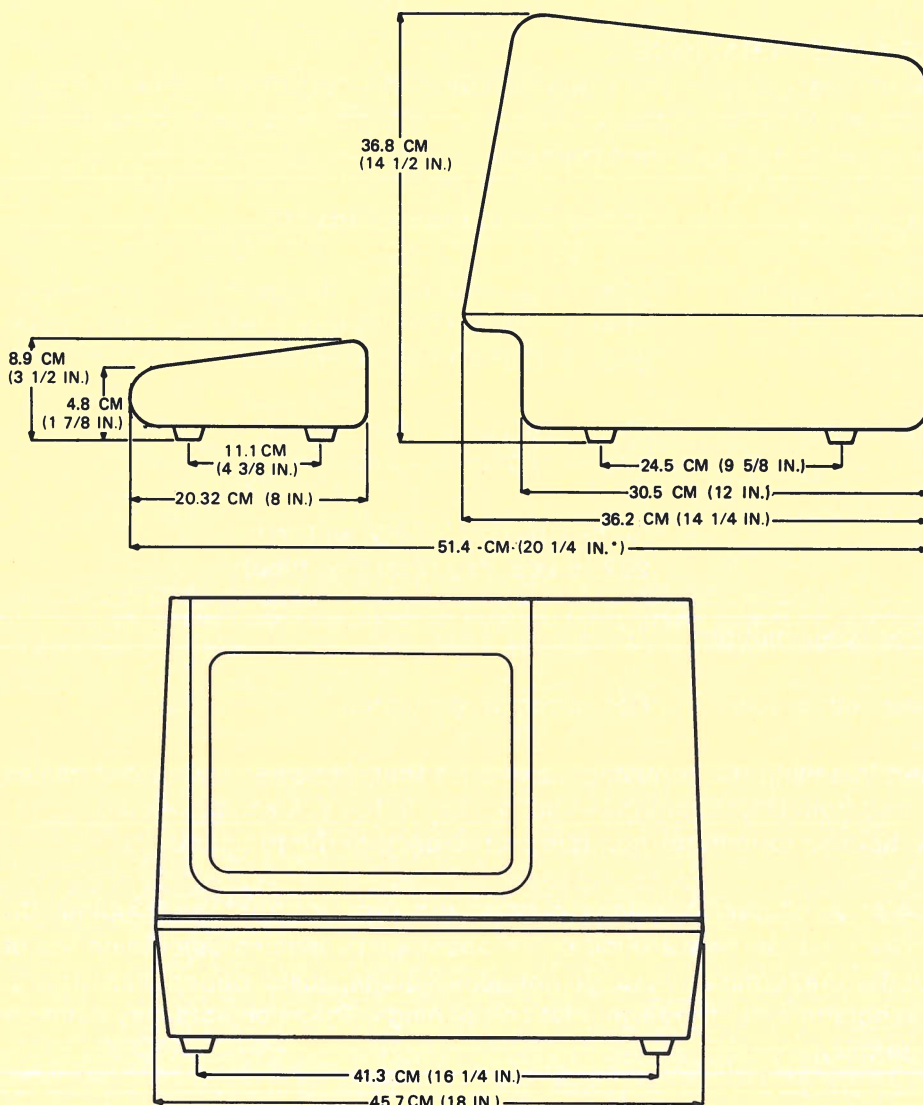
When installing the terminal, make sure that all power and signal cables are free from stress, sharp bends, or obstructions. Also, make sure to provide access to monitor controls on the back of the terminal.

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

You can place the terminal on a desk or tabletop. However, operators 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 (A&SG). (See Chapter 10 for more information on accessories.)

Position the video monitor to avoid reflected light. The screen should face away from light sources. However, if reflected light is a problem, filter screens are available from A&SG.

For installations with static electricity problems, static mats are available from A&SG.



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

MA-1991

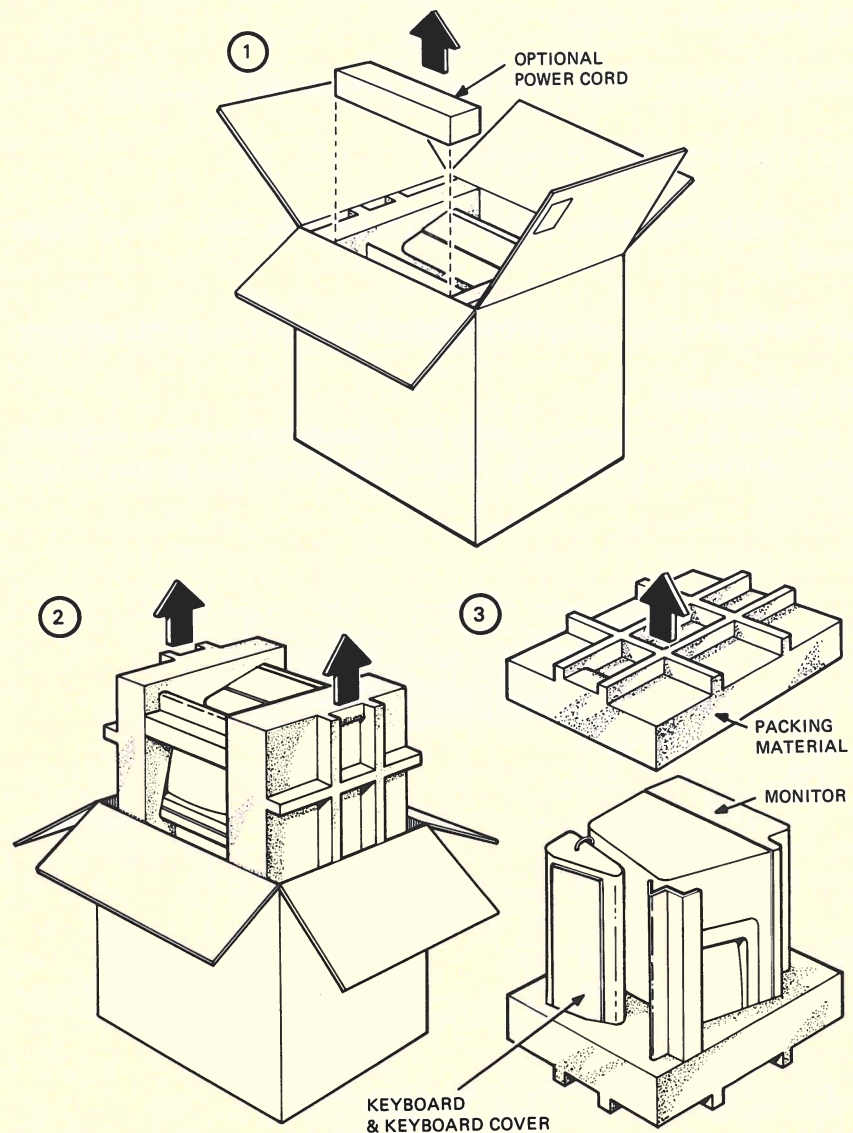
Figure 7-1 Terminal Dimensions

UNPACKING AND INSPECTION PROCEDURE

The terminal is packed in a carton with the following items.

- Monitor
- Keyboard
- AC power cord(s)
- SET-UP label
- User guide
- Programming reference card

Figure 7-2 shows the terminal's packaging. Unpack the terminal from the shipping carton by using the following procedure.



MA-6674A

Figure 7-2 Terminal Packaging

1. Cut the carton sealing tape and open the carton flaps.
2. Lift the non-US power cord out of the carton. This power cord is supplied with some variations of the terminal.

NOTE: All terminals are shipped with a US power cord.

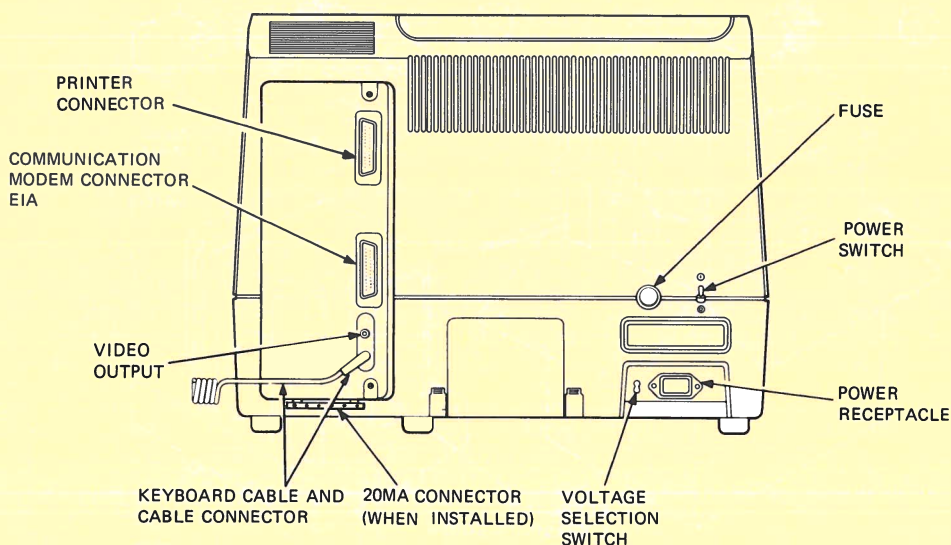
3. Lift the terminal out of the carton by using the handles in the packing material. Place the terminal and packing on its left side (when facing the front of the terminal).
4. Remove the packing material on the right side.
5. Remove the keyboard and keyboard cover, then the monitor from the left-side 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 by using the installation procedure in this chapter.

PACKING PROCEDURE

Pack the terminal for shipment by using the following procedure. Figure 7-2 shows the terminal's packaging; Figure 7-3 shows power switch and cable locations.



MA-6675E

Figure 7-3 Power Switch and Cable Locations

1. Turn the power switch off (0).
2. Disconnect all cables at the back of the terminal.
3. Place the monitor and keyboard in plastic bags.
4. Place the packing material for the left side (facing the front of the terminal) on a flat surface, with the cutouts facing up. Place the monitor in the large cutout.
5. Route the keyboard cable behind the keyboard. Place the connector in the small cutout.
6. Place the keyboard cover over the keys, then place the keyboard into the small cutout.
7. Place the packing material for the right side over the monitor and keyboard.
8. Place the packaged terminal and power cable in the shipping carton. Fold the carton flaps and tape the carton closed with sealing tape.

INSTALLATION PROCEDURE

Install the terminal by using the following procedure. Figure 7-3 shows switch and cable locations.

1. Perform the unpacking and inspection procedure in this chapter.
2. Check the terminal for the correct voltage range selection. The terminal can operate with either 120 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 for the correct voltage range. Make sure the voltage range matches your local ac power source.

Select 120 volts by performing the following procedure.

- a. Set the voltage selection switch to 115* (operating range 99-128 Vac).
- b. Remove the fuse holder cap by pressing in and turning counter-clockwise. Check for a 1.25 A fuse (DIGITAL PN 90-00020-01). Replace the fuse and fuse holder cap by pressing in and turning clockwise.

*On some terminals, the setting is 100 (operating range 87-107 Vac).

Select 220–240 volts by performing the following procedure.

- a. Set the voltage selection switch to 230* (operating range 198–256 Vac).
 - b. Remove the fuse holder cap by pressing in and turning counter-clockwise. Check for a 0.75 A slow blow fuse (DIGITAL PN 12-11237-00). Replace the fuse and fuse holder cap by pressing in and turning clockwise.
3. Remove the backing paper from the self-sticking SET-UP label and attach to the bottom of the keyboard.
 4. If necessary, install the 20 mA current loop option (VT1XX-CA). Perform the option installation and checkout procedures in Chapter 8.
 5. When using the standard modem connector, select the internal communication switches. See Communication Switch Selection in this chapter when selecting the communication switches.

NOTE: When using the 20 mA current loop option, the terminal ignores the position of the communication switches.

6. Place the keyboard in front of the terminal. Plug the keyboard into the keyboard connector.
7. Connect the communication cable to the terminal. See Communication and Printer Cables in this chapter for more information. Also, see Chapter 6 for information about connector use and signal/pin definitions.
8. Connect the printer cable to the printer interface connector. See the sections referenced in step 7.
9. Connect the external video device, such as a video monitor, to the video output connector. The terminal uses a 75-ohm BNC connector. See Appendix A for detailed specifications for this output.
10. Connect one end of the ac power cord to the terminal and the other end to a nonswitched, grounded receptacle.

NOTE: Make sure the power switch is off (0) before connecting the power cord.

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

*On some terminals, the setting is 250 (operating range 222–268 Vac).

Internal Communication Switch Selection

The terminal has ten internal communication switches to connect or disconnect modem communication lines. See Chapter 6 for more information on these communication lines. Select these switches by using the following procedure.

1. Turn the power switch off (0) and loosen the two captive screws holding the access cover in place (Figure 7-4).
2. Pull the access cover straight out from the back of the terminal, until loose. Then move the cover to the left, off the supporting studs. Finally, remove the cover by pulling straight out (Figure 7-5).

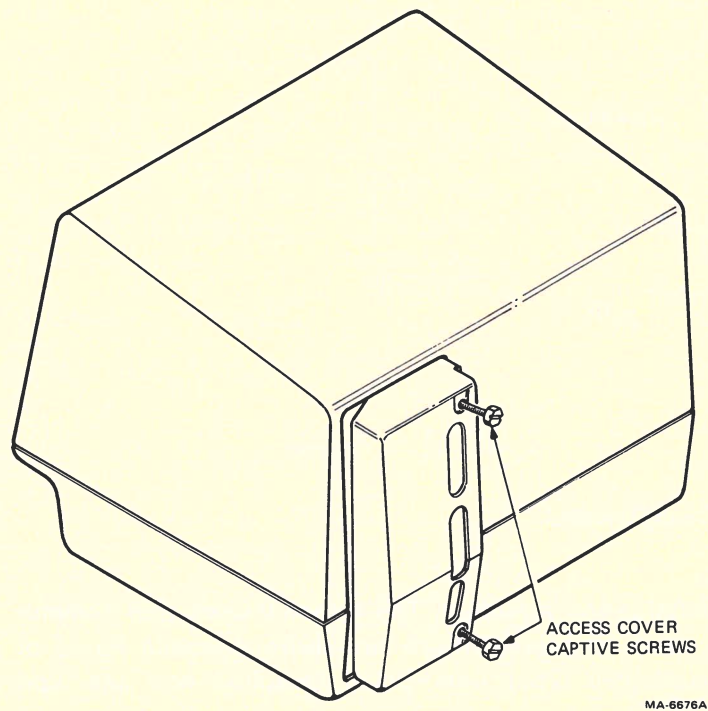
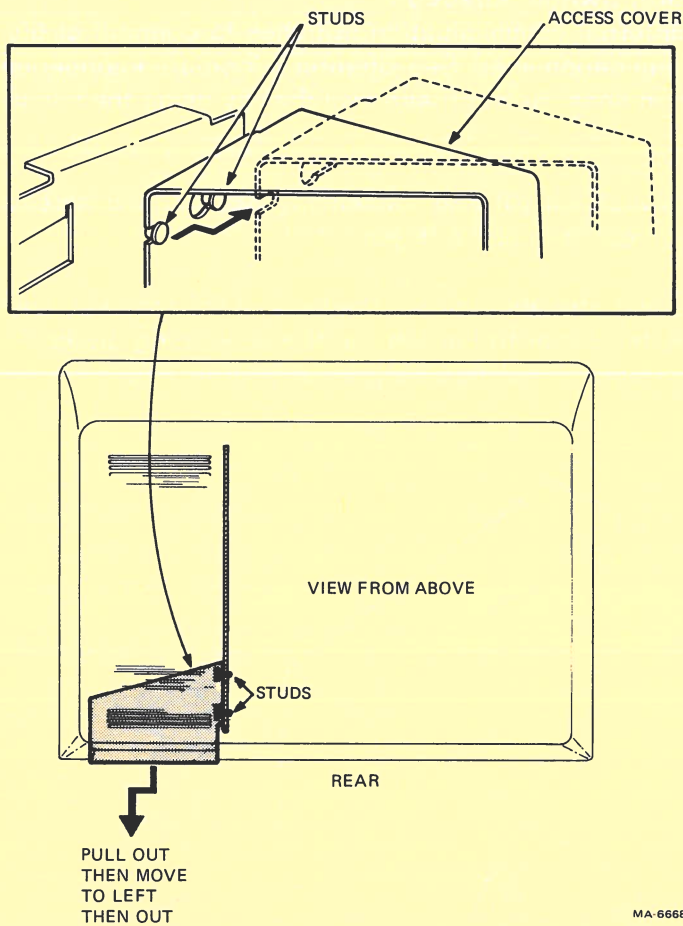


Figure 7-4 Access Cover Screw Locations



MA-6668

Figure 7-5 Access Cover Removal

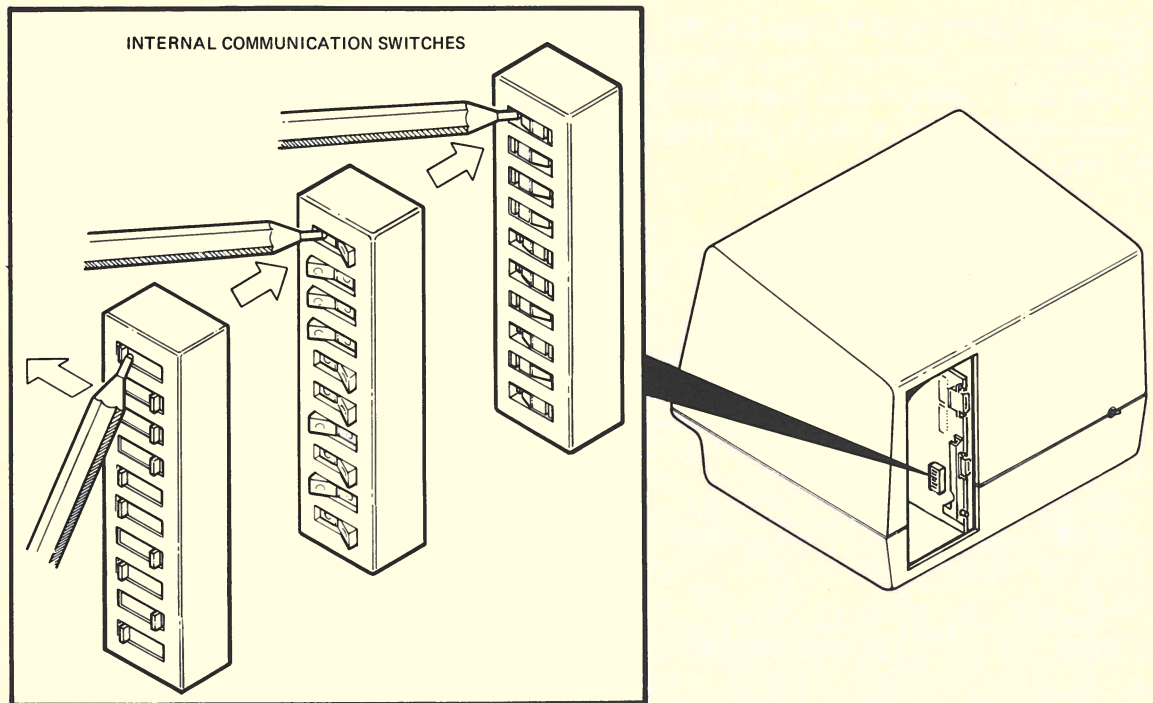
3. Select the communication switches. The terminal uses one communication switch pack. However, there are three possible types of switch packs used; two types use rocker switches and one type uses slide switches.

To select the rocker switch, press the side of the switch that corresponds to the desired selection. To select the slide switch, push the switch tab to the side that corresponds to the desired setting. Figure 7-6 shows the location of the communication switches. Figure 7-7 shows the communication lines connected (on, closed) or disconnected (off, open) by these switches.

NOTE: Always use a small-blade screwdriver or ball-point pen to change the communication switches. Never use a lead pencil.

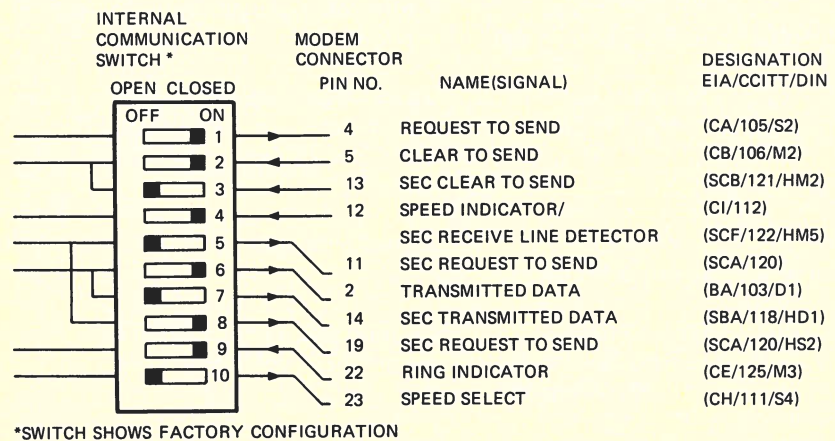
4. Install the access cover.

CAUTION: You may damage the access cover by tightening the captive screws too much.



MA-7256G

Figure 7-6 Internal Communication Switch Locations



MA-9361

Figure 7-7 Internal Communication Switch Selections

Communication and Printer Cables

You can order communication and printer cables from A&SG. See Chapter 10 for part numbers and ordering information. Table 7-1 describes each communication cable used, and Figure 7-8 shows connection examples for each cable.

Table 7-1 Interface Cables

Part Number	Connector Types	Function
BC22A-10 (10 ft)	RS-232 (female) to RS-232 (female)	Null modem; connects terminal directly to computer or printer (6-conductor cable).
BC22A-25 (25 ft)	RS-232 (female) to RS-232 (female)	Null modem; connects terminal directly to computer or printer (6-conductor cable).
BC22B-10 (10 ft)	RS-232 (male) to RS-232 (female)	Extension; connects terminal to a modem (14-conductor cable).
BC22B-25 (25 ft)	RS-232 (male) to RS-232 (female)	Extension; connects terminal to a modem (14-conductor cable).
BC03M-xx (variable length)	RS-232 (female) to RS-232 (female)	Null modem; connects terminal directly to computer or printer.
BC05D-xx (variable length)	RS-232 (male) to RS-232 (female)	Extension; connects terminal to a modem.
BC05F-15 (15 ft)	Mate-N-Lok™ to Mate-N-Lok	20 mA; connects terminal with 20 mA option installed directly to computer. (Supplied with 20 mA option.)
BC05X-xx (variable length)	Mate-N-Lok to Mate-N-Lok	20 mA extension
30-10958-02 EIA 20 mA	RS-232 (male) to RS-232 (female) and 20 mA (male)	Connects acoustic coupler to terminal EIA or 20 mA.
™ AMP, Inc.		

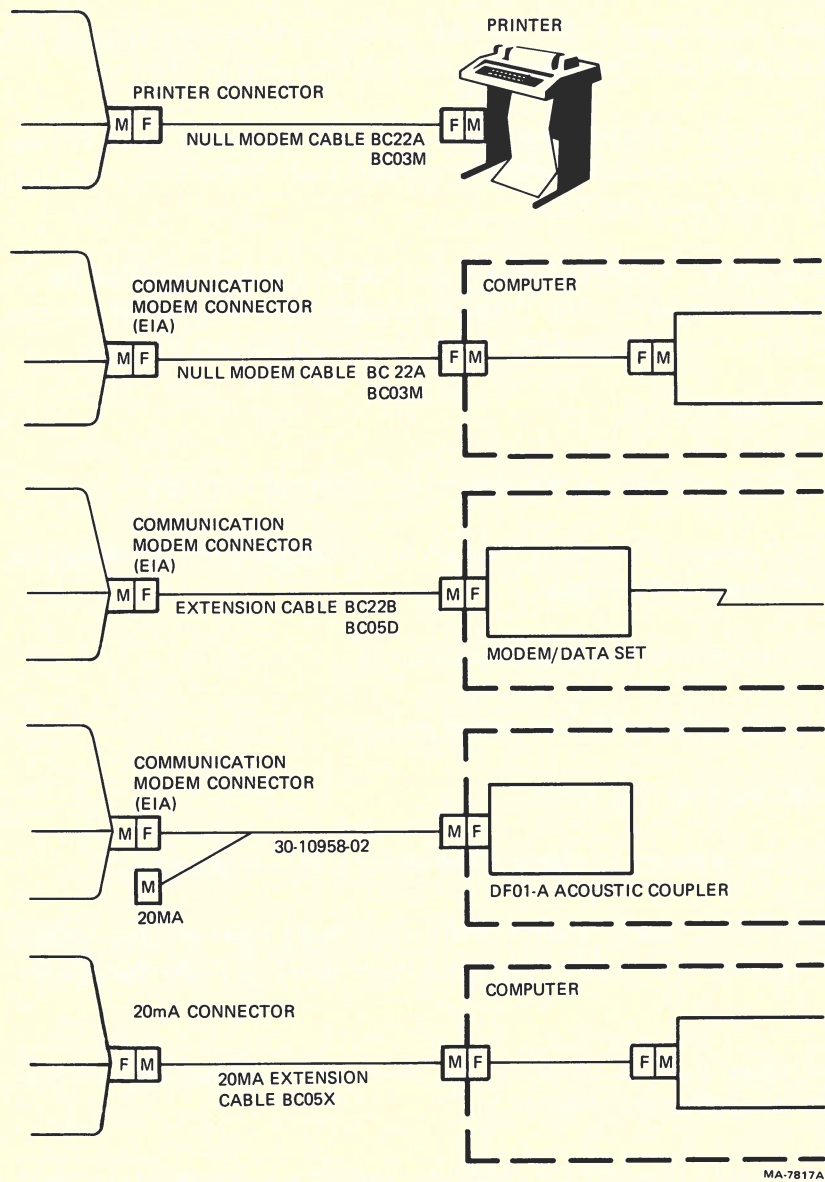


Figure 7-8 Cable Connection Examples

POWER-UP AND CHECKOUT PROCEDURE

A power-up self-test procedure verifies the terminal operation each time you power up. Power up and check out the terminal by using the following procedure. See Figure 7-3.

1. Turn the power switch on (1). The terminal automatically runs the power-up self-test. The test provides the following indications.
 - The terminal displays test data, the wait message, then erases screen. (The test data and wait message are not visible if the terminal is not warmed up.)
 - All keyboard indicators turn on and off, and either the ON LINE or OFF LINE stays on. The other indicators may stay on or off, depending on feature selections and received modem signals.
 - A bell tone sounds.
 - The cursor appears in the upper-left corner of the screen.

When the power-up self-test finds an error, the terminal provides one of the following indications.

- Does not perform the step 1 sequence.
- Displays character at the cursor position.
- Sounds several bell tones.

See Chapter 9 for more information about self-test failures.

2. Enter SET-UP to verify a successful test. A SET-UP display should appear on the screen. If not call your local DIGITAL Field Service Office.
3. If the terminal powers up correctly, select the desired SET-UP features as described in Chapter 3.
4. After you select the SET-UP features, record the feature selections on the SET-UP label attached to the keyboard.
5. Save the SET-UP features by using **SHIFT** and **S**. See Chapter 3 for more information about saving SET-UP features.

Options

8

OPTIONS

GENERAL

The VT102 uses only one internally installed option, the 20 mA current loop option (VT1XX-CA). This chapter describes the option, its installation, and checkout. See Chapter 10 for ordering information.

20 mA CURRENT LOOP INTERFACE OPTION (VT1XX-CA)

This optional interface connects the terminal to a computer. The 20 mA option consists of a board and interface connector. When this option is installed, you must set the modem control SET-UP feature to FDX A (full-duplex with no modem control). The internal communication switches are not used with the 20 mA option. Figure 8-1 shows the 20 mA current loop interface connector and pin assignments.

NOTE: The terminal uses either the 20 mA or standard modem interface. If you use the standard modem interface with the 20 mA option, unplug the cable connecting the option to the terminal controller board.

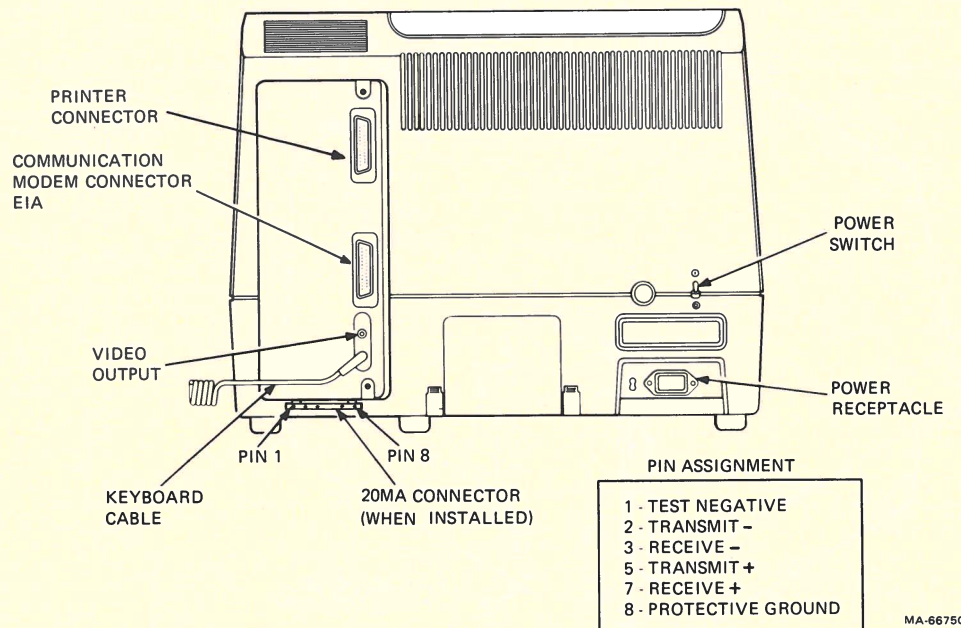
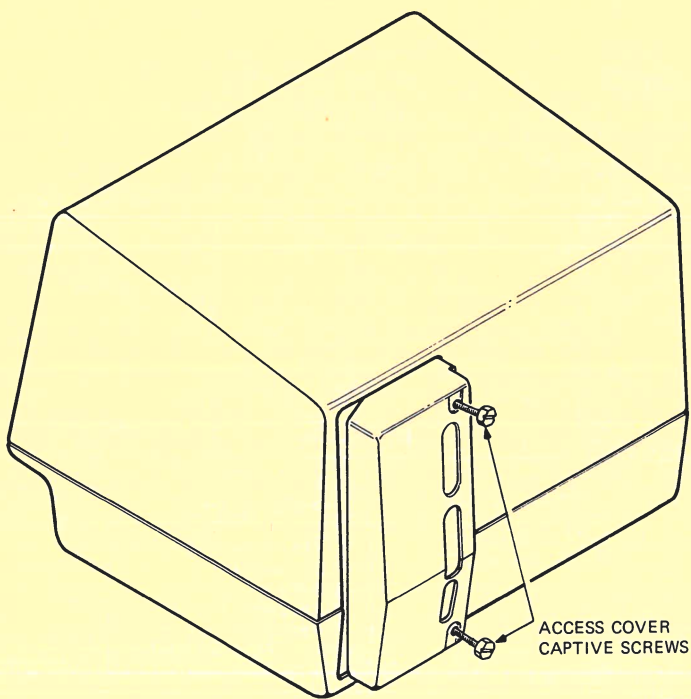


Figure 8-1 20 mA Connector and Pin Assignments

OPTION INSTALLATION

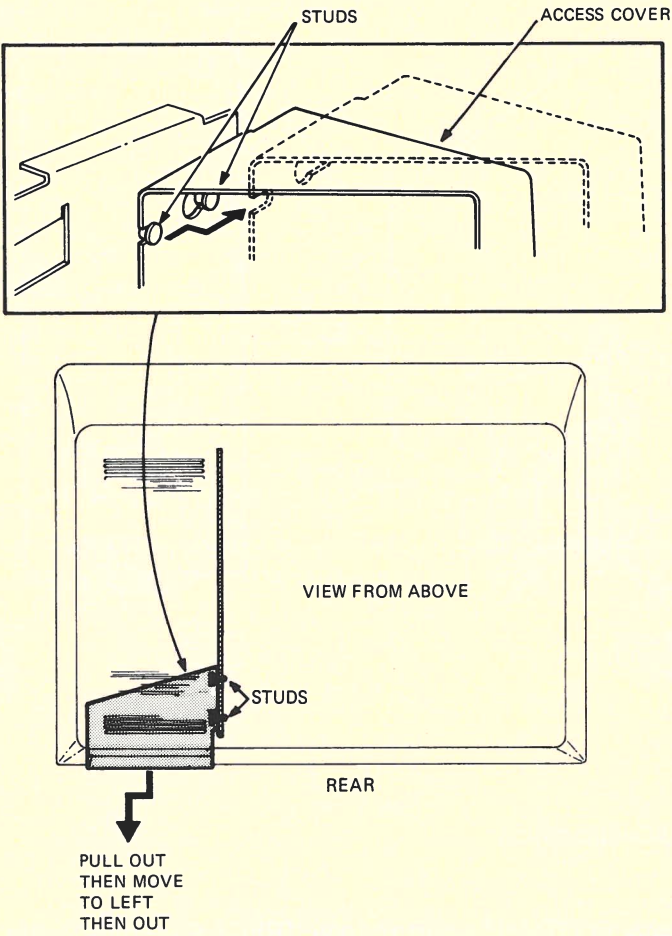
Install the option by using the following procedure (Figure 8-1).

1. Turn the power switch off (0) and unplug power cord.
2. Unplug keyboard, communication, printer, and composite video output cables.
3. Loosen the two captive screws holding the access cover in place (Figure 8-2).
4. Pull the access cover straight out from the back of the terminal, until loose. Then move the cover to the left, off the supporting studs. Finally, remove the access cover by pulling straight out (Figure 8-3).
5. Install the 20 mA option board in the access cover by using the three Phillips head screws provided (Figure 8-4).
6. Install the 20 mA connector to the bottom of the access cover by using the two spacers and two hex head screws provided.
7. Install the 20 mA loopback connector around a spacer holding the 20 mA connector to the access cover. This prevents the loss of the loopback connector.



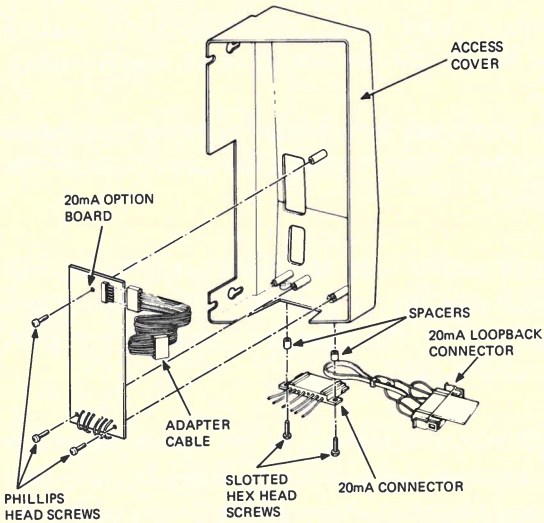
MA-6676A

Figure 8-2 Access Cover Screw Locations



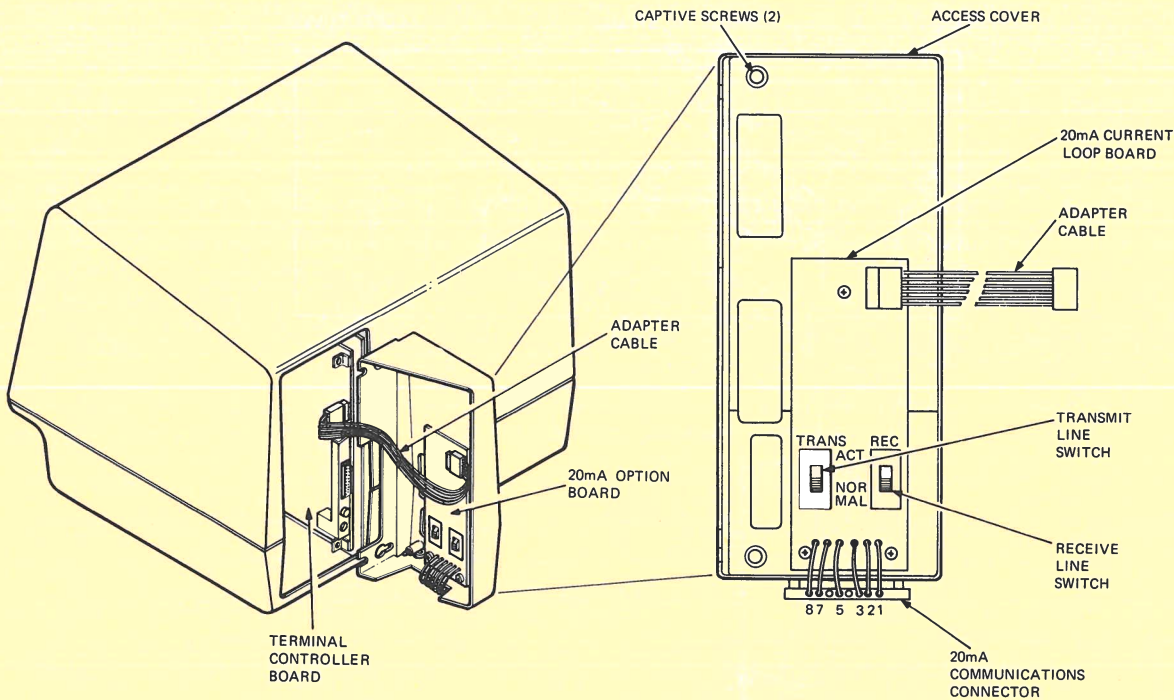
MA-6668

Figure 8-3 Access Cover Removal



MA-6667A

Figure 8-4 20 mA Board Installation



MA-6666A

Figure 8-5 20 mA Board Configuration

8. Set the 20 mA transmit (TRANS) and receive (REC) switches to the proper configuration (Figure 8-5).

The switches determine if the transmitter and receiver of the 20 mA interface are active or normal (passive). Usually, the switches are set for normal (passive) operation. Passive means the terminal does not supply the 20 mA current used when communicating. Active means the terminal supplies the 20 mA current when communicating.

NOTE: You must set these switches for normal (passive) operation to perform the loopback self-test. The test verifies operation of the 20 mA option after installation.

9. Connect the adapter cable provided with the option to the 20 mA board. Place the access cover next to its opening in the back of the terminal. Connect the other end of the adapter cable to the connector on the terminal controller board.
10. Hold the access cover straight up and move it to the right side of the terminal opening. Push the access cover into the opening and feel for the studs on the right in the terminal. Push the access cover onto the studs until the cover is in place. Figure 8-3 shows how the access cover fits on the studs.

11. Tighten the two captive screws that hold the access cover in place (Figure 8-2).

CAUTION: You may damage the access cover by tightening the captive screws too much.

12. Perform the following option checkout procedure.

OPTION CHECKOUT

The data loopback test verifies the 20 mA current loop option can transmit and receive characters. Characters transmitted during the test pass through the loopback connector back to the terminal. The test checks these characters to verify the option's operation. Perform the data loopback self-test by using the following procedure.

1. Turn the power switch off (0) and unplug the power cord (Figure 8-1).
2. Unplug the communication cable.
3. Install the 20 mA loopback connector (DIGITAL PN 70-15503-00) supplied with the option (Figure 8-6).
4. Remove the access cover and set the 20 mA TRANS and REC switches by using the following procedure.

NOTE: Remove the access cover only if the TRANS and REC switches are not set to normal.

- a. Unplug the keyboard, printer, and composite video output cables.
- b. Loosen the two captive screws holding the access cover in place (Figure 8-2).
- c. Pull the access cover straight out the back of the terminal, until loose. Then, move the cover to the left, off the supporting studs. Finally, remove the access cover by pulling straight out (Figure 8-3).
- d. Set the TRANS and REC switches to normal (Figure 8-5) and install the access cover (Figure 8-3).

CAUTION: You may damage the access cover by tightening the captive screws too much.

- e. Connect the keyboard cable.
5. Turn the power switch on (1). The terminal performs the power-up self-test.

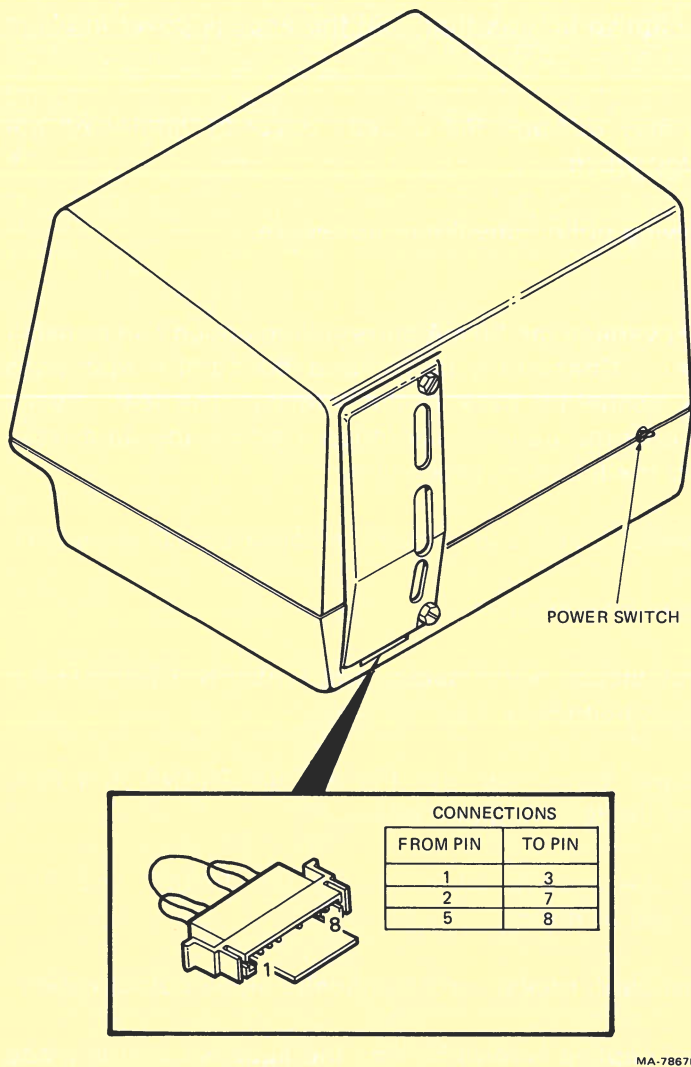


Figure 8-6 20 mA Loopback Connector

6. Enter SET-UP and select:

- Off-line (Transmit and receive speeds do not have to be the same.)
- ANSI/VT52 SET-UP feature to ANSI (SET-UP B switch 2-3 = 1)
- Modem control SET-UP feature to FDX A.

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

ESC [2 ; 2 y Performs test once.

ESC [2 ; 10 y Performs test continuously.

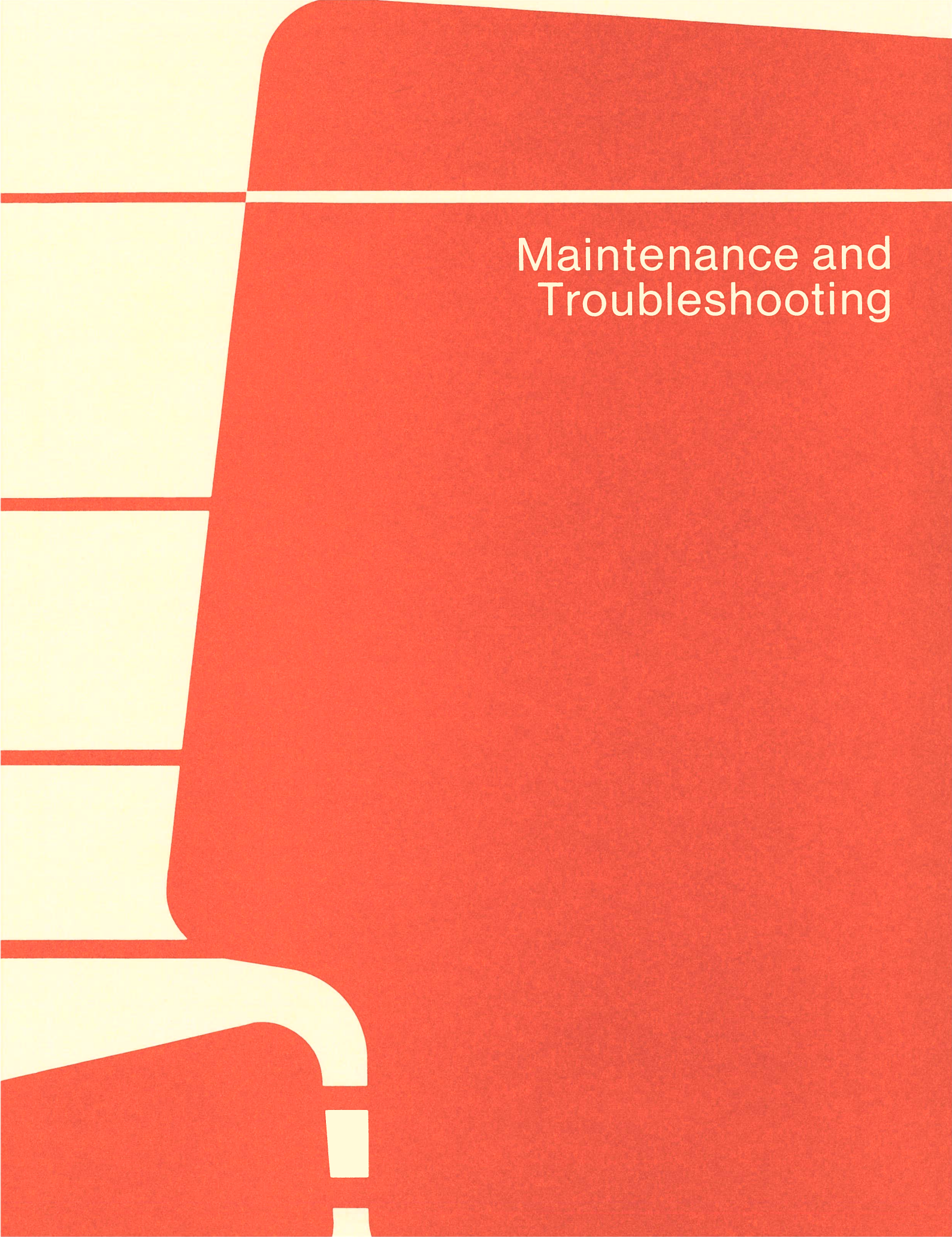
The single test displays the wait message while running. The test ends with the following indications.

- The wait message is erased.
- ON LINE or OFF LINE turns on.
- The cursor appears in the upper-left corner of the screen.

The continuous test also displays the wait message while running. The test ends only when it finds an error or power is turned off.

When either test finds an error, the terminal displays an error code. An error means the option is not operating correctly. Call your local Digital Field Service Office for assistance.

8. Turn the power switch off (0) and remove the loopback connector.
9. If you set the TRANS and REC switches in step 4, select the correct switch settings.
10. Connect the communication, printer, and video output cables.

The background features a large, solid red shape on the right side, which has a rounded top-left corner. To the left of this red shape are several horizontal yellow bands of varying widths, separated by thin red lines. At the bottom left, there is a red shape with a rounded top-right corner and a small white rectangular notch. The overall design is minimalist and geometric.

Maintenance and Troubleshooting

MAINTENANCE AND TROUBLESHOOTING



GENERAL

This chapter describes maintenance procedures, troubleshooting (what to do in the event of a problem), and self-tests used with the VT102. You should troubleshoot the terminal before requesting service.

MAINTENANCE

The terminal does not need preventive maintenance. However, you can clean terminal and screen surfaces with any mild detergent that does not use solvents; apply the detergent with a cloth or tissue. To clean the keys, rub with a dry or moist cloth.

CAUTION: Do not use too much detergent when cleaning the terminal. Liquids can damage the inside of the terminal. Do not remove the keycaps when cleaning; you can damage the keyswitch contacts by replacing the keycaps incorrectly.

TROUBLESHOOTING

If you suspect a problem with the terminal, check Table 9-1 to see if the symptoms are there. If the problem is not listed in Table 9-1, use the following procedure.

1. Turn the power switch off (0) (Figure 9-1).
2. Check the following items.

Voltage selection switch and fuse. Make sure the switch is in the correct position. Select 120 volts by performing the following procedure.

- a. Set the voltage selection switch to 115* (operating voltage range 99 to 128 Vac).
- b. Remove the fuse holder cap by pressing in and turning counter-clockwise. Check for a 1.25 A fuse (DIGITAL PN 90-0020-01) and make sure the wire in the fuse is not broken.

*On some terminals, the setting is 100 (operating range 87-107 Vac).

Select 220–240 volts by performing the following procedure.

- a. Set the voltage selection switch to 230* (operating voltage range 198 to 256 Vac).
- b. Remove the fuse holder cap by pressing in and turning counter-clockwise. Check for a 0.75 A slow blow fuse (DIGITAL PN 12-11237-00) and make sure the wire in the fuse is not broken.

Power cord. Make sure the cord is connected securely at both the terminal and the wall outlet. Check ac power at the wall outlet with another device such as a lamp.

Keyboard coiled cord. Make sure the cord is securely plugged into the keyboard connector at the back of the terminal.

3. Perform all the self-tests in the following section.

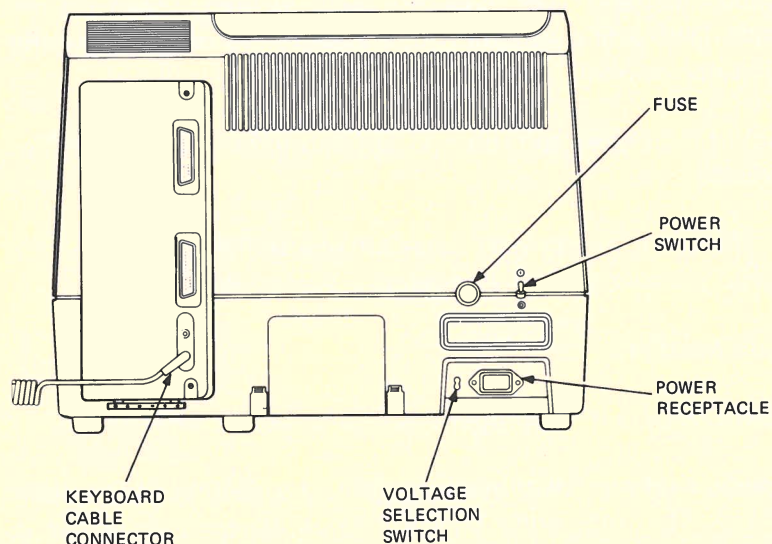
Table 9-1 Problem Checklist

Symptom	Possible Cause	Corrective Action
ON LINE or OFF LINE is on with no cursor on screen.	Screen brightness too low.	Enter SET-UP and increase screen brightness.
ON LINE and OFF LINE are not on with no keyboard response. Cursor on screen.	Keyboard cable not connected to terminal.	Connect keyboard cable.
KBD LOCKED is on.	Characters are typed faster than terminal can transmit them.	Cleared when terminal transmits characters in keyboard character buffer to computer.
	Locked condition occurs when terminal is receiving characters with half-duplex communication selected (by modem control SET-UP feature). Terminal cannot transmit characters when receiving characters in half-duplex.	Cleared when line turns around and terminal can transmit keyboard characters.
	Print operation selected while off-line.	Cleared when print operation ends.

*On some terminals, the setting is 250 (operating range 222–268 Vac).

Table 9-1 Problem Checklist (Cont)

Symptom	Possible Cause	Corrective Action
	Terminal not connected to computer correctly. Communication line signals are not correct.	Cleared when correct connection exists between computer and terminal.
Terminal does not respond to typed characters.	Computer cannot update screen.	Press NO SCROLL .
	Computer turns keyboard off.	Computer turns keyboard on.
Garbled or error (X) characters or no characters appearing on screen.	Incorrect SET-UP feature selected.	Correct SET-UP features.
	Computer error occurred.	Check computer system.
Two characters appear on screen for each character typed.	Local echo on.	Turn local echo off.
Several bell tones during power up, reset or recall.	Read or write problem with user permanent memory.	Check SET-UP feature settings and try save operation.
Printer does not print characters.	Printer and terminal features do not match.	Check SET-UP feature settings of terminal and printer.



MA-6675D

Figure 9-1 Monitor Controls

SELF-TESTS

The terminal uses self-tests to verify operation. The self-tests provided are a power-up self-test, three loopback self-tests, and a printer test. The power-up self-test runs each time the terminal is powered up. The loopback self-tests may run after the power-up self-test ends; these self-tests need an optional loopback test connector. The printer test ensures that the terminal and printer can communicate.

Power-Up Self-Test

A power-up self-test runs each time you turn the power on (power up). The test checks general terminal operation, user memory (holding SET-UP features), and the keyboard. Perform the power-up self-test by using the following procedure.

1. Start the power-up self-test in one of the following ways.
 - Turn the power switch to on (1) (Figure 9-1).
 - If power is on, press **SET-UP** and then **RESET**.
 - If power is on, type one of the following sequences. The terminal must be off-line with the ANSI/VT52 SET-UP feature set to ANSI (SET-UP B switch 2-3 = 1).

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

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

The single test ends with the following indications.

- The terminal displays test data, the wait message, then erases the screen. (The test data and wait message are not visible if the terminal is not warmed up.)
- All keyboard indicators turn on and off, and either the ON LINE or OFF LINE stay on.

NOTE: The on or off state of other keyboard indicators depends on received modem signals and feature selections.

- A bell tone sounds.
- The cursor appears in the upper-left corner of the screen.

The continuous test also displays test data, the wait message, then erases screen. This test ends only if it finds an error or power is turned off.

When the power-up self-test finds an error, the terminal provides one of the following indications.

- Does not perform the above sequence.
- Displays character at the cursor position.
- Sounds several bell tones.

There are two failures that allow terminal operation to continue: a user memory failure indicated by a 2 on the screen and several bell tones, and a keyboard failure indicated by a 4 on the screen. The user memory failure allows continued operation after you select SET-UP features in operating memory. The keyboard failure allows the terminal to continue to operate as a receive-only terminal.

2. After a single test, enter SET-UP to verify a successful test. A SET-UP A display should appear on the screen. If not, call your local DIGITAL Field Service Office.

Data Loopback Self-Test

The data loopback self-test verifies that the terminal can transmit and receive characters. You must connect the transmit and receive lines to each other with the EIA loopback connector (DIGITAL PN 12-15336) available from the DIGITAL Accessories and Supplies Group (Chapter 10). The terminal transmits characters on the transmit line and receives the characters on the receive line. Perform the data loopback self-test by using the following procedure.

NOTE: See Chapter 8 to perform the data loopback self-test with the 20 mA current loop option (VT1XX-CA) installed.

1. Turn the power switch off (0).
2. Unplug the communication cable and install the EIA loopback connector on the modem connector (Figure 9-2).
3. The internal communication switch S6 must be on (closed) to perform this test. If the switch is off (open), remove the access cover, turn the switch on (closed), and install the access cover. See Internal Communication Switch Selection in Chapter 7 for details.

NOTE: Usually, this switch is only open when you set the modem control SET-UP feature for asymmetric full-duplex (FDX C).

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

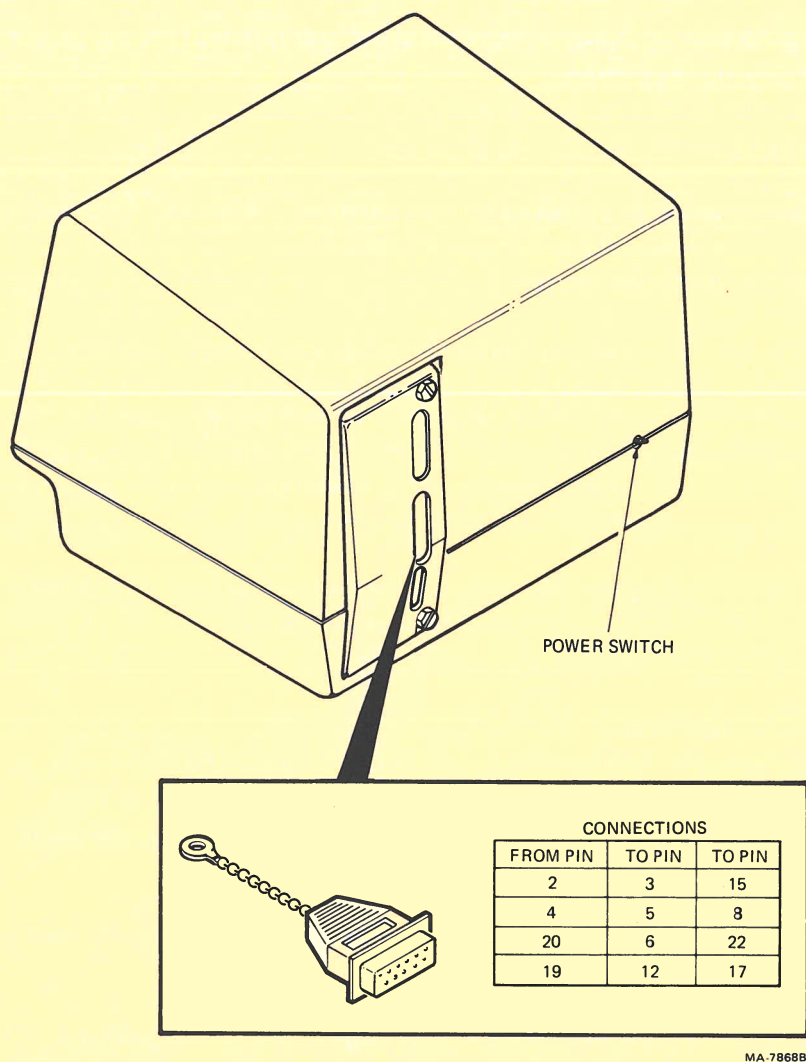


Figure 9-2 EIA Loopback Connector (Modem)

5. Type one of the following sequences to perform the data loopback self-test. The terminal must be off-line with the ANSI/VT52 SET-UP feature set to ANSI (SET-UP B switch 2-3 = 1).

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

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

The single test displays the wait message while running. The single test ends with the following indications.

- The wait message is erased.
- ON LINE turns on.

NOTE: The on or off state of other keyboard indicators depends on received modem signals and feature selections.

- The cursor appears in the upper-left corner of the screen.

The continuous test displays the wait message while running. The test ends only if it finds an error or power is turned off.

When the test finds an error, the terminal displays an error character. Call your local DIGITAL Field Service office for assistance.

6. If the test runs successfully, turn the power switch off and remove the loopback connector. If you set switch S6 to run this test, change the switch to its original position.
7. Connect the communication cable.

EIA Loopback Self-Test

The EIA loopback self-test verifies that the terminal can operate its modem control lines. Perform the EIA loopback self-test by using the following procedure.

1. Turn the power switch off (0).
2. Unplug the communication cable and install the EIA loopback connector on the modem connector (Figure 9-2). The EIA loopback connector (DIGITAL PN 12-15336) is available from the DIGITAL A&SG (Chapter 10).
3. The internal communication switches S1, S2, S4, S6, S8, and S9 must be on (closed) to perform this test. If any of these switches are off (open), remove the access cover, turn the switches on (closed), and install the access cover. See Internal Communication Switch Selection in Chapter 7 for details.
4. Turn the power switch on (1). The terminal performs the power-up self-test.
5. Type one of the following sequences to perform the EIA loopback self-test. The terminal must be off-line with the ANSI/VT52 SET-UP feature set to ANSI (SET-UP B switch 2-3 = 1).

ESC[2 ; 4 y	Performs the self-test once.
---------------------	------------------------------

ESC [2 ; 12 y	Performs the self-test continuously.
-----------------------	--------------------------------------

The single test displays the wait message while running. The test ends with the following indications.

- The wait message is erased.
- OFF LINE and DSR turns on.

NOTE: The on or off state of other keyboard indicators, depends on modem signals received and feature selections.

- The cursor appears in the upper-left corner of the screen.

The continuous test displays the wait message while running. The test ends only if it finds an error or power is turned off.

When the test finds an error, the terminal displays an error character. Call your local DIGITAL Field Service office for assistance.

6. If the test runs successfully, turn the power switch off and remove the loopback connector. If you set switches S1, S2, S4, S6, S8 or S9 to run the test, change the switches to their original position.
7. Connect the communication cable.

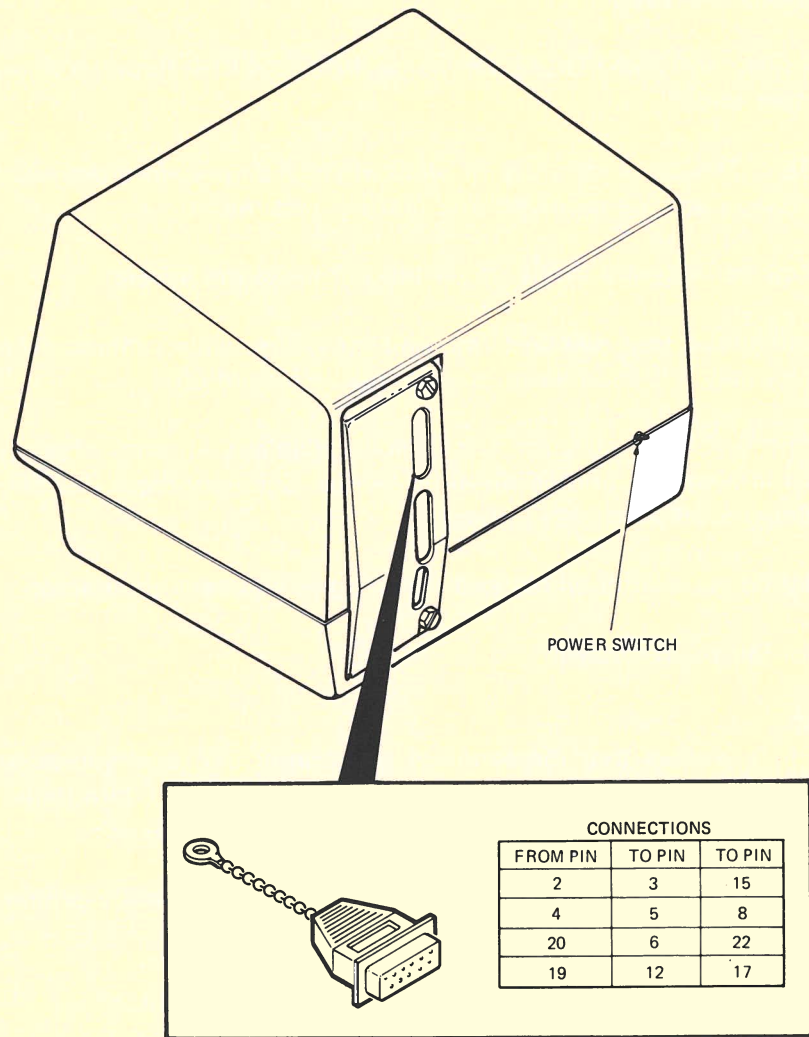
Printer Loopback Self-Test

The printer loopback self-test verifies that the terminal's printer interface can transmit and receive characters. In this test, you connect the transmit and receive lines with the EIA loopback connector. The terminal transmits characters on the transmit line and receives the characters on the receive line. Perform the printer loopback self-test by using the following procedure.

1. Turn the power switch off (0).
2. Unplug the printer cable and install the EIA loopback connector on the printer interface connector (Figure 9-3). The EIA loopback connector (DIGITAL PN 12-15336) is available from A&SG.
3. Turn the power switch on (1). The terminal performs the power-up self-test.
4. Type one of the following sequences to perform the printer loopback self-test. The terminal is off-line with the ANSI/VT52 SET-UP B feature set to ANSI (SET-UP B switch 2-3 = 1).

ESC [2 ; 16 y	Performs the self-test once.
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ESC [2 ; 24 y	Performs the self-test continuously.
-----------------------	--------------------------------------



MA-7868C

Figure 9-3 EIA Loopback Connector (Printer)

The single test displays the wait message while running. The test provides the following indications.

- The wait is erased.
- OFF LINE and KBD LOCKED turns on. KDB LOCKED turns off when the test ends.

NOTE: The on or off state of other keyboard indicators depends on modem signals received and feature selections.

- The cursor appears in the upper-left corner of the screen.

The continuous test displays the wait message while running. The test ends only if it finds an error or power is turned off.

When the test finds an error, the terminal displays an error character. This indicates a printer interface failure. Call your local DIGITAL Field Service office for assistance.

5. Turn the power switch off (O) and remove the loopback connector.
6. Connect the printer cable.

Printer Test

The printer test verifies that the terminal and printer can communicate. This test generates sample data for printing and transmits that data to the printer. Perform the printer test by using the following procedure.

1. Connect the printer cable to the printer and the terminal's printer connector. Turn both the terminal and printer on.
2. Make sure the following terminal and printer features match.
 - Printer transmit/receive speed (baud rate)
 - Printer data/parity bits (data bits per character and parity)
3. Type the following sequence on the keyboard. The terminal must be off-line with the ANSI/VT52 SET-UP feature set to ANSI (SET-UP B switch 2-3 = 1).

ESC # 8

The screen fills with E's.

4. Hold down **SHIFT** and press (**PRINT**); the E's should print. If the E's do not print, call your local DIGITAL Field Service Office.

Accessories and Supplies

ACCESSORIES AND SUPPLIES

10

GENERAL

This chapter describes the accessories and supplies offered by DIGITAL for the VT102. Part numbers and ordering information are included. Item numbers in Figure 10-1 correspond to item numbers in the following table.

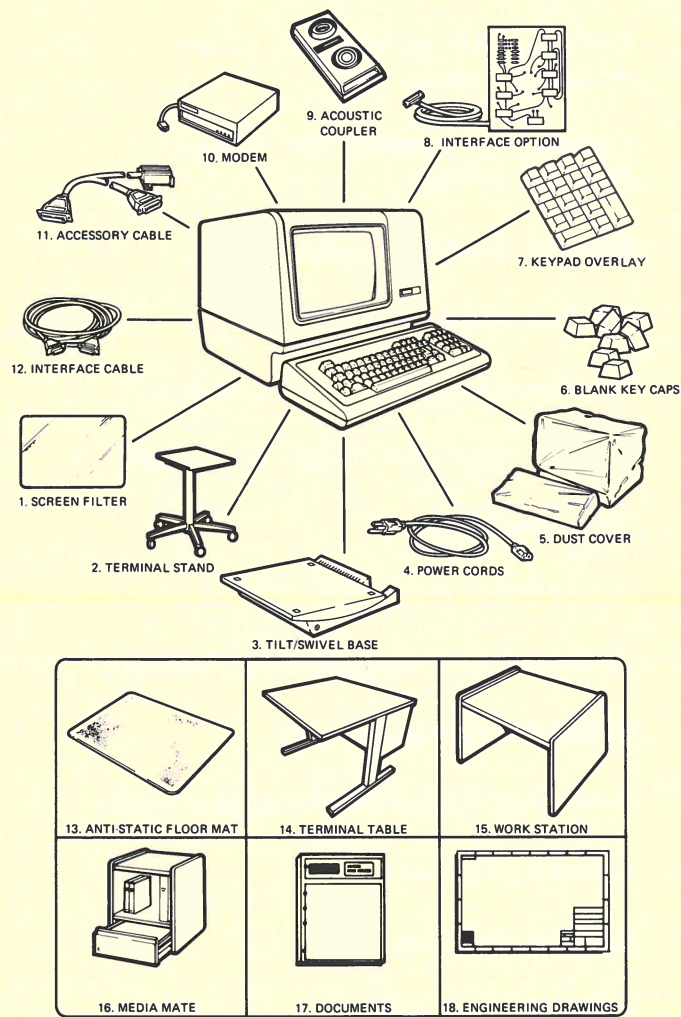


Figure 10-1 Accessories

ACCESSORIES

Item	Part Number	Description
1	VT1XX-FA	Glass filter, gray, antiglare
1	VT1XX-FB	Glass filter, green, antiglare
1	VT1XX-FC	Glass filter, bronze, antiglare
1	VT1XX-AE	Formed plastic screen filter, gray, antiglare coating
1	VT1XX-AW	Formed plastic screen filter, green , antiglare coating
1	VT1XX-AX	Formed plastic screen filter, yellow , antiglare coating
1	VT1XX-AY	Formed plastic screen filter, amber, antiglare coating
1	VT1XX-AR	Nonreflective filter screen
2	VT1XX-ST	Terminal stand with casters
2	VT1XX-SU	Terminal stand with casters (lots of 25)
2	VT1XX-SV	Terminal stand with casters (lots of 50)
3	VT1XX-SA	Tilt / swivel base
4	17-00083-09	United States power cord (120 Vac)
4	17-00083-10	United States power cord (220 – 240 Vac)
4	17-00209-00	United Kingdom power cord
4	17-00199-00	Continental Europe (SCHUKO) power cord
4	17-00210-00	Switzerland power cord
4	17-00198-00	Australia power cord
4	17-00310-00	Denmark power cord
4	90-00020-01	1.25 A fuse (115 or 100 Vac)
4	12-11237-00	0.75 A slow blow fuse (230 or 250 Vac)

Item	Part Number	Description
5	H9850-HK	Heavy gauge vinyl dust cover, charcoal brown (2-cover set)
6	LA12X-UP	Blank keycap kit of 50, Keypad 0
6	LA12X-UB	Blank keycap kit of 50, Row 1 *
6	LA12X-UC	Blank keycap kit of 50, Row 2
6	LA12X-UR	Blank keycap kit of 50, Row 3
6	LA12X-UA	Blank keycap kit of 50, Row 4
6	LA12X-US	Blank keycap kit of 50, Row 5
6	LA12X-UD	Blank keycap kit of 50, F&J type
6	LA12X-UE	Blank keycap kit of 50, SET-UP
6	LA12X-UF	Blank keycap kit of 50, TAB
6	LA12X-UH	Blank keycap kit of 50, CAPS LOCK
6	LA12X-UJ	Blank keycap kit of 50, SHIFT
6	LA12X-UL	Main array blank keycap set
6	LA12X-UM	Blank keycap kit of 50, CR
6	LA12X-UN	Blank keycap kit of 50, ENTER
6	LA12X-UT	Keypad blank keycap set
7	VT1XX-KA	KED/EDT keypad overlay
7	VT1XX-KB	FMS-FED (form editor) keypad overlay
7	VT1XX-KC	FMS-FDV (form driver) keypad overlay
8	VT1XX-CA	20 mA current loop interface option with BC05F-15 cable
9	DF01-A	Acoustic telephone coupler, 300 baud
10	DF02-AA	Direct connect, Bell 103J/212 A equivalent, 300 baud full-duplex modem with EIA RS-232-C interface

* Row 1 is first row above space bar.

Item	Part Number	Description
10	DF03-AA	Direct connect, Bell 103J / 212 A equivalent, 300 / 1200 baud full-duplex modem with EIA RS-232-C interface
11	30-10958-02	Accessory cable DF01-A couplers to terminals
12	BC22A-10	EIA RS-232 female - female shielded null modem cable, 3.0 m (10 ft)
12	BC22A-25	EIA RS-232 female - female shielded null modem cable, 7.6 m (25 ft)
12	BC22B-10	EIA RS-232 male - female shielded extension cable, 3.0 m (10 ft)
12	BC22B-25	EIA RS-232 male - female shielded extension cable, 7.6 m (25 ft)
12	BC23A-10	Kit of 5 BC22A-10
12	BC23A-25	Kit of 5 BC22A-25
12	BC23B-10	Kit of 5 BC22B-10
12	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).

12	BC03M-AO	Female - female null modem cable, 30.5 m (100 ft)
12	BC03M-B5	Female - female null modem cable, 76.2 m (200 ft)
12	BC03M-EO	Female - female null modem cable, 152.4 m (500 ft)
12	BC03M-LO	Female - female null modem cable, 304.8 m (1000 ft)
12	BC05X-15	20 mA current loop extension cable, 4.6 m (15 ft)
12	BC05X-25	20 mA current loop extension cable, 7.6 m (25 ft)

Item	Part Number	Description
12	BC05X-50	20 mA current loop extension cable, 15.2 m (50 ft)
13	H9850-DA	Antistatic floor mat, DECmat, 122 cm × 183 cm (4 ft × 6 ft), driftwood color (brownish gray)
13	H9850-DB	Antistatic floor mat, DECmat, 122 cm × 183 cm (4 ft × 6 ft), summer earth color (brown/gold)
13	H9850-DC	Antistatic floor mat, DECmat, 91 cm × 305 cm (3 ft × 10 ft), silver birch color (silver gray/brown)
13	H9850-DD	Antistatic floor mat, DECmat, 91 cm × 305 cm (3 ft × 10 ft), autumn bronze color (orange/brown)
13	H9850-DE	Antistatic floor mat, DECmat, 91 cm × 305 cm (3 ft × 10 ft), driftwood color (brownish gray)
13	H9850-DF	Antistatic floor mat, DECmat, 122 cm × 183 cm (4 ft × 6 ft), silver birch color (silver gray/brown)
13	H9850-DH	Antistatic floor mat, DECmat, 122 cm × 183 cm (4 ft × 6 ft), autumn bronze color (orange/brown)
14	H970-EB	Terminal table, 68.6 cm high × 91.4 cm wide × 76.2 cm deep (27 in × 36 in × 30 in), with levelers
14	H970-HB	Terminal table, 68.6 cm high × 61.0 cm wide × 76.2 cm deep (27 in × 24 in × 30 in), with levelers
15	H9532-AA	Workstation with blue front panel and gray side panels, levelers, 122 cm wide × 76.2 cm high × 76.2 cm deep (48 in × 30 in × 30 in)
15	H9532-AB	Workstation with brown front panel and brown side panels, levelers, 122 cm wide × 76.2 cm high × 76.2 cm deep (48 in × 30 in × 30 in)
16	H9850-AP	Media mate, file or shelf storage cart with casters and locking drawer, 64.1 cm high × 38.1 cm deep × 47.0 cm wide (25.25 in × 15 in × 18.5 in)

RELATED DIGITAL DOCUMENTATION

Item	Part Number	Description
17	EK-VT102-UG	<i>VT102 User Guide</i> . Describes the installation, operation, and programming of the VT102. This document is shipped with the terminal.
17	EK-VT101-PS	<i>VT101 Series Pocket Service Guide</i> . Describes procedures used to troubleshoot and repair the VT102 to the field replaceable unit.
17	EK-VT101-TM	<i>VT101 Series Technical Manual</i> . Describes VT102 to a detailed block level. Provides troubleshooting information for the terminal. This manual does not contain detailed schematic drawings. The <i>VT101 Family Field Maintenance Print Set</i> has detailed schematic drawings. It is ordered separately.
17	EK-VT102-IP	<i>VT102 Video Terminal IPB</i> . Provides a detailed parts breakdown of the VT102 field replaceable units. This document does not contain part numbers for printed circuit boards components. However, components are listed in the the <i>VT101 Family Field Maintenance Print Set</i> . It is ordered separately.
17	EK-VT102-RC	<i>VT102 Terminal Programming Reference Card</i> . Provides a summary of the VT101 escape and control sequences on a pocket size reference card.
18	MP-01066	<i>VT101 Family Field Maintenance Print Set</i> . Provides a complete set of electrical and mechanical schematic diagrams for the VT102 terminal.

ALIGNMENT TEMPLATES

Part Number	Description
94-03220-3	Screen alignment template
94-03246-3A	Character width template
94-03246-3B	Character height template

DATA LOOPBACK TEST CONNECTORS

Part Number	Description
12-15336-00	EIA loopback connector
70-15503-00	20 mA loopback connector

SPARES KIT

4A-VT102-00	VT102 spares kit
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ORDERING INFORMATION

You can order accessories and supplies (including documentation) by mail or phone.

Continental USA

Call 800-258-1710 or mail order to:
 Digital Equipment Corporation
 P.O. Box CS2008
 Nashua, NH 03061

New Hampshire

Call 603-884-6660 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

Appendices

SPECIFICATIONS



GENERAL

This appendix lists the specifications of the VT102 terminal. Also included are X-ray emission statements, loopback connector wiring and related documentation not provided by DIGITAL.

VT102 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 (30,000 ft)

Power

Line voltage	99 to 128 Vac (115 V setting) 198 to 256 Vac (230 V setting) 87 to 107 Vac (100 V setting) 222 to 268 Vac (250 V setting) Single phase, grounded, 3-wire
Line frequency	47 to 63 Hz
Current	0.70 Arms maximum at 115 Vrms 0.40 Arms maximum at 220 – 240 Vrms
Input power	70 Wrms or 85 VA apparent
Current limiting	1.25 A fuse (120 Vac) 0.75 A slow blow fuse (220 – 240 Vac)
Power cord	Detachable, 3-conductor grounded
Power cord receptacle	EIA specified CEE22-6A
Display	
CRT	12-inch diagonal measure, P4 phosphor
Format	24 lines × 80 characters or 24 lines × 132 characters (selected from keyboard or computer)
Character	7 × 10 dot matrix with descenders
Character size	3.35 mm × 2.0 mm (0.132 in × 0.078 in) in 80-column mode 3.35 mm × 1.3 mm (0.132 in × 0.051 in) in 132-column mode
Active display size	203 mm × 127 mm (8 in × 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-key arrangement and sculpturing similar to standard typewriter keyboard with an 18-key numeric keypad
Numeric keypad	18-key numeric pad with period, comma, minus, enter, and four general-purpose function keys
Visual indicators	Seven indicators: ON LINE, OFF LINE, KBD LOCKED, CTS, DSR, INSERT and one programmable indicator.
Audible signals	
Keyclick	Provides audible feedback for each keystroke (selected from keyboard)
Bell	<ul style="list-style-type: none"> • Sounds when BEL character received. • Sounds eight characters from right margin (selected from keyboard).
Multiple bell	Sounds on error in SET-UP store or recall operation.
Modem Communication	
Type	Full-duplex with / without modem control, asymmetric full-duplex, half-duplex supervisory and half-duplex with coded control
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 no space (selected from keyboard)

Buffer overflow prevention	Automatic generation of XON and XOFF control codes (selected from keyboard)
Echo	Local echo available (selected from keyboard)
Printer Communication	
Type	Full-duplex
Speeds	50, 75, 110 (two stop bits), 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, 19,200 (one stop bit) 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 no space (selected from keyboard)
Buffer overflow prevention	Automatic generation of XON and XOFF control codes

Composite Video Output (J9)

The composite video output provides RS170 output with the following nominal characteristics. See Figure A-1.

- Output impedance = 75 ohms, dc-coupled
- Sync level = 0 V
- Black level = approximately 0.3 V with 75-ohm load
- White level = approximately 1.0 V with 75-ohm load

The composite sync waveform meets EIA RS170 standards.

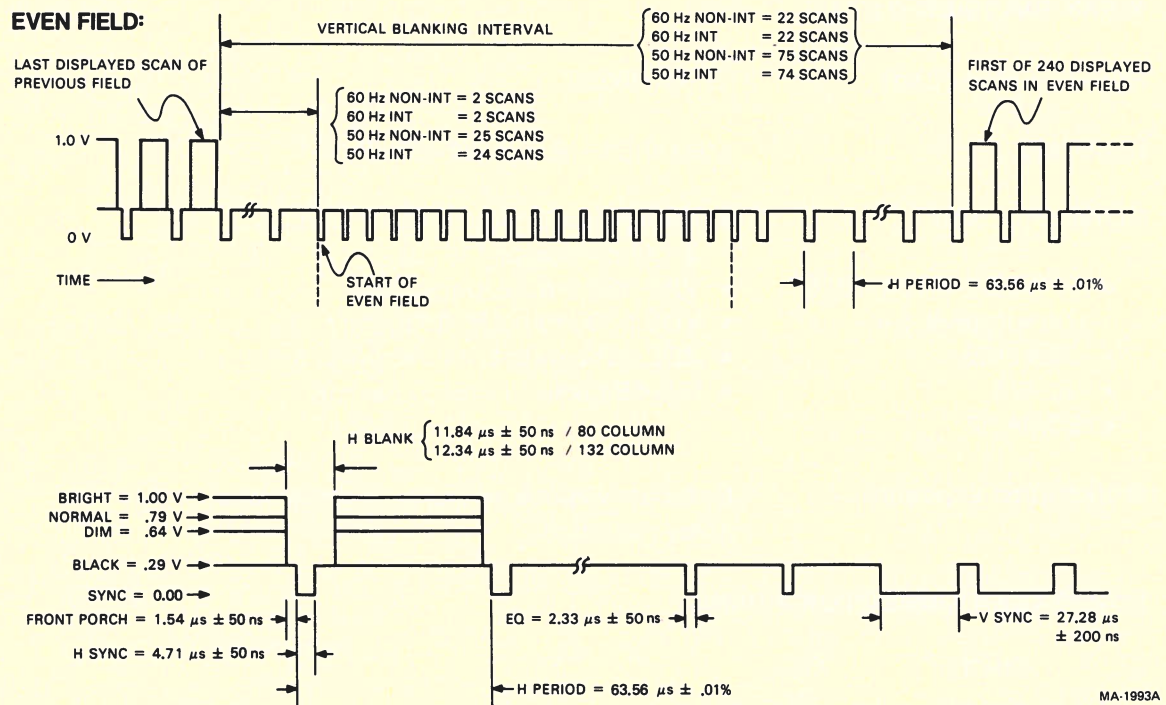


Figure A-1 Composite Video Output

The vertical interval is six equalizing pulses, six vertical sync pulses, and six more equalizing pulses. The timing is as follows.

Equalizing pulse width	=	$2.33 \mu s \pm 50 ns$
Vertical pulse width	=	$27.28 \mu s \pm 200 ns$
Horizontal pulse width	=	$4.71 \mu s \pm 50 ns$
Horizontal blank width	=	$11.84 \mu s \pm 50 ns$, 80 column mode
	=	$12.34 \mu s \pm 50 ns$, 132 column mode
Front porch	=	$1.54 \mu s \pm 50 ns$

FCC 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 Subset 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.

VDE Notice

RFI-suppressed according to German regulation 529/1970 and 227/1976 (VDE 0871 Class B).

X-RAY EMISSION DATA

Rated anode voltage	12 kV (fixed)
Dose rate	Less than 1.43 pA/kg (20 uR/h)*
Compliance with	<ul style="list-style-type: none"> • Paragraph 5, clause (2) of German X-ray ordinance (1973) • CSA 22.2 # 154-1975 Paragraph 4.1.4 • VDE 0804/5.72, para. 23 • CSA #65 • VDE 0730 part 2P/6.76, para. 33 • UL 478 • VDE 0860 part 1/11.76, para. 6 • ECMA 57 • IEC 65 public. 1/1972, para. 6
Workstation exposure	Does not expose operator to dangerous X-ray radiation.

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 are available from:

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

EIA specifications are available from:

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

International standards are available from:

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

*Measured at a distance of 5 cm at any accessible point from the outer surface.

SET-UP SUMMARY

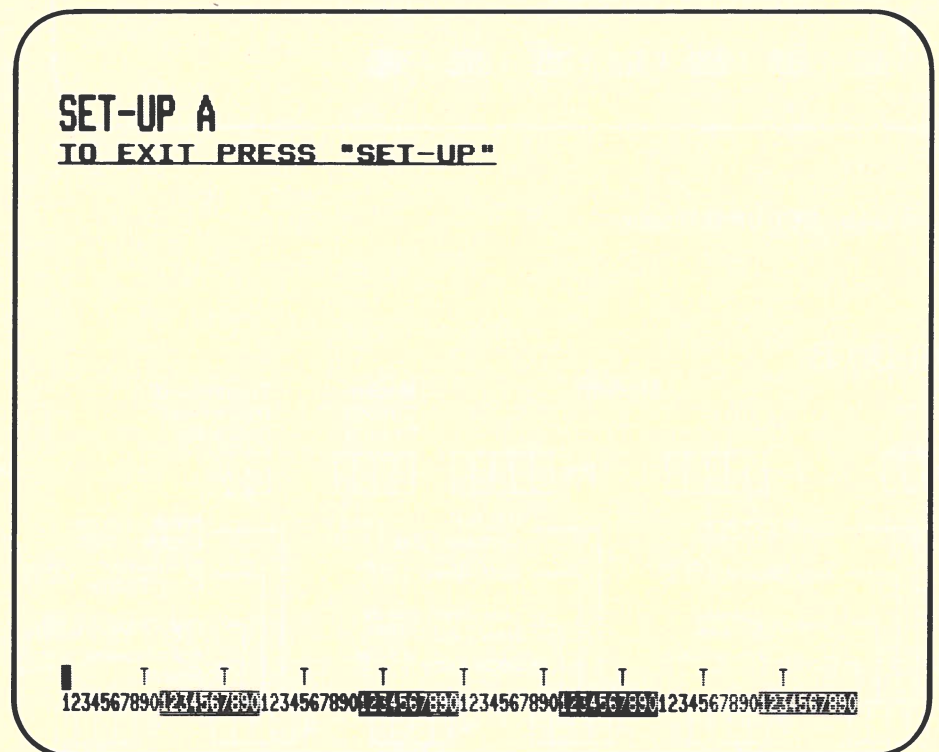
B

GENERAL

This appendix provides a summary of the VT102 SET-UP features.

SUMMARY

Figure B-1 shows the screen displays. Figure B-2 summarizes the SET-UP B features.



MA-9363

Figure B-1a SET-UP A Display

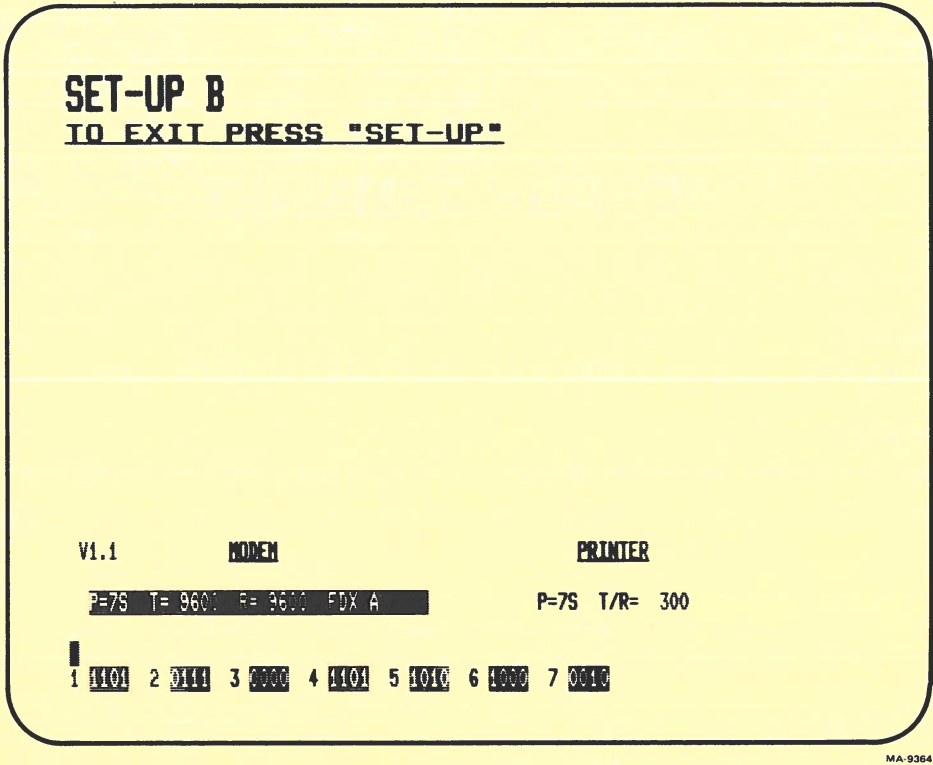
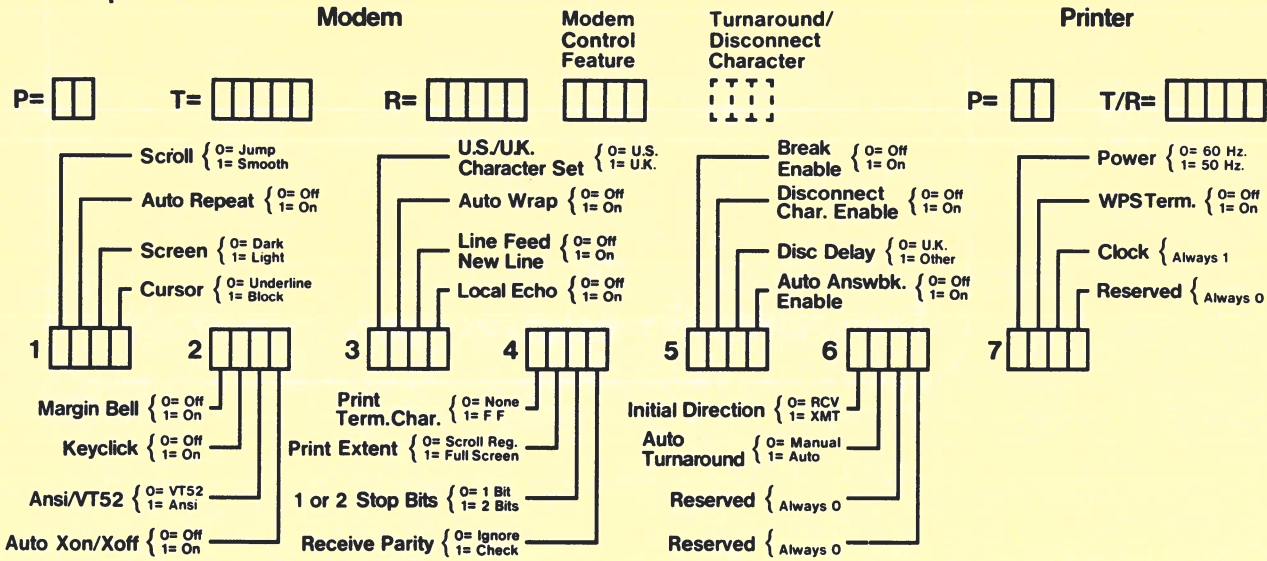


Figure B-1b SET-UP B Display

Set-Up B



This appendix provides a summary of VT102 escape and control sequences.

ACTUAL CODES GENERATED BY KEYCAP LEGENDS
(SHIFTED CODES SHOWN ABOVE KEYCAP LEGENDS
UNSHIFTED CODES SHOWN BELOW KEYCAP LEGENDS)

The diagram shows a keyboard layout with the following codes:

- Top Row:** [Function Key], [Function Key], [Function Key], [Function Key], [Function Key], [Function Key], [Function Key], [Function Key], [Function Key], [Function Key]
- Second Row:** [Caps Lock], [1 | ! | 061], [2 | @ | 062], [3 | # | 063], [4 | \$ | 064], [5 | % | 065], [6 | ^ | 066], [7 | & | 067], [8 | * | 070], [9 | (| 071], [0 |) | 060], [137 | _ | 055], [153 | = | 075], [176 | \ | 140], [Function Key], [Function Key]
- Third Row:** [121 | Q | 161], [127 | W | 167], [105 | E | 145], [122 | R | 162], [124 | T | 164], [131 | Y | 171], [125 | U | 165], [111 | I | 151], [117 | O | 157], [120 | P | 160], [173 | | 133], [175 | | 135], [Function Key], [Function Key]
- Fourth Row:** [Caps Lock], [101 | A | 141], [123 | S | 163], [104 | D | 144], [106 | F | 146], [107 | G | 147], [110 | H | 150], [112 | J | 152], [113 | K | 153], [114 | L | 154], [072 | ; | 073], [042 | ' | 047], [Function Key], [174 | \ | 134]
- Fifth Row:** [Shift], [132 | Z | 172], [130 | X | 170], [103 | C | 143], [126 | V | 166], [102 | B | 142], [116 | N | 156], [115 | M | 155], [074 | < | 054], [076 | > | 056], [077 | / | 057], [Shift], [Line Feed]

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MEMORISATIONS SHOWN ABOVE KEYCAP LEGENDS																			
OCTAL CODES SHOWN BELOW KEYCAP LEGENDS																			
ESC ESC 033																	RS ~ 036	BS BACK SPACE 010	
HT TAB 011	XON Q 021	ETB W 027	ENQ E 005	DC2 R 022	DC4 T 024	EM Y 031	NAK U 025	HT I 011	SI O 017	DLE P 020	ESC | 033	GS | 035	CR RETURN 015		DEL DELETE 177				
CTRL		SOH A 001	XOFF S 023	EOT D 004	ACK F 006	BEL G 007	BS H 010	LF J 012	VT K 013	FF L 014			FS \ 034						
		SUB Z 032	CAN X 030	ETX C 003	SYN V 026	STX B 002	SO N 016	CR M 015			US /? 037		LF LINE FEED 012						
NUL 000																			

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PROGRAMMING SEQUENCES

The rest of this appendix repeats the information on the *VT102 Programming Reference Card* (EK-VT102-RC-001).

CONTROL CHARACTERS RECEIVED

Name	Character Mnemonic	Octal Code	Function
Null	NUL	000	Ignored when received (not stored in input buffer) and used as a fill character.
End of text	ETX	003	Can be selected as a half-duplex turnaround character.
End of transmission	EOT	004	Can be selected as a disconnect character or half-duplex turnaround character. When used as a turnaround character, the disconnect character is DLE-EOT.
Enquire	ENQ	005	Transmits answerback message.
Bell	BEL	007	Generates bell tone.
Backspace	BS	010	Moves cursor to the left one character position; if cursor is at left margin, no action occurs.
Horizontal tab	HT	011	Moves cursor to next tab stop, or to right margin if there are no more tab stops.
Linefeed	LF	012	Causes a linefeed or a new line operation. (See linefeed/ new line mode.) Also causes printing if auto print operation selected.

Name	Character Mnemonic	Octal Code	Function
Vertical tab	VT	013	Processed as LF.
Form feed	FF	014	Processed as LF. FF can also be selected as a half-duplex turnaround character.
Carriage return	CR	015	Moves cursor to left margin on current line. CR can also be selected as a half-duplex turnaround character.
Shift out	SO	016	Selects G1 character set designated by a select character set sequence.
Shift in	SI	017	Selects G0 character set designated by a select character set sequence.
Device control 1	DC1	021	Processed as XON. DC1 causes terminal to continue transmitting characters.
Device control 3	DC3	023	Processed as XOFF. DC3 causes terminal to stop transmitting all characters except XOFF and XON. DC3 can also be selected as a half-duplex turnaround character.
Cancel	CAN	030	If received during an escape or control sequence, cancels the sequence and displays substitution character (§).
Substitute	SUB	032	Processed as CAN.
Escape	ESC	033	Processed as a sequence introducer.

ANSI COMPATIBLE SEQUENCES**Set Mode**

Name	Mnemonic	Mode	Sequence
Keyboard action	KAM	Locked	ESC [2 h
Insertion-replacement	IRM	Insert	ESC [4 h
Send-receive	SRM	Off	ESC [1 2 h
Linefeed/new line	LMN	New line	ESC [2 0 h
Cursor key	DECCKM	Application	ESC [? 1 h
ANSI/VT52	DECANM	ANSI	N/A
Column	DECCOLM	132 column	ESC [? 3 h
Scrolling	DECSCLM	Smooth	ESC [? 4 h
Screen	DECSCNM	Reverse	ESC [? 5 h
Origin	DECOM	Relative	ESC [? 6 h
Auto wrap	DECAWM	On	ESC [? 7 h
Auto repeat	DECARM	On	ESC [? 8 h
Print form feed	DECPFF	On	ESC [? 1 8 h
Print extent	DECPEX	Full screen	ESC [? 1 9 h

Reset Mode

Name	Mnemonic	Mode	Sequence*
Keyboard action	KAM	Unlocked	ESC [2 l
Insertion-replacement	IRM	Replace	ESC [4 l
Send-receive	SRM	On	ESC [1 2 l
Linefeed/new line	LMN	Linefeed	ESC [2 0 l
Cursor key	DECCKM	Cursor	ESC [? 1 l
ANSI/VT52	DECANM	VT52	ESC [? 2 l
Column	DECCOLM	80 column	ESC [? 3 l
Scrolling	DECSCLM	Jump	ESC [? 4 l
Screen	DECSCNM	Normal	ESC [? 5 l
Origin	DECOM	Absolute	ESC [? 6 l
Auto wrap	DECAWM	Off	ESC [? 7 l
Auto repeat	DECARM	Off	ESC [? 8 l
Print form feed	DECPFF	Off	ESC [? 1 8 l
Print extent	DECPEX	Scrolling region	ESC [? 1 9 l

* The last character of the sequence is lowercase L (154₈)

Cursor Key Codes Generated

Cursor Key (Arrow)	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 >

Keypad Codes Generated

Key	VT52 Numeric Keypad Mode	VT52 Alternate Keypad Mode	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 (154₈)

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
Alternate character ROM	ESC (1	ESC) 1
Alternate character ROM – special characters	ESC (2	ESC) 2

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

US/UK Character Set

Continued from page 197

BITS B7 B6 B5 B4 B3 B2 B1				0 0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1		
				COLUMN																
ROW				0		1		2		3		4		5		6		7		
0 0 0 0				0	NUL	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)	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	ETX	3 3 3	DC3 (XOFF)	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	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	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	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	10 8 8	CAN	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	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	12 10 A	SUB	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	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	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	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	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	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	_	137 95 5F	o	157 111 6F		177 127 7F

*NOTE: DEPENDS ON THE CHARACTER SET SELECTED; U.S.=# U.K.=£

KEY

ASCII CHARACTER

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Special Characters and Line Drawing Set

BITS					0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
B7	B6	B5	COLUMN		0		1		2		3		4		5		6		7	
B4	B3	B2	B1	ROW	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL	0 0 0		20 16 10	SP	40 32 20	0	60 48 30	@	100 64 40	P	120 80 50	↑	140 96 60	—	160 112 70
0	0	0	1	1		1 1 1	DC1 (XON)	21 17 11	!	41 33 21	1	61 49 31	A	101 65 41	Q	121 81 51	#	141 97 61	—	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	—	162 114 72
0	0	1	1	3	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	£	143 99 63	—	163 115 73
0	1	0	0	4	EOT	4 4 4		24 20 14	\$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	ℳ	144 100 64	†	164 116 74
0	1	0	1	5	ENQ	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	ø	146 102 66	ℒ	166 118 76
0	1	1	1	7	BEL	7 7 7		27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	±	147 103 67	ℓ	167 119 77
1	0	0	0	8	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	ℕ	150 104 68	|	170 120 78
1	0	0	1	9	HT	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	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	ℐ	152 106 6A	↗	172 122 7A
1	0	1	1	11	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	ℓ	153 107 6B	π	173 123 7B
1	1	0	0	12	FF	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	15 13 D		35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	ℓ	155 109 6D	£	175 125 7D
1	1	1	0	14	SO	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	17 15 F		37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	(BLANK)	137 95 5F	—	157 111 6F		177 127 7F

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Character Attributes

Name	Mnemonic	Sequence
Select graphic rendition (no attributes)	SGR	ESC [m
Select graphic rendition (no attributes)	SGR	ESC [0 m
Select graphic rendition (select attribute bold)	SGR	ESC [1 m
Select graphic rendition (select attribute underline)	SGR	ESC [4 m
Select graphic rendition (select attribute blink)	SCR	ESC [5 m
Select graphic rendition (select attribute, reverse video)	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 [0 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 [0 J
Erase in display (beginning of screen to cursor)	ED	ESC [1 J
Erase in display (entire screen)	ED	ESC [2 J

Editing Functions

Name	Mnemonic	Sequence
Delete character	DCH	ESC [Pn P
Insert line	IL	ESC [Pn L
Delete line	DL	ESC [Pn M

Print Commands

Name	Mnemonic	Sequence
Media copy (enter auto print)	MC	ESC [? 5 i
Media copy (exit auto print)	MC	ESC [? 4 i
Media copy (enter printer controller)	MC	ESC [5 i
Media copy (exit printer controller)	MC	ESC [4 i
Media copy (print screen)	MC	ESC [i
Media copy (print screen)	MC	ESC [0 i
Media copy (print cursor line)	MC	ESC [? 1 i

Reports

Name	Mnemonic	Sequence
Device status report (request status of VT102)	DSR	ESC [5 n
Response:		
Terminal OK	DSR	ESC [0 n
Terminal not OK	DSR	ESC [3 n
Device status report (request status of printer)	DSR	ESC [? 1 5 n
Response:		
Printer ready	DSR	ESC [? 1 0 n
Printer not ready	DSR	ESC [? 1 1 n
No printer	DSR	ESC [? 1 3 n
Device status report (report cursor position)	DSR	ESC [6 n
Cursor position report	CPR	ESC [P1; Pc R
Device attributes (what are you)	DA	ESC [c
Device attributes (what are you)	DA	ESC [0 c
Identify terminal (what are you)	DECID	ESC Z

NOTE: ESC Z is not recommended.

Device attributes response: VT102	DA	ESC [? 6 c
--------------------------------------	----	-------------

Reset

Name	Mnemonic	Sequence
Reset to initial state	RIS	ESC c

Tests 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 (EIA modem control test; requires test connector)	DECTST	ESC [2 ; 4 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 ; 1 0 y
Invoke confidence test (repeat EIA test continuously until failure or power-off; requires test connector)	DECTST	ESC [2 ; 1 2 y
Invoke confidence test printer port data loopback test; requires test connector)	DECTST	ESC [2 ; 1 6 y
Invoke confidence test (repeat printer port data loopback test continuously until failure or power-off; requires test connector)	DECTST	ESC [2 ; 2 4 y

Keyboard LEDs

Name	Mnemonic	Sequence
Load LEDs (L1 off)	DECLL	ESC [q
Load LEDs (L1 off)	DECLL	ESC [0 q
Load LEDs (L1 on)	DECLL	ESC [1 q

VT52 COMPATIBLE MODE

Modes	Sequence
Enter ANSI mode	ESC <

Keypad Character Selection

Name	Sequence
Enter alternate keypad mode	ESC =
Exit alternate keypad mode (Numeric keypad mode)	ESC >

NOTE: VT52 alternate keypad and numeric keypad mode different than ANSI.

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

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

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 Y PI Pc†
Reverse line feed	ESC I‡

* 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 37₈.
Line and column numbers start at one.

‡ The last character of the sequence is an uppercase i (111₈).

Erasing

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

Print Commands

Name	Sequence
Enter auto print mode	ESC ^
Exit auto print mode	ESC -
Enter printer controller mode	ESC W
Exit printer controller mode	ESC X
Print screen	ESC]
Print cursor line	ESC V

Reports

Name	Sequence
Identify (what are you)	ESC Z
Response: VT102 (same as VT52)	ESC / Z



CONTROL FUNCTIONS (SEQUENCE FORMATS)

GENERAL

This appendix summarizes the ANSI code extension techniques defined in standards X3.41-1974 and X3.64-1979. Those specifications cover many special cases and details not included here.

CONTROL FUNCTIONS

The ANSI standards define types of characters used for specific purposes. You can determine a character's type by its position in the ASCII table (Table D-1). There are two general categories of characters:

- display (columns 2 through 7)
- control (columns 0 and 1).

This table and the ANSI system can work for either a 7-bit or 8-bit character environment. The VT102 uses only 7-bit characters.

NOTE: *The ASCII 7-bit table corresponds to International Standards Organization (ISO) standard 646 and International Telegraph and Telephone Consultative Committee (CCITT) alphabet 5.*

All control characters and groups of characters (sequences) not intended for display on the screen are 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 to it. 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.

Table D-1 ASCII Table

BITS				0 0		0 0 1		0 1 0		0 1 1		1 0 0		1 0 1		1 1 0		1 1 1	
B7	B6	B5		COLUMN															
B4	B3	B2	B1	ROW	0	1	2	3	4	5	6	7							
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p	0	00	00	00	00	00	00
0	0	0	1	1	SOH	DC1 (XON)	!	1	A	Q	a	q	1	01	01	01	01	01	01
0	0	1	0	2	STX	DC2	"	2	B	R	b	r	2	10	10	10	10	10	10
0	0	1	1	3	ETX	DC3 (XOFF)	#	3	C	S	c	s	3	11	11	11	11	11	11
1	1	0	0	4	EOT	DC4	\$	4	D	T	d	t	4	100	100	100	100	100	100
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u	5	010	010	010	010	010	010
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v	6	011	011	011	011	011	011
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w	7	101	101	101	101	101	101
1	0	0	0	8	BS	CAN	(	8	H	X	h	x	8	100	100	100	100	100	100
1	0	0	1	9	HT	EM	)	9	I	Y	i	y	9	101	101	101	101	101	101
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z	10	110	110	110	110	110	110
1	0	1	1	11	VT	ESC	+	;	K	[	k	{	11	111	111	111	111	111	111
1	1	0	0	12	FF	FS	,	<	L	\	l	|	12	100	100	100	100	100	100
1	1	0	1	13	CR	GS	-	=	M	]	m	}	13	101	101	101	101	101	101
1	1	1	0	14	SO	RS	.	>	N	^	n	~	14	110	110	110	110	110	110
1	1	1	1	15	SI	US	/	?	O	_	o	DEL	15	111	111	111	111	111	111

KEY

ASCII CHARACTER

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ESCAPE AND CONTROL SEQUENCES

Escape and control sequences provide more controls in addition to the control characters in the ASCII 7-bit table. These multiple-character control sequences are not displayed but control the displaying, processing, and transmission of characters. At the end of a sequence or during an error condition, the terminal continues to display received characters. See Error Recovery in Chapter 5 for specific error conditions.

Escape Sequences

The format for an escape sequence is as follows.

ESC	I....I	F
033	040-057	060-176
Escape sequence introducer	Intermediate characters (0 or more characters)	Final character (1 character)

Escape Sequence Introducer – This is the ESC character (octal 033) defined by ANSI X3.4-1977. After receiving ESC, the terminal stores (but does not display) all control characters received in the proper range.

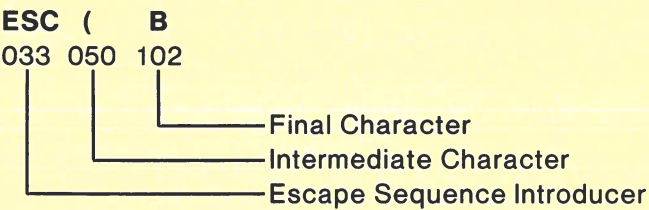
Intermediate Characters – These are characters received after ESC in the octal range of 040 - 057 (column 2 of the ASCII table). The terminal stores intermediate characters as part of the control function.

Final Character – This is a character received after ESC in the octal range of 060 - 176 (columns 3 - 7 of the ASCII table). The final character indicates the end of the control function. The intermediate and final characters together define the function of the sequence. The terminal then performs the specified 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 table). Private sequences have a final character in the octal range of 060 - 077 (column 3 of the ASCII table).

Example

Action: Designate ASCII character set as G0.

Sequence



Control Sequence Format

The format of a control sequence is as follows.

CSI	P.....P	I.....I	F
033 133	060-077	040-057	100-176
Control sequence introducer	Parameter characters (0 or more characters)	Immediate characters (0 or more characters)	Final character (1 character)

Control Sequence Introducer – The CSI is the ESC (octal 033) and [(octal 133) characters defined by ANSI X3.41-1977. These characters provide 8-bit control functions by using 7-bit characters. The VT102 supports only 7-bit characters. After receiving CSI characters, the terminal stores (but does not display) all control characters received in the proper range.

Parameter Characters – These are characters received after the CSI character, in the octal range of 060 – 077 (column 3 of the ASCII table). The parameter characters modify the action or interpretation of the control function. The terminal interprets parameter characters as private when the < = > ? characters (octal 074 – 077) begin the parameter string. The : character (octal 072) is reserved. This means an ANSI-specified control sequence can have a parameter function with 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 0 – 9 (octal 000 – 071). A selective parameter comes from a list of specified parameters, designated by Ps.

If a control sequence includes more than one parameter, the parameters are separated by a delimiter, the ; character (octal 073).

Intermediate Characters – These are characters received after the CSI character, in the octal range of 040 – 057 (column 2 of the ASCII table). The terminal stores these characters as part of the control function.

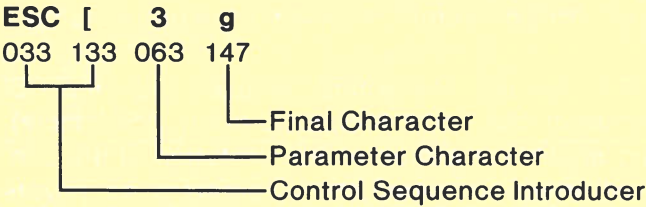
NOTE: *The terminal does not use intermediate characters in control functions.*

Final Character – This is a character received after the CSI character, in the octal range of 100 – 176 (columns 4 – 7 of the ASCII table). The final character indicates the end of the control function. The intermediate and final characters together define the function of the sequence. The terminal then performs the specified function and continues to display received characters. ANSI standard control functions have a final character in the octal range of 100 – 157 (columns 4 – 6 of the ASCII table). Private sequences have a final character in the octal range of 160 – 176 (column 7 of the ASCII table).

Example

Action: Clear all horizontal tabs.

Sequence



Sequence 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
033	133	077	064	150	(? = ANSI private parameter)

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

VT102/VT100 DIFFERENCES

E

GENERAL

This appendix describes the differences between the VT102 and VT100 video terminals.

DIFFERENCES

The VT102 is a bounded video terminal with no expansion or upgrade capabilities. Therefore, the VT102 does not provide the following VT100 features.

- Video input connector.
- Graphics connector (This is an internal connector on the VT100.)
- EIA connector pin 23 connection to pins 11 and 19.
- STP options and report parameters (DECREPTPARM).
- The same number of fill characters (The VT102 uses a different number of fill characters.)
- Interlace feature.
- Four programmable indicators (The VT102 has one programmable indicator.)

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INSTALLATION, WARRANTY, AND SERVICE INFORMATION

INSTALLATION/WARRANTY

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

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

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129 Parker Street
Maynard, MA 01754

ATTN: Field Services Marketing – PK3-2/S77

digital

TECHNICAL DOCUMENTATION CHANGE NOTICE

VT102 VIDEO TERMINAL USER GUIDE ADDENDUM (EK-VT102-UG-003)

Use the following instructions to incorporate new and revised information into the VT102 Video Terminal User Guide.

Page 42, Reserved (Switch 6-3: Always = 0)

Replace this paragraph with the following.

Limited Transmit (Switch 6-3: 0=Off, 1=On) – When set to 0 (unlimited), the terminal transmits characters as fast as the baud rate allows. When set to 1 (limited), the terminal transmits characters no faster than one character per 1/60th second (60 Hz line frequency), or one character per 1/50th second (50 Hz line frequency). The transmit and receive baud rates are unaffected. This set-up feature cannot be changed by the computer.

Pages 22, 35, 51, 192, SET-UP B Screen Display Figures

Change the version number on the screen display from V1.1 to V1.2.

Pages 27, 35, 192, SET-UP B Summary Figures

Replace the descriptive feature of Block 6, Bit 3 with the following.

Limited Transmit $\begin{cases} 0=\text{Off} \\ 1=\text{On} \end{cases}$

Page 113, Print Cursor Line

Change the escape sequence and its octal code to the following.

ESC V
033 126

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Page 114, Print Screen

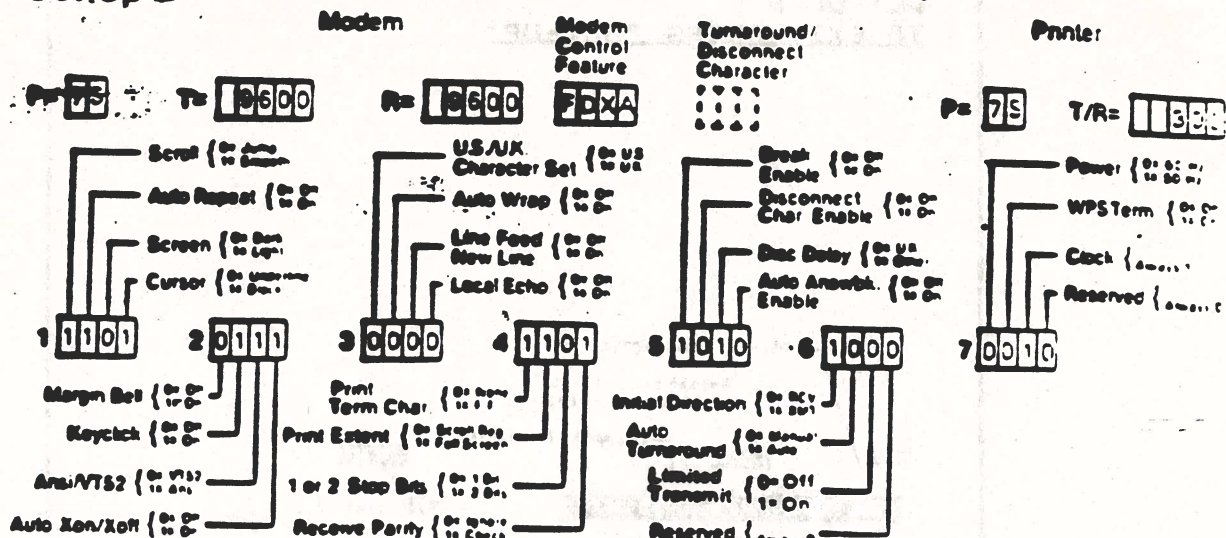
Change the escape sequence and its octal code to the following.

**ESC J
033 135**

Pages 23, 68, SET-UP Features the Computer Can Change

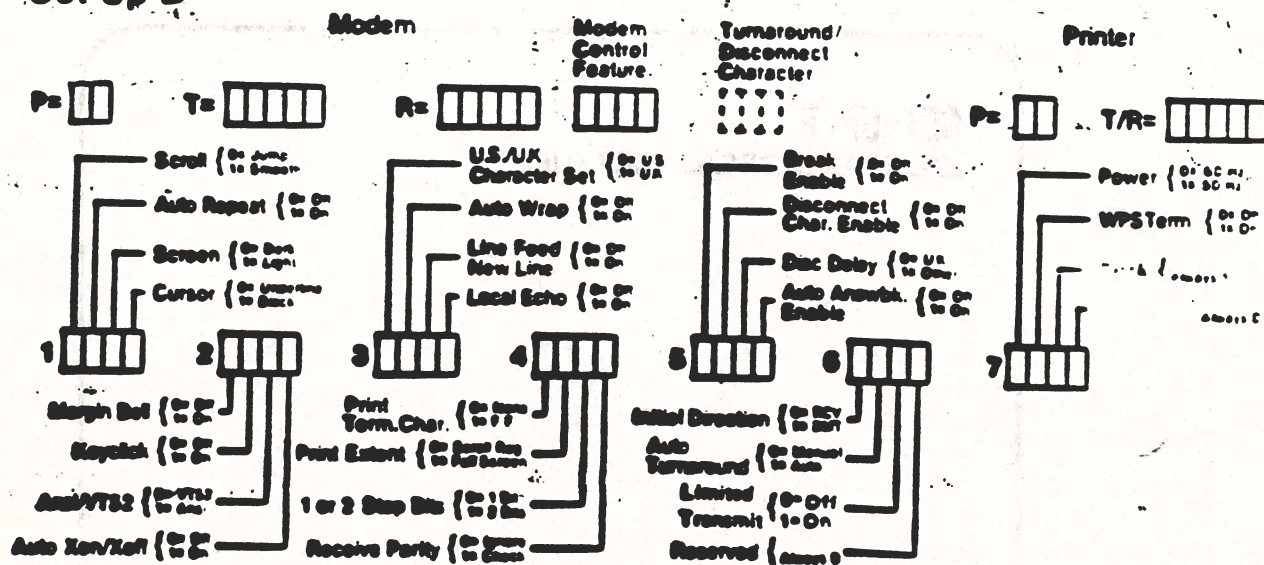
Add Limited Transmtr to the list of SET-UP features the computer cannot change.

Set-Up B



MA 9495A

Set-Up B



MA-9499

SET-UP B

TO EXIT PRESS "SET-UP"

VI.2 DELIMITER CHARACTER ANSWER BACK MESSAGE (UP TO 20 CHARACTERS) DELIMITER CHARACTER PRINTES

75 T= 960/ R= 9600 FD: A P=75 T/R= 300

A=

1 101 2 011 3 000 4 101 5 101 6 000 7 010

SET-UP B

TO EXIT PRESS "SET-UP"

VI.2 MODEM PRINTES

75 T= 960 R= 9600 FD: A P=75 T/R= 300

1 101 2 011 3 000 4 101 5 101 6 000 7 010