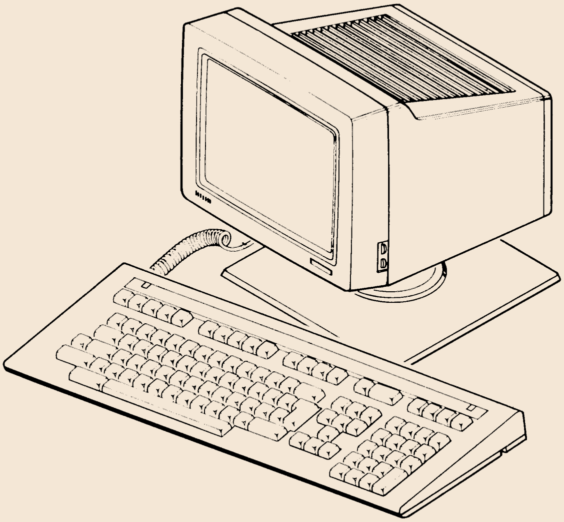
EK-VT3XX-TP-002

VT330/VT340

Programmer Reference Manual
Volume 1: Text Programming



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Installing and Using The VT330/VT340 Video Terminal

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VT330/VT340 Programmer Reference Manual

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Program the terminal's graphics features	Volume 2

EK-VT3XX-TP-002

VT330/VT340

Programmer Reference Manual
Volume 1: Text Programming

Prepared by Educational Services
of
Digital Equipment Corporation

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UNIBUS
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ABOUT THIS MANUAL

This reference manual is for people with a general knowledge of computer programming. If you are a programmer, this manual provides the information you need to program the text features of your VT330 or VT340 terminal. Volume 2 covers graphics programming features. The VT330 is a text and monochrome graphics terminal. The VT340 is a text and color graphics terminal.

This manual is part of the VT300 user documentation package. Each manual in the package is for a certain audience.

- *Installing and Using the VT330/VT340 Video Terminal*
  For the installer and general user
- *VT330/VT340 Programmer Reference Manual*
  Programmers writing applications for the VT330/VT340

Volume 1	Text applications
Volume 2	Graphics applications
Pocket Guide	Summary of volumes 1 and 2

ORGANIZATION

The manual is divided into four parts.

Part 1, Introduction to Your VT300 Terminal
covers the information you need to know before you begin programming the terminal.

- Chapter 1, "VT300 Features," provides an overview of the terminal. The chapter briefly describes the terminal's major features and operating modes.

- Chapter 2, "Character Encoding," describes the character-encoding concepts used when the VT300 operates as a text terminal. The chapter also describes the terminal's character sets, and control function format.

Part 2, Control Functions Sent to the Host
covers the codes sent from the keyboard.

- Chapter 3, "Keyboard Codes," describes the characters and control functions that the terminal sends to the host.

Part 3, Control Functions Received from the Host
covers all the control functions you can use to program the terminal.

- Chapter 4, "Emulating VT Series Terminals," describes the control functions used to emulate Digital's other VT series terminals.
- Chapter 5, "Using Character Sets," describes the control functions used to select the terminal's built-in character sets and your own soft character sets.
- Chapter 6, "Page Memory," describes the control functions used to format and move through the terminal's page memory.
- Chapter 7, "Setting Visual Character and Line Attributes," describes the control functions used to highlight text, such as bolding and underlining.
- Chapter 8, "Editing and Character Protection," describes the control functions used to edit or protect characters in the terminal's page memory.
- Chapter 9, "Local Editing," describes the control functions that let the terminal perform local editing tasks. To use this feature, your host system must support local editing.
- Chapter 10, "Cursor Movement and Panning," describes the control functions used to move the cursor and pan through data in page memory.
- Chapter 11, "Keyboard, Printing, and Display Commands," describes the control functions used to program the terminal's keyboard, printer port, and display screen.

- Chapter 12, "VT300 Reports," describes the control functions used to request reports on the operating state of the terminal. The chapter also describes the format of the reports sent by the terminal, and the control functions use to restore the terminal to a previous state.
- Chapter 13, "Resetting the Terminal," describes the control functions used to reset the terminal's operating features to factory-default or saved settings.

Part 4, Dual Sessions
describes two methods for managing sessions on the VT300.

- Chapter 14, "Session Management," describes the commands used to control the terminal's dual-session capability. You can use Digital's SSU software to run dual sessions over a single communication line.

Appendix A, "VT52 Mode Control Codes," describes control functions used when the terminal is in VT52 mode.

Appendix B, "Communication," describes how the terminal communicates with the host system and local devices, such as modems and printers. The appendix also describes how to connect to non-Digital systems and provides cabling information.

Appendix C, "Compatibility with Other Digital Terminals," compares the VT330 and VT340 terminals to other VT series terminals.

CONVENTIONS USED IN THIS MANUAL

- This manual uses the term **VT300** when describing features common to the VT330 and VT340 terminals.
- Notes and programming tips appear throughout this manual.
  - Notes provide general operating information.
  - Programming tips provide helpful suggestions to consider when writing applications.
- Set-up features and keyboard keys appear in **bold** type.

  Examples

  Press the **Return** key.

Use the **Clear Communications** feature in the Set-Up Directory screen.

- Characters used in control functions appear in **bold** type. Below each character is a column/row number that indicates the character's position in a standard code table.

  Example

ESC	**#**	**6**	<—	Control function
1/11	2/3	3/6	<—	Column/row numbers

- Glossary entries appear in italics when first used in text.

  Example

  The VT300 stores information in its *page memory.*

PART 1
INTRODUCTION TO YOUR VT330/VT340 TERMINAL

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The VT330/VT340 Terminal

This chapter provides an overview of the VT330 and VT340 video terminals. The chapter briefly describes the major features and operating modes of each terminal. Each section tells you where to look in the manual for more information on that feature.

The VT330 is a monochrome text and graphics terminal. The VT340 is a text and color graphics terminal. Each terminal has two major components, a monitor/terminal unit and keyboard. The monitor has a tilt-swivel base. See *Installing and Using the VT330/VT340 Video Terminal* for a description of these components.

This manual covers the programming information you need to use the text features for both terminals. Each terminal uses control functions specified by the American National Standards Institute (ANSI) and the International Organization for Standardization (ISO). Volume 2 covers the graphics features for the VT330 and VT340.

This manual uses the term **VT300** when describing features common to all models. The manual only refers to a specific model when a feature is unique to that model. Most text features work on both VT300 models.

Figure 1-1 shows a typical VT300 terminal. The next section describes some of the more important new features of the VT300.

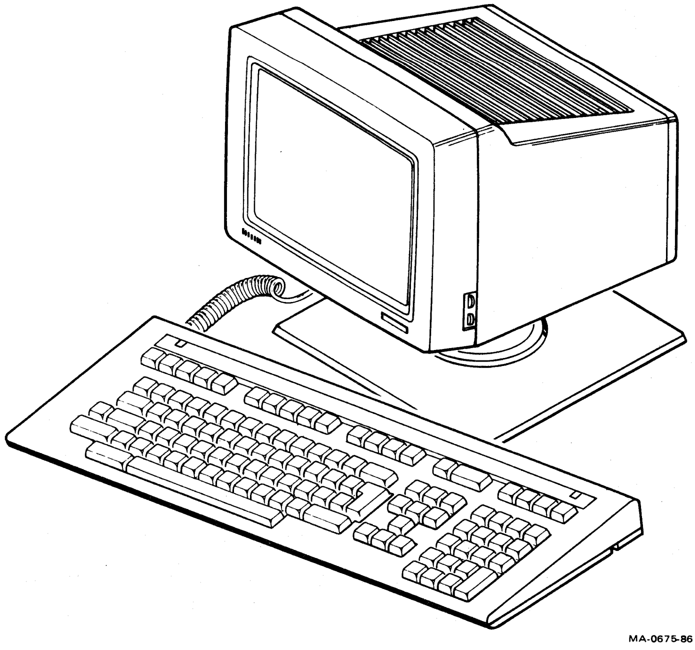

Figure 1-1 VT330/VT340 Video Display Terminal

NEW FEATURES

The VT300 is compatible with Digital's VT220 terminal and offers major new features such as dual sessions, user windows, added page memory, and local editing.

Dual Sessions

When you electronically connect to a host system from your terminal, you start an interactive *session.* The VT300 lets you run two sessions at the same time. That is, you can connect to two different jobs on your system. If you connect your VT300 to two systems, you can log in to both systems and run those sessions at the same time. If you connect your VT300 to a *terminal server* that supports several systems, you can run two sessions, each on a different system.

The dual sessions feature gives you two terminals in one. The VT300 maintains the two sessions separately. You can easily switch back and forth between the two sessions by pressing a single key.

The VT300 has two different methods for managing dual sessions, multiple system communications (MSC) and Digital's Session Support Utility.

MSC	Uses two separate communication lines to maintain two sessions at the same.
SSU software	Uses one communication line and Digital's proprietary SSU software protocol to maintain two sessions at the same time.

You can select different operating features for each session. For example, you can use different set-up selections, page memory format, and user-defined keys.

For more information on session management, see Chapter 14.

User Windows

The VT300 lets you view data from two sessions at the same time. To view data from two sessions, you divide the screen into two windows.

By default, each session you open with a VT300 terminal uses the complete screen. This means the terminal can only display data from one session at a time. To divide the screen into two windows, you press a sequence of keys. Each window is assigned to a session. Information from one session appears in one half of the screen, information from the second session appears in the other half.

You can divide the screen vertically or horizontally. When you divide the screen vertically, a border appears down the middle of the screen from line 1 to line 24. When you divide the screen horizontally, a border appears across the middle of the screen from column 1 to the last column.

For more information on user windows, see Chapter 8 of *Installing and Using the VT330/VT340 Video Terminal.*

Page Memory

The VT300 has a multiple-page display memory. This feature lets the terminal store more text than appears on the screen. For example, when you use dual sessions the terminal can store up to three screen areas of text (three 24-line pages) for each session.

You can select different page sizes. The page sizes available depend on whether you are running dual sessions or a single session.

Dual Sessions

- 3 pages of 24 lines × 80 or 132 columns
- 2 pages of 36 lines × 80 or 132 columns
- 1 page of 72 lines × 80 or 132 columns

Single Session

- 6 pages of 24 lines × 80 or 132 columns
- 4 pages of 32 lines × 80 or 132 columns
- 2 pages of 72 lines × 80 or 132 columns
- 1 page of 144 lines × 80 or 132 columns

A *page* is a section of the terminal's page memory. Each page has left, right, top and bottom margins. You can define the size and layout of a page by using set-up features or control functions.

For more information on page memory, see Chapter 6.

Local Editing

The VT300 lets you perform local editing, also known as block mode editing. However, local editing requires host software support.

Local editing lets you edit and store data in the terminal, so the host system is free to perform other tasks. When you finish editing, you can send the edited data to the host in a block.

Local editing mode is compatible with the local editing feature on Digital's VT131 terminal, with some added functions.

For more information on local editing, see Chapter 9.

ROM Cartridge Firmware

All *firmware* for the VT300 is on a ROM cartridge, installed at the rear of the terminal. This cartridge *must* be installed for the terminal to operate. The terminal comes with the ROM cartridge already installed.

GENERAL FEATURES

This section describes the general operating and communication features of the VT300. You can set many of these features from the keyboard, using set-up.

Set-Up

Set-up is a series of display screens. Each screen lists a group of features, such as communications or printing.

You can use set-up screens to examine and change the current settings for features. For example, you can select the keyclick feature, transmit or receive speeds, page size, and type of session management.

The VT300 set-up feature is similar to the VT200 set-up feature. However, the VT300 set-up screens have an enhanced format that provides more information and is easier to use. *Installing and Using the VT330/VT340 Video Terminal* describes the set-up screens in detail.

Display Features

The VT300 screen has the following basic features.

Monitor	VT330: 359 mm (14 inch), flat screen monitor VT340: 333 mm (13 inch), conventional color monitor
Display area	25 lines × 80 or 132 columns 800 (horizontal) × 500 (vertical) pixels
Status line	on the 25th display line
Character size	For 80 columns: 9 × 12 pixel body in 10 × 20 character cell

	For 132 columns: 5 × 12 pixel body in 6 × 20 character cell
Bitmap	VT330: 2 plane (permits 4 shades of gray, out of a possible 64) VT340: 4 plane (permits 16 shades or colors, out of a possible 4096)
Scrolling	Horizontal split-screen scrolling on any line boundary (same as VT100)

Text Features

The VT300 provides a variety of text and editing features.

Character sets (See next section.)	5 sets of 94 characters each 1 set of 96 characters Down-line-loadable character set (94 or 96 characters)
Top-row function keys	5 local function keys 15 user-definable keys
Editing functions	All VT200 editing functions Erasure mode Local editing
Visual character attributes	Normal, bold, underline, blinking, reverse video, and invisible characters
Line attributes	Single-width/single-height lines Double-width/single-height lines Double-width/double-height lines
Character protection styles	Independent (not based on visual character attributes) Visual attribute (VT131 style)
Control functions	7-bit and 8-bit control characters ANSI control functions DEC private control functions Ability to display control functions

Character Sets

The VT300 has the following built-in character sets.

- ASCII
- DEC Supplemental Graphic
- ISO Latin Alphabet Nr 1 supplemental graphic
- 12 National replacement character sets (NRCs)
- DEC Technical
- DEC Special Graphic (VT100 line drawing)

You can also design a soft character set and load it from the host system into the terminal.

Together, the ASCII and DEC Supplemental Graphic sets make up the **DEC Multinational** character set. When you turn on or reset the terminal, the VT300 automatically uses the DEC Multinational set. The ASCII and ISO Latin-1 supplemental sets make up the ISO Latin-1 character set.

Chapter 2 describes the VT300 character sets. Chapter 5 describes how to select and use different character sets.

Communication Features

The VT300 provides the following features for communicating with the host system.

Character format	7-bit or 8-bit
Baud rate	Asynchronous communication speeds up to 19.2K bits per second
Connectors	Two DEC-423 host ports, allowing longer distances between the terminal and host(s) One RS232-C host port, with a 25-pin D-subminiature connector for a host or external modem One DEC-423 printer port One 7-pin micro-DIN connector for a mouse or graphic tablet

OPERATING STATES

The VT300 has two major operating states. You select the operating state in set-up.

On-line
Local

On-Line

The on-line state lets the terminal communicate with a host system. The terminal sends data entered at the keyboard to the host. The terminal displays data received from the host on the screen.

Local

The local state lets you place the host system on hold. Data entered at the keyboard is sent to the screen, but not to the host. The terminal stores data received from the host, until you put the terminal back on-line.

OPERATING MODES

The VT300 has four major operating modes for text operations. You can select each mode from the keyboard via set-up, or from the host via control codes. The VT300 uses standard ANSI functions in all operating modes, except VT52 mode.

VT300 mode, 7-bit controls (default)
VT300 mode, 8-bit controls
VT100 mode
VT52 mode

VT300 mode, 7-bit controls is the default operating mode. This mode provides the full range of VT300 capabilities, using 8-bit characters and 7-bit control characters. All character sets are available. This mode provides full compatibility with Digital's VT200 series terminals. Digital recommends this mode for most applications.

VT300 mode, 8-bit controls provides the full range of VT300 capabilities, using 8-bit characters and 8-bit control characters. All character sets are available, and the terminal recognizes both 7-bit and 8-bit controls. This mode will run VT200 applications that use 8-bit control characters. The terminal operates most efficiently in this mode, but many systems and applications do not yet support 8-bit operation.

VT100 mode provides full compatibility with Digital's VT102 terminal. This mode restricts the terminal to a 7-bit environment. The keyboard is restricted to VT100 keys, and the only available character sets are ASCII, national replacement characters, and DEC Special Graphic. You can use this mode with applications that require strict VT100 compatibility.

VT52 mode provides full compatibility with Digital's VT52 terminal. This mode only uses Digital's private control functions, not standard ANSI functions. You use this mode with applications written for the VT52.

Chapter 2 describes the format for 7-bit and 8-bit character codes. Chapter 4 describes how the VT300 can emulate other VT series terminals.

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The VT300 uses a communication line to exchange information with a host system. The terminal and the host do not send data in the form you see on your screen. They must encode the information first. They also must be able to decode the information received from each other.

This chapter describes the character-encoding system that the VT300 uses for text. The terminal uses a different system for graphics. You must have a basic understanding of the character-encoding system described in this chapter before you use the control functions in the rest of this manual.

The chapter also describes the VT300 character sets and the format for sending control functions to the terminal. You can select character sets for different countries or for special uses, such as technical characters. You use control functions to make the terminal perform special functions, such as editing or printing.

CODING STANDARDS

All terminals and computers encode information as binary digits, or bits. Older systems use 7 bits to encode each character. Newer systems such as the VT300 use 8 bits, which provide more codes. The newer systems can also use the 7-bit codes.

The VT300 uses an 8-bit character-encoding system and a 7-bit equivalent representation technique. The "7-Bit C1 Representation Technique" section in this chapter explains what 7-bit equivalent representations are.

The American National Standards Institute (ANSI) and International Organization for Standardization (ISO) specify standards for character encoding in the information processing industry. The VT300 terminal is compatible with the following ANSI and ISO standards.

Standard	**Description**
dpANS X3.134.1	8-Bit ASCII structure and rules
dpANS X3.134.2	Code for information interchange of 7-bit and 8-bit ASCII supplemental multilingual graphic character set
ANSI X3.4 — 1977	American Standard Code for Information Interchange (ASCII)

Standard	Description
ANSI X3.41 — 1974	Code Extension Techniques for Use with the 7-Bit Coded Character Set of American National Code Information Interchange
ANSI X3.32 — 1973	Graphic Representation of the Control Characters of American National Code for Information Interchange
ANSI X3.64 — 1979	Additional Controls for Use with American National Standard for Information Interchange
ISO 646 — 1977	7-Bit Coded Character Set for Information Processing Interchange
ISO 2022 — 1986	7-Bit and 8-Bit Coded Character Sets — Code Extension Techniques
ISO 6429 — 1983	Additional Control Functions for Character Imaging Devices
ISO 8859-1 — 1987	8-Bit single byte code graphic character sets-Part 1: Latin Alphabet Nr 1
ISBN 2-12-953907-0	ISO international register of character sets used with escape sequences

You can order ANSI and ISO standards from the following sources.

ANSI Standards

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

ISO Standards

CCITT
UN Book Store
United Nations Building
New York, NY 10017

CHARACTERS AND CHARACTER SETS

In Digital's computing environment, a character is a symbol represented by an 8-bit binary code. These symbols include letters, digits, and punctuation marks, as well as other symbols used to organize, control, or represent data.

Here are a few examples of characters and their corresponding 8-bit codes.

Character	Code
A	01000001
}	01111101
CSI	10011011

There are two types of computing environments, 7-bit and 8-bit. In a 7-bit environment, only the last 7 bits of the character code define the character. In an 8-bit environment, all 8 bits define the character.

The A character above is defined in a 7-bit or 8-bit environment, because the eighth bit of the code is 0. The 8-bit form of the CSI character is defined only in a 8-bit environment, because its eighth bit is 1.

A coded character set is a group of characters that conform to certain rules and standards. These standards are set by organizations such ANSI and ISO. Each character in a character set is represented by a different combination of 8 bits.

CODE TABLE

A code table is a convenient way to show all the characters in a character set with their codes. Most standard character sets put similar characters into groups, so they have similar codes. A code table lets you see groups of characters and their relative codes clearly.

There are two basic types of characters, graphic characters and control characters. These two character types are defined by ANSI and ISO standards. The VT300 processes received characters based on these two character types.

Graphic characters are characters you can display. Graphic characters include letters, numbers, punctuation marks, and any other characters you can display.

Control characters are characters you do not usually display. They make the terminal or host system perform specific functions in data communications and text processing.

NOTE: You can display control characters on the screen, to help you debug your applications. To display control characters, use the **Control Representation Mode** *feature in the Display Set-Up screen. See the "Display Controls" section at the end of this chapter.*

This section describes the format for 7-bit and 8-bit code tables.

7-Bit ASCII Code Table

Figure 2-1 is the 7-bit ASCII code table. The table has 128 character codes, arranged in 8 columns and 16 rows.

Every character in a row uses the same binary code for its four least significant bits (Figure 2-2). This value appears at the left of each row. For example, every character in row 0 uses the binary code 0000 for its four least significant bits.

Every character in a column uses the same binary code for its three most significant bits. This value appears at the top of each column. For example, every character in column 0 uses the binary code 000 for its three most significant bits

The ASCII table also shows the octal, decimal, and hexadecimal code for each character. Different programmers may prefer using octal, decimal, or hexadecimal codes for different purposes.

This manual refers to characters by their position in the table. For example, the character **H** is at 4/8 (column 4, row 8). You can use the column/row number to find a character and its codes in the table. For example

ESC	**#**	**6**
1/11	2/3	3/6

means

The **ESC** character is at column 1, row 11.
The **#** character is at column 2, row 3.
The **6** character is at column 3, row 6.

The ASCII graphic characters are in positions 2/1 through 7/14 of the ASCII table. ASCII graphic characters include all American and English alphanumeric characters, plus punctuation marks and various text symbols. Examples are C, n, ", !, +, and $. (The British pound sign is not an ASCII graphic character.)

ROW	COLUMN	0		1		2		3		4		5		6		7	
	BITS b8 b7 b6 b5 b4 b3 b2 b1	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
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
1	0 0 0 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
2	0 0 1 0	**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
3	0 0 1 1	**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
4	0 1 0 0	**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
5	0 1 0 1	**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
6	0 1 1 0	**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
7	0 1 1 1	**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
8	1 0 0 0	**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
9	1 0 0 1	**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
10	1 0 1 0	**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
11	1 0 1 1	**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
12	1 1 0 0	**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
13	1 1 0 1	**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
14	1 1 1 0	**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
15	1 1 1 1	**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

|←— C0 CODES —→|←— GL CODES (ASCII GRAPHIC) —→|

KEY

CHARACTER			
	ESC	33	OCTAL
		27	DECIMAL
		1B	HEX

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Figure 2-1 7-Bit ASCII Code Table

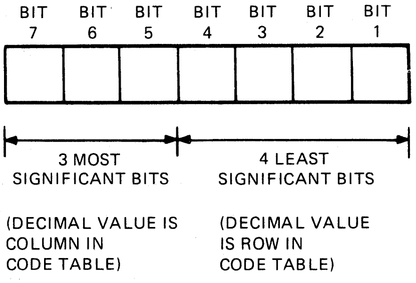

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Figure 2-2 7-Bit Code

The ASCII control characters are in positions 0/0 through 1/15 (columns 0 and 1) of the ASCII table. The SP character (2/0) may act as a graphic space character or a control character, depending on the context. DEL (7/15) is always a control character.

ANSI and ISO standards define control character codes and their functions. These standards also define the *mnemonic* used to represent each control character in a code table. Here are some examples of ASCII control characters with their mnemonics.

ASCII Control Character	Mnemonic (Appears in Code Table)
Carriage return	CR
Form feed	FF
Cancel	CAN

8-Bit Code Table

Figure 2-3 shows the format for an 8-bit code table. It has the same number of rows as the 7-bit table, but twice as many columns and character code positions.

Each character in a row of the 8-bit table uses the same binary code for its four least significant bits (Figure 2-4). Each character in a column uses the same binary code for its four most significant bits.

The codes on the left half of the 8-bit table (columns 0 through 7) work like the codes in the 7-bit table. You can use these codes in a 7-bit or 8-bit environment. The eighth bit of these codes is 0.

The codes on the right half of the table (columns 8 through 15) have an eighth bit of 1. You can only use these codes in an 8-bit environment.

The 8-bit code table has two sets of control characters, C0 (control zero) and C1 (control one). The VT300 uses the ANSI definitions for the functions of C0 and C1 controls. The C0 controls are in columns 0 and 1. The C0 controls are the same as the ASCII control characters in the 7-bit table. You can use C0 controls in a 7-bit environment.

The C1 controls are in columns 8 and 9. They perform different functions than the C0 controls. You can only use C1 controls directly in an 8-bit environment. You can select C1 codes indirectly in a 7-bit environment. The "7-Bit Code Extension Technique" section in this chapter explains how to select C1 controls indirectly. Some C1 code positions are blank, because their functions are not yet standardized.

COLUMN / ROW	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
00	NUL	DLE	SP							DCS						
01	SOH	DC1								PU1						
02	STX	DC2								PU2						
03	ETX	DC3								STS						
04	EOT	DC4							IND	CCH						
05	ENQ	NAK							NEL	MW						
06	ACK	SYN							SSA	SPA						
07	BEL	ETB							ESA	EPA						
08	BS	CAN							HTS							
09	HT	EM							HTJ							
10	LF	SUB							VTS							
11	VT	ESC							PLD	CSI						
12	FF	FS							PLU	ST						
13	CR	GS							RI	OSC						
14	SO	RS							SS2	PM						
15	SI	US						DEL	SS3	APC						

C0 CODES (columns 00–01) | GL CODES (columns 02–07) | C1 CODES (columns 08–09) | GR CODES (columns 10–15)

7-BIT CODE TABLE (columns 00–07)

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Figure 2-3 8-Bit Code Table

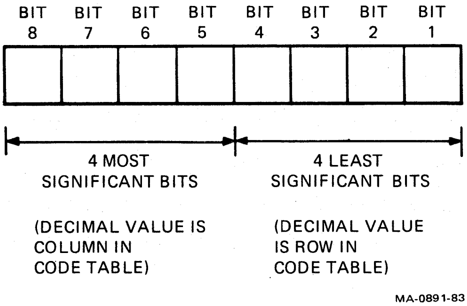
BIT 8
BIT 7
BIT 6
BIT 5
BIT 4
BIT 3
BIT 2
BIT 1
4 MOST SIGNIFICANT BITS
(DECIMAL VALUE IS COLUMN IN CODE TABLE)
4 LEAST SIGNIFICANT BITS
(DECIMAL VALUE IS ROW IN CODE TABLE)
MA-0891-83

Figure 2-4 8-Bit Code

NOTE: The VT300 does not recognize all C0 and C1 codes. Tables 2-2 and 2-3 list the codes the terminal recognizes. The terminal generally ignores all other control codes.

The table also has two sets of graphic characters, GL (graphic left) and GR (graphic right). There are 94 GL codes in positions 2/1 through 7/14. You can use GL codes in 7-bit or 8-bit environments.

There are 96 GR codes in positions 10/0 through 15/15. Some 8-bit character sets only use 94 of these GR codes. You can use GR codes only in an 8-bit environment.

Together, the GL and GR sets make up the terminal's *in-use table.* The in-use table contains the graphic characters the terminal can currently use. Before the terminal can display and send characters from a character set, the set must be mapped into the in-use table. Chapter 5 describes the in-use table in detail.

VT300 CHARACTER SETS

The VT300 provides the following built-in character sets.

ASCII
DEC Supplemental Graphic
ISO Latin Alphabet Nr 1 supplemental graphic
12 national replacement character sets (NRCs)
DEC Special Graphic
DEC Technical

You can also design and load a soft character set into the terminal.

Down-line-loadable (soft) set

All the VT300 character sets contain graphic and control characters. The function of control characters never change, no matter what character set you use. The terminal always interprets C0 and C1 control codes as defined by ANSI.

The terminal stores the codes for graphic characters in GL and GR tables. Selecting a new character set changes the characters associated with the GL or GR codes. When you turn on or reset the terminal, you automatically select the following character sets.

ASCII in GL
DEC Supplemental (or ISO Latin-1 supplemental) graphic in GR

Together, the ASCII and DEC Supplemental Graphic sets are known as the DEC Multinational character set.

DEC Supplemental Graphic Character Set

This 8-bit character set has 94 graphic characters. The graphic characters include letters with accents and *diacritical marks*, used in many European languages. There are also special symbols, such as currency signs.

When you first turn on your terminal, you automatically select the ASCII character set and the DEC Supplemental Graphic set. The terminal maps the ASCII set into its GL table, and the DEC Supplemental Graphic set into its GR table. Together, these two character sets are known as the DEC Multinational character set (Figure 2-5).

	COLUMN	0		1		2		3		4		5		6		7	
	BITS b8 b7 b6 b5	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
ROW	b4 b3 b2 b1																
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
1	0 0 0 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
2	0 0 1 0	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
3	0 0 1 1	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
4	0 1 0 0	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
5	0 1 0 1	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
6	0 1 1 0	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
7	0 1 1 1	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
8	1 0 0 0	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
9	1 0 0 1	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
10	1 0 1 0	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
11	1 0 1 1	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
12	1 1 0 0	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
13	1 1 0 1	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
14	1 1 1 0	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
15	1 1 1 1	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

|←C0 CODES→|← GL CODES (ASCII GRAPHIC) →|

KEY

CHARACTER		
ESC	33	OCTAL
	27	DECIMAL
	1B	HEX

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Figure 2-5 DEC Multinational Character Set (Left Half — C0 and GL Codes)

NOTE: All control function descriptions in this manual assume that the terminal is using the DEC Multinational set.

The DEC Supplemental Graphic set is the right half of Figure 2-5. The C1 controls are in columns 8 and 9. The graphic characters are in columns 10 through 15.

You can select the DEC Supplemental Graphic set as the default by using control functions or set-up. You can only use the DEC Supplemental Graphic set in VT300 mode.

8		9		10		11		12		13		14		15		COLUMN	
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 b7 BITS b6 b5 b4 b3 b2 b1	ROW
	200 128 80	DCS	220 144 90	▨	240 160 A0	°	260 176 B0	À	300 192 C0		320 208 D0	à	340 224 E0		360 240 F0	0 0 0 0	0
	201 129 81	PU1	221 145 91	¡	241 161 A1	±	261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
	202 130 82	PU2	222 146 92	¢	242 162 A2	2	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
	203 131 83	STS	223 147 93	£	243 163 A3	3	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94		244 164 A4		264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96		246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	Œ	327 215 D7	ç	347 231 E7	œ	367 247 F7	0 1 1 1	7
HTS	210 136 88		230 152 98	¤	250 168 A8		270 184 B8	È	310 200 C8	Ø	330 216 D8	è	350 232 E8	ø	370 248 F8	1 0 0 0	8
HTJ	211 137 89		231 153 99	©	251 169 A9	1	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A		232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	233 155 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C		254 172 AC	¼	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
RI	215 141 8D	OSC	235 157 9D		255 173 AD	½	275 189 BD	Í	315 205 CD	Ÿ	335 221 DD	í	355 237 ED	ÿ	375 253 FD	1 1 0 1	13
SS2	216 142 8E	PM	236 158 9E		256 174 AE		276 190 BE	Î	316 206 CE		336 222 DE	î	356 238 EE		376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F		257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF	▨	377 255 FF	1 1 1 1	15

C1 CODES

GR CODES (DEC SUPPLEMENTAL GRAPHIC)

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Figure 2-5 DEC Multinational Character Set (Right Half — C1 and GR Codes)

ISO Latin Alphabet Nr 1 Supplemental Character Set

This 8-bit character set has 96 graphic characters. The graphic characters are similar to those in the DEC Supplemental Graphic set. The ISO Latin-1 supplemental set includes letters with accents and diacritical marks, used in many European languages. It also has other special symbols and letters, not included in the DEC Supplemental Graphic set.

Figure 2-6 shows the ISO Latin-1 supplemental set. The C1 controls are in columns 8 and 9. The graphic characters are in columns 10 through 15.

You can select the ISO Latin-1 supplemental set as the default by using control functions (Chapter 5) or set-up. The combination of the ASCII character set in GL and the ISO Latin-1 supplemental set in GR is called the ISO Latin Alphabet Nr 1 character set.

You can only use the ISO Latin-1 set in VT300 mode.

8		9		10		11		12		13		14		15		COLUMN	
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 b7 b6 b5 BITS b4 b3 b2 b1	ROW
	200 128 80	DCS	220 144 90	NBSP	240 160 A0	°	260 176 B0	À	300 192 C0	Ð	320 208 D0	à	340 224 E0	ð	360 240 F0	0 0 0 0	0
	201 129 81	PU1	221 145 91	¡	241 161 A1	±	261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
	202 130 82	PU2	222 146 92	¢	242 162 A2	²	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
	203 131 83	STS	223 147 93	£	243 163 A3	³	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94	¤	244 164 A4	´	264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96	¦	246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	×	327 215 D7	ç	347 231 E7	÷	367 247 F7	0 1 1 1	7
HTS	210 136 88		230 152 98	¨	250 168 A8	¸	270 184 B8	È	310 200 C8	Ø	330 216 D8	è	350 232 E8	ø	370 248 F8	1 0 0 0	8
HTJ	211 137 89		231 153 99	©	251 169 A9	¹	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A		232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	233 155 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C	¬	254 172 AC	¼	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
RI	215 141 8D	OSC	235 157 9D	–	255 173 AD	½	275 189 BD	Í	315 205 CD	Ý	335 221 DD	í	355 237 ED	ý	375 253 FD	1 1 0 1	13
SS2	216 142 8E	PM	236 158 9E	®	256 174 AE	¾	276 190 BE	Î	316 206 CE	Þ	336 222 DE	î	356 238 EE	þ	376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F	¯	257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF	ÿ	377 255 FF	1 1 1 1	15

C1 CODES

GR CODES
ISO LATIN-1 SUPPLEMENTAL GRAPHIC

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Figure 2-6 ISO Latin Nr 1 Supplemental Character Set

National Replacement Character Sets (NRC Sets)

The NRC sets provide character sets for many European languages. There are 12 NRC sets. Each is a 7-bit character set with 94 graphic characters. The NRC sets are similar to the ASCII set, except for a few characters.

NOTE: Digital recommends that you operate the terminal in an 8-bit environment. The NRC sets are only provided for compatibility with 7-bit environments.

Table 2-1 lists the characters in each NRC set that are different from the ASCII set. To use an NRC set, you must select national replacement character set mode. You can select this mode by using a control function or set-up. You can only use one NRC set at a time. The NRC set used depends on the keyboard selected in set-up, as follows.

Keyboard	**NRC Set**
United Kingdom	United Kingdom
Danish	Norwegian/Danish
Dutch	Dutch
Finnish	Finnish
Flemish	French
French/Belgian	French
French Canadian	French Canadian
German	German
Italian	Italian
Norwegian	Norwegian/Danish
Portuguese	Portuguese
Spanish	Spanish
Swedish	Swedish
Swiss (French)	Swiss
Swiss (German)	Swiss

Table 2-1 National Replacement Character Sets

Character Set	2/3	4/0	5/11	5/12	5/13	5/14
ASCII	#	@	[	\	]	^
United Kingdom	£	@	[	\	]	^
Dutch	£	¾	ÿ	½	|	^
Finnish	#	@	Ä	Ö	Å	Ü
French	£	à	°	ç	§	^
French Canadian	#	à	â	ç	ê	î
German	#	§	Ä	Ö	Ü	^
Italian	£	§	°	ç	é	^
Norwegian/Danish	#	@	Æ	Ø	Å	^
Portuguese	#	@	Ã	Ç	Õ	^
Spanish	£	§	¡	Ñ	¿	^
Swedish	#	É	Ä	Ö	Å	Ü
Swiss	ù	à	é	ç	ê	î

Character Set	5/15	6/0	7/11	7/12	7/13	7/14
ASCII	_	`	{	|	}	~
United Kingdom	_	`	{	|	}	~
Dutch	_	`	¨	ƒ	¼	´
Finnish	_	é	ä	ö	å	ü
French	_	`	é	ù	è	¨
French Canadian	_	ô	é	ù	è	û
German	_	`	ä	ö	ü	ß
Italian	_	ù	à	ò	è	ì
Norwegian/Danish	_	`	æ	ø	å	~
Portuguese	_	`	ã	ç	õ	~
Spanish	_	`	`	°	ñ	ç
Swedish	_	é	ä	ö	å	ü
Swiss	è	ô	ä	ö	ü	û

DEC Special Graphic Character Set

This 7-bit character set has 94 graphic characters. Most of the graphic characters are also in the ASCII character set. The other graphic characters include special symbols and line-drawing characters.

Figure 2-7 shows the DEC Special Graphic set. The C0 controls are in columns 0 and 1. The graphic characters are in columns 2 through 7.

Another name for this character set is the VT100 line-drawing character set. The line-drawing characters let you create a limited range of pictures when you use the VT300 as a text terminal.

You can use the DEC Special Graphic set to replace the ASCII set in GL or the DEC Supplemental Graphic set in GR. Chapter 5 describes how to select character sets.

	COLUMN	0		1		2		3		4		5		6		7	
ROW	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	
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	— SCAN 3	160 112 70
1	0 0 0 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	▒	141 97 61	— SCAN 5	161 113 71
2	0 0 1 0	STX	2 2 2	DC2	22 18 12	"	42 34 22	2	62 50 32	B	102 66 42	R	122 82 52	HT	142 98 62	— SCAN 7	162 114 72
3	0 0 1 1	ETX	3 3 3	DC3 (XOFF)	23 19 13	#	43 35 23	3	63 51 33	C	103 67 43	S	123 83 53	FF	143 99 63	— SCAN 9	163 115 73
4	0 1 0 0	EOT	4 4 4	DC4	24 20 14	$	44 36 24	4	64 52 34	D	104 68 44	T	124 84 54	CR	144 100 64	├	164 116 74
5	0 1 0 1	ENQ	5 5 5	NAK	25 21 15	%	45 37 25	5	65 53 35	E	105 69 45	U	125 85 55	LF	145 101 65	┤	165 117 75
6	0 1 1 0	ACK	6 6 6	SYN	26 22 16	&	46 38 26	6	66 54 36	F	106 70 46	V	126 86 56	°	146 102 66	┴	166 118 76
7	0 1 1 1	BEL	7 7 7	ETB	27 23 17	'	47 39 27	7	67 55 37	G	107 71 47	W	127 87 57	±	147 103 67	┬	167 119 77
8	1 0 0 0	BS	10 8 8	CAN	30 24 18	(	50 40 28	8	70 56 38	H	110 72 48	X	130 88 58	NL	150 104 68	│	170 120 78
9	1 0 0 1	HT	11 9 9	EM	31 25 19	)	51 41 29	9	71 57 39	I	111 73 49	Y	131 89 59	VT	151 105 69	≤	171 121 79
10	1 0 1 0	LF	12 10 A	SUB	32 26 1A	*	52 42 2A	:	72 58 3A	J	112 74 4A	Z	132 90 5A	┘	152 106 6A	≥	172 122 7A
11	1 0 1 1	VT	13 11 B	ESC	33 27 1B	+	53 43 2B	;	73 59 3B	K	113 75 4B	[	133 91 5B	┐	153 107 6B	π	173 123 7B
12	1 1 0 0	FF	14 12 C	FS	34 28 1C	,	54 44 2C	<	74 60 3C	L	114 76 4C	\	134 92 5C	┌	154 108 6C	≠	174 124 7C
13	1 1 0 1	CR	15 13 D	GS	35 29 1D	-	55 45 2D	=	75 61 3D	M	115 77 4D	]	135 93 5D	└	155 109 6D	£	175 125 7D
14	1 1 1 0	SO	16 14 E	RS	36 30 1E	.	56 46 2E	>	76 62 3E	N	116 78 4E	^	136 94 5E	┼	156 110 6E	·	176 126 7E
15	1 1 1 1	SI	17 15 F	US	37 31 1F	/	57 47 2F	?	77 63 3F	O	117 79 4F	(BLANK)	137 95 5F	— SCAN 1	157 111 6F	DEL	177 127 7F

|←— C0 CODES —→|←— GL CODES (DEC SPECIAL GRAPHIC) —→|

KEY

CHARACTER	ESC	33 27 1B	OCTAL DECIMAL HEX

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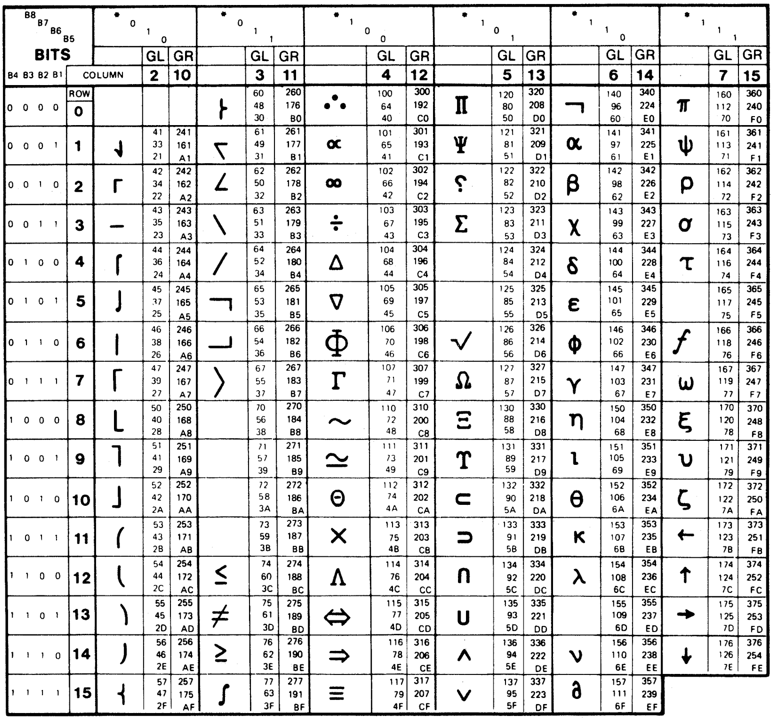
Figure 2-7 DEC Special Graphic Character Set

DEC Technical Character Set

This 7-bit character set has 94 graphic characters. The DEC Technical set has characters and symbols often used in technical applications, such as schematic and logic diagrams.

Figure 2-8 shows the DEC Technical set. The C0 controls are in columns 0 and 1. The graphic characters and symbols are in columns 2 through 7. You can use the characters in positions 2/1 through 3/7 to form large composite characters.

You can use the DEC Technical set to replace the ASCII set in GL or the DEC Supplemental Graphic set in GR. You can only use the DEC Technical set in VT300 mode.



B8 B7 B6 B5 BITS		* 0 1 0			* 0 1 1			* 1 0 0			* 1 0 1			* 1 1 0			* 1 1 1		
			GL	GR		GL	GR		GL	GR		GL	GR		GL	GR		GL	GR
B4 B3 B2 B1	COLUMN		2	10		3	11		4	12		5	13		6	14		7	15
	ROW																		
0 0 0 0	0				⎬	60 48 30	260 176 B0	∴	100 64 40	300 192 C0	Π	120 80 50	320 208 D0	¬	140 96 60	340 224 E0	π	160 112 70	360 240 F0
0 0 0 1	1	⎷	41 33 21	241 161 A1	⎲	61 49 31	261 177 B1	∝	101 65 41	301 193 C1	Ψ	121 81 51	321 209 D1	α	141 97 61	341 225 E1	ψ	161 113 71	361 241 F1
0 0 1 0	2	┌	42 34 22	242 162 A2	⎳	62 50 32	262 178 B2	∞	102 66 42	302 194 C2	?	122 82 52	322 210 D2	β	142 98 62	342 226 E2	ρ	162 114 72	362 242 F2
0 0 1 1	3	─	43 35 23	243 163 A3	╲	63 51 33	263 179 B3	÷	103 67 43	303 195 C3	Σ	123 83 53	323 211 D3	χ	143 99 63	343 227 E3	σ	163 115 73	363 243 F3
0 1 0 0	4	⌠	44 36 24	244 164 A4	╱	64 52 34	264 180 B4	Δ	104 68 44	304 196 C4		124 84 54	324 212 D4	δ	144 100 64	344 228 E4	τ	164 116 74	364 244 F4
0 1 0 1	5	⌡	45 37 25	245 165 A5	┐	65 53 35	265 181 B5	∇	105 69 45	305 197 C5		125 85 55	325 213 D5	ε	145 101 65	345 229 E5		165 117 75	365 245 F5
0 1 1 0	6	│	46 38 26	246 166 A6	┘	66 54 36	266 182 B6	Φ	106 70 46	306 198 C6	√	126 86 56	326 214 D6	φ	146 102 66	346 230 E6	ƒ	166 118 76	366 246 F6
0 1 1 1	7	⎡	47 39 27	247 167 A7	⟩	67 55 37	267 183 B7	Γ	107 71 47	307 199 C7	Ω	127 87 57	327 215 D7	γ	147 103 67	347 231 E7	ω	167 119 77	367 247 F7
1 0 0 0	8	⎣	50 40 28	250 168 A8		70 56 38	270 184 B8	∼	110 72 48	310 200 C8	Ξ	130 88 58	330 216 D8	η	150 104 68	350 232 E8	ξ	170 120 78	370 248 F8
1 0 0 1	9	⎤	51 41 29	251 169 A9		71 57 39	271 185 B9	≃	111 73 49	311 201 C9	Υ	131 89 59	331 217 D9	ι	151 105 69	351 233 E9	υ	171 121 79	371 249 F9
1 0 1 0	10	⎦	52 42 2A	252 170 AA		72 58 3A	272 186 BA	Θ	112 74 4A	312 202 CA	⊂	132 90 5A	332 218 DA	θ	152 106 6A	352 234 EA	ζ	172 122 7A	372 250 FA
1 0 1 1	11	⎛	53 43 2B	253 171 AB		73 59 3B	273 187 BB	×	113 75 4B	313 203 CB	⊃	133 91 5B	333 219 DB	κ	153 107 6B	353 235 EB	←	173 123 7B	373 251 FB
1 1 0 0	12	⎝	54 44 2C	254 172 AC	≤	74 60 3C	274 188 BC	Λ	114 76 4C	314 204 CC	∩	134 92 5C	334 220 DC	λ	154 108 6C	354 236 EC	↑	174 124 7C	374 252 FC
1 1 0 1	13	⎞	55 45 2D	255 173 AD	≠	75 61 3D	275 189 BD	⇔	115 77 4D	315 205 CD	∪	135 93 5D	335 221 DD		155 109 6D	355 237 ED	→	175 125 7D	375 253 FD
1 1 1 0	14	⎠	56 46 2E	256 174 AE	≥	76 62 3E	276 190 BE	⇒	116 78 4E	316 206 CE	∧	136 94 5E	336 222 DE	ν	156 110 6E	356 238 EE	↓	176 126 7E	376 254 FE
1 1 1 1	15	⎨	57 47 2F	257 175 AF	∫	77 63 3F	277 191 BF	≡	117 79 4F	317 207 CF	∨	137 95 5F	337 223 DF	∂	157 111 6F	357 239 EF			

LEGEND

CHARACTER ∝	4/1	12/1	COLUMN/ROW
	101	301	OCTAL
	65	193	DECIMAL
	41	C1	HEX

* NOTE:
WHEN SET IS MAPPED INTO GR, BIT B8 IS 1

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Figure 2-8 DEC Technical Character Set

Down-Line-Loadable (Soft) Character Set

The VT300 lets you down-line-load a character set from the host system. The character set can have up to 96 graphic characters. You can design your own character set, then load the set into the terminal. You can use the set in GL or GR. Chapter 5 describes how to load and use a soft character set.

You can only use this character set in VT300 mode.

CONTROL CHARACTERS

The purpose of a control character is to control an action such as line spacing, paging, or data flow. The terminal does not display control characters unless you select display controls mode (described later in this chapter). There are two groups of control characters.

C0	7-bit control characters, in columns 0 and 1 of the 8-bit code table
C1	8-bit control characters, in columns 8 and 9 of the 8-bit code table

Table 2-2 lists the C0 control characters the VT300 recognizes. Table 2-3 lists the C1 control characters the VT300 recognizes. You can also code C1 control characters as 7-bit escape sequences. Table 2-4 lists the equivalent 7-bit sequences for 8-bit control characters. All three tables give column/row locations to help you find the characters in the character sets.

Table 2-2 C0 (7-Bit) Control Characters Recognized

Name	Mnemonic Column/Row	Function
Null	NUL 0/0	Ignored.
Enquiry	ENQ 0/5	Sends answerback message.
Bell	BEL 0/7	Sounds the bell tone if the Warning Bell feature is enabled in the Keyboard Set-Up.
Backspace	BS 0/8	Moves the cursor one character position to the left. If the cursor is at the left margin, no action occurs.

Table 2-2 C0 (7-Bit) Control Characters Recognized (Cont)

Name	Mnemonic Column/Row	Function
Horizontal tab	**HT** 0/9	*Interactive mode* Moves the cursor to the next tab stop. If there are no more tab stops, the cursor moves to the right margin. HT does not cause text to auto wrap. *Local editing mode* Depends on the setting of erasure mode (ERM). ERM set Moves the cursor to the next tab stop or field boundary. ERM reset Moves the cursor to the next unprotected field boundary. If there are no tab stops or character fields in the scrolling region, the page scrolls to the next tab stop or field.
Line feed	**LF** 0/10	Causes a line feed or a new line operation, depending on the setting of line feed/new line mode.
Vertical tab	**VT** 0/11	Treated as LF.
Form feed	**FF** 0/12	Treated as LF.
Carriage return	**CR** 0/13	Moves the cursor to the left margin on the current line.
Shift out (Locking shift 1)	**SO** (LS1) 0/14	Maps the G1 character set into GL. You designate G1 by using a select character set (SCS) sequence (Chapter 5).

Table 2-2 C0 (7-Bit) Control Characters Recognized (Cont)

Name	Mnemonic Column/Row	Function
Shift in (Locking shift 0)	**SI** 0/15	Maps the G0 character set into GL. You designate G0 by using a select character set (SCS) sequence (Chapter 5).
Device control 1 (XON)	**DC1** 1/1	Also known as XON. If XON/XOFF flow control is enabled in set-up, DC1 clears DC3 (XOFF). This action causes the VT300 to continue sending characters.
Device control 3 (XOFF)	**DC3** 1/3	Also known as XOFF. If XON/XOFF flow control is enabled in set-up, DC3 causes the VT300 to stop sending characters. The terminal cannot resume sending characters until it receives a DC1 control character.
Device control 4	**DC4** 1/4	Introduces an SSU session management command. The VT300 and host use this control to separate SSU commands from ANSI text and control functions. See Chapter 14.
Cancel	**CAN** 1/8	Immediately cancels an escape sequence, control sequence, or device control string in progress. The VT300 does not display any error characters.
Substitute	**SUB** 1/10	Immediately cancels an escape sequence, control sequence, or device control string in progress. The VT300 displays a reverse question mark ⸮ for an error character.
Escape	**ESC** 1/11	Introduces an escape sequence. ESC also cancels any escape sequence, control sequence, or device control string in progress.
Delete	**DEL** 7/15	Ignored when received, unless a 96-character set is mapped into GL. DEL is not used as a fill character. Digital does not recommend using DEL as a fill character. Use NUL instead.

Table 2-3 C1 (8-Bit) Control Characters Recognized

Name	Mnemonic Column/Row	Function
Index	IND 8/4	Moves the cursor down one line in the same column. If the cursor is at the bottom margin, the page scrolls up.
Next line	NEL 8/5	Moves the cursor to the first position on the next line. If the cursor is at the bottom margin, the page scrolls up.
Start selected area	SSA 8/6	Defines the cursor position as the start of a block of data eligible to be sent to the host (Chapter 9).
End selected area	ESA 8/7	Defines the cursor position as the end of a block of data eligible to be sent to the host (Chapter 9).
Horizontal tab set	HTS 8/8	Sets a horizontal tab stop at the column where the cursor is.
Reverse index	RI 8/13	Moves the cursor up one line in the same column. If the cursor is at the top margin, the page scrolls down.
Single shift 2	SS2 8/14	Temporarily maps the G2 character set into GL, for the next graphic character. You designate the G2 set by using a select character set (SCS) sequence (Chapter 5).
Single shift 3	SS3 8/15	Temporarily maps the G3 character set into GL, for the next graphic character.You designate the G3 set by using a select character set (SCS) sequence (Chapter 5).
Device control string	DCS 9/0	Introduces a device control string.
Set transmit state	STS 9/3	The VT300 sends STS to the host to request a block transmission (Chapter 9).

Table 2-3 C1 (8-Bit) Control Characters Recognized (Cont)

Name	Mnemonic Column/Row	Function
Start protected area	**SPA** 9/6	Defines the cursor position as the start of a character string that you cannot edit from the keyboard.
End protected area	**EPA** 9/7	Defines the cursor position as the end of a character string that you cannot edit from the keyboard.
Control sequence introducer	**CSI** 9/11	Introduces a control sequence.
String terminator	**ST** 9/12	Ends a device control string. You use ST in combination with DCS.
Operating system command	**OSC** 9/13	Introduces an operating system command.*
Privacy message	**PM** 9/14	Introduces a privacy message string.*
Application program command	**APC** 9/15	Introduces an application program command.*

* The VT300 ignores all following characters, until it receives a SUB, ST, or any other C1 control character.

Table 2-4 8-Bit Control Characters and Their 7-Bit Equivalents

Name	8-Bit Character	7-Bit Sequence	
Index	**IND** 8/4	**ESC** 1/11	**D** 4/4
Next line	**NEL** 8/5	**ESC** 1/11	**E** 4/5

Table 2-4 8-Bit Control Characters and Their 7-Bit Equivalents (Cont)

Name	8-Bit Character	7-Bit Sequence
Start selected area	SSA 8/6	ESC F 1/11 4/6
End selected area	ESA 8/7	ESC G 1/11 4/7
Horizontal tab set	HTS 8/8	ESC H 1/11 4/8
Reverse index	RI 8/13	ESC M 1/11 4/13
Single shift 2	SS2 8/14	ESC N 1/11 4/14
Single shift 3	SS3 8/15	ESC O 1/11 4/15
Device control string	DCS 9/0	ESC P 1/11 5/0
Set transmit state	STS 9/3	ESC S 1/11 5/3
Start protected area	SPA 9/6	ESC V 1/11 5/6
End protected area	EPA 9/7	ESC W 1/11 5/7
Control sequence introducer	CSI 9/11	ESC [1/11 5/11
String terminator	ST 1/11	ESC \\ 1/11 5/12
Operating system command	OSC 9/13	ESC] 1/11 5/13
Privacy message	PM 9/14	ESC ^ 1/11 5/14
Application program	APC 9/15	ESC _ 1/11 5/15

CONTROL FUNCTIONS

You use control functions to make the terminal perform special actions in your applications. These functions range from the simple — editing data — to the complex — reporting on the terminal's operating state. The rest of this manual covers the many uses for control functions. Here are some examples.

Move the cursor.
Delete a line of text.
Select bold or underlined text.
Change character sets.
Make the terminal emulate a VT52 or VT100 terminal.

You can use all control functions in text mode. There are single-character and multiple-character control functions.

The single-character functions are the C0 and C1 control characters. You can use C0 characters in a 7-bit or 8-bit environment. C1 characters provide a few more functions than C0 characters, but you can only use C1 characters directly in an 8-bit environment. To use C1 characters in a 7-bit environment, you must use their 7-bit equivalent representation. See "7-Bit C1 Representation Technique " in this chapter.

Multiple-character functions provide many more functions than the C0 and C1 characters. Multiple-character functions can use control characters and graphic characters. There are three basic types of multiple-character functions.

escape sequences
control sequences
device control strings

Many sequences are based on ANSI and ISO standards, and are used throughout the industry. Others are private sequences created by manufacturers like Digital for specific families of products. ANSI sequences and private sequences follow ANSI and ISO standards for control functions.

In this manual, private control functions created by Digital have the prefix DEC in their mnemonic name. For example, column mode has the mnemonic DECCOLM. All other control functions are standardized.

The following sections describe the format for escape sequences, control sequences, and device control strings.

PROGRAMMING TIP: When you use control functions, remember that the binary codes define a function—-not the graphic characters. This manual uses graphic characters from the DEC Multinational character set to show control functions. If you use another character set, the graphic characters for control functions may change, but the code is always the same.

Sequence Format

This manual shows escape and control sequences in their 8-bit format. You can also use equivalent 7-bit sequences (Table 2-4).

The 8-bit format uses the C0 and C1 control characters and ASCII characters from the DEC Multinational character set. The sequences also show each character's column/row position in the character set table, below the character. The column/row code eliminates confusion over similar looking characters such as 0 (3/0) and O (4/15).

NOTE: Spaces appear between characters in a sequence for clarity. These spaces are not part of the sequence. If a space is part of the sequence, the SP (2/0) character appears.

Escape Sequences

An escape sequence uses two or more bytes to define a specific control function. Escape sequences do not include variable parameters, but may include intermediate characters. Here is the format for an escape sequence.

ESC	**I**	**F**
1/11	2/0 to 2/15	3/0 to 7/14
Escape	Intermediate characters (zero or more characters)	Final character (one character)

ESC introduces escape sequences. After receiving the ESC control character, the terminal interprets the next received characters as part of the sequence.

I represents zero or more *intermediate characters* that can follow the ESC character. Intermediate characters come from the 2/0 through 2/15 range of the code table.

F is the *final character*. This character indicates the end of the sequence. The final character comes from the 3/0 through 7/14 range of the code table. The intermediate and final characters together define a single control function.

For example, the following escape sequence changes the current line of text to double-width, single-height characters.

ESC	**#**	6
1/11	2/3	3/6

Control Sequences

A control sequence uses two or more bytes to define a specific control function. Control sequences usually include variable parameters. Here is the format for a control sequence.

CSI	**P...P**	**I...I**	**F**
9/11	3/0 to 3/15	2/0 to 2/15	4/0 to 7/14
Control sequence introducer	Parameter (zero or more characters)	Intermediate (zero or more characters)	Final (one character)

CSI is the *control sequence introducer.* You can also use the equivalent 7-bit sequence, ESC (1/11) [(5/11), as a substitute for CSI. After receiving CSI, the terminal interprets the next received characters as part of the sequence.

P...P are *parameter characters* received after CSI. These characters are in the 3/0 to 3/15 range in the code table. Parameter characters modify the action or interpretation of the sequence. You can use up to 16 parameters per sequence. You must use the ; (3/11) character to separate parameters.

All parameters are unsigned, positive decimal integers, with the most significant digit sent first. Any parameter greater than 9999 (decimal) is set to 9999 (decimal). If you do not specify a value, a 0 value is assumed. A 0 value or omitted parameter indicates a *default value* for the sequence. For most sequences, the default value is 1.

NOTE: All parameters must be positive decimal integers. Do not use a decimal point in a parameter— the terminal will ignore the command.

If the first character in a parameter string is the ? (3/15) character, it indicates that DEC private parameters follow.

The VT300 processes two types of parameters, numeric and selective.

Numeric Parameters - A numeric parameter indicates a number value such as a margin location. In this manual, numeric parameters appear as actual values or as Pn, Pn1, Pn2, and so on.

The following is an example of a control sequence with numeric parameters.

CSI	**5**	**;**	**2**	**0**	**r**
9/11	3/5	3/11	3/2	3/0	7/2
Control sequence introducer	First numeric parameter	Delimiter	Second numeric parameter		Final character

This sequence sets the top and bottom margins of the current page. The top margin is at line 5, the bottom is at line 20. The ; (3/11) separates the two parameters.

Selective Parameters - A selective parameter selects an action associated with the specific parameter. In this manual, selective parameters usually appear as Ps, Ps1, Ps2 and so on.

The following is an example of a control sequence using selective parameters.

CSI	**1**	**;**	**4**	**m**
9/11	3/1	3/11	3/4	6/13
Control sequence introducer	First selective parameter	Delimiter	Second selective parameter	Final character

This control sequence turns on the bold and underline attribute at the the cursor position. The parameters are 1 (indicating the bold attribute)and 4 (indicating the underline attribute). The ; (3/11) delimiter separates the two parameters.

I...I are zero or more *intermediate characters* received after CSI. These characters are in the 2/0 to 2/15 range.

F is the *final character* from the 4/0 to 7/14 range. The final character indicates the end of the sequence. The intermediate and final characters together define a control function. If there are no intermediate characters, the final character defines the function.

Device Control Strings

Device control strings (DCS), like control sequences, use two or more bytes to define specific control functions. However, a DCS also includes a data string. Here is the format for a device control string.

DCS	P...P	I...I	F	Data string	ST
9/0	3/0 to 3/15	2/0 to 2/15	4/0 to 7/15	************	9/12
Device control string introducer	Zero or more parameters	Zero or more intermediates	Final	String	String terminator

DCS is *the device control string introducer.* DCS is the C1 control character at position 9/0. You can also use the equivalent 7-bit sequence, ESC (1/11) P (5/0). After receiving DCS, the terminal processes the next received characters as part of the string function.

P..P are *parameter characters* received after DCS. Parameter characters are in the 3/0 to 3/15 range. They modify the action or interpretation of the device control string. You can use up to 16 parameters per string. Each parameter is separated with a ; (3/11) character. These characters follow the same rules as in a control sequence. See the "Control Sequences" section in this chapter.

I...I are zero or more intermediate characters received after CSI. These characters are in the 2/0 to 2/15 range.

F is the final character in the 4/0 to 7/14 range. The final character indicates the end of the string. The intermediate and final characters define the string. If there are no intermediates, the final character defines the string.

Data string follows the final character and usually includes several definition strings. Each definition string can be several characters in length. Individual strings are separated by the ; (3/11) delimiter.

ST is the *string terminator.* ST (9/12) indicates the end of a string. You can also use the equivalent 7-bit sequence, ESC (1/11) \ (5/12).

The following is an example of a device control string.

DCS	0	!	u	%	5	ST
9/0	3/0	2/1	7/5	2/5	3/5	9/12
Device control string introducer	Parameter	Intermediate	Final	Data string		String terminator

This device control string assigns the DEC Supplemental Graphic set as the user-preferred supplemental set.

Using Control Characters in Sequences

You can use control characters — ESC, CAN, and SUB — to interrupt or recover from errors in escape sequences, control sequences, and device control strings.

- You can send ESC (1/11) to cancel a sequence in progress and begin a new sequence.
- You can send CAN (1/8) to indicate the present data is in error or to cancel a sequence in progress. The VT300 interprets the characters following CAN as usual.
- You can send SUB (1/10) to cancel a sequence in progress. The VT300 interprets the characters following SUB as usual.

The VT300 does not lose data when errors occur in escape or control sequences and device control strings. The terminal ignores unrecognized sequences and strings, unless they end a current escape sequence.

7-Bit C1 Representation Technique

You can represent all C1 control characters as 7-bit escape sequences. You can use the C1 characters indirectly, by representing them as 2-character escape sequences. ANSI calls this technique a 7-bit C1 representation technique. The 7-bit equivalent representation provides a way of using C1 characters in applications written for a 7-bit environment. Here are some examples.

8-Bit C1 Character	**7-Bit C1 Representation Escape Sequence**	
CSI	**ESC**	**[**
9/11	1/11	5/11
SS3	**ESC**	**O**
8/15	1/11	4/15
IND	**ESC**	**D**
8/4	1/11	4/4
DCS	**ESC**	**P**
9/0	1/11	5/0

In general, you can use the 7-bit C1 representation technique in two ways.

- You can represent any C1 control character as a 2-character escape sequence. The second character of the sequence has a code that is 40 (hexadecimal) and 64 (decimal) less than that of the C1 character.
- You can make any escape sequence whose second character is in the range of 4/0 through 5/15 one byte shorter by removing the ESC character and adding 40 (hexadecimal) to the code of the second character. This generates an 8-bit control character. For example, you can change ESC [to CSI with this method.

WORKING WITH 7-BIT AND 8-BIT ENVIRONMENTS

There are three requirements for using one of the terminal's 8-bit character sets.

- Your program and communication environment must be 8-bit compatible.
- The terminal cannot be in national replacement character set mode (DECNRCM).
- The terminal must operate in VT300 mode. When the terminal operates in VT100 mode or VT52 mode, you are limited to working in a 7-bit environment.

The following sections describe conventions that apply in VT300 mode.

Conventions for Codes Received by the Terminal

The terminal expects to receive character codes in a form compatible with 8-bit coding. Your application can use the C0 and C1 control characters, as well as the 7-bit C1 representations, if necessary. The terminal always interprets these codes correctly.

When your program sends GL or GR codes, the terminal interprets the character codes according to the graphic character sets in use. When you turn on or reset the terminal, you automatically select the DEC Multinational character set. This mapping assumes the current terminal mode is VT300 mode.

Conventions for Codes Sent by the Terminal

The terminal can send data to an application in two ways.

- Directly from the keyboard
- In response to commands from the host (application or operating system)

Most function keys on the keyboard send multiple-character control functions. Many of these functions start with CSI (9/11) or SS3 (8/15), which are C1 characters. If your application cannot handle 8-bit characters, you can make the terminal automatically convert all C1 characters to their equivalent 7-bit representations before sending them to the application. To convert C1 characters, you use the DECSCL commands described in Chapter 4.

By default, the terminal is set to automatically convert all C1 characters sent to the application to 7-bit representations. However, to ensure the correct mode of operation, always use the appropriate DECSCL commands.

NOTE: In VT300 mode, the terminal can send GR graphic characters to an application, even if the application cannot handle 8-bit codes. However, in a 7-bit environment, the terminal sends C1 controls as 7-bit escape sequences and does not send 8-bit graphic characters.

New programs should accept both 7-bit and 8-bit forms of the C1 control characters.

DISPLAY CONTROLS MODE

The VT300 lets you display control characters as graphic characters, when you want to debug your applications. In this mode, the terminal does not perform all control functions.

To select this mode, you must set the **Control Representation** feature in the Set-Up Display screen to Display Controls. You cannot select this mode with an escape sequence.

The effect of the Display Controls setting depends on the operating mode you use.

In VT300 mode
When you select Display Controls, the terminal temporarily loads a special graphic character set into C0, GL, C1, and GR. Figure 2-9 shows this special set, called the display controls font. The terminal uses this font to display control characters on the screen.

In VT52 or VT100 mode

When you select Display Controls, the terminal temporarily loads the left half of the display controls font into C0 and GL. The terminal uses this half of the font to display all C0 and GL characters. (C1 and GR are meaningless in VT52 or VT100 mode.)

ROW	COLUMN	0		1		2		3		4		5		6		7	
	BITS b8 b7 b6 b5 b4 b3 b2 b1	0 0 0 0		0 0 0 1		0 0 1 0		0 0 1 1		0 1 0 0		0 1 0 1		0 1 1 0		0 1 1 1	
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
1	0 0 0 1	SOH	1 1 1	DC1	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
2	0 0 1 0	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
3	0 0 1 1	ETX	3 3 3	DC3	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
4	0 1 0 0	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
5	0 1 0 1	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
6	0 1 1 0	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
7	0 1 1 1	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
8	1 0 0 0	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
9	1 0 0 1	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
10	1 0 1 0	LF	12 10 A	⸮	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
11	1 0 1 1	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
12	1 1 0 0	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
13	1 1 0 1	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
14	1 1 1 0	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
15	1 1 1 1	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	DT	177 127 7F

|←— C0 CODES —→|←— GL CODES (ASCII GRAPHIC) —→|

KEY

CHARACTER	ESC	33	OCTAL
		27	DECIMAL
		1B	HEX

MA-0893-83W

Figure 2-9 Display Controls Font (Left Half)

Exceptions

Some control functions still work in this mode.

- LF, FF, and VT cause a carriage return and line feed (CR LF) that move the cursor to a new line. The terminal displays the LF, FF, or VT character before performing the new line function.
- XOFF (DC3) and XON (DC1) maintain flow control, if enabled in set-up. The terminal displays the DC1 or DC3 character after performing the control function.
- The terminal does not display SSU session management commands (Chapter 14).

8		9		10		11		12		13		14		15		COLUMN	
1 0 0 0		1 0 0 1		1 0 1 0		1 0 1 1		1 1 0 0		1 1 0 1		1 1 1 0		1 1 1 1		b8 b7 b6 b5 BITS b4 b3 b2 b1	ROW
80	200 128 80	DCS	220 144 90	NSP	240 160 A0	°	260 176 B0	À	300 192 C0	Ð	320 208 D0	à	340 224 E0	ð	360 240 F0	0 0 0 0	0
81	201 129 81	PU1	221 145 91	¡	241 161 A1	±	261 177 B1	Á	301 193 C1	Ñ	321 209 D1	á	341 225 E1	ñ	361 241 F1	0 0 0 1	1
82	202 130 82	PU2	222 146 92	¢	242 162 A2	²	262 178 B2	Â	302 194 C2	Ò	322 210 D2	â	342 226 E2	ò	362 242 F2	0 0 1 0	2
83	203 131 83	STS	223 147 93	£	243 163 A3	³	263 179 B3	Ã	303 195 C3	Ó	323 211 D3	ã	343 227 E3	ó	363 243 F3	0 0 1 1	3
IND	204 132 84	CCH	224 148 94	¤	244 164 A4	´	264 180 B4	Ä	304 196 C4	Ô	324 212 D4	ä	344 228 E4	ô	364 244 F4	0 1 0 0	4
NEL	205 133 85	MW	225 149 95	¥	245 165 A5	µ	265 181 B5	Å	305 197 C5	Õ	325 213 D5	å	345 229 E5	õ	365 245 F5	0 1 0 1	5
SSA	206 134 86	SPA	226 150 96	¦	246 166 A6	¶	266 182 B6	Æ	306 198 C6	Ö	326 214 D6	æ	346 230 E6	ö	366 246 F6	0 1 1 0	6
ESA	207 135 87	EPA	227 151 97	§	247 167 A7	·	267 183 B7	Ç	307 199 C7	×	327 215 D7	ç	347 231 E7	÷	367 247 F7	0 1 1 1	7
HTS	210 136 88	98	230 152 98	¨	250 168 A8	¸	270 184 B8	È	310 200 C8	Ø	330 216 D8	è	350 232 E8	ø	370 248 F8	1 0 0 0	8
HTJ	211 137 89	99	231 153 99	©	251 169 A9	¹	271 185 B9	É	311 201 C9	Ù	331 217 D9	é	351 233 E9	ù	371 249 F9	1 0 0 1	9
VTS	212 138 8A	9A	232 154 9A	ª	252 170 AA	º	272 186 BA	Ê	312 202 CA	Ú	332 218 DA	ê	352 234 EA	ú	372 250 FA	1 0 1 0	10
PLD	213 139 8B	CSI	233 155 9B	«	253 171 AB	»	273 187 BB	Ë	313 203 CB	Û	333 219 DB	ë	353 235 EB	û	373 251 FB	1 0 1 1	11
PLU	214 140 8C	ST	234 156 9C	¬	254 172 AC	¼	274 188 BC	Ì	314 204 CC	Ü	334 220 DC	ì	354 236 EC	ü	374 252 FC	1 1 0 0	12
RI	215 141 8D	OSC	235 157 9D	-	255 173 AD	½	275 189 BD	Í	315 205 CD	Ý	335 221 DD	í	355 237 ED	ý	375 253 FD	1 1 0 1	13
SS2	216 142 8E	PM	236 158 9E	®	256 174 AE	¾	276 190 BE	Î	316 206 CE	Þ	336 222 DE	î	356 238 EE	þ	376 254 FE	1 1 1 0	14
SS3	217 143 8F	APC	237 159 9F	¯	257 175 AF	¿	277 191 BF	Ï	317 207 CF	ß	337 223 DF	ï	357 239 EF	ÿ	377 255 FF	1 1 1 1	15

|← C1 CODES →|← GR CODES ISO LATIN-1 SUPPLEMENTAL GRAPHIC →|

MA-0401-86

Figure 2-9 Display Controls Font (Right Half)

PART 2

CONTROL FUNCTIONS SENT TO THE HOST

KEYBOARD CODES 3

Keyboard Codes, 47
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  Unlocking the Keyboard, 61

This chapter describes the codes that the terminal can send to an application program. The chapter assumes that you are familiar with the character-encoding concepts described in Chapter 2.

In VT300 or VT100 mode, the keyboard keys send codes that are compatible with ANSI standards. In VT52 mode, some keys send codes that differ from those sent in the ANSI-compatible modes. This chapter lists VT52 codes that differ from the ANSI-compatible codes.

The terminal can use 16 different national keyboards. This chapter describes significant differences among the keyboards.

KEYBOARD CODES

The keyboard (Figure 3-1) has four groups of keys: a main keypad, an editing keypad, an auxiliary keypad, and the top-row function keys.

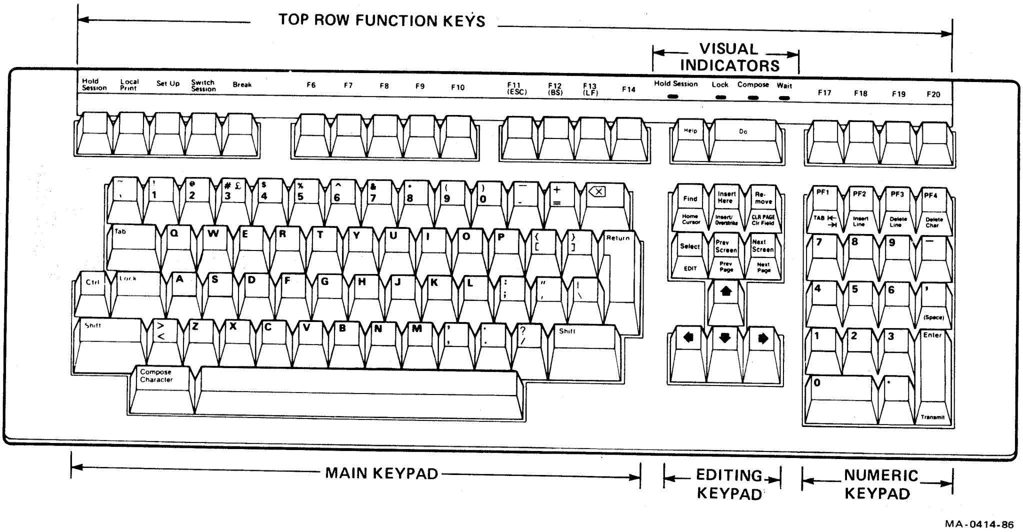
TOP ROW FUNCTION KEYS
VISUAL INDICATORS
Hold Session
Local Print
Set Up
Switch Session
Break
F6
F7
F8
F9
F10
F11 (ESC)
F12 (BS)
F13 (LF)
F14
Hold Session
Lock
Compose
Wait
F17
F18
F19
F20
Help
Do
Tab
Return
Ctrl
Lock
Shift
Shift
Compose Character
Find
Insert Here
Re-move
Select
Prev Screen
Next Screen
PF1
PF2
PF3
PF4
Enter
MAIN KEYPAD
EDITING KEYPAD
NUMERIC KEYPAD
MA-0414-86

Figure 3-1 Four Key Groups (North American/U.K. Keyboard)

Main Keypad

The main keypad has standard keys and function keys. You use the standard keys to send letters, numbers, and other symbols. You use the function keys to send special function codes.

Standard Keys - The standard keys send alphanumeric characters. You must use more than one key to produce some special characters.

Some standard keys vary on the different keyboards. On the North American/United Kingdom keyboard, all standard keys are ASCII characters and send only ASCII codes. The North American/U.K. keyboard does not have any standard keys that send DEC Supplemental Graphic or ISO Latin-1 supplemental characters alone.

The North American/U.K. keyboard is a special case. Most other keyboards have some standard keys that send DEC Supplemental Graphic or ISO Latin-1 supplemental characters, as well as ASCII characters. For example, many of the European keyboards have standard keys that send characters with accent marks or diacritical marks.

On the The North American/U.K. keyboard, when you set the Keyboard Dialect feature in the Keyboard Set-Up screen to British, you can use the 3 key on the top row to type the £ sign. Chapter 4 of *Installing and Using the VT330/VT340 Video Terminal* explains how to set the £ sign.

You can create any DEC or ISO Latin-1 supplemental character that is not available on a standard key by typing a compose sequence. Chapter 6 of *Installing and Using the VT330/VT340 Video Terminal* explains how to use compose sequences.

Each graphic character has a unique code. This code is always the same, no matter which keyboard you use or how many keys you press to create that character. The code is based on the character's position in the 8-bit code table (Chapter 2).

You can use GL characters in a 7-bit or 8-bit environment. You can use GR characters only in an 8-bit environment. VT52 and VT100 modes are intended for use in 7-bit environments, as well as data exchange over a 7-bit host line. VT300 mode is intended for use in 8-bit environments, as well as data exchange over an 8-bit host line.

Some standard keys can work as data processing keys. Every keyboard except the North American/U.K. keyboard has some data processing keys. Data processing keys have three or four characters on the top of their keycap, rather than the normal two. The data processing keys send characters that are commonly used in data processing applications. Figure 3-2 shows an example.

You can select "Typewriter Keys" or "Data Processing Keys" in the Keyboard Set-Up screen. When you select "Data Processing Keys," the data processing keys send the character on the right side of their keycap. When you select "Typewriter Keys," they send the character on the left side of their keycap. You can select shifted (upper) character codes for these keys by holding the Shift key down.

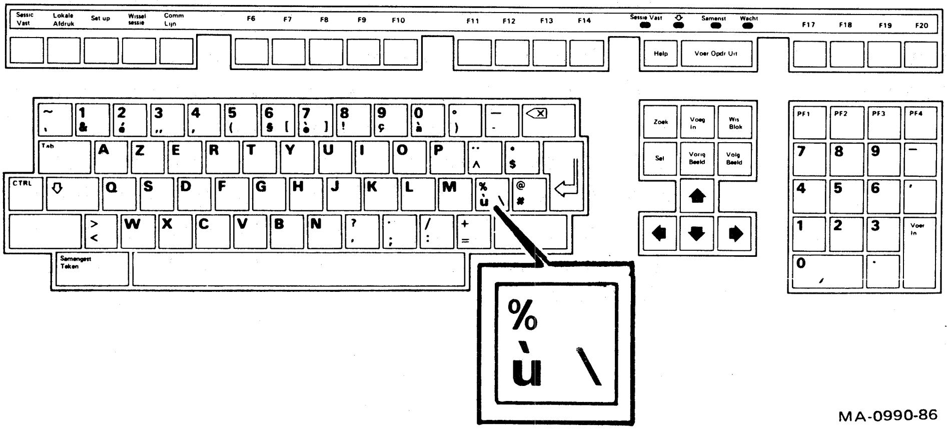

Figure 3-2 Standard Key with a Data Processing Character (French/Belgian Keyboard)

Function Keys - This section describes the function keys on the main keypad. Remember, the column/row numbers that appear after a character tell you the position of the character in the code table (Chapter 2). For example, the DEL character is at column 7/ row 15.

Key	Function
<X]	The <X] key sends a delete character (DEL, 7/15) or a backspace character (BS, 0/8), depending on the backarrow key mode selected. You can select the mode by using set-up or a control function.
Tab	The **Tab** key sends a horizontal tab character (HT, 0/9).
Return	The **Return** key sends either a carriage return (CR, 0/13), or a carriage return (CR, 0/13) and line feed (LF, 0/10), depending on the state of line feed/new line mode (LNM). See Chapter 11.
Ctrl	The **Ctrl** key alone does not send a code.You use **Ctrl** with another key to send a control code.
Lock	The **Lock** key alone does not send a code. You use **Lock** to set or clear the "caps lock" or "shift lock" state. You select "caps lock" or "shift lock" in the Keyboard Set-Up screen.
Shift (2 keys)	The **Shift** key alone does not send a code. You use **Shift** with another standard key, to send the top character shown on the key.
Space bar	The space bar sends a space character (SP, 2/0).
Compose Character	The **Compose Character** key does not send a code. Pressing **Compose Character** starts a compose sequence. You can use compose sequences to create characters that do not appear on any single key (such as characters from the DEC Supplemental Graphic set). You can disable the **Compose Character** key in set-up. See *Installing and Using the VT330/VT340 Video Terminal.*

Editing Keypad

The editing keypad includes the editing keys and arrow keys. Table 3-1 lists the codes sent by the editing keys, and Table 3-2 lists the codes sent by the arrow keys. Normally, you use the arrow keys to control the cursor on the screen.

Table 3-1 Codes Sent by Editing Keys

	Code Sent	
Key	**VT300 Mode**	**VT100, VT52 Modes**
Find	CSI 1 ~ 9/11 3/1 7/14	The editing keys do not send codes in these two modes.
Insert Here	CSI 2 ~ 9/11 3/2 7/14	
Remove	CSI 3 ~ 9/11 3/3 7/14	
Select	CSI 4 ~ 9/11 3/4 7/14	
Prev Screen	CSI 5 ~ 9/11 3/5 7/14	
Next Screen	CSI 6 ~ 9/11 3/6 7/14	

Table 3-2 Codes Sent by Arrow Keys

	Cursor Key Mode Setting (DECCKM)			
	ANSI Mode		VT52 Mode*	
Key	Cursor	Application	Cursor	Application
↑	CSI A	SS3 A	ESC A	ESC A
	9/11 4/1	8/15 4/1	1/11 4/1	1/11 4/1
↓	CSI B	SS3 B	ESC B	ESC B
	9/11 4/2	8/15 4/2	1/11 4/2	1/11 4/2
→	CSI C	SS3 C	ESC C	ESC C
	9/11 4/3	8/15 4/3	1/11 4/3	1/11 4/3
←	CSI D	SS3 D	ESC D	ESC D
	9/11 4/4	8/15 4/4	1/11 4/4	1/11 4/4

* ANSI mode applies to VT300 and VT100 modes. VT52 mode is not compatible with ANSI mode.

Numeric Keypad

The characters sent by the numeric keypad depend on the setting of VT52 mode and keypad numeric mode. The application usually selects the application keypad codes. However, you can select the application keypad codes in the Keyboard Set-Up screen. See Chapter 11 for more information about the numeric keypad.

Table 3-3 lists the character codes sent by the numeric keypad in ANSI modes (VT100 and VT300) and in VT52 mode.

Table 3-3 Codes Sent by Numeric Keypad Keys

	Keypad Mode Setting (DECNKM)						
	ANSI Mode*			VT52 Mode*			
Key	Numeric	Application		Numeric	Application		
0	0	SS3	p	0	ESC	?	p
	3/0	8/15	7/0	3/0	1/11	3/15	7/0
1	1	SS3	q	1	ESC	?	q
	3/1	8/15	7/1	3/1	1/11	3/15	7/1
2	2	S3	r	2	ESC	?	r
	3/2	8/15	7/2	3/2	1/11	3/15	7/2
3	3	SS3	s	3	ESC	?	s
	3/3	8/15	7/3	3/3	1/11	3/15	7/3
4	4	SS3	t	4	ESC	?	t
	3/4	8/15	7/4	3/4	1/11	3/15	7/4
5	5	SS3	u	5	ESC	?	u
	3/5	8/15	7/5	3/5	1/11	3/15	7/5
6	6	SS3	v	6	ESC	?	v
	3/6	8/15	7/6	3/6	1/11	3/15	7/6
7	7	SS3	w	7	ESC	?	w
	3/7	8/15	7/7	3/7	1/11	3/15	7/7
8	8	SS3	x	8	ESC	?	x
	3/8	8/15	7/8	3/8	1/11	3/15	7/8
9	9	SS3	y	9	ESC	?	y
	3/9	8/15	7/9	3/9	1/11	3/15	7/9

* ANSI mode applies to VT300 and VT100 modes. VT52 mode is not compatible with ANSI standards.

Table 3-3 Codes Sent by Numeric Keypad Keys (Cont)

	Keypad Mode Setting (DECNKM)			
	ANSI Mode*		VT52 Mode*	
Key	Numeric	Application	Numeric	Application
-	(minus)	SS3 m	-	ESC ? m
	2/13	8/15 6/13	2/13	1/11 3/15 6/13†
,	(comma)	SS3 l	,	ESC ? l
	2/12	8/15 6/12	2/12	1/11 3/15 6/12†
.	(period)	SS3 n	.	ESC ? n
	2/14	8/15 6/14	2/14	1/11 3/15 6/14
Enter	CR or	SS3 M	CR or	ESC ? M
	0/13	8/15 4/13	0/13	1/11 3/15 4/13
	CR LF		CR LF†	
	0/13 0/10		0/13 0/10	
PF1	SS3 P	SS3 P	ESC P	ESC P
	8/15 5/10	8/15 5/0	1/11 5/0	1/11 5/0
PF2	SS3 Q	SS3 Q	ESC Q	ESC Q
	8/15 5/1	8/15 5/1	1/11 5/1	1/11 5/1
PF3	SS3 R	SS3 R	ESC R	ESC R
	8/15 5/2	8/15 5/2	1/11 5/2	1/11 5/2
PF4	SS3 S	SS3 S	ESC S	ESC S
	8/15 5/3	8/15 5/3	1/11 5/3	1/11 5/3†

* ANSI mode applies to VT300 and VT100 modes. VT52 mode is not compatible with ANSI standards.

† You cannot use these sequences on a VT52 terminal.

‡ Keypad numeric mode. **Enter** sends the same codes as **Return**. You can use line feed/new line mode (LNM) to change the code sent by **Return**. When LNM is reset, pressing **Return** sends one control character (CR). When LNM is set, pressing **Return** sends two control characters (CR, LF).

Top-Row Function Keys

There are 20 top-row function keys, F1 through F20. The first five keys— labeled **Hold Session**, **Local Print**, **Set-Up**, **Switch Session**, and **Break**— are local function keys that do not send codes. You use these keys to perform predefined functions local to the terminal. Keys **F6** through **F20** send the codes listed in Table 3-4. For more information, see Chapter 4 of *Installing and Using the VT330/VT340 Video Terminal.*

7-Bit Control Characters

Table 3-5 lists the key or keys you use to send each 7-bit control character. This table applies to all keyboards. The 7-bit control characters are the C0 characters. You cannot send 8-bit C1 control characters by using the control key, but you can use hexidecimal compose sequences to send 8-bit C1 control characters. For more information, see Chapter 6 of *Installing and Using the VT330/VT340 Video Terminal.*

Table 3-4 Codes Sent by the Top-Row Function Keys

		Code Sent				
Name on Legend Strip	**Key Number**	**VT300 Mode**				**VT100, VT52 Modes**
Hold Session	(F1)*	—				—
Local Print	(F2)*	—				—
Set-Up	(F3)*	—				—
Switch Session	(F4)*	—				—
Break	(F5)*	—				—
F6	F6	CSI	1	7	~	—
		9/11	3/1	3/7	7/14	
F7	F7	CSI	1	8	~	—
		9/11	3/1	3/8	7/14	

* F1 through F5 are local function keys that do not send codes.

Table 3-4 Codes Sent by the Top-Row Function Keys (Cont)

		Code Sent				
Name on Legend Strip	Key Number	VT300 Mode				VT100, VT52 Modes
F8	F8	CSI	1	9	~	—
		9/11	3/1	3/9	7/14	
F9	F9	CSI	2	0	~	—
		9/11	3/2	3/0	7/14	
F10	F10	CSI	2	1	~	—
		9/11	3/2	3/1	7/14	
F11 (ESC)	F11	CSI	2	3	~	ESC
		9/11	3/2	3/3	7/14	1/11
F12 (BS)	F12	CSI	2	4	~	BS
		9/11	3/2	3/4	7/14	0/8
F13 (LF)	F13	CSI	2	5	~	LF
		9/11	3/2	3/5	7/14	0/10
F14	F14	CSI	2	6	~	—
		9/11	3/2	3/6	7/14	
Help	F15	CSI	2	8	~	—
		9/11	3/2	3/8	7/14	
Do	F16	CSI	2	9	~	—
		9/11	3/2	3/9	7/14	
F17	F17	CSI	3	1	~	—
		9/11	3/3	3/1	7/14	
F18	F18	CSI	3	2	~	—
		9/11	3/3	3/2	7/14	
F19	F19	CSI	3	3	~	—
		9/11	3/3	3/3	7/14	
F20	F20	CSI	3	4	~	—
		9/11	3/3	3/4	7/14	

Table 3-5 Keys Used to Send 7-Bit Control Codes

Control Character Mnemonic	Code Table Position	Key Pressed With Ctrl (All Modes)	Dedicated Function Key
NUL	0/00	2 or space bar	—
SOH	0/01	A	—
STX	0/02	B	—
ETX	0/03	C	—
EOT	0/04	D	—
ENQ	0/05	E	—
ACK	0/06	F	—
BEL	0/07	G	—
BS	0/08	H	F12 (BS)*
HT	0/09	I	Tab
LF	0/10	J	F13 (LF)*
VT	0/11	K	—
FF	0/12	L	—
CR	0/13	M	Return
SO	0/14	N	—
SI	0/15	O	—
DLE	1/00	P	—
DC1	1/01	Q†	—
DC2	1/02	R	—
DC3	1/03	S†	—
DC4	1/04	T	—
NAK	1/05	U	—
SYN	1/06	V	—
ETB	1/07	W	—
CAN	1/08	X	—
EM	1/09	Y	—
SUB	1/10	Z	—
ESC	1/11	3 or [	F11 (ESC)*
FS	1/12	4 or /	—
GS	1/13	5 or]	—
RS	1/14	6 or ~	—
US	1/15	7 or ?	—
DEL	7/15	8	Delete

* 7-bit control codes sent in VT100 and VT52 modes only.

† 7-bit control codes sent only when XON/XOFF support is off.

SPECIAL CASES

This section describes special functions and modes that affect the keyboard.

Local Editing Mode

When the terminal is in local editing mode, certain keys on the editing and numeric keypads have local editing functions. Table 3-6 lists the local editing keys.

See Chapter 9 for details on local editing mode. Chapter 9 of *Installing and Using the VT330/VT340 Video Terminal* describes the local editing keys.

Table 3-6 Keys Affected By Local Editing Mode

Interactive Mode	**Local Editing Mode**	
Name on Top of Key	**Name on Front of Key or Template**	**Local Editing Function**
Return	———	If DECLNM is set, sends a block of text to the host.
Find	Home Cursor	Moves the cursor to the top left corner of the scrolling region.
Insert Here	Insert/Overstrike	Switches between insert and overstrike modes (Chapter 8).
Remove	CLR PAGE* Clr Field	Erases the characters on the current page, or erases the characters in a field.

* To select this function, you press the Shift key and this key.

Table 3-6 Keys Affected By Local Editing Mode

Interactive Mode	Local Editing Mode	
Name on Top of Key	Name on Front of Key or Template	Local Editing Function
Select	EDIT*	Switches the terminal between interactive mode and local editing mode.
Prev Screen	Prev Page	Displays the previous page in page memory on the screen.
Next Screen	Next Page	Displays the next page in page memory on the screen.
PF1	Tab |<—* —>|	Tabs to the next unprotected field or tab stop. **Shift-Tab** tabs to the previous unprotected field or tab stop.
PF2	Insert Line	Inserts a line of character positions on the page.
PF3	Delete Line	Deletes a line of character positions from the current page.
PF4	Delete Char	Deletes a character from the current page.
,	(Space)	Inserts a space character or a comma, depending on the setting of the **Keypad comma** feature in Keyboard Set-Up.
Enter	Transmit	Sends a block of characters to the host.

* To select this function, you press the Shift key and this key.

Turning Autorepeat On and Off

The autorepeat feature makes most keys send their character repeatedly when you hold the key down. You can turn the autorepeat feature on and off by using the Keyboard Set-Up screen or the DECARM control function (Chapter 11).

The following keys do not repeat: **Hold Session**, **Local Print**, **Set-Up**, **Switch Session**, **Break**, **Compose Character**, **Shift**, **Return**, **Lock**, and **Ctrl**. Shifted keys and keys pressed with Ctrl can repeat. When the terminal is in edit mode, the editing keys listed in Table 3-6 do not repeat.

Keys that can auto repeat usually start repeating after a delay of 0.5 seconds. The autorepeat speed depends on the baud rate of the host system and the type of key. At speeds of 2400 baud or above, all keys repeat 30 times per second. At lower speeds, the keyboard is divided into three groups.

Group A	Main keyboard
Group B	Cursor keys and keypad keys
Group C	Top-row function keys and editing keys

The keys in each group repeat at the fixed rate set by the baud rate of the host, regardless of how many codes the key actually sends.

Host Baud Rate	**Autorepeat Rate (Characters/Second)**		
	Group A	**Group B**	**Group C**
2400	30	30	30
1200	30	30	24
600	30	20	12
300	30	12	12
150	6	6	6
110	6	6	6
75	6	6	6

In general, the **Transmit Rate Limiting** feature in the Communications Set-Up screen does not affect repeat rates. The terminal can send codes at the speed of 150 characters per second at most baud rates. In local mode, keys repeat at 30 keystrokes per second.

Unlocking the Keyboard

Two conditions can cause the keyboard to lock.

- An application sends a control function to set the keyboard action mode (KAM), as described in Chapter 11.

- The keyboard input buffer is full.

When the keyboard is locked, all keys except **Hold Session**, **Local Print**, **Set-Up**, **Switch Session**, and **Break** are disabled. Also, the keyboard's Wait indicator turns on.

Any of the following events can unlock the keyboard.

- The output buffer becomes less than full (assuming KAM is not set).
- The terminal receives KAM when the output buffer is not full (Chapter 11).
- You select **Clear Communications**, **Reset Session**, or **Recall Factory Default Settings** from the Set-Up Directory screen. (Entering set-up unlocks the keyboard. If you do not select one of these functions in set-up, the keyboard locks again when you leave set-up.)
- The terminal performs the power-up self-test (DECTST) or a hard reset (RIS). See Chapter 13.

PART 3

CONTROL FUNCTIONS RECEIVED FROM THE HOST

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The VT300 terminal can operate like VT200, VT100, and VT52 series terminals. This feature lets you use the VT300 with applications designed for these terminals. You can select from two possible levels of operation.

Level 1 for VT100 operation
Level 3 for VT200 and VT300 operation (default)

When you operate the terminal at level 1, you cannot use some VT300 control functions. Table 4-1 lists the functions you cannot use.

The following paragraphs describe other limits that apply to each operating level. The chapter also describes how to select an operating level and how to send 7-bit or 8-bit C1 controls to the host.

Appendix A describes how to use VT52 mode.

NOTE: Level 3 includes level 2 (VT200 operation). Applications designed for level 2 will run in level 3.

LEVEL 1 (VT100 Mode)

The following limits apply to operating level 1.

- The keyboard only sends 7-bit ASCII characters.
- The terminal interprets keystrokes that send DEC Supplemental Graphic or ISO Latin-1 supplemental characters as errors.
- The following keys do not operate.
  - special-function keys, except **F11 (ESC)**, **F12 (BS)**, and **F13 (LF)**
  - six editing keys
  - user-defined keys
- Only the ASCII, national replacement (NRC), and DEC Special Graphic character sets are available.
- Soft character sets are not available.
- The terminal sets the eighth bit of all received characters to 0.
- The terminal sends all C1 control characters as 7-bit escape sequences (ESC Fe).

LEVEL 3 (VT300 Mode)

In VT300 mode, you can use all VT300 features. This mode is fully compatible with Digital's VT200 series terminals. All keyboard functions are available. You can use all control functions and device control strings described in this manual.

ALL LEVELS

You can use the following features at any operating level.

- Printer port
- Edit mode (DECEDM) and the keyboard editing functions
- Status line (view only). You must be at level 3 to change or enable the status line.
- Session management
- User windows

Table 4-1 Control Functions Ignored in Level 1 (VT100 mode)

Mnemonic	Name
DECCIR	Cursor information report
DECCTR	Color table report
DECDLD	Down-line-loadable set
DECRPDE	Report displayed extent
DECRPM	Report mode
DECRPSS	Report selection or setting
DECRQDE	Request displayed extent
DECRQM	Request mode
DECRQPSR	Request presentation state
DECRQSS	Request selection or setting
DECRQTSR	Request terminal state
DECRSPS	Restore presentation state
DECRSTS	Restore terminal state
DECSASD	Select active status display
DECSCA	Select character attribute
DECSED	Selective erase in display
DECSEL	Selective erase in line
DECSSDT	Select status display type
DECSTR	Soft terminal reset
DECTABSR	Tabulation stop report
DECTSR	Terminal state report
DECUDK	User-defined keys
DSR	Locator device port
DSR	UDK and keyboard language
ECH	Erase character
ICH	Insert character
LS2	Locking shift 2
LS3	Locking shift 3
LS1R	Locking shift 1 right
LS2R	Locking shift 2 right
LS3R	Locking shift 3 right
S7C1T	Send 7-bit C1 controls
S8C1T	Send 8-bit C1 controls

SELECTING AN OPERATING LEVEL (DECSCL)

You select the terminal's operating level by using the following select compatibility level (DECSCL) control sequences. The factory default is level 3 (VT300 mode, 7-bit controls).

NOTE: When you change the operating level, the terminal performs a soft reset (DECSTR). See Chapter 13 for details.

Sequence							**Level Selected**
							Level 1
CSI	6	1	"	p			VT100 mode
9/11	3/6	3/1	2/2	7/0			
							*Level 3**
CSI	6	2	"	p			VT300 mode, 8-bit controls
9/11	3/6	3/2	2/2	7/0			
CSI	6	2	;	0	"	p	VT300 mode, 8-bit controls
9/11	3/6	3/2	3/11	3/0	2/2	7/0	
CSI	6	2	;	2	"	p	VT300 mode, 8-bit controls
9/11	3/6	3/3	3/11	3/2	2/2	7/0	
CSI	6	3	"	p			VT300 mode, 8-bit controls
9/11	3/6	3/3	2/2	7/0			
CSI	6	3	;	0	"	p	VT300 mode, 8-bit controls
9/11	3/6	3/3	3/11	3/0	2/2	7/0	
CSI	6	3	;	2	"	p	VT300 mode, 8-bit controls
9/11	3/6	3/3	3/11	3/2	2/2	7/0	
CSI	6	2	;	1	"	p	VT300 mode, 7-bit controls
9/11	3/6	3/2	3/11	3/1	2/2	7/0	(default)
CSI	6	3	;	1	"	p	VT300 mode, 7-bit controls
9/11	3/6	3/3	3/11	3/1	2/2	7/0	(default)

* Level 3 includes level 2.

SENDING C1 CONTROLS TO THE HOST

The VT300 can send C1 control characters to the host as single 8-bit characters or as 7-bit equivalent representations. You should select the format that matches the operating level you are using. You can use the following sequences to select the format for C1 control characters. See Chapter 2 for information on working with 7-bit and 8-bit environments.

Select 7-Bit C1 Control Characters (S7C1T)

The following sequence causes the terminal to send all C1 control characters as their 7-bit representations.

ESC	**sp**	**F**
1/11	2/0	4/7

This sequence changes the terminal mode as follows.

Mode Before	**Mode After**
VT300 mode, 8-bit controls	VT300 mode,7-bit controls.
VT300 mode, 7-bit controls	Same. Terminal ignores sequence.
VT100 mode or VT52 mode	Same. Terminal ignores sequence.

Select 8-Bit C1 Control Characters (S8C1T)

The following sequence causes the terminal to send C1 control characters to the host as single 8-bit characters.

ESC	**sp**	**G**
1/11	2/0	4/6

This sequence changes the terminal mode as follows.

Mode Before	**Mode After**
VT300 mode, 8-bit controls	Same. Terminal ignores sequence.
VT300 mode, 7-bit controls	VT300 mode, 8-bit controls.
VT100 mode or VT52 mode	Same. Terminal ignores sequence.

NATIONAL REPLACEMENT CHARACTER SET MODE (DECNRCM)

The terminal has twelve 7-bit character sets for different national languages. Only one national replacement character set is available at a time.

To use an NRC set, you must select national replacement character set mode. When you reset this mode, the terminal uses the DEC Multinational or ISO Latin-1 character set.

Default: Multinational

Mode	Sequence					Function
Set (national)	CSI	?	4	2	h	The terminal uses 7-bit characters from an NRC set.
	9/11	3/15	3/4	3/2	6/8	
Reset (multinational)	CSI	?	4	2	l	The terminal uses 7-bit and 8-bit characters from the DEC Multinational or ISO Latin-1 set.
	9/11	3/15	3/4	3/2	6/12	

Notes on DECNRCM

- When DECNRCM is reset, the VT300 operates as a level 3 terminal. The terminal can send and receive 8-bit characters from the DEC Multinational or ISO Latin-1 character set.

  When DECNRCM is set (national), the VT300 operates as a level 3 terminal. However, the terminal can only send and receive 7-bit characters. Also, the terminal uses one of the national replacement character sets.

- Setting DECNRCM causes the terminal to change character sets to their default state (at power-up or reset).

- The terminal ignores DECNRCM if you set the **Keyboard Dialect** feature in Keyboard Set-Up screen to "North American". If you set the dialect to "British" the terminal recognizes DECNRCM.

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This chapter describes how you can select different character sets to use with your VT300 terminal. This chapter assumes you are familiar with the character-encoding concepts described in Chapter 2.

You can use two types of character sets in the terminal, hard sets and soft sets. *Hard character sets* are the character sets built into the VT300, such as the ASCII and DEC Supplemental Graphic sets. *Soft character sets* are sets that you down-line-load into the terminal from a host computer. You can design your own soft character sets.

The VT300 has seven hard character sets. However, the number of hard sets available depends on the operating mode you select, VT100 or VT300 (Chapter 4). Table 5-1 lists the hard character sets you can select at each operating level. VT300 mode supports VT200 operation.

Table 5-1 Character Sets Available

	Level 1 (VT100 mode)	**Level 3 (VT300 mode)**
ASCII	Yes	All character sets are available.
DEC Supplemental Graphic	No	
ISO Latin-1 supplemental	No	
User-preferred supplemental	No	
National replacement (NRCs)	Yes	
DEC Special Graphic	Yes	
DEC Technical	No	
Soft character sets (DRCS)	No	

SELECTING CHARACTER SETS

To understand how to select character sets, you must first understand the function of the terminal's *in-use table*. The in-use table contains the character sets the terminal can currently access. You can place any two character sets in the terminal's in-use table. The in-use table consists of the *graphic left* (GL) and *graphic right* (GR) logical tables.

Each time you turn on the terminal, the terminal places the following default character sets into the in-use table.

ASCII in GL
DEC Supplemental Graphic (or ISO Latin-1 supplemental) in GR

The ASCII and DEC Supplemental Graphic sets together make up the DEC Multinational set.

You can select a different character set by following these two steps.

1. **Designate the set as G0, G1, G2, or G3.**

   G0 through G3 are logical sets that the terminal uses to access character sets. You can designate up to four character sets and have them ready for use in the in-use table.

2. **Map the designated set into the in-use table.**

   After you map the set into the in-use table, you can display or send any character from that set using 8-bit codes.

Figure 5-1 shows how you select character sets. The following sections describe the control functions you use to designate and map character sets.

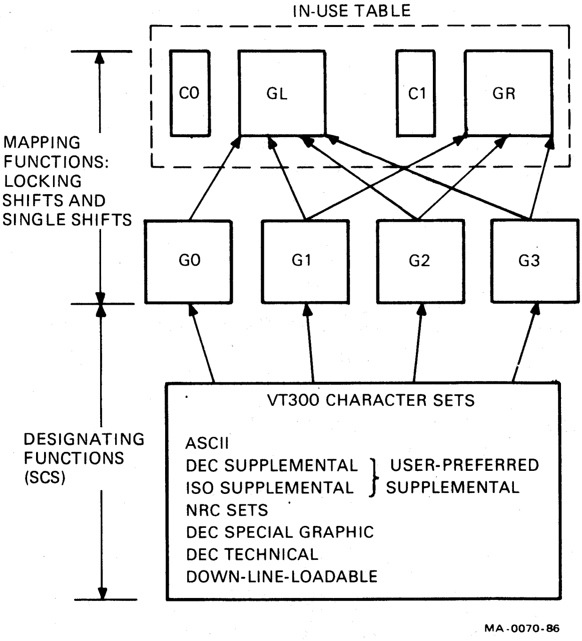

IN-USE TABLE
C0
GL
C1
GR
MAPPING FUNCTIONS: LOCKING SHIFTS AND SINGLE SHIFTS
G0
G1
G2
G3
DESIGNATING FUNCTIONS (SCS)
VT300 CHARACTER SETS
ASCII
DEC SUPPLEMENTAL
ISO SUPPLEMENTAL
USER-PREFERRED SUPPLEMENTAL
NRC SETS
DEC SPECIAL GRAPHIC
DEC TECHNICAL
DOWN-LINE-LOADABLE
MA-0070-86

Figure 5-1 Character Set Selection

Designating Character Sets (SCS Sequences)

You designate both hard and soft character sets as G0 through G3 by using a select character set (SCS) escape sequence. You cannot designate a 96-character set as G0.

SCS sequences use the format shown in Table 5-2. The table lists the code used to select each available character set.

NOTE: The ISO Latin-1 supplemental character set is the only 96-character hard set available in the terminal. All other hard sets have 94 characters.

Table 5-2 Designating Character Sets

ESC	Intermediate	Final
1/11	********	****

Intermediate

To Select	Use
94-Character Sets	
G0	(2/8
G1	) 2/9
G2	* 2/10
G3	+ 2/11
96-Character Sets	
G1	- 2/13
G2	. 2/14
G3	/ 2/15

Final

To Select	Use
ASCII	B 4/2
DEC Supplemental Graphic	% 5 2/5 3/5
ISO Latin-1 supplemental (96 characters)	A 4/1
User-preferred supplemental (VT300 mode only)	< 3/12
DEC Special Graphic	0 3/0
DEC Technical	> 3/14
*National Replacement Character Sets**	
British	A 4/1
Dutch	4 3/4

* Only one national character set is available at a time. You must select national mode to use national character sets. See "National Replacement Character Sets" in this chapter.

† Digital recommends using the first code shown.

Table 5-2 Designating Character Sets (Cont)

Intermediate		**Final**	
To Select	**Use**	**To Select**	**Use**
		*National Replacement Character Sets (Cont)**	
		Finnish†	5 or C 3/5 4/3
		French	R 5/2
		French Canadian†	9 or Q 3/9 5/1
		German	K 4/11
		Italian	Y 5/9
		Norwegian/Danish†	‘ or E or 6 6/0 4/5 3/6
		Portuguese	% 6 2/5 3/6
		Spanish	Z 5/10
		Swedish†	7 or H 3/7 4/8
		Swiss	= 3/13

* Only one national character set is available at a time. You must select national mode to use national character sets. See "National Replacement Character Sets" in this chapter.

† Digital recommends using the first code shown.

Examples

- The following sequence designates the DEC Special Graphic character set as the G1 logical set.

  ESC) 0

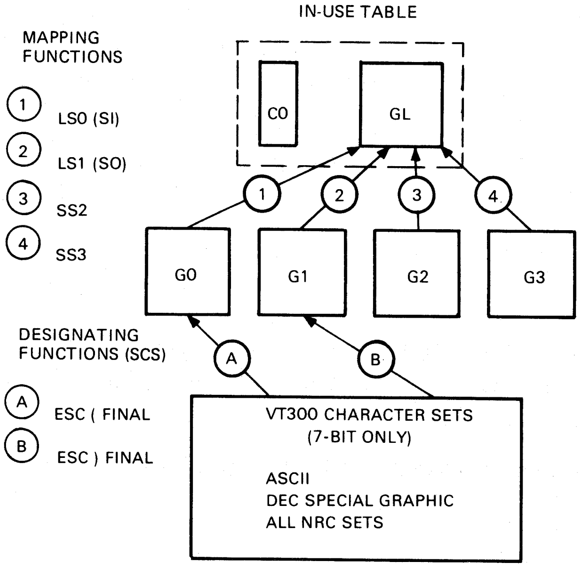
- The following sequence designates the ISO Latin-1 supplemental character set as the G3 logical set.

  ESC / A

Mapping Character Sets

After you designate a character set as G0, G1, G2, or G3, you must map the set into the in-use table as GL or GR. To map a set, you use *locking-shift* or *single-shift* control functions.

Figure 5-2 shows how you use locking shifts and single shifts in VT100 mode. Figure 5-3 shows how you use locking shifts and single shifts in VT300 mode.


IN-USE TABLE
MAPPING FUNCTIONS
① LS0 (SI)
② LS1 (SO)
③ SS2
④ SS3
C0
GL
G0
G1
G2
G3
DESIGNATING FUNCTIONS (SCS)
Ⓐ ESC (FINAL
Ⓑ ESC) FINAL
VT300 CHARACTER SETS
(7-BIT ONLY)
ASCII
DEC SPECIAL GRAPHIC
ALL NRC SETS

MA-0071-86

Figure 5-2 Designating and Mapping Character Sets in VT100 Mode

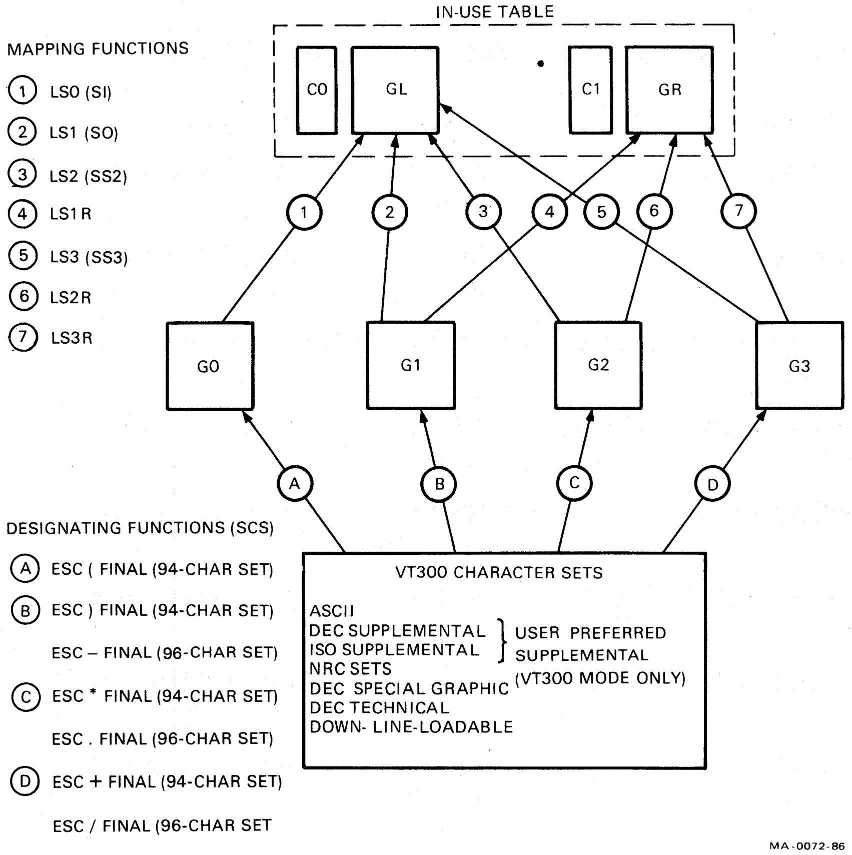

IN-USE TABLE
C0
GL
C1
GR
MAPPING FUNCTIONS
① LS0 (SI)
② LS1 (SO)
③ LS2 (SS2)
④ LS1R
⑤ LS3 (SS3)
⑥ LS2R
⑦ LS3R
1
2
3
4
5
6
7
G0
G1
G2
G3
A
B
C
D
DESIGNATING FUNCTIONS (SCS)
Ⓐ ESC (FINAL (94-CHAR SET)
Ⓑ ESC) FINAL (94-CHAR SET)
ESC – FINAL (96-CHAR SET)
Ⓒ ESC * FINAL (94-CHAR SET)
ESC . FINAL (96-CHAR SET)
Ⓓ ESC + FINAL (94-CHAR SET)
ESC / FINAL (96-CHAR SET
VT300 CHARACTER SETS
ASCII
DEC SUPPLEMENTAL
ISO SUPPLEMENTAL
USER PREFERRED SUPPLEMENTAL (VT300 MODE ONLY)
NRC SETS
DEC SPECIAL GRAPHIC
DEC TECHNICAL
DOWN- LINE-LOADABLE
MA-0072-86

Figure 5-3 Designating and Mapping Character Sets in VT300 Mode

Locking Shifts - When you use a locking shift, the character set remains in GL or GR until you use another locking shift. Table 5-3 lists all locking shifts available.

Table 5-3 Mapping Character Sets with Locking Shifts

Locking Shift	Code	Function
LS0 (locking shift 0)	SI 0/15	Map G0 into GL. (default)
LS1 (locking shift 1)	SO 0/14	Map G1 into GL.

NOTE: The following locking shift functions are available only in VT300 mode.

Locking Shift	Code	Function
LS1R (locking shift 1, right)	ESC ~ 1/11 7/14	Map G1 into GR.
LS2 (locking shift 2)	ESC n 1/11 6/14	Map G2 into GL.
LS2R (locking shift 2, right)	ESC } 1/11 7/13	Map G2 into GR.
LS3 (locking shift 3)	ESC o 1/11 6/15	Map G3 into GL.
LS3R (locking shift 3, right)	ESC | 1/11 7/12	Map G3 into GR.

Examples

- The following sequence designates the DEC Technical character set as G1, then maps G1 into GL.

ESC) >	SO
designate as G1	map G1 into GL

- The following sequences designate the ISO Latin-1 supplemental character set as G2, then map G2 into GR.

ESC . A	ESC }
designate as G2	map G2 into GR

Single Shifts - You use a single shift when you want to display the next character from a different character set. A single shift maps the G2 or G3 set into GL. The character set is active for only one character. Then the terminal returns to the previous character set in GL.

The terminal has two single-shift control functions available.

Single-Shift Control	8-Bit Character	7-Bit Equivalent Sequence	Function
Single shift 2	SS2 8/14	ESC N 1/11 4/14	Maps G2 into GL for the next character.
Single shift 3	SS3 8/15	ESC O 1/11 4/15	Maps G3 into GL for the next character.

Example

Suppose the ASCII character set is in GL. You want to display the alpha character from the DEC Technical character set, already designated as G3. You do not want to replace the ASCII set just to display one character. Instead, you can use single shift 3 to temporarily map the DEC Technical set (G3) into GL.

SS3 8/15	a 6/1
single shift 3	alpha character

After displaying the alpha character, the terminal maps the ASCII set (G1) back into GL, replacing the DEC Technical set (G3).

National Replacement Character Sets

The terminal has twelve 7-bit character sets for different national languages (Chapter 2). Only one national replacement character set is available at a time.

To use a national replacement character set, you must select national replacement character set mode. When you reset this mode, the terminal uses 7-bit and 8-bit characters from one of the multinational character sets (DEC Multinational or ISO Latin-1). When you set this mode, the terminal uses 7-bit characters from an NRC set.

See "National Replacement Character Set Mode" at the end of Chapter 4.

Preferred Supplemental Character Sets

You can assign the supplemental character set you use most often as a special standby set. This standby set is called the user-preferred supplemental set. This feature provides applications with an easy way to access the user's preferred supplemental set.

You can assign the DEC Supplemental Graphic or ISO Latin-1 supplemental set as the standby set. After you assign a set, you must designate and map the set before using it.

1. Designate the set as G1, G2, or G3.
2. Map the set into GR.

For more information on designating and mapping sets, see "Selecting Character Sets" in this chapter.

You can assign a supplemental character set as follows.

Assign User-Preferred Supplemental Set (DECAUPSS)

Default: DEC Supplemental Graphic

Sequence							**Function**
DCS	**0**	**!**	**u**	**%**	**5**	**ST**	Assigns the DEC Supplemental Graphic set as the preferred supplemental set.
9/0	3/0	2/1	7/5	2/5	3/5	9/12	
DCS	**1**	**!**	**u**	**A**	**ST**		Assigns the ISO Latin-1 supplemental set as the preferred supplemental set.
9/0	3/1	2/1	7/5	4/1	9/12		

ANSI Conformance Levels

This control function lets an application map certain character sets into the terminal's in-use table as default sets. The character sets are based on ANSI conformance levels, listed below. These conformance levels are from the dpANS X3.134.1 standard.

ANSI conformance levels represent an agreement between the sender and receiver for compatible data exchange. The control function acts as an *announcer* for the data exchange that follows between the terminal and application software. The control function selects which character sets the terminal uses by default in the data exchange.

The VT300 supports three ANSI conformance levels.

ANSI Levels 1 and 2

- ASCII designated as G0.
- ISO Latin-1 supplemental designated as G1.
- G0 mapped into GL.
- G1 mapped into GR.

ANSI Level 3

- ASCII designated as G0.
- G0 mapped into GL.

The announcer function is as follows.

ESC	**sp**	**Final**
1/11	2/0	4/?

where

Final indicates the ANSI conformance level for the following data exchange.

Final	**ANSI Conformance Level**
L	Level 1
M	Level 2
N	Level 3

Notes

- If the terminal is reset, turned off, or changed with a set conformance level (DECSCL) sequence, software must send another announcer sequence to the terminal. Otherwise, the terminal uses the default character sets (ASCII in GL, DEC or ISO Latin-1 supplemental in GR).
- The announcer sequence is available in VT300 mode only.
- Do not confuse ANSI conformance levels with Digital conformance levels (Chapter 4).

SOFT CHARACTER SETS

You can down-line-load a soft character set from the host computer into the terminal. This feature lets you design your own soft character sets for use with the terminal. You can only load soft character sets in VT300 mode.

NOTE: VT200 fonts may appear different on a VT300 terminal, because VT300 character cell sizes are different from those of the VT200. See the Pcmw parameter in Table 5-6.

The soft character set is also known as a *dynamically redefinable character set (DRCS).* The terminal stores the soft characters in its DRCS buffer.

NOTE: The terminal does not store the soft character set in nonvolatile RAM. When you turn off the terminal, the soft characters are lost.

The next section describes the guidelines for designing a soft set. The sections that follow describe how to code, load, designate, and clear a soft set.

Designing a Soft Character Set

Your terminal displays each character by turning on a series of pixels. A *pixel* (picture element) is the smallest displayable unit on the screen. Each character must fit in a limited area, called the character cell. The VT300 uses a default character cell size of 10 × 20 pixels.

When you design a character, you should lay out a character cell on grid paper. The little boxes on the grid paper represent pixels. You fill in the pixels that make up the character. The next section shows an example of a character design.

You can design characters for an 80-column or 132-column font. The largest character cell you can use is the default size of 10 × 20 pixels (200 pixels) for an 80-column font. Figure 5-4 shows the cell sizes for 80- and 132-column fonts. The built-in fonts supplied by Digital follow the guidelines in Table 5-4.

You must design your characters to fit the cell. The terminal ignores any pixels that are defined outside the cell.

Figure 5-5 shows an example of this spacing for an uppercase D character. In this example, the character for the 80-column font has two pixel columns reserved for spacing.

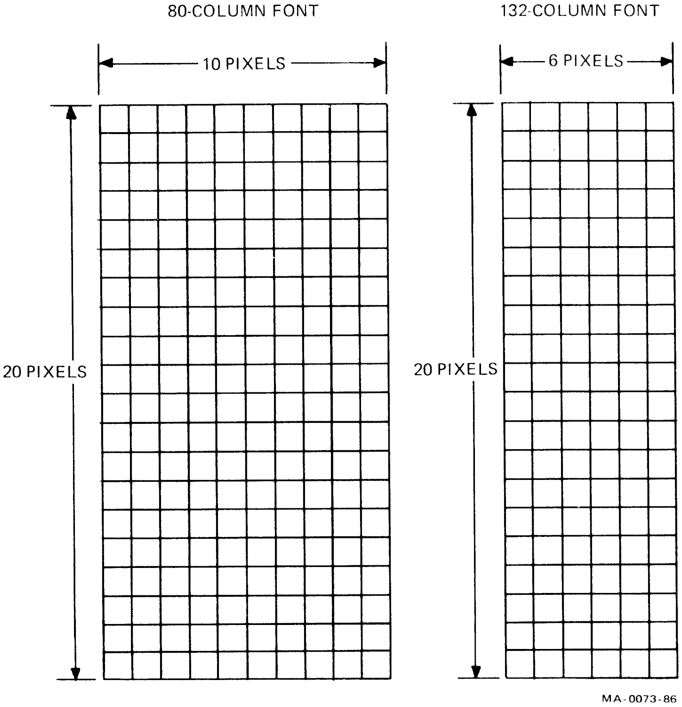

80-COLUMN FONT
132-COLUMN FONT
10 PIXELS
6 PIXELS
20 PIXELS
20 PIXELS
MA-0073-86

Figure 5-4 Character Cell Sizes for 80- and 132-Column Fonts

Table 5-4 Guidelines for Designing Soft Characters

Character Dimension	80-Column Font		132-Column Font	
Cell width	10	pixels	6	pixels
Cell height	20		20	
Body width	9		5	
Body height	12		12	
Ascender height	4		4	
Descender height	4		4	
Spacing before character	0		0	
Spacing after character	1		1	

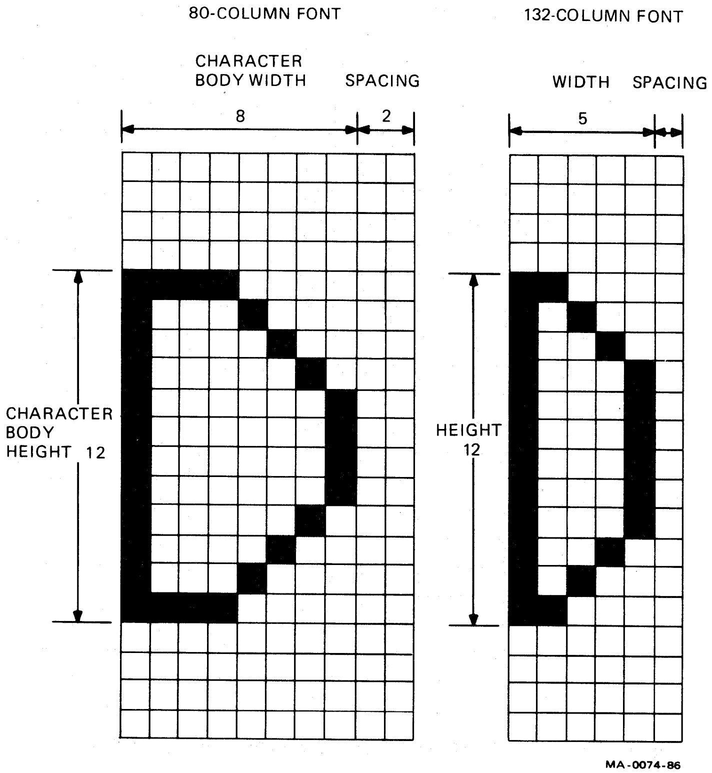

80-COLUMN FONT
CHARACTER BODY WIDTH
SPACING
8
2
CHARACTER BODY HEIGHT 12
132-COLUMN FONT
WIDTH
SPACING
5
HEIGHT 12
MA-0074-86

Figure 5-5 Character Body Sizes for 80- and 132-Column Fonts

Coding the Soft Character Set

After you design your characters, you must code them for the terminal. This section describes how to code soft characters. The next section describes how to load the character codes into the terminal.

Each pixel of a soft character cell receives a binary value of 0 or 1. A 1 bit indicates the pixel is on, and a 0 bit indicates the pixel is off.

The terminal receives the code for a soft character in sections, called *sixels.* A sixel is a 6-bit binary code that represents a vertical column of 6 pixels on the screen. Each bit in a sixel corresponds to a pixel on the screen. The following example describes how to design and code a soft character.

Example

Suppose you want to design an uppercase D for an 80-column font.

1. **Draw your design on a grid.**

   Use the grid for an 80-column character cell to draw your design. Mark which pixels will be on and which pixels will be off. Your design may look like Figure 5-5.

2. **Divide the character cell into columns of 6 bits each.**

   Use the format shown in Figure 5-6. Each 6-bit pattern represents 6 pixels, or a sixel. The least significant bit is at the top, and the most significant bit is at the bottom. The terminal would receive the sixel columns in order (1 to 10), starting with Group A.

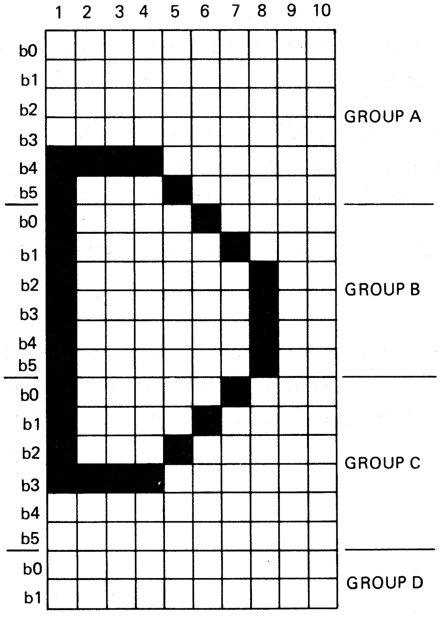


Figure 5-6 Example of an Uppercase D in an 80-Column Font

Because the character cell height (20 pixels) is not a multiple of 6, the columns on the bottom of the character cell (Group D) have only 2 bits each, b0 and b1. Bits b2 through b5 in the bottom cell do not affect the character's appearance, so they have been excluded from Figure 5-6.

3. **Convert the binary value of each sixel to its hexadecimal value.**

   Sixels codes are restricted to characters in the range of ? (hex 3F) to ~ (hex 7E), so you must add an offset of hex 3F to the hex value of each column. For example,

$$\text{000000(2)} = \begin{array}{r} \text{00(16)} \\ +\,\text{3F(16)} \\ \hline \text{3F(16)} \end{array} \qquad \text{110101} = \begin{array}{r} \text{35(16)} \\ +\,\text{3F(16)} \\ \hline \text{74(16)} \end{array} \qquad \text{111111(2)} = \begin{array}{r} \text{3F(16)} \\ +\,\text{3F(16)} \\ \hline \text{7E(16)} \end{array}$$

4. **Use Table 5-5 to convert each binary number to the equivalent ASCII character.**

   Table 5-5 lists the results of steps 3 and 4 for each possible binary value. All you have to do is find the 6-digit binary number for each sixel bit pattern in your character design.

   Figure 5-7 shows this conversion for the uppercase D in this example.

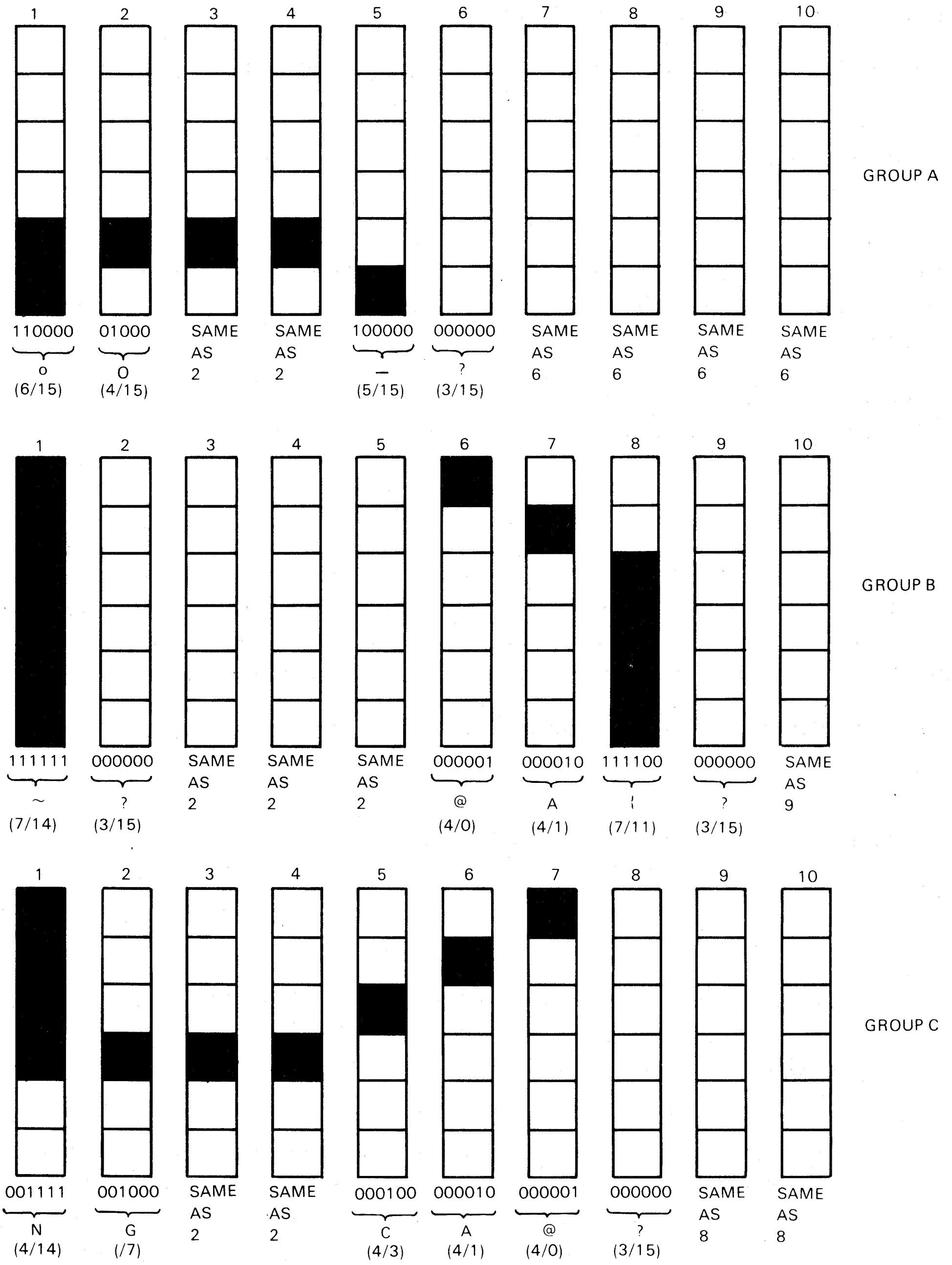
You use this procedure to convert each character of your soft character set into a string of sixel bit patterns. Then you can down-line-load your DRCS characters into the terminal, using the DECDLD device control string described in the next section.

Table 5-5 Converting Binary Code to an ASCII Character

Binary Value	Hex Value	Hex Value + 3F Offset	Character Equivalent
000000	00	3F	?
000001	01	40	@
000010	02	41	A
000011	03	42	B
000100	04	43	C
000101	05	44	D
000110	06	45	E
000111	07	46	F
001000	08	47	G
001001	09	48	H
001010	A	49	I
001011	B	4A	J
001100	C	4B	K
001101	D	4C	L
001110	E	4D	M
001111	F	4E	N
010000	10	4F	O
010001	11	50	P
010010	12	51	Q
010011	13	52	R
010100	14	53	S
010101	15	54	T
010110	16	55	U
010111	17	56	V
011000	18	57	W
011001	19	58	X
011010	1A	59	Y
011011	1B	5A	Z
011100	1C	5B	[
011101	1D	5C	\

Table 5-5 Converting Binary Code to an ASCII Character (Cont)

Binary Value	Hex Value	Hex Value + 3F Offset	Character Equivalent
011110	1E	5D	]
011111	1F	5E	^
100000	20	5F	_
100001	21	60	`
100010	22	61	a
100011	23	62	b
100100	24	63	c
100101	25	64	d
100110	26	65	e
100111	27	66	f
101000	28	67	g
101001	29	68	h
101010	2A	69	i
101011	2B	6A	j
101100	2C	6B	k
101101	2D	6C	l
101110	2E	6D	m
101111	2F	6E	n
110000	30	6F	o
110001	31	70	p
110010	32	71	q
110011	33	72	r
100100	34	73	s
110101	35	74	t
110110	36	75	u
110111	37	76	v
111000	38	77	w
111001	39	78	x
111010	3A	79	y
111011	3B	7A	z
111100	3C	7B	{
111101	3D	7C	|
111110	3E	7D	}
111111	3F	7E	~


1 2 3 4 5 6 7 8 9 10
GROUP A
110000 o (6/15)
01000 O (4/15)
SAME AS 2
SAME AS 2
100000 _ (5/15)
000000 ? (3/15)
SAME AS 6
SAME AS 6
SAME AS 6
SAME AS 6
1 2 3 4 5 6 7 8 9 10
GROUP B
111111 ~ (7/14)
000000 ? (3/15)
SAME AS 2
SAME AS 2
SAME AS 2
000001 @ (4/0)
000010 A (4/1)
111100 ¦ (7/11)
000000 ? (3/15)
SAME AS 9
1 2 3 4 5 6 7 8 9 10
GROUP C
001111 N (4/14)
001000 G (/7)
SAME AS 2
SAME AS 2
000100 C (4/3)
000010 A (4/1)
000001 @ (4/0)
000000 ? (3/15)
SAME AS 8
SAME AS 8
MA-0076-86

NOTE:
FOR THIS EXAMPLE, THE BITS IN GROUP D DO NOT AFFECT THE APPEARANCE OF THE CHARACTER.

Figure 5-7 Sixel-to-ASCII Conversion

Down-Line-Loading Soft Characters

You can load two font renditions of your soft character set.

80-column
132-column

You should load both an 80-column and a 132-column rendition of your soft set. Then the terminal can select the correct rendition if you change the page width (Chapter 6).

Do not confuse the font rendition with the actual character set. You cannot load two different soft sets. However, you can load two renditions of the same soft set.

You load your soft character set with a DECDLD device control string.

PROGRAMMING TIP: When you use the DECDLD device control string to load a soft character set, the control string does not affect the characters currently on the screen. You can refresh the screen to show the new character sets. See Chapter 2 for general information about device control strings.

This DECDLD control string has the following format.

DCS Pfn ; Pcn ; Pe ; Pcmw ; Pw ; Pt ; Pcmh ; Pcss {

Dscs Sxbp1 ; Sxbp2 ;...; Sxbpn ST

where

DCS (9/0)
is the *device control string introducer.* DCS is an 8-bit C1 character. You can use the equivalent 7-bit sequence ESC P (1/11, 5/0) when coding for a 7-bit environment.

Pfn ; Pcn ; Pe ; Pcmw ; Pw ; Pt ; Pcmh ; Pcss
are *parameter characters,* separated by semicolons (3/11). Table 5-6 describes these parameters and lists their possible values. Table 5-7 describes the combinations of Pcmw, Pt, and Pcmh you can use for 80- and 132-column fonts. If you use any other combinations, the terminal ignores the DECDLD string.

{ (7/11)

is the *final character.* It marks the end of the parameter characters and indicates that this string is a DECDLD function.

Dscs

defines the name for the soft character set. You use this name in the select character set (SCS) escape sequence. You use the following format for the Dscs name.

I F

where

I

is 0, 1 or 2 intermediate characters from the range 2/0 to 2/15 in the ASCII character set.

F

is a final character in the range 3/0 to 7/14.

Examples of Dscs Names

Name	**Function**
sp @ 2/0 4/0	Defines the character set as an unregistered soft set. **This value is the recommended default for user-defined sets.** The value of Pcss defines whether this set has 94 or 96 characters.
A 4/2	If Pcss is 0, A defines the soft character set as the U.K. national replacement character set. If Pcss is 1, A defines the soft character set as the ISO Latin-1 supplemental set.
& % C 2/6 2/5 4/3	Defines the soft character set as % C, which is currently an unregistered set. The value of Pcss defines whether this set has 94 or 96 characters.

Sxbp1 ; Sxbp2 ;...; Sxbpn

are the sixel bit patterns for individual characters, separated by semicolons (3/11). Your character set can have 1 to 94 patterns or 1 to 96 patterns, depending on the setting of the character set size parameter (Pcss). Each sixel bit pattern is in the following format.

S...S/S...S

where

the first S...S

represents the sixels in Group A of the soft character (Figure 5-6)

/ (2/5)

advances the sixel pattern to Group B of the soft character

the second S....S

represents the sixels in Group B of the soft character.

ST (9/12)

is the *string terminator.* ST is an 8-bit C1 character. You can use the equivalent 7-bit sequence ESC \ (1/11, 5/12) when coding for a 7-bit environment.

After you load your soft character set, you must designate the set as G0, G1, G2, or G3.

Table 5-6 DECDLD Parameter Characters

Parameter	**Name**	**Description**
Pfn	Font number	Selects the DRCS font buffer to load. The VT300 has two DRCS font buffers. One font buffer is dedicated to session 1, the other to session 2. Each font buffer is called DRCS buffer 1. Pfn has two valid values, 0 and 1. Both values refer to DRCS buffer 1 for each session.

Table 5-6 DECDLD Parameter Characters (Cont)

Parameter	Name	Description
Pcn	Starting character	Selects where to load the first character in the DRCS font buffer. The location corresponds to a location in the ASCII code table (Table 2-1). For example, a Pcn value of 0 means that the first soft character is loaded into position 2/0 of the character table. A Pcn value of 1 means position 2/1 in the table, and so on up to Pcn = 95 (position 7/15). Pcn is affected by the character set size. See Pcss below.
Pe	Erase control	Selects which characters to erase from the DRCS buffer before loading the new font. 0 = erase all characters in the DRCS buffer with this number, width and rendition. 1 = erase only characters in locations being reloaded. 2 = erase all renditions of the soft character set (80-column and 132-column).
Pcmw	Character matrix width	Selects the maximum character cell width. *VT300 mode* 0 = 10 pixels wide for 80 columns, 6 pixels wide for 132 columns. (default) 1 = illegal. 2 = 5 × 10 pixel cell (VT200 compatible). 3 = 6 × 10 pixel cell (VT200 compatible). 4 = 7 × 10 pixel cell (VT200 compatible). 5 = 5 pixels wide. 6 = 6 pixels wide. . . 10 = 10 pixels wide.

Table 5-6 DECDLD Parameter Characters (Cont)

Parameter	Name	Description
Pcmw (cont)		If you omit a Pcmw value, the terminal uses the default character width. If the Pe parameter is 0, Pcmw must be less than 10. Any Pcmw value over 10 is illegal. **For VT200 compatible software:** Use a Pcmw value of 2, 3, or 4. When you use these values, the VT300 doubles the height of the font definitions in memory. This makes the soft set the same height as the hard sets. If you use a Pcmw value of 0, the VT300 does not double the height and the soft set appears smaller than the hard sets.Remember that the VT200 fonts may appear different on the VT300. **For fonts designed for the VT300:** Use values 5 through 10. **For compatibility between VT200 and VT300 terminals:** Use a Pcmw value of 5, 6, or 7.
Pw	Font Width	Selects the number of columns per line (font set size). **0 = 80 columns. (default)** 1 = 80 columns. 2 = 132 columns.

Table 5-6 DECDLD Parameter Characters (Cont)

Parameter	Name	Description
Pt	Text or full-cell	Defines the font as a text font or *full-cell font.* 0 = text. (default) 1 = text. 2 = full cell. Full-cell fonts can individually address all pixels in a cell. Text fonts cannot individually address all pixels. If you specify a text cell, the terminal automatically performs spacing and centering of the characters.
Pcmh	Character matrix height	Selects the maximum character cell height. 0 or omitted = 20 pixels high. (default) 1 = 1 pixel high. 2 = 2 pixels high. 3 = 3 pixels high. . . . 20 = 20 pixels high. Pcmh values over 20 are illegal. If the value of Pcmw is 2, 3, or 4, Pcmh is ignored.
Pcss	Character set size	Defines the character set as a 94- or 96-character graphic set. 0 = 94-character set. (default) 1 = 96-character set.

The value of Pcss changes the meaning of the Pcn (starting character) parameter above.

Table 5-6 DECDLD Parameter Characters (Cont)

Parameter	Name	Description

Examples

- If Pcss = 0 (94-character set)

  The terminal ignores any attempt to load characters into the 2/0 or 7/15 table positions.

Pcn	Specifies
1	column 2/row 1
.	
.	
94	column 7/row 14

- If Pcss = 1 (96-character set)

Pcn	Specifies
0	column 2/row 0
.	
.	
95	column 7/row 15

Table 5-7 Valid DECDLD Parameter Combinations

Pcmw	Pt	Pcmh	Pw
80-Column Fonts			
2 to 9	0, 1	1 to 20	0, 1
2 to 10	2	1 to 20	0, 1
132-Column Fonts			
2 to 5	0, 1	1 to 20	2
2 to 6	2	1 to 20	2

Designating the Soft Character Set

You designate your soft character set the same way you designate the hard character sets — using a select character set (SCS) sequence. You also use the same format for the SCS sequence.

ESC	Intermediate(s)	Final
1/11	*********	*****

where

Intermediate(s)

are zero or more characters that designate the soft character set as one of the logical sets, G0 through G3. You use the same intermediate characters that you use for hard character sets (Table 5-2).

An intermediate character also indicates that the soft character set is a 94- or 96-character set. Make sure you use an intermediate character that matches the setting of the character set size parameter (Pcss) in the DECDLD string (Table 5-6).

Final

is the Dcsc name you used for the soft character set in the DECDLD string.

Notes on Designating Soft Character Sets

- *Replacing a soft set with a new soft set*

  If you use a new Dscs name when you replace the current soft set with another soft set, then the following occurs.

  - Characters from the old soft set are undefined. If you redefine the soft set, characters currently on the screen may change.
  - Any logical sets (G0, G1, G2, G3) used to designate the old soft set are undefined. The in-use table is also undefined.

  After you load a new soft set, use a select character set (SCS) sequence to designate the soft set. Using SCS eliminates the confusion involved with undefined characters.

- *Replacing a hard set with a soft set*

  You can define a soft set that replaces one of the hard sets (such as ASCII or DEC Special Graphic).

  A soft set that replaces a hard set remains in effect until you perform one of the following actions.

  - Clear the soft set (using the **Recall Saved Settings** or **Recall Factory Default Settings** set-up features, or the power-up self-test).
  - Redefine the soft set (using another DECDLD string).

Soft Character Set Example

Suppose you want to create a soft character set containing a solid rectangle, a blank, a rectangular box, and a striped rectangle. This example shows how you would

- down-line-load the set,
- designate the set as G1, and
- map the G1 set into GL.

NOTE: Make sure the terminal is in VT300 mode before you try to load a soft character set. You cannot load soft sets in VT100 mode.

1. You could use the following DECDLD string to load your character set. (The string is shown divided into sections for clarity.)

```
DCS

1 ; 1 ; 0 ; 8 ; 1 ; 1 ; 20; 0 { sp @

~~~~~~~~/~~~~~~~~/~~~~~~~~/~~~~~~~~;

????????/????????/????????/????????;

~@@@@@@~/~??????~/~??????~/~AAAAAA~;

TTTTTTTT/TTTTTTTT/TTTTTTTT/TTTTTTTT;

ST
```

where

DCS (9/0)
introduces the device control string.

1 ; 1 ; 0 ; 8 ; 1 ; 1 ; 20 ; 0
is the parameter string specifying the following. (See Table 5-6 for parameter definitions.)

Parameter	**Function**
Pfn = 1	Loads this soft set into the DRCS font buffer.
Pcn = 1	Selects the character at row 2/ column 1 in the ASCII table (Chapter 2) as the first character to load.
Pe = 0	Erases all characters in the font buffer for that rendition.
Pcmw = 8	Selects a maximum character width of 8 pixels.
Pw = 1	Selects a font width of 80 columns.
Pt = 1	Defines the set as a text font.
Pcmh = 20	Selects a maximum character height of 20 pixels.
Pcss = 0	Defines the set as a 94-character set.

{ (7/11)
indicates the end of the parameter characters and specifies that this sequence is a DECDLD string.

sp @ (2/0, 4/0)
defines the character set as an unregistered soft set. This value is the recommended default value for user-defined sets. The sp represents one space. You can use other values to define other specific character sets.

```
~~~~~~~~/~~~~~~~~/~~~~~~~~/~~~~~~~~
```

represents the first character (a solid rectangle).

; (3/11)

separates the soft characters.

`????????/????????/????????/????????`

represents the second character (a blank).

`~@@@@@@~/~??????~/~??????~/~AAAAAA~`

represents the third character (a hollow rectangle).

`TTTTTTTT/TTTTTTTT/TTTTTTTT/TTTTTTTT`

represents the fourth character (a set of horizontal stripes).

ST (9/12)

indicates the end of the DECDLD string.

2. Now you are ready to designate the character set as G1. You can use the following SCS escape sequence.

ESC) sp @

where

ESC (1/11)

introduces the SCS sequence.

) (2/9)

designates the character set as G1.

sp @ (2/0, 4/0)

selects the soft set as the set to designate as G1. Remember, sp @ was the name used for the soft set in the DECDLD string.

3. Finally, you want to map the G1 set into the in-use table as GL. You can map the set by sending a shift out (SO) control character. To send the SO character, you hold down the **Ctrl** key and press N key.

NOTE: For information on using shift characters, see Chapter 3. For information on mapping sets, see "Mapping Character Sets" in this chapter.

The soft character set should now be loaded and ready for use.

Clearing a Soft Character Set

You can clear a soft character set that you loaded into the terminal by using the following DECDLD control string.

DCS 1;1;2 { sp @ ST

Any of the following actions also clear the soft character set.

- Performing the power-up self-test.
- Selecting the **Recall Saved Settings** or **Recall Factory Default Settings** set-up features.
- Using a reset to initial state (RIS) sequence.

6 PAGE MEMORY

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This chapter describes the control functions that affect the terminal's *page memory.* The chapter covers the following topics.

- What is page memory?
- Controlling page format
- Moving through pages

This chapter assumes you are familiar with the character-encoding concepts described in Chapter 2.

WHAT IS PAGE MEMORY?

Many terminals only have enough memory to store the data that appears on their screen. The VT300 has memory to store more data than you can display on the screen. The size of this memory is equal to 144 lines by 80 or 132 columns. You can divide this memory into one or more pages.

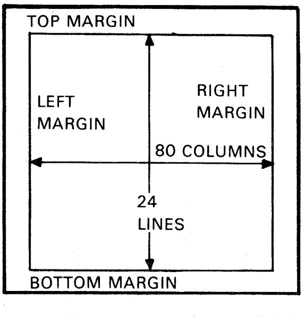
Page memory lets you store more text locally in the terminal. The screen can display up to 24 lines from page memory at a time. You can use control functions (such as scrolling and panning) to display the other lines.

Page memory can provide a faster response time. While the terminal displays one page, the host can write to another (Chapter 10).

You divide page memory into a number of equal-sized pages, by selecting one of several standard page sizes. A page in page memory is similar to a page in a book. Each page has left, right, top, and bottom margins. You can define the position of the top and bottom margins on a page. The left and right margins are always set according to the current page width. You select the page format by using control functions or set-up. This chapter describes the control functions.

Applications can write to page memory by first addressing a page, then writing data to the page. If the application wants write to another page, the application must address that page.

Figure 6-1 shows the basic parts of a page. The figure shows the default page size of 24 lines × 80 columns. Your terminal screen can display 24 lines at a time. However, you can make the length of a page larger than the screen.



MA-0079-86

Figure 6-1 A Page in Page Memory

Page Memory for a Single Session

When you use a single session, the full 144 lines of page memory are available. See Chapter 14 for details on session management.

You can select one of the following page sizes for a single session. Figure 6-2 shows these page sizes.

- 6 pages of 24 lines × 80 or 132 columns
- 4 pages of 36 lines × 80 or 132 columns
- 2 pages of 72 lines × 80 or 132 columns
- 1 page of 144 lines × 80 or 132 columns

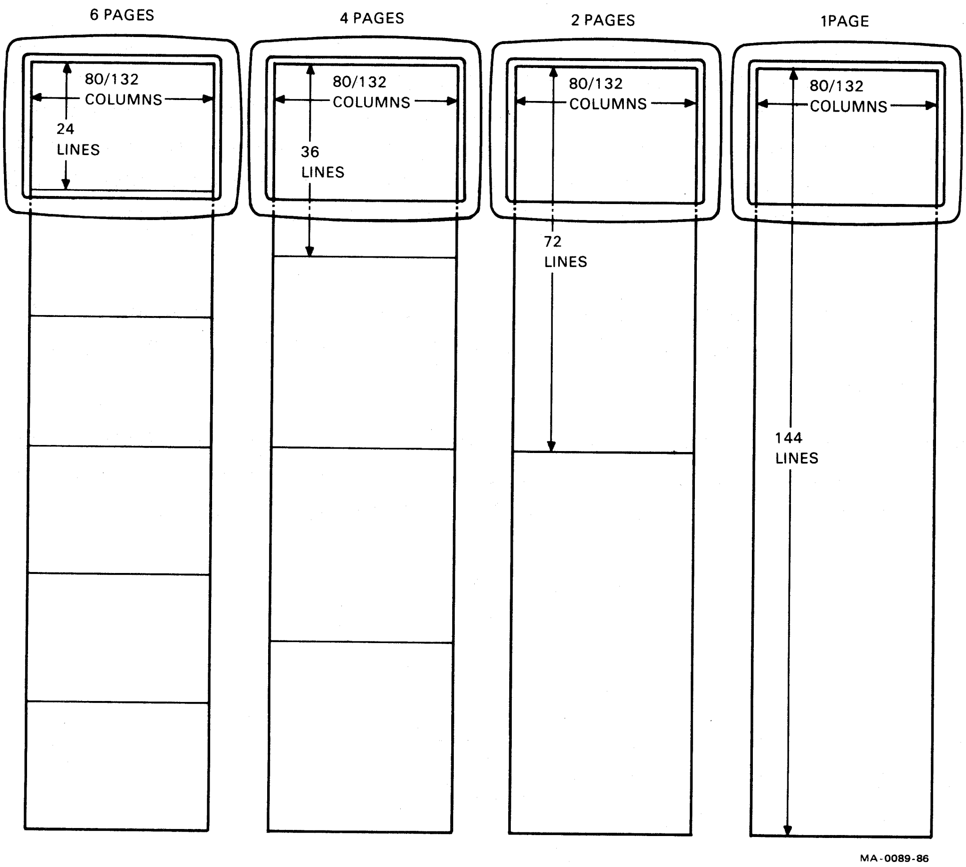

6 PAGES
4 PAGES
2 PAGES
1PAGE
80/132 COLUMNS
24 LINES
80/132 COLUMNS
36 LINES
80/132 COLUMNS
72 LINES
80/132 COLUMNS
144 LINES
MA-0089-86

Figure 6-2 Page Sizes for a Single Session

Page Memory for Dual Sessions

When you use dual sessions, each session has 72 lines of page memory available. See Chapter 14 for details on session management.

You can select one of the following page sizes for dual sessions. Figure 6-3 shows these page sizes.

- 3 pages of 24 lines × 80 or 132 columns
- 2 pages of 36 lines × 80 or 132 columns
- 1 page of 72 lines × 80 or 132 columns

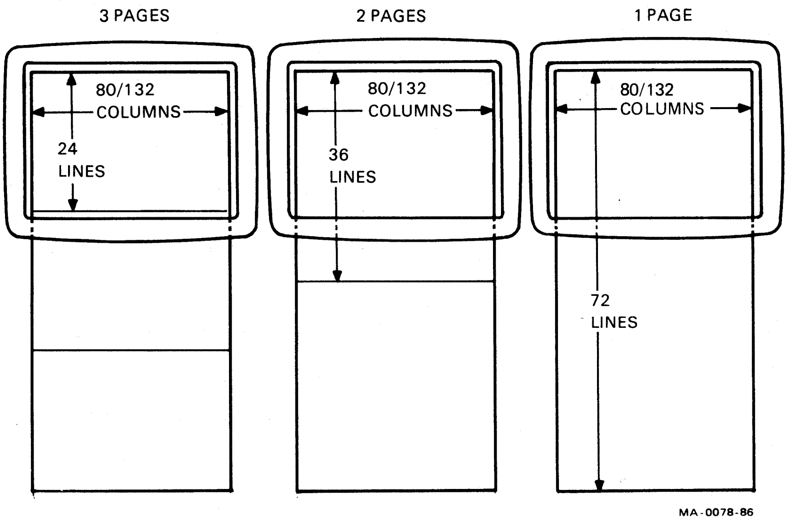

3 PAGES
2 PAGES
1 PAGE
80/132 COLUMNS
24 LINES
80/132 COLUMNS
36 LINES
80/132 COLUMNS
72 LINES
MA-0078-86

Figure 6-3 Page Sizes for Dual Sessions

CONTROLLING THE PAGE FORMAT

This section describes how to select the page size, and top and bottom margins for page memory. You use the same basic control functions for single or dual sessions.

Selecting 80 or 132 Columns per Page

There are two control functions that can set the page width to 80 or 132 columns, DECSCPP and DECCOLM.

PROGRAMMING TIP: Digital recommends that new applications use DECSCPP rather than DECCOLM. DECSCPP does not clear page memory or reset the scrolling regions, as does DECCOLM. DECCOLM is provided mainly for compatibility with previous products.

Set Columns per Page (DECSCPP)

Default: 80 columns

Sequence	**Action**
CSI $ | 9/11 2/4 7/12	Sets each page to 80 columns.
CSI 0 $ | 9/11 3/0 2/4 7/12	Sets each page to 80 columns.
CSI 8 0 $ | 9/11 3/8 3/0 2/4 7/12	Sets each page to 80 columns.
CSI 1 3 2 $ | 9/11 3/1 3/3 3/2 2/4 7/12	Sets each page to 132 columns.

Notes on DECSCPP

- If you switch from 132-column to 80-column pages, you can lose data from page memory. Columns no longer present in page memory are lost. Make sure you set page columns *before* you enter data into page memory.

Column Mode (DECCOLM)

Default: 80 columns

Mode	**Sequence**	**Action**
Set (132)	CSI ? 3 h 9/11 3/15 3/3 6/8	Selects the 132-column font to display text on the screen.

Reset (80)	CSI 9/11	? 3/15	3 3/3	1 6/12	Selects the 80-column font to display text on the screen.

Notes on DECCOLM

- If you change the DECCOLM setting, the terminal
  - sets the top and bottom scrolling margins to their default positions, and sets all pages to have 24 lines
  - erases all data in page memory.
- DECCOLM clears data from the status line.

Set Lines per Page (DECSLPP)

This control function sets the number of lines for each page in page memory. The number of lines you can select depends on whether you use a single session or dual sessions.

Default: 3 pages of 24 lines

	Page Length	
Sequence	**Dual Session**	**Single Session**
CSI 2 4 t 9/11 3/2 3/4 7/4	3 pages of 24 lines	6 pages of 24 lines
CSI 3 6 t 9/11 3/3 3/6 7/4	2 pages of 36 lines	4 pages of 36 lines
CSI 7 2 t 9/11 3/7 3/2 7/4	1 page of 72 lines	2 pages of 72 lines
CSI 1 4 4 t 9/11 3/1 3/4 3/4 7/4	Not available	1 page of 144 lines

Notes on DECSLPP

- If you switch to a smaller page size, data that was on the larger page may be split across the smaller pages. To avoid confusion, make sure you set the lines per page *before* you enter data into page memory.

- DECSLPP usually does not change the top and bottom scrolling margins. However, if you change the page size, and the current scrolling margins exceed the new page size, the terminal resets the margins to the page limits.

Origin Mode (DECOM)

This control function allows cursor addressing relative to the top and bottom margins or the complete page. DECOM determines if the *cursor position* is restricted to inside the page margins. When you power up or reset the terminal, you reset origin mode.

Default: Origin at upper-left of screen, independent of margins.

Mode	Sequence				Action
Set (Margin-dependent)	CSI 9/11	? 3/15	6 3/6	h 6/8	Sets the home cursor position at the upper-left corner of the screen, within the margins. The starting point for line numbers depends on the current top margin setting. The cursor *cannot* move outside of the margins.
Reset (Margin-independent)	CSI 9/11	? 3/15	6 3/6	l 6/12	Sets the home cursor position at the upper-left corner of the screen. The starting point for line numbers is independent of the margins. The cursor *can* move outside of the margins.

Set Top and Bottom Margins (DECSTBM)

This control function sets the top and bottom margins for the current page. You cannot perform scrolling outside the margins.

Default: Margins at page limits.

CSI	Pt	;	Pb	r
9/11	3/?	3/11	3/?	7/2

where

Pt is the line number for the top margin.
Default: Pt = 1.

Pb is the line number for the bottom margin.
Default: Pb = 24, 36, 48, or 72 (depending on the number of lines per page).

Notes on DECSTBM

- The value of Pt must be less than Pb.
- The maximum size of the scrolling region is the page size.
- DECSTBM moves the cursor to column 1, line 1 of the page.

MOVING TO ANOTHER PAGE

The following control functions let you move the cursor forward or backward to another page in page memory. You can move in sequence or randomly. Applications can use these control functions to select the page to write to.

Next Page (NP)

This control function moves the cursor forward to the home position on one of the following pages in page memory. If there is only one page, the terminal ignores NP.

Default: Move to the next page.

CSI	**Pn**	**U**
9/11	3/?	5/5

where

Pn indicates how many pages to move the cursor forward.
Default: Pn = 0.

If Pn is 0 or 1, then the cursor moves to the next page in page memory. If Pn tries to move the cursor past the last page in memory, then the cursor stops at the last page.

Preceding Page (PP)

This control function moves the cursor backward to the home position on one of the preceding pages in page memory. If there is only one page, the terminal ignores PP.

Default: Move to the preceding page.

CSI	Pn	V
9/11	3/?	5/6

where

Pn indicates how many pages to move the cursor backward.
Default: Pn = 0.

If Pn is 0 or 1, the cursor moves to the preceding page. If Pn tries to move the cursor back farther than the first page in memory, the cursor stops at the first page.

Page Position Absolute (PPA)

This control function can move the cursor to the corresponding row and column on any page in page memory. You select the page by its number. If there is only one page, the terminal ignores PPA.

Default: Move to the next page.

CSI	Pn	sp	P
9/11	3/?	2/0	5/0

Pn is the number of the page to move the cursor to. If Pn is greater than the number of the last page in memory, the cursor stops at the last page. If Pn is less than the number of the first page, the cursor stops at the first page.

Page Position Backward (PPB)

This control function moves the cursor backward to the corresponding row and column on one of the preceding pages in page memory. If there is only one page, the terminal ignores PPB.

Default: Move backward one page.

CSI	Pn	sp	R
9/11	3/?	2/0	5/2

where

Pn indicates the number of pages to move the cursor backward. If Pn tries to move the cursor back farther than the first page in memory, the cursor stops at the first page.

Page Position Relative (PPR)

This control function moves the cursor forward to the corresponding row and column on one of the following pages in page memory. If there is only one page, the terminal ignores PPR.

Default: Move to the next page.

CSI	Pn	sp	Q
9/11	3/?	2/0	5/1

where

> **Pn** indicates how many pages to move the cursor forward. If Pn tries to move the cursor beyond the last page in memory, the cursor stops at the last page.

SUMMARY

Tables 6-1 and 6-2 list the control functions described in this chapter.

Table 6-1 Page Format Sequences

<table>
<tr><th>Name</th><th>Mnemonic</th><th>Sequence</th></tr>
<tr><td>Set columns per page</td><td>DECSCPP</td><td>CSI Pn $ |
Pn columns (80 or 132).</td></tr>
<tr><td>Column mode</td><td>DECCOLM</td><td>Set: CSI ? 3 h
132 columns.
Reset: CSI ? 3 l
80 columns. (D)</td></tr>
<tr><td>Set lines per page</td><td>DECSLPP</td><td>CSI Pn t
Pn lines per page.
The number of pages depend on how many you use.
<table>
<tr><th>Pn</th><th>Dual</th><th>Single</th></tr>
<tr><td>24</td><td>3 pages</td><td>pages</td></tr>
<tr><td>36</td><td>2</td><td>4</td></tr>
<tr><td>72</td><td>1</td><td>2</td></tr>
<tr><td>144</td><td>—</td><td>1</td></tr>
</table>
</td></tr>
<tr><td>Origin mode</td><td>DECOM</td><td>Set: CSI ? 6 h
Move within margins.
Reset: CSI ? 6 l
Move outside margins. (D)</td></tr>
<tr><td>Set top and bottom margins</td><td>DECSTBM</td><td>CSI Pt ; Pb r
Pt = top line.
Pb = bottom line.</td></tr>
</table>

(D) = default.

Table 6-2 Sequences for Moving Through Page Memory

Name	Mnemonic	Sequence	New Cursor Position*
Next page	NP	CSI Pn U	Home.
Preceding page	PP	CSI Pn V	Home.
Page position absolute	PPA	CSI Pn sp P	Same as old page.
Page position backward	PPB	CSI Pn sp R	Same as old page.
Page position relative	PPR	CSI Pn sp Q	Same as old page.

* Pn = the number of pages to move, except for PPA. For PPA, Pn = the actual page number.

7 SETTING VISUAL CHARACTER AND LINE ATTRIBUTES

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This chapter describes how to select visual attributes for display characters. *Visual character attributes* change the way characters appear on the screen, without changing the actual characters. For example, the bold character attribute makes a character appear heavier on the screen. You can also select the visual attributes for a complete display line on the screen.

SETTING VISUAL CHARACTER ATTRIBUTES

This section describes how to select, change, and reverse visual character attributes. You can set the following attributes.

bold
underline
blink
negative image (dark character on a light background)
invisible

Select Graphic Rendition (SGR)

This control function selects one or more character attributes at the same time.

Default: Clear all attributes.

CSI	Ps	;	Ps	...	m
9/11	3/?	3/11	3/?	...	6/13

where

> Ps is a number representing a certain visual attribute. You can use more than one Ps value to select different character attributes. Table 7-1 lists Ps values and the attributes they select.
>
> Default: Ps = 0 (clears all attributes).

Table 7-1 Visual Character Attribute Values

Ps	Attribute	Mode
0	All attributes off	VT100 or VT300
1	Bold	
4	Underline	
5	Blinking	
7	Negative image	
8	Invisible	VT300 only
22	Bold off	
24	Underline off	
25	Blinking off	
27	Negative image off	
28	Invisible off	

Examples

- When you select more than one attribute in an SGR sequence, they are executed in order. For example, you can use the following sequence to display text that is bold, blinking, and underlined.

  CSI 0 ; 1 ; 5 ; 4 m

- The following sequence displays the negative image of text.

  CSI 7 m

Notes on SGR

- After you select an attribute, the terminal applies that attribute to all new characters received. If you move characters by scrolling, the attributes move with the characters.
- If you display control characters, the terminal ignores the bold attribute for displayed control characters. See "Display Controls Mode" at the end of Chapter 2.

SETTING LINE ATTRIBUTES

Line attributes are display features that affect the way a line of characters appears on the screen. For example, the double-width, single height line (DECDWL) attribute makes a line of characters appear twice as wide as a normal line of characters. This section describes how to select line attributes.

Single-Width, Single-Height Line (DECSWL)

This control function makes the line with the cursor single-width and single-height. This line attribute is the standard for all new lines on the screen.

ESC	**#**	**5**
1/11	2/3	3/5

Double-Width, Single-Height Line (DECDWL)

This control function makes the line with the cursor double-width and single-height. If the line was single-width and single-height, all characters to the right of the screen's center are lost.

ESC	**#**	**6**
1/11	2/3	3/6

Double-Width, Double-Height Line (DECDHL)

These two control functions make the line with the cursor the top or bottom half of a double-height, double-width line. You must use these sequences in pairs on adjacent lines. In other words, the same display characters must appear in the same positions on both lines to form double-height characters. If the line was single-width and single-height, all characters to the right of the screen center are lost.

Top Half			**Bottom Half**		
ESC	**#**	**3**	**ESC**	**#**	**4**
1/11	2/3	3/3	1/11	2/3	3/4

Example
The following sequences make the phrase "VT300 Video Terminal" double-height and double-width.

ESC#3 VT300 Video Terminal
ESC#4 VT300 Video Terminal

SUMMARY

Table 7-2 lists the control functions described in this chapter.

Table 7-2 Character and Line Attribute Sequences

Name	Mnemonic	Sequence
Select graphic rendition	SGR	CSI Ps...Ps m Ps = character attribute value(s). (Table 7-1)
Single-width, single-height line	DECSWL	ESC # 5
Double-width, single-height line	DECDWL	ESC # 6
Double-width, double-height line	DECDHL	ESC # 3 (top half) ESC # 4 (bottom half)

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You use editing control functions to insert, delete, and erase characters and lines of characters at the cursor position. You use character protection control functions to protect characters in the terminal's page memory. Protected characters cannot be changed, erased, or moved by certain editing control functions.

This chapter describes how to edit and protect characters in page memory.

EDITING

This section describes the editing control functions available in the VT300. The cursor does not move when you use these functions.

Erasure Mode (ERM)

This control function determines whether the erasure functions can edit protected characters. Table 8-1 lists the functions that ERM affects. ERM also affects the independent style of character protection. See "Character Protection" later in this chapter for information on protection styles.

Default: Unprotected.

Mode	Sequence			Action
Set (All)	CSI 9/11	6 3/6	h 6/8	Erasure functions (ED, EL, and ECH) can affect all characters, protected and unprotected.
Reset (Unprotected)	CSI 9/11	6 3/6	l 6/12	Erasure functions (ED, EL, and ECH) can affect only unprotected characters.

Notes on ERM

- ERM does not affect the selective erase functions (DECSED, DECSEL). DECSED and DECSEL *can* never erase protected characters, regardless of the setting of ERM.
- In edit mode (DECEDM): ERM also affects the following editing functions: DL, IL, DCH, ICH. See Chapter 9.

Table 8-1 Control Functions Affected by Character Protection

Always	*If Edit Mode (DECEDM) Is Set*
Erase character (ECH)	Insert character (ICH)
Erase in line (EL)	Insert line (IL)
Erase in display (ED)	Delete character (DCH)
	Delete line (DL)

Insert/Replace Mode (IRM)

This control function selects how the terminal adds characters to page memory. The terminal always adds new characters at the cursor position.

Default: Replace.

Mode	Sequence	Action
Set (Insert)	CSI 4 h 9/11 3/4 6/8	Selects insert mode. New characters move characters in page memory to the right. Characters moved past the right page border are lost from page memory.
Reset (Replace)	CSI 4 l 9/11 3/4 6/12	Selects replace mode. New characters replace the character at the cursor position.

Notes on IRM

- If erasure mode (ERM) is reset, text moved into a protected character field is lost.

Delete Line (DL)

This control function deletes one or more lines in the scrolling region, starting with the line that has the cursor.

CSI	Pn	M
9/11	3/?	4/13

where

Pn is the number of lines to delete.
Default: Pn = 1.

As lines are deleted, lines below the cursor and in the scrolling region move up. Blank lines with no visual attributes are added at the bottom of the scrolling region. If Pn is greater than the number of lines remaining on the page, DL deletes only the remaining lines. DL has no effect outside the scrolling margins.

Notes on DL

- In edit mode (DECEDM): If erasure mode (ERM) is reset, DL cannot delete lines that have protected characters. As lines are deleted, the area moved up is bounded by the bottom of the scrolling region, or by the next line with a protected character field. See Chapter 9.

Insert Line (IL)

This control function inserts one or more blank lines, starting at the cursor.

CSI	**Pn**	**L**
9/11	3/?	4/12

where

Pn is the number of lines to insert.
Default: Pn = 1

As lines are inserted, lines below the cursor and in the scrolling region move down. Lines scrolled off the page are lost. IL has no effect outside the page margins.

Notes on IL

- In edit mode (DECEDM): If erasure mode (ERM) is reset, lines that move down into a line with a protected character field are lost. See Chapter 9.

Delete Character (DCH)

This control function deletes one or more characters, from the cursor position to the right.

CSI	**Pn**	**P**
9/11	3/?	5/0

where

Pn is the number of characters to delete. If Pn is greater than the number of characters remaining on the line, DCH only deletes the remaining characters.
Default: Pn = 1.

As characters are deleted, characters to the right of the cursor move left. Character attributes move with the characters. The spaces created at the end of the line have all attributes off.

Notes on DCH

- In edit mode (DECEDM)
  - If erasure mode (ERM) is reset, DCH cannot delete protected characters.
  - If characters are protected by the DECPRO function, DCH cannot delete protected characters. See Chapter 9.

Insert Character (ICH)

This control function inserts one or more space (SP) characters, starting at the cursor position.

Available in: VT300 mode only

CSI	Pn	@
9/11	3/?	4/0

where

Pn is the number of characters to insert.
Default: Pn = 1.

The ICH sequence inserts Pn blank characters with the normal character attribute. The cursor remains at the beginning of the blank characters. Text to the right of the cursor moves right. Characters scrolled off the page are lost.

Notes on ICH

- In edit mode (DECEDM): If erasure mode (ERM) is reset, text moved into a protected character field is lost. See Chapter 9.

Erase in Display (ED)

This control function erases characters from part or all of the display. When you erase complete lines, they become single-height and single-width, with all visual character attributes cleared. ED works inside or outside the current margins

CSI	Ps	J
9/11	3/?	4/10

where

Ps represents the amount of the display to erase, as follows.

Ps	**Area Erased**
0 (default)	From the cursor through the end of the display
1	From the beginning of the display through the cursor
2	The complete display

PROGRAMMING TIP: Use a Ps value of 2 to erase the complete display in a fast, efficient manner.

Notes on ED

- If erasure mode (ERM) is reset, ED cannot erase protected character positions.

Erase in Line (EL)

This control function erases characters on the line that has the cursor. EL clears all character attributes from erased character positions. EL works inside or outside the current margins.

CSI	**Ps**	**K**
9/11	3/?	4/11

where

Ps represents the section of the line to erase, as follows.

Ps	**Section Erased**
0 (default)	From the cursor through the end of the line
1	From the beginning of the line through the cursor
2	The complete line

Notes on EL

- If erasure mode (ERM) is reset, EL cannot erase protected characters.

Erase Character (ECH)

This control function erases one or more characters, from the cursor position to the right. ECH clears character attributes from erased character positions. ECH works inside or outside the current margins.

Available in: VT300 mode only

CSI	Pn	X
9/11	3/?	5/8

where

Pn is the number of characters to erase. A Pn value of 0 or 1 erases one character.
Default: Pn = 1.

Notes on ECH

- If erasure mode (ERM) is reset, ECH cannot erase protected characters.

Selective Erase in Display (DECSED)

This control function erases some or all of the erasable characters in the display. DECSED can only erase characters defined as erasable by the DECSCA, SPA, or EPA control functions. See "Character Protection" later in this chapter for details. DECSED works inside or outside the scrolling margins, except in edit mode (DECEDM). In edit mode, DECSED cannot erase characters outside the scrolling margins.

Available in: VT300 mode only

CSI	?	Ps	J
9/11	3/15	3/?	4/10

where

Ps represents the area of the display to erase, as follows.

Ps	Area Erased
0 (default)	From the cursor through the end of the display
1	From the beginning of the display through the cursor
2	The complete display

Notes on DECSED

- DECSED is *not* affected by erasure mode (ERM).
- DECSED does not affect visual character attributes set by the select graphic rendition (SGR) function, or selection attributes set with SSA or ESA functions (Chapter 9).
- DECSED provides full compatibility with applications that use the VT220 selective erase feature.

Selective Erase in Line (DECSEL)

This control function erases some or all of the erasable characters in a single line of text. DECSEL erases only those characters defined as erasable by the DECSCA, SPA, or EPA control functions. See "Character Protection" later in this chapter for details. DECSEL works inside or outside the scrolling margins, except in edit mode (DECEDM). In edit mode, DECSEL cannot erase characters outside the scrolling margins.

Available in: VT300 mode only

CSI	**?**	**Ps**	**K**
9/11	3/15	3/?	4/11

where

Ps represents the section of the line to erase, as follows.

Ps	**Section Erased**
0 (default)	From the cursor through the end of the line
1	From the beginning of the line through the cursor
2	The complete line

Notes on DECSEL

- DECSEL is *not* affected by erasure mode (ERM).
- DECSEL does not affect visual character attributes set by the select graphic rendition (SGR) function.
- DECSEL provides full compatibility with applications that use the VT220 selective erase feature.

CHARACTER PROTECTION

You can protect character positions in the terminal's page memory. Protected characters cannot be changed, erased, or moved by certain editing control functions (such as ED, EL, or ECH).

There are two styles of character protection available.

- Independent protection
- Visual attribute protection

You should use only *one* style of protection at a time. The two styles do not protect characters in the same way. To avoid confusion, Digital recommends that you use only one style of protection for each text form you design.

The following sections describe each style of character protection and list the editing control functions affected.

PROGRAMMING TIP: Digital recommends that new applications use independent protection. Visual attribute protection is only provided for strict compatibility with Digital's VT131 terminal.

INDEPENDENT PROTECTION

This style of character protection lets you protect all the characters in an area of page memory, independent of their visual attributes (such as bold and underline). When you use independent protection, the following control functions cannot change, erase, or move the protected characters.

Erase in display (ED)
Erase in line (EL)
Erase character (ECH)

In addition, if you set edit mode (DECEDM), the following control functions cannot change, delete, or move protected characters.

Insert line (IL)
Insert character (ICH)
Delete line (DL)
Delete character (DCH)

See Chapter 9 for details on edit mode.

How It Differs from Visual Attribute Protection

There are three basic differences between independent protection and visual attribute protection.

- Independent protection lets you protect characters independent of their visual character attributes. Visual attribute protection applies to characters with the same visual character attribute.
- You can use independent protection in any operating mode. You can use visual attribute protection only in edit mode (Chapter 9).
- Independent protection depends on the current setting of erasure mode (ERM), visual attribute protection does not.

  ERM determines whether or not independently protected characters can be changed, erased, or moved.

ERM set	All characters can be changed, erased, or moved, regardless of protection.
ERM reset	Only unprotected characters can be changed, erased, or moved (using the erasure control functions).

  See "Erasure Mode (ERM)" earlier in this chapter for details. Table 8-1 describes how erasure mode (ERM) affects protected characters.

For more details, see "Visual Attribute Protection" later in this chapter.

NOTE: You should use only one style of protection at a time. The two styles of protection (independent and visual attribute) do not protect characters in the same way. To avoid confusion, use only one style of protection for each text form you design.

PROGRAMMING TIP: Digital recommends that new applications use independent protection. Visual attribute protection is only provided for strict compatibility with Digital's VT131 terminal.

The following sections describe the control functions you use to define areas of page memory as independently protected.

Select Character Protection Attribute (DECSCA)

This control function defines successive characters written to page memory as protected or unprotected. The erasure control functions (ED, EL, or ECH) cannot erase protected characters.

Available in: VT300 mode only

CSI	**Ps**	**"**	**q**
9/11	3/?	2/2	7/1

where

Ps defines all following characters as protected or unprotected.

Ps	**Meaning**
0 (default)	Not protected.
1	Protected.
2	Not protected. Same as default setting.

Notes on DECSCA

- DECSCA does *not* affect visual character attributes set by the select graphic rendition (SGR) function.
- If erasure mode (ERM) is set, you can erase protected characters by using the ED, EL, or ECH functions.

Start Protected Area (SPA) and End Protected Area (EPA)

These control functions define the beginning and end of a protected area in page memory. The erasure control functions (ED, EL, and ECH) cannot change protected areas.

You can represent SPA or EPA as an 8-bit control character, or as a 7-bit escape sequence.

Name	**8-Bit**	**7-Bit**		**Action**
Start of protected area (SPA)	**SPA** 9/6	**ESC** 1/11	**V** 5/6	Defines the cursor position as the beginning of a series of protected characters.
End of protected area (EPA)	**EPA** 9/7	**ESC** 1/11	**W** 5/7	Defines the cursor position as the end of a series of protected characters.

Notes on SPA and EPA

- The terminal ignores any EPA received before an SPA.
- If SPA is not followed by an EPA on the same page, SPA has no effect on the page.

VISUAL ATTRIBUTE PROTECTION

This style of character protection lets you protect characters with the same visual attribute in an area of page memory. When you use visual attribute protection, the following control functions cannot change, erase, or move protected characters.

Insert character (ICH)
Insert line (IL)
Delete character (DCH)
Delete line (DL)
Erase character (ECH)
Erase in line (EL)
Erase in display (ED)

How It Differs from Independent Protection

There are three basic differences between visual attribute protection and independent protection.

- Visual attribute protection applies to characters with the same visual character attribute. For example, you can protect all characters with the bold attribute or underline attribute. Independent protection is independent of visual attributes.
- Visual attribute protection is only available in edit mode (DECEDM). You can use independent protection in all operating modes.
- Visual attribute protection is *not* affected by erasure mode (ERM). Independent protection is affected.

NOTE: You should use only one style of protection at a time. The two styles of protection (independent and visual attribute) do not protect characters in the same way. To avoid confusion, use only one style of protection for each text form you design.

PROGRAMMING TIP: Digital recommends that new applications use independent protection. Visual attribute protection is only provided for strict compatibility with Digital's VT131 terminal.

You use the DECPRO control function to protect characters based on their visual attributes.

Protected Fields Attributes (DECPRO)

This control function selects character protection based on visual attributes.

Available in: edit mode (DECEDM)

CSI	**Ps**	**...**	**Psn**	}
9/11	3/?	...	3/?	7/13

where

Ps defines characters with a certain character attribute as protected or unprotected. You can select more than one attribute.

Ps	Protection	Characters Affected
0	On	Characters with no attribute (normal)
1	On	Bold characters
4	On	Underlined characters
5	On	Blinking characters
7	On	Negative image characters
8	On	Invisible characters
22	Off	Bold characters
24	Off	Underlined characters
25	Off	Blinking characters
27	Off	Negative image characters
28	Off	Invisible characters
254	Off	All characters

When you select more than one attribute in a DECPRO sequence, any character position with one or more of the selected attributes is protected.

Examples

- The following sequence protects characters with the bold attribute, blinking attribute, or both attributes.

  CSI 0 ; 1 ; 5 }

- The following sequence protects only characters with the underline attribute.

  CSI 4 }

Notes on DECPRO

- DECPRO does not change the appearance of characters (their visual attributes). DECPRO only changes the protection of characters for editing.
- DECPRO is only available in edit mode (DECEDM). You can use both styles of protection (independent or visual attribute) in edit mode.

SUMMARY

Tables 8-2 and 8-3 list the control functions described in this chapter.

Table 8-2 Editing Sequences

Name	Mnemonic	Sequence
Erasure mode	ERM	Set: CSI 6 h You can edit all characters. Reset: CSI 6 l You can only edit unprotected characters. (D)
Insert/ replace mode	IRM	Set: CSI 4 h Insert characters. Reset: CSI 4 l Replace characters.
Delete line	DL	**CSI Pn M** Pn lines.
Insert line	IL	**CSI Pn L** Pn lines.
Delete character	DCH	**CSI Pn P** Pn characters.
Insert character	ICH	**CSI Pn @** Pn characters.

(D) = default.

Table 8-2 Editing Sequences (Cont)

Name	Mnemonic	Sequence
Erase in display	ED	**CSI Ps J** Ps = 0, cursor to end. (D) Ps = 1, beginning to cursor. Ps = 2, complete display.
Erase in line	EL	**CSI Ps K** Ps = 0, cursor to end. (D) Ps = 1, beginning to cursor. Ps = 2, complete line.
Erase character*	ECH	**CSI Pn X** Pn characters.
Selective erase in display*	DECSED	**CSI ? Ps J** Ps = 0, cursor to end. (D) Ps = 1, beginning to cursor. Ps = 2, complete display.
Selective erase in line*	DECSEL	**CSI ? Ps K** Ps = 0, cursor to end. (D) Ps = 1, beginning to cursor. Ps = 2, complete line.

(D) = default.

* Available in VT300 mode only.

Table 8-3 Character Protection Sequences

Name	Mnemonic	Sequence
Independent Protection		
Select character attribute*	DECSCA	**CSI Ps " q** Ps = 0 or 2, unprotected. (D) Ps = 1, protected.
Start protected area	SPA	8-bit: **SPA** 7-bit: **ESC V**
End protected area	EPA	8-bit: **EPA** 7-bit: **ESC W**
Visual Attribute Protection (For Local Editing Only)		
Protected fields attribute	DECPRO	**CSI Ps }** Ps = character attribute value. See "Setting Visual Character Attributes."

* Available in VT300 mode only.

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HOW LOCAL EDITING WORKS

The VT300 can operate as an interactive or editing terminal. As an *interactive* terminal, the VT300 immediately sends each character you type to the host computer. Host software must perform any editing functions.

As an *editing* terminal, the VT300 does not send your typed characters immediately to the host. Instead, the terminal stores the characters in its page memory and displays them on the screen. You can edit the displayed characters, then send them to the host in a single *block*. The terminal performs your editing functions locally.

NOTE: Local editing requires host software support.

To use the local editing feature, you must change the **Edit Mode** feature in the Local Editing Set-Up screen to other than "unavailable." See Appendix C for additional information about local editing.

By using the local editing feature, applications can free the host from editing tasks. You can edit as much data as you can store in page memory. You send the block of edited data to the host by using a control function. The terminal locks the keyboard until the transmission is complete.

What Control Functions Do You Use?

In edit mode, you can use the erasure, deletion, and insertion control functions described in Chapter 8. You can also use either style of character protection, independent or visual attribute.

The character protection feature lets you design text forms that cannot be changed or overwritten. In edit mode, character protection also depends on the setting of erasure mode (ERM).

- If ERM is set, all characters can be changed, erased, and moved, regardless of protection.
- If ERM is reset, only unprotected characters can be changed, erased, and moved. The following control functions will not affect protected areas in page memory.

Insert line (IL)
Delete line (DL)
Insert character (ICH)
Delete character (DCH)

Erase in display (ED)
Erase in line (EL)
Erase character (ECH)

This chapter describes how to select local editing and send edited data to the host. The chapter also describes how to select what areas of page memory you send to the host. For example, you may not want to send protected areas to the host.

SELECTING EDIT MODE

There are two ways to select edit mode. Applications can use the edit mode (DECEDM) sequence, or you can press **Shift-EDIT**.

Edit Mode (DECEDM)

This control function selects edit mode or interactive mode. This function determines when the terminal sends data to the host.

Default: Interactive mode

Mode	Sequence					Action
Set (Edit mode)	CSI 9/11	? 3/15	1 3/1	0 3/0	h 6/8	Selects edit mode. (Turns on the edit mode indicator on the status line.) The terminal stores all typed characters in page memory, for local editing. After you edit the stored data, you can send it in a block to the host.
Reset (Interactive mode)	CSI 9/11	? 3/15	1 3/1	0 3/0	l 6/12	Selects interactive mode. (Turns off the edit mode indicator.) The terminal immediately sends typed characters to the host.

Edit Key Execution Mode (DECEKEM)

You can switch between edit mode and interactive mode by pressing **Shift-EDIT**. This control function determines if the terminal switches modes immediately or when the application decides.

Default: Immediate

Mode	Sequence					Action
Set (Immediate)	CSI 9/11	? 3/15	1 3/1	6 3/6	h 6/8	When you press **Shift-EDIT**, the terminal immediately switches between interactive and edit modes.

Reset	CSI	?	1	6	l	When you press **Shift-EDIT**, the terminal sends DECEDM (set or reset) to the host to switch modes. Then the terminal waits for the host to return DECEDM to change the terminal's current mode.
(Deferred)	9/11	3/15	3/1	3/6	6/12	

DEFINING THE SIZE OF THE CHARACTER BLOCK

In edit mode, you can select which data the terminal sends to the host. The amount of data sent depends on two factors.

- the size of the character block you define
- the areas of text you select as eligible to send

This section describes how to define the size of the character block. The next section describes how to select areas of page memory as eligible to send.

You can send up to a page of data at one time. You can use three control functions to define the size of the character block sent to the host.

Line transmit mode (DECLTM)
Transmit termination mode (TTM)
VT131 transmit mode (DEC131TM)

Table 9-1 lists the block sizes you can select with these functions. You can select from three different block sizes.

VT131 partial page
Includes the text on the current page between the partial page marker and the cursor. The partial page marker does not appear on the screen. The terminal automatically places the marker at the position of the last character sent. If there is no marker, or the marker is after the cursor, the terminal sends all eligible characters between the top margin and the cursor.

ANSI partial page
Includes the text on the current page from the beginning of a selected area to the cursor. A selected area is a block of text that is selected as eligible to send to the host.

Scrolling region
Includes the text of the current page that is inside the margins.

Table 9-1 **Defining the Character Block Size for Transmission**

Block Size	**Line Transmit Mode (DECLTM)**	**Transmit Termination Mode (TTM)**	**VT131 Transmit Mode (DEC131TM)**
Line	Set	—	—
VT131 partial page	Reset	Reset	Set
ANSI partial page	Reset	Reset	Reset
Scrolling region	Reset	Set	—

Line Transmit Mode (DECLTM)

This control function lets you select one of two options for the size of the character block.

- a line of characters
- a full or partial page

To select a scrolling region or partial page, you must also use transmit termination mode (TTM) and VT131 transmit mode (DEC131TM).

In a line transmission, the terminal sends eligible characters from the line with the cursor. These characters are followed by any end-of-line characters and end-of-block characters. To start a line transmission, you can press the **Return** or **Enter** key.

If you press **Return** to start a line transmission, the cursor moves to the left page border of the active line. If you press **Enter** to start a line transmission, the cursor does not initially move.

If line feed/new line mode is set, the cursor moves to the first unprotected field in the next line.

If the cursor is at the end of scrolling region, the cursor moves to the first unprotected field on the current line.

DECLTM applies only in edit mode (DECEDM).

Default: Page of characters

Mode	Sequence					Action
Set (Line)	CSI 9/11	? 3/15	1 3/1	1 3/1	h 6/8	Selects line transmission.
Reset (Page)	CSI 9/11	? 3/15	1 3/1	1 3/1	l 6/12	Selects full or partial page block transmission, depending on the settings of transmit termination mode (TTM) and VT131 transmit mode (VT131TM).

Notes on DECLTM

- When DECLTM is reset (page), TTM and VT131TM let you select from three block sizes: VT131 partial page, ANSI partial page, or the scrolling region.

Transmit Termination Mode (TTM)

If line transmit mode (DECLTM) is reset (page), transmit termination mode (TTM) and VT131 transmit mode (DEC131TM) define the size of the character block. TTM determines whether the terminal includes the cursor position as part of the criteria that ends a block transmission.

Default: Scrolling region

Mode	Sequence				Action
Set (Scrolling region)	CSI 9/11	1 3/1	6 3/6	h 6/8	The terminal sends the scrolling region.
Reset (Partial page)	CSI 9/11	1 3/1	6 3/6	l 6/12	The terminal sends a VT131 or or ANSI partial page, based on VT131 transmit mode (DEC131TM).

DEC131TM	Selects
Set	VT131 partial page
Reset	ANSI partial page

Notes on TTM

- When you select a **VT131 partial page**, the terminal sends all eligible characters between the partial page marker and the cursor. If there is no marker, or the marker is after the cursor, the terminal sends all eligible characters between the top margin and the cursor.

  The partial page marker does not appear on the screen. The terminal automatically places the marker at the position of the last character sent.

  You use this setting for compatibility with the VT131 terminal.

- When you select an **ANSI partial page**, the terminal sends all eligible characters from the beginning of a selected area to the cursor.

VT131 Transmit Mode (DEC131TM)

If line transmit mode (DECLTM) is reset (page), DEC131TM and transmit termination mode (TTM) together define the size of the character block the terminal can send to the host. You cannot use DEC131TM and TTM separately.

Table 9-1 shows how the terminal determines the size of the character block to send. Table 9-2 shows how the terminal determines which characters are eligible to send.

Default: ANSI

Mode	**Sequence**					**Action**
Set (VT131)	CSI 9/11	? 3/15	5 3/5	3 3/3	h 6/8	The terminal works like a VT131 terminal.
Reset (ANSI)	CSI 9/11	? 3/15	5 3/5	3 3/3	l 6/12	The terminal works according to ANSI rules.

Table 9-2 Selecting Character Fields for Transmission

Fields Selected	Guarded Area Transfer Mode (GATM)	Selected Area Transfer Mode (SATM)	Multiple Area Transfer Mode (MATM)
All fields	Set	Set	Not available
Unprotected fields only	Reset	Set	Not available
Selected fields only	Set	Reset	Set
Selected field with cursor only	Set	Reset	Reset
Unprotected and selected fields	Reset	Reset	Set
Unprotected fields and selected field with cursor	Reset	Reset	Reset

SELECTING THE CHARACTERS TO SEND

There are five control functions that select which characters the terminal can send to the host.

Function	Use
Guarded area transfer mode (GATM)	Send protected areas.
Selected area transfer mode (SATM) Multiple area transfer mode (MATM)	Send one or all selected areas.
Start selected area (SSA) End selected area (ESA)	Define a selected area.

The following sections describe each control function. Table 9-2 shows how these functions select which characters the terminal sends. Table 9-1 shows how other functions select the size of the character block to send.

Guarded Area Transfer Mode (GATM)

This control function selects whether the terminal can send all characters or only unprotected characters to the host. See "Character Protection" in Chapter 8 for information on the two styles of character protection available.

Default: All characters

Mode	Sequence	Action
Set (All)	CSI 1 h 9/11 3/1 6/8	Selects all characters. During block transmission, the terminal can send all protected and unprotected characters to the host.
Reset (Unprotected)	CSI 1 l 9/11 3/1 6/12	Selects unprotected characters. During a block transmission, the terminal can send only unprotected characters to the host.

Notes on GATM

- When GATM is reset (unprotected), the terminal sends a record separator (RS, 1/14) to the host in place of a protected field. The terminal sends a space character (SP, 2/0) to a printer in place of a protected field.

Selected Area Transfer Mode (SATM)

This control function determines whether the terminal can send all characters or only selected characters to the host. Selected characters are characters defined as eligible to send to the host.

You can define *selected* areas on the current page with the start selected area (SSA) and end selected area (ESA) control functions.

Default: All characters

Mode	Sequence	Action
Set (All)	CSI 1 7 h 9/11 3/1 3/7 6/8	Selects all characters. The terminal can send selected and unselected characters on the current page to the host.
Reset (Selected only)	CSI 1 7 l 9/11 3/1 3/7 6/12	Selects only selected characters. The terminal

can only send selected
characters on the current
page to the host.

Multiple Area Transfer Mode (MATM)

This control function determines what selected character areas the terminal can send to the host. MATM only works when selected area transfer mode (SATM) is reset.

Default: All selected areas

Mode	Sequence				Action
Set (All)	CSI 9/11	1 3/1	5 3/5	h 6/8	The terminal can send all selected areas on the page to the host.
Reset (One area)	CSI 9/11	1 3/1	5 3/5	l 6/12	Selects one area. The terminal can send only the selected area with the cursor.

Notes on MATM

- If MATM is reset (one area) and the cursor is not in a selected field, the cursor moves to the next selected field.

Defining Selected Areas

The next two control functions select what characters are eligible to send to the host. Eligible characters are called *selected* characters.

Start Selected Area (SSA) and End Selected Area (ESA) - These two control functions select which characters on the current page the terminal can send to the host. SSA and ESA only work when selected area transfer mode (SATM) is reset.

SSA and ESA are 8-bit C1 control characters. You can also code SSA and ESA as 7-bit escape sequences.

Name	8-Bit	7-Bit Equivalent		Action
Start selected area (SSA)	SSA 8/6	ESC 1/11	F 4/6	Marks the cursor position as the first of a string of

				character positions the terminal can send to the host.
End selected area (ESA)	**ESA** 8/7	**ESC** 1/11	**G** 4/7	Defines the cursor position as the last of a string of character fields the terminal can send to host.

Notes on SSA and ESA

- If the terminal receives ESA before SSA, the terminal ignores ESA.
- If SSA is not followed by ESA on the same page, the SSA has no effect on that page. Selected areas must always end with ESA.
- Selected areas cannot be changed by the ED, EL, or ECH control functions.

END-OF-BLOCK AND UNUSED SPACE CHARACTERS

These control functions affect the way the terminal sends end-of-block, end-of-line, and space characters to the host in edit mode.

Set transmit termination character (DECTTC)	Selects one or more end-of-block characters.
Set transmit line termination character (DECTLTC)	Selects one or more end-of-line characters.
Space compression mode (DECSCFDM)	Determines whether or not to send unused space characters.

Set Transmit Termination Character (DECTTC)

This control function lets you select a character to indicate the end of a block transmission. You do not have to use an end-of-block character. The terminal sends the end-of-block character to the host at the end of each block transmission.

CSI	**Ps**	|
9/11	3/?	7/12

where

Ps represents the end-of-block character, as follows.

Ps	**End-of-Block Character**	
0 (default)	No character (DECTTC disabled.)	
1	**FF** 0/12	form feed
2	**ETX** 0/3	end of text
3	**EOT** 0/4	end of transmission
4	**CR** 0/13	carriage return
5	**DC3** 1/3	XOFF

Extended Form
An extended form of the DECTTC control function lets you select a string of characters to indicate the end of a block. This extended form uses decimal codes to represent characters. You can use the extended form to send a control function at the end of a block transmission, instead of a single character. You can send a control sequence of up to six characters (Pn1 through Pn5) at the end of a block.

CSI	**?**	**Pn1**	**;**	**...**	**Pn6**	**|**
9/11	3/15	3/?	3/11	...	3/?	7/12

where

Pn1 through **Pn6** are decimal codes for characters that you can define as end-of-block characters. For example, the decimal code for the ESC (1/11) character is 27. The code table in Chapter 2 lists decimal codes for characters. Any code value outside of the range of 0 to 254 is ignored.

Example
Suppose you want to send the default code of the **PF1** key on the numeric keypad at the end of a block transmission. You could use the following procedure.

1. The **PF1** key sends the following default code.

ESC	**O**	**P**
1/11	4/15	5/0

You must translate each character in the sequence to decimal code.

2. Use the code table in Chapter 2 to find the decimal code for each character.

ASCII characters:	**ESC**	**O**	**P**
Decimal codes:	27	79	80

3. Now insert the decimal codes in the extended DECTTC sequence.

CSI ? 27 ; 79 ; 80 |

Transmit Line Termination Characters (DECTLTC)

This control function lets you select the character(s) that the terminal sends to the host at the end of each line of transmitted data.

Default: Carriage return (CR) — decimal code 13

CSI	**?**	**Pn1**	**;**	**...**	**Pn6**	**'**	**s**
9/11	3/15	**	3/11		**	2/7	7/3

where

Pn1 through **Pn6** are decimal codes for characters that you can define as end-of-line characters. The code table in Chapter 2 lists decimal codes for characters. Any code value outside of the range of 0 to 254 is ignored.

Example
Suppose you want to send the default code of the **Do** key on the top row of function keys at the end of a block transmission. You could use the following procedure.

1. The **Do** key sends the following default code.

CSI	**2**	**9**	**~**
9/11	3/2	3/9	7/14

You must translate each character in the sequence to decimal code.

2. Use the code table in Chapter 2 to find the decimal code for each character.

Characters:	CSI	2	9	~
Decimal codes:	155	50	57	126

3. Now insert the decimal codes in the DECTLTC sequence.

CSI ? 155; 50; 57; 126 ' s

Space Compression Mode (DECSCFDM)

This control function determines whether the terminal sends space characters (SP, 2/0) at the end of characters fields. If the terminal does not send spaces, it uses the record separator character (RS, 1/14) to indicate the end of a field.

Default: Spaces

Mode	Sequence					Action
Set (No spaces)	CSI 9/11	? 3/15	1 3/1	3 3/3	h 6/8	Selects space compression. The terminal does not send spaces characters at the end of a character field. All fields sent end with a single record separator (RS) character, except the last field on a line. The last field ends with the end-of-block character defined by the transmit termination character (DECTTC) function.
Reset (Spaces)	CSI 9/11	? 3/15	1 3/1	3 3/3	l 6/12	Selects no space compression. The terminal sends space characters to the host at the end of a character field. The terminal sends characters as they appear on the page.

SENDING EDITED DATA TO THE HOST

After you finish editing, you press the **Enter** key to send edited data to the host. Transmit execution mode (DECTEM) determines when the terminal actually sends the data.

Transmit Execution Mode (DECTEM)

When you press **Enter**, this control function determines whether the terminal sends data immediately or waits for the host's permission. DECTEM operates only in edit mode (DECEDM).

Default: Immediate

Mode	**Sequence**					**Action**
Set (Immediate)	CSI 9/11	? 3/15	1 3/1	4 3/4	h 6/8	When you press **Enter**, the terminal immediately sends a block of characters to the host.
Reset (Deferred)	CSI 9/11	? 3/15	1 3/1	4 3/4	l 6/12	When you press **Enter**, the terminal sends a request to the host, asking if the host is ready to receive a block of characters. Then the terminal waits until the host responds.

Notes on DECTEM

- When DECTEM is reset, the terminal requests a block transmission by sending the set transmit state (STS) sequence to the host. The host must respond with the DECXMIT sequence.
- If line transmit mode (DECLTM) is set, the **Return** key works like the **Enter** key. That is, pressing **Return** sends a block of characters to the host.
- See *Installing and Using the VT330/VT340 Video Terminal* for more information on sending characters to the host.

Set Transmit State (STS) — From Terminal

The terminal sends this escape sequence to the host to request a block transmission. The terminal only sends STS when transmit execution mode (DECTEM) is reset.

ESC	S
1/11	5/3

Transmit (DECXMIT) — From Host

The host responds to a set transmit state (STS) sequence by sending a DECXMIT sequence to the terminal. DECXMIT tells the terminal to send a block of characters.

ESC	5
1/11	3/5

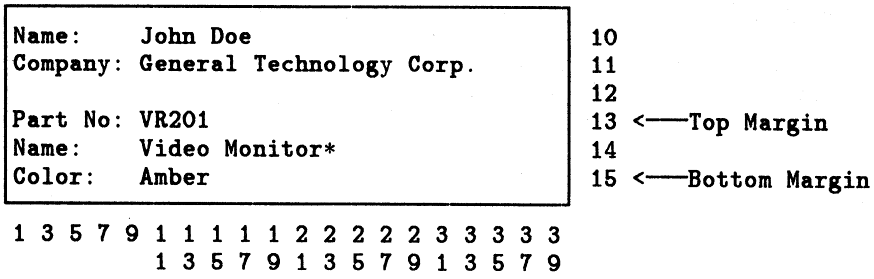
BLOCK TRANSMISSION EXAMPLES

This section shows examples of what data the terminal sends to the host in a block transmission. The data sent depends on the settings of various local editing control functions.

Each example lists an initial set of conditions in effect. Then each example shows what data the terminal sends when you press the **Transmit** key, based on these conditions.

All the examples are based on the screen in Figure 9-1. This screen is not 24 lines by 80 columns. However, a full screen is not needed to illustrate block transmission. For the examples in this section, consider the screen in Figure 9-1 to be a full page. The following conditions apply to this figure.

- The asterisk * indicates the cursor position.
- Character positions in columns 1 through 9 are defined as protected from erasure or movement. These characters have their protection attribute set.
- Character positions in columns 10 through 39 on lines 13 through 15 are defined as eligible for transmission. These characters have their selection attribute set.
- The top and bottom scrolling margins are set at lines 13 and 15 respectively.



```
Name:     John Doe                                      10
Company:  General Technology Corp.                      11
                                                        12
Part No:  VR201                                         13 <——Top Margin
Name:     Video Monitor*                                14
Color:    Amber                                         15 <——Bottom Margin

1 3 5 7 9 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3
          1 3 5 7 9 1 3 5 7 9 1 3 5 7 9
```

Figure 9-1 Sending Data in Edit Mode

The following abbreviations are used for characters in the examples.

Character	Abbreviation
End-of-block	<EOB>
End-of-line	<EOL>
Record separator	<RS>

Example 1

The following conditions are in effect.

DECLTM	reset	Scrolling region
TTM	set	
DEC131TM	set	
GATM	set	All characters
SATM	set	
DECSCFDM	reset	Send spaces

When you press **Transmit**, the terminal sends the following data.

```
Part No:VR201                        <EOL>
Name:   Video Monitor                <EOL>
Color:  Amber                        <EOL><EOB>
```

Example 2

The following conditions are in effect.

DECLTM	reset	Scrolling region
TTM	set	
DEC131TM	set	
GATM	reset	Unprotected characters in the scrolling region are selected for for transmission.
SATM	—	
DECSCFDM	reset	Send spaces

When you press **Transmit**, the terminal sends the following data.

```
VR201                        <EOL>
Video Monitor                <EOL>
Amber                        <EOL><EOB>
```

Example 3

The following conditions are in effect.

DECLTM	reset	Partial page
TTM	reset	
DEC131TM	set	
GATM	set	All characters
SATM	set	
DECSCFDM	set	Do not send spaces

When you press **Transmit**, the terminal sends the following data.

```
Part No:<RS>VR201<EOL>
Name:<RS>Video Monitor<EOL>
```

Example 4

The following conditions are in effect.

DECLTM	reset	Page
TTM	set	
DEC131TM	reset	
GATM	set	Between active position and cursor
SATM	reset	
MATM	reset	
DECSCFDM	set	Do not send spaces

When you press **Transmit**, the terminal sends the following data.

```
Video Monitor<EOL><EOB>
```

Example 5

The following conditions are in effect.

DECLTM	reset	Page
TTM	set	
DEC131TM	reset	
GATM	set	All characters
SATM	set	
DECSCFDM	set	Do not send spaces

When you press **Transmit**, the terminal sends the following data.

```
Name:<RS>John Brown<EOL>
Company:<RS>General Technology Corp.<EOL>
<EOL>
Part No:<RS>VR201<EOL>
Name:<RS>Video Monitor<EOL>
Color:<RS>Amber<EOL><EOB>
```

Example 6

The following conditions are in effect.

DECLTM	set	Active line
TTM	—	
DEC131TM	—	

GATM	set	All characters
SATM	set	
DECSCFDM	reset	Send spaces

When you press **Transmit**, the terminal sends the following data.

```
Name:    Video Monitor       <EOL><EOB>
```

CHARACTER SETS AND BLOCK TRANSMISSION

The terminal can send characters from several possible character sets during a block transmission. The VT300 sends characters based on the following general rules.

- If space compression mode (DECSCFDM) is reset, the terminal sends unwritten character positions as SP (2/0).
- The terminal never sends characters from the control representation (CRM) font.
- Characters that are in page memory, but not available in the character sets in the in-use table, are sent as SUB (1/10). For example, characters that are not in the current user-preferred supplemental set, or unique NRC characters such as the Dutch florin are sent as SUB.

The algorithm the terminal uses to send characters depends on whether the terminal is operating in an 8-bit or 7-bit environment.

Block Transmission in an 8-Bit Environment

National replacement character set mode (DECNRCM) is reset, and the terminal is in VT300 mode. The terminal selects the character set for each transmitted character as follows.

NOTE: If the host communication line is set to 7 bits, data can be lost during a block transmission. The host forces the eighth bit of all received characters to 0. If the current host line is set to 7 bits, terminal cannot correctly send 8-bit characters in a block transmission.

1. At the beginning of a block transmission, the terminal assumes the ASCII set is in GL and the user-preferred supplemental set is in GR.

2. The VT300 sends ASCII graphic and SP characters with their eighth bit set to 0. The VT300 never sends a designating sequence for ASCII or space characters.

3. For characters that are not ASCII characters or spaces, the VT300 sends the appropriate G2 designating sequence for the character set containing those characters (Chapter 5). Then the VT300 sends the characters from that set.

   The VT300 always sends the actual designating sequence for the desired character set. This removes any ambiguity for applications that need to know which character set is currently defined as the user-preferred set (ISO Latin-1 or DEC Supplemental Graphic).

   NOTE: If the application sends the ISO level 1 announcer at the beginning of execution, the VT300 sends the appropriate G1 designating sequence.

4. If the same character is in more than one character set, the VT300 uses the following priority system.

   — ASCII
   — User-preferred supplemental
   — DEC Technical
   — DEC Special Graphic

   After the VT300 selects the appropriate character set, the VT300 sends the designating sequence, followed by the characters from the designated set.

5. If the user-preferred character set is not in GR at the end of a block transmission, the VT300 sends a designating sequence to the host. This sequence specifies the current user-preferred supplemental set. The VT300 sends the designating sequence before the end-of-block character, if any.

Block Transmission in a 7-Bit Environment

National replace character set mode (DECNRCM) is set, or the terminal is in VT100 mode. The terminal selects the character set for each transmitted character as follows.

1. At the beginning of a block transmission, the terminal assumes that the ASCII set is in GL.

2. The VT300 sends ASCII graphic and SP characters with their eighth bit set to 0. The VT300 never sends a designating sequence for ASCII or space characters.

3. For characters not in the ASCII set, the VT300 sends the appropriate G0 designating sequence for the character set containing those characters (Chapter 5). Then the VT300 sends the characters from that set.

   The VT300 always sends the actual designating sequence for the desired NRC set. This removes any ambiguity for applications that need to know which NRC set (other than ASCII) is currently in GL.

4. If the same character is in more than one character set, the VT300 uses the following priority system.

   — ASCII
   — DEC Technical
   — DEC Special Graphic

   After the VT300 selects the appropriate character set, the VT300 sends the designating sequence followed by the characters from the designated set.

5. If the NRC set is not in G0 at the end of a block transmission, the VT300 sends a designating sequence to the host. This designator specifies the current NRC set. The VT300 sends the designating sequence before the end-of-block character, if any.

PROGRAMMING TIP: You can program your application to be independent of the following settings.

National replacement character set mode
VT100 or VT300 mode
ISO level 1 announcer (maps G1 into GR, instead of G2)

To do this, make sure your application can accept 8-bit characters and designating sequences for G0, G1, or G2. See Chapter 5 for details on designating character sets.

SUMMARY

Table 9-3 lists the control functions described in this chapter. You can only use these control functions in edit mode.

Table 9-3 Local Editing Sequences Summary

Name	Mnemonic	Sequence
Edit mode	DECEDM	Set: **CSI ? 10 h** Edit mode. Reset: **CSI ? 10 l** Interactive mode.
Edit key execution mode	DECEKEM	Set: **CSI ? 16 h** Immediate. (D) Reset: **CSI ? 16 l** Deferred.
Line transmit mode	DECLTM	Set: **CSI ? 11 h** Line. Reset: **CSI ? 11 l** Page. (D)
Transmit termination mode	TTM	Set: **CSI 16 h** Scrolling region. (D) Reset: **CSI 16 l** Partial page.
VT131 transmit mode	DEC131TM	Set: **CSI ? 53 h** VT131. Reset: **CSI ? 53 l** ANSI. (D)

(D) = default.

Table 9-3 Local Editing Sequences Summary (Cont)

Name	Mnemonic	Sequence
Guarded area transfer mode	GATM	Set: **CSI 1 h** All characters. (D) Reset: **CSI 1 l** Unprotected characters.
Selected area transfer mode	SATM	Set: **CSI 17 h** All characters. (D) Reset: **CSI 17 l** Selected characters.
Multiple area transfer mode	MATM	Set: **CSI 15 h** All characters. (D) Reset: **CSI 15 l** Area with cursor.
Start selected area	SSA	8-bit: **SSA** 7-bit: **ESC F**
End selected area	ESA	8-bit: **ESA** 7-bit: **ESC G**
Set transmit termination character	DECTTC	*Normal* **CSI Ps |** Ps = end-of-block character. 0 = no character. (D) 1 = FF (form feed). 2 = ETX (end of text). 3 = EOT (end of transmission). 4 = CR (carriage return). 5 = DC3 (XOFF). *Extended* **CSI ? Pn1;...; Pn6 |** Pn1;...;Pn6 = decimal code of end-of-block character(s).

(D) = default.

Table 9-3 Local Editing Sequences Summary (Cont)

Name	Mnemonic	Sequence
Transmit line termination characters	DECTLTC	**CSI ? Pn1;...; Pn6 ' s** Pn1;...;Pn6 = decimal code of end-of-line character(s). Default = carriage return (CR).
Space compression mode	DECSCFDM	Set: CSI ? 13 h No spaces. Reset: CSI ? 13 l Spaces. (D)
Transmit execution mode	DECTEM	Set: CSI ? 14 h Immediate. (D) Reset: CSI ? 14 l Deferred.
Set transmit state	STS	**ESC S** From VT300.
Transmit	DECXMIT	**ESC 5** From host.

(D) = default.

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This chapter describes the control functions you use to move the cursor and view different areas in the terminal's page memory. Chapter 6 describes page memory.

Before you read this chapter, you should understand the difference between *scrolling* and *panning.*

> *Scrolling* is the movement of data between the margins of a page. Data scrolled beyond the margins is lost from page memory. Data is not lost from the host system's memory.
>
> *Panning* is the movement of the user window in page memory to view different parts of a page. You do not lose data in page memory, because the window moves rather than the data. You only use panning functions when the page you are viewing is larger than the user window.
>
> For example, suppose the current page is 72 lines × 80 columns. You can only display 24 lines of the page on the screen. To view other parts of the page, you can pan the user window up or down.
>
> Figure 10-1 shows the difference between scrolling and panning.

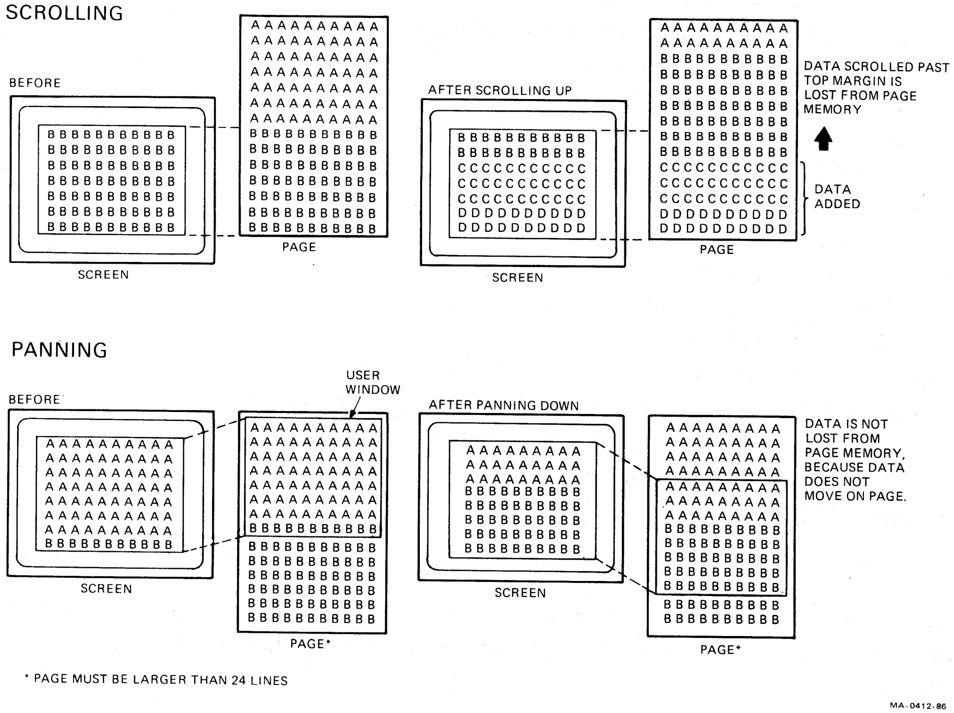
SCROLLING
BEFORE
SCREEN
PAGE
AFTER SCROLLING UP
SCREEN
PAGE
DATA SCROLLED PAST TOP MARGIN IS LOST FROM PAGE MEMORY
DATA ADDED
PANNING
BEFORE
USER WINDOW
SCREEN
PAGE*
AFTER PANNING DOWN
SCREEN
PAGE*
DATA IS NOT LOST FROM PAGE MEMORY, BECAUSE DATA DOES NOT MOVE ON PAGE.
* PAGE MUST BE LARGER THAN 24 LINES
MA-0412-86

Figure 10-1 The Difference Between Scrolling and Panning

A *user window* is the display area that lets you view data in page memory. The default user window for the VT300 is the complete screen (24 lines × 80 or 132 columns). You can also divide the screen into two user windows, to view data from two sessions at the same time. Chapter 8 of *Installing and Using the VT330/VT340 Video Terminal* describes how to use windows. Also see Chapter 14 of this manual for more details on dual sessions.

This chapter covers the control functions you use to move the cursor on a page and pan the user window across a page or pages.

THE CURSOR

The cursor is a marker that indicates the *active position* in page memory. The active position is the point on the current page where the next character is written.

The default text cursor style is a blinking box. The cursor can also be a steady box, a blinking underscore, or a steady underscore. The user can select one of these cursor styles in the Display Set-Up screen. See Chapter 5 of *Installing and Using the VT330/VT340 Video Terminal* for details.

Usually, the cursor appears on the screen. However, you can use control functions to move the cursor anywhere on the current page, or to any other page in page memory.

Text Cursor Enable Mode (DECTCEM)

This control function makes the cursor visible or invisible.

Default: Visible

Mode	Sequence					Action
Set (Visible)	CSI 9/11	? 3/15	2 3/2	5 3/5	h 6/8	Makes the cursor visible if the active position is on the screen.
Reset (Invisible)	CSI 9/11	? 3/15	2 3/2	5 3/5	l 6/12	Makes the cursor invisible.

MOVING THE CURSOR ON THE CURRENT PAGE

This section describes the control functions you can use to move the cursor on the current page. Remember, *page* and *display* are two different concepts. The area of the main display is restricted to the screen — 24 lines by 80 or 132 columns. The area of the current page can be 24, 36, 72 or 144 lines by 80 or 132 columns, depending on the page format you select (Chapter 6).

NOTE: Some C0 and C1 control characters not covered in this chapter also move the cursor. See Chapter 2 for detailed descriptions of these control characters.

In the following sequences, the parameters Pn, Pl, and Pc indicate cursor position. If you omit a parameter or use a value of 0, the terminal uses a default value of 1.

Name	Sequence	Action
Cursor position (CUP)	**CSI Pl ; Pc H** 9/11 3/? 3/11 3/? 4/8	Moves the cursor to line Pl, column Pc. The starting point for lines and columns depends on the setting of origin mode (DECOM). CUP applies only to the current page. If Pl is 0 or 1, the cursor moves to the first line of the page. If Pc is 0 or 1, the cursor moves to the first column of the page.
Horizontal and vertical position (HVP)	**CSI Pl ; Pc f** 9/11 3/? 3/11 3/? 6/6	Works the same as CUP. New applications should use CUP instead of HVP. HVP is provided for compatibility with earlier Digital products.
Cursor forward (CUF)	**CSI Pn C** 9/11 3/? 4/3	Moves the cursor right Pn columns. The cursor stops at the right border of the page border.
Cursor backward (CUB)	**CSI Pn D** 9/11 3/? 4/4	Moves the cursor left Pn columns. The cursor stops at the left border of the page.
Cursor up (CUU)	**CSI Pn A** 9/11 3/? 4/1	Moves the cursor up Pn lines in the same column. The cursor stops at the

		top margin. If the cursor is already above the top margin, the cursor stops at the top line.
Cursor down (CUD)	**CSI Pn B** 9/11 3/? 4/2	Moves the cursor down Pn lines in the same column. The cursor stops at the bottom margin. If the cursor is already below the bottom margin, the cursor stops at the bottom line.

PANNING

You can display any part of the current page by moving the user window across the page. The following control functions let you pan the user window up or down, left or right. To a user viewing the screen, data appears to scroll in the opposite direction. For example, if you pan up, the data appears to scroll down.

In the following sequences, Pn indicates the cursor position. If you omit Pn or use a value of 0, the terminal uses a default value of 1. The term *current page* refers to the page with the cursor.

NOTE: The ANSI mnemonics in parentheses are provided only for reference. These mnemonics do not indicate how the VT300 uses the panning functions. For example, the ANSI mnemonic for pan down is SU (scroll up).

Name	Sequence	Action
Pan down (SU)	**CSI Pn S** 9/11 3/? 5/3	Moves the user window down Pn lines in page memory. Pn new lines appear at the bottom of the display. Pn old lines disappear at the top of the display. You cannot pan past the bottom margin of the current page.
Pan up (SD)	**CSI Pn T** 9/11 3/? 5/4	Moves the user window up Pn lines in page

					memory. Pn new lines appear at the top of the display. Pn old lines disappear at the bottom of the display. You cannot pan past the top margin of the current page.
Pan right (SL)	**CSI** 9/11	**Pn** 3/?	**sp** 2/0	**@** 4/0	Moves the user window right Pn columns in page memory. Pn new columns appear at the right of the display. Pn old columns disappear at the left of the display. You cannot pan past the right page border.
Pan left (SR)	**CSI** 9/11	**Pn** 3/?	**sp** 2/0	**A** 4/1	Moves the user window left Pn columns in page memory. Pn new columns appear at the left of the display. Pn old columns disappear at the right of the display. You cannot pan past the left page border.

CURSOR COUPLING

This section describes control functions that make the user window pan with the cursor when the cursor moves past the window boundaries. These functions are called cursor coupling modes.

A *coupled* cursor is a cursor that appears to pull the user window through the page. When an application tries to write data beyond the borders of the user window, it pans in that direction to keep the cursor visible in the display. The cursor looks like it is connected, or coupled, to the display.

You can have applications set the coupling modes to cause automatic panning. You can also reset the coupling modes to write data into off-screen page memory.

Horizontal Cursor Coupling Mode (DECHCCM)

This control function determines whether the user window pans with the cursor when the cursor moves past the left or right border of the window. DECHCCM is only useful when the width of the current user window is narrower than the page. The cursor must stay on the current page.

Default: Uncoupled

Mode	Sequence					Action
Set	CSI	?	6	0	h	Couples the cursor to the display for horizontal movement. When the cursor tries to move past the left or right border of the user window, the window pans to keep the cursor in view. If the cursor tries to move past the left border of the user window, the window pans left. New columns appear at the left, while columns at the right move out of view.
(Coupled)	9/11	3/15	3/6	3/0	6/8	
Reset	CSI	?	6	0	l	Uncouples the cursor from the display, for horizontal movement. If the cursor moves past the left or right border of the user window, the cursor disappears.
(Uncoupled)	9/11	3/15	3/6	3/0	6/12	

Vertical Cursor Coupling Mode (DECVCCM)

This control function determines whether the user window pans with the cursor when the cursor moves past the top or bottom border of the user window. DECVCCM is only useful when the height of the current user window is smaller than the page. The cursor must stay on the current page.

Default: Coupled

Mode	Sequence					Action
Set	CSI	?	6	1	h	Couples the cursor to the display for vertical movement. If the cursor tries to move past the top or bottom border of the user window, the window pans to keep the cursor in view. If the cursor tries to move past the top of the display, the user window pans up. New lines appear at the top of the screen, while lines at the bottom move out of view.
(Coupled)	9/11	3/15	3/6	3/1	6/8	
Reset	CSI	?	6	1	l	Uncouples the cursor from the display. If the cursor moves past the top or bottom border of the user window, the cursor disappears.
(Uncoupled)	9/11	3/15	3/6	3/1	6/12	

Page Cursor Coupling Mode (DECPCCM)

This control function determines if a new page appears in the display when the cursor moves to a new page. DECPCCM is only useful with a multiple-page format (Chapter 6).

Default: Coupled

Mode	Sequence					Action
Set	CSI	?	6	4	h	Couples the cursor to the display when the cursor moves to a new page. The new page appears in the display to keep the cursor visible.
(Coupled)	9/11	3/15	3/6	3/4	6/8	

Reset (Uncoupled)	CSI 9/11	? 3/15	6 3/6	4 3/4	l 6/12	Uncouples the cursor from the display. If the cursor moves to a new page, the cursor disappears.

SUMMARY

Table 10-1 lists the control functions described in this chapter.

Table 10-1 Cursor Movement and Panning Sequences

Name	Mnemonic	Sequence
Enabling the Cursor		
Text cursor enable mode	DECTCEM	**Set: CSI ? 25 h** Visible cursor. (D) **Reset: CSI ? 25 l** Invisible cursor.
*Moving the Cursor**		
Cursor position	CUP	**CSI Pl ; Pc H** Line Pl, column Pc.
Horizontal and vertical position	HVP	**CSI Pl ; Pc f** Line Pl, column Pc. (Recommend use of CUP.)
Cursor forward	CUF	**CSI Pn C** Pn columns right.
Cursor backward	CUB	**CSI Pn D** Pn columns left.
Cursor up	CUU	**CSI Pn A** Pn lines up.
Cursor down	CUD	**CSI Pn B** Pn lines down.

(D) = default.

* In these sequences, the default value for Pn, Pl, and Pc is 1.

Table 10-1 Cursor Movement and Panning Sequences (Cont)

Name	Mnemonic	Sequence
*Panning**		
Pan down	SU	CSI Pn S Pn lines down.
Pan up	SD	CSI Pn T Pn lines up.
Pan right	SL	CSI Pn sp @ Pn columns right.
Pan left	SR	CSI Pn sp A Pn columns left.
Horizontal cursor coupling mode	DECHCCM	Set: CSI ? 60 h Coupled
		Reset: CSI ? 60 l Uncoupled (D)
Vertical cursor coupling mode	DECVCCM	Set: CSI ? 61 h Coupled (D)
		Reset: CSI ? 61 l Uncoupled
Page cursor coupling mode	DECPCCM	Set: CSI ? 64 h Coupled (D)
		Reset: CSI ? 64 l Uncoupled

(D) = default.

* In these sequences, the default value for Pn is 1.

KEYBOARD, PRINTING, AND DISPLAY COMMANDS 11

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KEYBOARD CONTROL FUNCTIONS

This section describes control functions that affect keyboard operation.

Keyboard Action Mode (KAM)

This control function locks or unlocks the keyboard.

Default: Unlocked

Mode	Sequence			Action
Set (Locked)	CSI 9/11	2 3/2	h 6/8	Locks the keyboard. The keyboard cannot send characters to the host. The Wait indicator comes on. The terminal ignores all keystrokes that send characters to the host. KAM does not affect the Set-Up or Switch Session keys.
Reset (Unlocked)	CSI 9/11	2 3/2	l 6/12	Unlocks the keyboard. The keyboard can send characters to the host.

Backarrow Key Mode (DECBKM)

This control function determines whether the <x] key works as a backspace key or delete key.

NOTE: For compatibility with Digital's software, you should keep DECBKM reset (DEL).

Default: Delete key

Mode	**Sequence**					**Action**
Set (BS)	CSI 9/11	? 3/15	6 3/6	7 3/7	h 6/8	The <x] key works as a backspace key. When you press <x], the terminal sends a BS character to the host.
Reset (DEL)	CSI 9/11	? 3/15	6 3/6	7 3/7	1 6/12	The <x] key works as a delete key. When you press <x], the terminal sends a DEL character to the host.

Notes on DECBKM

- In edit mode, DECBKM is always reset (DEL).

Line Feed/New Line Mode (LNM)

This control function selects the characters sent to the host when you press the **Return** key. LNM also controls how the terminal interprets line feed (LF), form feed (FF), and vertical tab (VT) characters.

NOTE: For compatibility with Digital's software, you should keep LNM reset (line feed).

Default: Line feed

Mode	**Sequence**				**Action**
Set (New line)	CSI 9/11	2 3/2	0 3/0	h 6/8	When the terminal receives an LF, FF, or VT character, the cursor moves to the first column of the next line. When you press **Return**, the terminal sends both a carriage return (CR) and line feed (LF).

Reset (Line feed)	CSI 9/11	2 3/2	0 3/0	l 6/12	When the terminal receives an LF, FF, or VT character, the cursor moves to the current column of the next line. When you press **Return**, the terminal sends a CR only.

Notes on LNM

- When the auxiliary keypad is in keypad numeric mode (DECKPNM), the **Enter** key sends the same character(s) as the **Return** key.

Autorepeat Mode (DECARM)

This control function determines whether or not keys automatically repeat their character when held down. If DECARM is set, most keys you press for more than 0.5 seconds send a character repeatedly until you release the key.

Default: Repeat

Mode	Sequence				Action
Set (Repeat)	CSI 9/11	? 3/15	8 3/8	h 6/8	Keys autorepeat when pressed for more than 0.5 seconds.
Reset (No repeat)	CSI 9/11	? 3/15	8 3/8	l 6/8	Keys do not autorepeat.

Notes on DECARM

- The following keys never repeat: **Hold Session, Local Print, Switch Session, Break, Return, Compose Character, Lock, Shift,** and **Ctrl.**

Autowrap Mode (DECAWM)

This control function determines whether or not received characters automatically wrap to the next line when the cursor reaches the right border of a page in page memory.

Default: No autowrap

Mode	Sequence				Action
Set (Autowrap)	CSI 9/11	? 3/15	7 3/7	h 6/8	Selects autowrap. Graphic characters received when the cursor is at the right border of the page appear at the beginning of the next line. Any text on the page scrolls up if the cursor is at the end of the scrolling region.
Reset (No autowrap)	CSI 9/11	? 3/15	7 3/7	l 6/12	Turns off autowrap. Graphic characters received when the cursor is at the right border of the page replace characters already on the page.

Cursor Keys Mode (DECCKM)

This control function selects the sequences the arrow keys send. You can use the four arrow keys to move the cursor through the current page or to send special application commands. See Chapter 3 for the sequences the keys send.

Default: Cursor

Mode	Sequence				Action
Set (Application)	CSI 9/11	? 3/15	1 3/1	h 6/8	Arrow keys send application sequences to the host.
Reset (Cursor)	CSI 9/11	? 3/15	1 3/1	l 6/12	Arrow keys send ANSI cursor sequences to the host.

Numeric Keypad

The following control functions are for the numeric keypad. The keypad application and numeric modes (DECKPAM and DECKPNM) work the same as numeric keypad mode (DECNKM). See Chapter 3 for the sequences the keys send.

Keypad Application and Numeric Modes (DECKPAM and DECKPNM) - These control functions select whether the numeric keypad sends numeric characters or application sequences to the host.

Default: Numeric characters

Mode	Sequence	Action
Application (DECKPAM)	ESC = 1/11 3/13	Numeric keypad sends application sequences.
Numeric (DECKPNM)	ESC > 1/11 3/14	Numeric keypad sends the characters shown on the key (number, comma, period, or minus sign). Keys **PF1** through **PF4** send application sequences.

Notes on DECKPAM and DECKPNM

- When you turn on or reset the terminal, the terminal automatically selects numeric keypad mode.

Numeric Keypad Mode (DECNKM) - This control function selects whether the numeric keypad sends numeric characters or application sequences to the host.

Available in: VT300 mode only
Default: Numeric

Mode	Sequence					Action
Set (Application)	CSI 9/11	? 3/15	6 3/6	6 3/6	h 6/8	Numeric keypad sends application sequences.
Reset (Numeric)	CSI 9/11	? 3/15	6 3/6	6 3/6	l 6/12	Numeric keypad sends the characters shown on the key (number, comma, period, or minus sign). Keys **PF1** through **PF4** send control functions.

Notes on DECNKM

- DECNKM is provided mainly for use with the request and report mode (DECRQM/DECRPM) control functions (Chapter 12).

Typewriter or Data Processing Keys

You can select whether the main keyboard keys act as data processing keys or typewriter keys. See Chapter 3 for a description of data processing keys.

Keyboard Usage Mode (DECKBUM)

Default: Typewriter keys

Mode	Sequence					Action
Set (Data processing)	CSI 9/11	? 3/15	6 3/6	8 3/8	h 6/8	Selects data processing keys. The terminal sends the characters on the right half of the keycaps.
Reset (Typewriter)	CSI 9/11	? 3/15	6 3/6	8 3/8	l 6/12	Selects typewriter keys. The terminal sends the characters on the left half of the keycaps.

Notes on DECKBUM

- DECKBUM changes the characters that the main keyboard keys send. Make sure you are aware of this change if you use DECKBUM in an application.
- If you use the North American dialect, DECKBUM should always be reset (typewriter). For all other languages, you can use either mode.

USER-DEFINED KEYS (DECUDK)

The keyboard has 20 function keys on its top row. You can define the codes of 15 of these top-row keys.

- **F6** through **F14**
- **Do**
- **Help**
- **F17** through **F20**

The other five keys — **Hold Session**, **Local Print**, **Set-Up**, **Switch Session**, and **Break** — have dedicated local functions and are not definable.

User-defined keys (UDKs) are only available in VT300 mode. UDKs do not work in VT100 and VT52 modes.

Using UDKs

There are two ways to enter definitions for the 15 UDKs.

- Type in the definitions by using the UDK Set-Up screen. See Chapter 7 of *Installing and Using the VT330/VT340 Video Terminal.*
- Program the definitions with DECUDK device control strings.

This chapter describes how to program the keys using a DECUDK device control string.

After you define a key, you can use the new function by pressing Shift-<key>, where <key> is the key you defined.

UDK Memory Space

There are 256 bytes of memory available for the 15 user-defined keys. Space is supplied on a first-come/first-serve basis. When the 256 bytes are full, you cannot define any more keys until you clear some of the memory space. There are five ways you can clear space.

- Redefine one or more UDKs by using the UDK Set-Up screen.
- Redefine one or more UDKs by using a DECUDK control string.
- Clear one or more UDKs by using a DECUDK control string.
- Clear one or more UDKs by using the UDK Set-Up screen.
- Clear all UDKs with a terminal power-up or reset (RIS) operation.

Programming UDKs

You use the following device control string format to down-line-load definitions for user-defined keys. See Chapter 2 for general information about device control strings.

DECUDK Device Control String Format

Available in: VT300 mode only

DCS	**Pc ; Pl**	**|**	**Ky1/St1;...Kyn/Stn**	**ST**
Device Control String Introducer	Clear and Lock Parameters	Final Character	Key Definition String	String Terminator

where

DCS (9/0)

indicates the beginning of a device control string. DCS is an 8-bit C1 character. You can use ESC P (1/11 5/0) for a 7-bit environment.

Pc

is the *clear parameter.* Pc selects how to clear key definitions.

Pc	**Action**
0 **(default)** or none	Clear all keys before loading new values.
1	Clear one key at a time, before loading a new value.

When Pc is 1, the terminal only clears the keys you are loading. By using a Pc value of 1, you can redefine some keys without redefining them all.

NOTE: There are 256 bytes of memory for all user-defined keys. A key definition can only use the number of bytes available when that key is loaded.

PROGRAMMING TIP: If Pc is 1, a key load may fail because no memory space is available. The reason for this is as follows.

With Pc set to 1, keys are cleared and loaded sequentially. If the new definition for a key is larger than the old one, you may exceed the 256 byte limit.

For example, suppose **F6** contains 120 bytes, **F7** contains 110 bytes, and **F8** contains 20 bytes. You try to load **F8** with 40 bytes, **F6** with 1 byte, and **F7** with 1 byte, in that order. This works if all keys are cleared first (Pc is 0), but not if keys are cleared one at a time (Pc is 1). When you try to load **F8** with 40 bytes, the load fails because only 26 bytes are free at that time.

256 (maximum) - 120 (in **F6**) - 110 (in **F7**) = 26

Pl

is the *lock parameter.* Pl determines whether the key definitions are locked or unlocked after you load them.

Pl	Action
0 or none	Lock the keys. If you want to load new values into the keys, you must unlock the keys by using set-up.
1 (default)	Do not lock the keys. The keys are unlocked and can be redefined with another DECUDK string.

NOTE: If Pl is 1 and the keys are already locked, nothing happens,

The terminal uses a special lock to allow or prevent the programming of user-defined keys. You can turn on this lock from set-up or from the host (with a DECUDK device control string). The lock affects all programmable keys. When you use the lock, you should following these guidelines.

- **Unlock the keys to define them.**
  The keys must be unlocked before you can define them. You can only unlock the keys from set-up. If a key is locked and an application tries to redefine the key with a DECUDK sequence, the terminal ignores the sequence.
- **Lock the keys to prevent redefinition.**
  You can lock the keys from set-up or from the host (by sending a DECUDK sequence). New key definitions are locked by default.

is the *final character.* The vertical bar (7/12) identifies this control string as a DECUDK.

Ky1/St1;...Kyn/Stn

are the *key definition strings.* You include these strings between the final character (|) and the string terminator (ST). Each string consists of a key selector number (Kyn) and a string parameter (Stn), separated by a slash (/, 2/15). A semicolon (3/11) separates different strings.

- The key selector number (Kyn) indicates which key you are defining. Here is a list of definable keys and their identifying values.

Key	Value	Key	Value
F6	17	Help	28
F7	18	Do	29
F8	19	F17	31
F9	20	F18	32
F10	21	F19	33
		F20	34
F11	23		
F12	24		
F13	25		
F14	26		

- The string parameters (Stn) are the encoded definition of the keys. String parameters consist of hex pairs in the following ranges.

  3/0 through 3/9 (0 through 9)
  4/1 through 4/6 (A through F)
  6/1 through 6/6 (a through f)

  When you combine these hex values, they represent an 8-bit quantity. The ASCII table in Chapter 2 lists the hex values of characters.

  This method lets you use any of the 256 character codes in the key string. You can enter key definition strings in any order.

  Default: Empty. The key is undefined.

ST

is the *string terminator.* ST (9/12) is a C1 8-bit character. You can use ESC \ (1/11, 5/12) for a 7-bit environment.

Notes On Loading UDKs

Here are some general guidelines you should keep in mind when loading UDKs.

- **Clear UDK memory space before loading new definitions.**

  Use a DECUDK string to clear keys without locking them. Then you can use another DECUDK string to redefine the keys and lock them.

- **If you redefine a key, the old definition is lost.**

This may clear some space if the new definition uses less bytes than the old one.

- **There are two ways to lock UDKs, but only one way to unlock them.**

  To lock UDKs, you can use the UDK Set-Up screen or a DECUDK control string. To unlock UDKs, you must use the UDK Set-Up screen.

- **The default value for each key definition is empty.**

  When you clear UDKs, they are empty.

- **You can save UDK definitions by using the UDK Set-Up screen.**

  See Chapter 7 of *Installing and Using the VT330/VT340 Video Terminal* for details.

- **An invalid hex pair in a DECUDK string stops a UDK load sequence.**

  When a load sequence stops (due to error or other cause), the terminal saves any keys already loaded and sends the rest of the DECUDK sequence to the screen.

Examples of DECUDK Device Control Strings

- The following sequence clears UDKs.

  DCS 0 ; 1 | ST

- The following sequence locks UDKs.

  DCS 1 ; 0 | ST

- Suppose you want to define the **F20** key to be "PRINT", without clearing or locking any other keys. The first part of your sequence would look like this.

  DCS 1 ; 1 | 3 4 /

  where **34** is the code for the **F20** key.

  After the slash character (2/15), you include the definition. The rest of the sequence after the slash character would look like this.

5 0 5 2 4 9 4 E 5 4 ST

where the hex encoding for "PRINT" is as follows.

50 = P
52 = R
49 = I
4E = N
54 = T

The ST character (9/12) marks the end of the control string.

The complete string is as follows.

DCS 1 ; 1 | 34 / 50 52 49 4E 54 ST

PRINTER PORT CONTROL FUNCTIONS

This section describes control functions you use to control a local printer.

Printer Extent Mode (DECPEX)

This control function selects how much data you can print when you use the print page function described in the next section.

Default: Scrolling region

Mode	Sequence					Action
Set (Page)	CSI 9/11	? 3/15	1 3/1	9 3/9	h 6/8	The print page function prints the complete page.
Reset (Scrolling region)	CSI 9/11	? 3/15	1 3/1	9 3/9	l 6/12	The print page function only prints the scrolling region (data inside the margins).

Print Form Feed Mode (DECPFF)

This control function selects whether or not the terminal sends a form feed (FF) character to the printer at the end of a printing function.

To send a form feed to the printer following text or graphics operations, select print form feed mode from the host session or set the **Print Terminator** feature in the Printer Set-Up screen to "FF."

Default: No form feed

Mode	Sequence					Action
Set (Form feed)	CSI 9/11	? 3/15	1 3/1	8 3/8	h 6/8	The terminal sends a form feed (FF) to the printer at the end of a printing function.
Reset (No form feed)	CSI 9/11	? 3/15	1 3/1	8 3/8	l 6/12	The terminal sends nothing to the printer at the end of a printing function.

Notes on DECPFF

- DECPFF does not affect the print cursor line function described in the next section.

PRINTING FUNCTIONS

This section describes control functions you use to print text from the terminal. If you do not have a printer connected to the terminal, the terminal ignores these functions.

When you print characters from the screen or current page, the printer converts all tabs to spaces. Printed characters are spaced with the space (SP) character. The terminal sends a carriage return (CR), line feed (LF), vertical tab (VT), or form feed (FF) character to the printer after the last printed character on a line.

All the printing functions described in this section are variations of the media copy (MC) command. There are two versions of the MC command, standard and DEC private. The format of each version is as follows.

MC	ANSI standard	CSI 9/11	Ps 3/?	i 6/9	
MC	DEC private	CSI 9/11	? 3/15	Ps 3/?	i 6/9

where

Ps indicates the function of the command

Printing a Display Line: Autoprint Mode

In this mode, the printer prints a line from the screen when you move the cursor off that line with an LF, FF, or VT character, or an autowrap occurs. The printed line ends with a CR and the character (LF, FF, or VT) that moved the cursor off the previous line.

Sequence	Action
CSI ? 5 i	Turns on autoprint mode.
CSI ? 4 i	Turns off autoprint mode.

Sending Characters Directly to the Printer: Printer Controller Mode

In this mode, the terminal sends received characters to the printer without displaying them on the screen. The terminal sends all characters and control sequences to the printer, except NUL, XON, XOFF, and the printer controller mode sequences.

Sequence	Action
CSI 5 i	Turns on printer controller mode.
CSI 4 i	Turns off printer controller mode.

Notes on Printer Controller Mode

- Printer controller mode cancels autoprint mode. When the terminal leaves printer controller mode, the terminal returns to the normal method for printing operations.
- The printer's active column position should always be on the left margin before the terminal leaves printer controller mode.

Print Page

This control function prints the page that has the cursor. The terminal stores data from the keyboard until printing is complete.
You can use either of the following sequences to print the page.

CSI i or CSI 0 i

Notes on Print Page

- If printer extent mode (DECPEX) is currently reset, the print page function only prints the scrolling region.

Print Composed Main Display

This control function prints the data on the screen. This data may include information from two sessions, if the screen is displaying data from both sessions. See Chapter 14 for information of dual sessions.

CSI ? 10 i

Notes on Print Composed Main Display

- Printer extent mode (DECPEX) does not affect this function.

Print All Pages

This control function prints all pages in page memory for the current session. For example, if the current page format is 3 pages of 24 lines each, the printer prints 3 pages of 24 lines. The terminal stores new data from the keyboard until printing is complete.

CSI ? 11 i

Notes on Print All Pages

- If print form feed mode (DECPFF) is set, the terminal sends a form feed (FF) to the printer after each page.

Print Cursor Line

This control function prints the line that has the cursor. The cursor does not move.

CSI ? 1 i

Start Printer-to-Host Session

This control function enables communication from the printer port to the active host session. See Chapter 14 for details on session management.

CSI ? 9 i

Stop Printer-to-Host Session

This control function disables communication from the printer port to the active host session. See Chapter 14 for details on session management.

CSI ? 8 i

Assign Printer to Active Host Session

This control function lets the terminal accept printer commands from the current session only . See Chapter 14 for details on session management.

Software should use a device status report (DSR) to ask if the printer is not assigned to the other session. If the inactive session sends a DSR while the printer is assigned to the active session, the inactive session receives a "printer assigned" message. See Chapter 12 for details on DSR reports.

CSI ? 18 i

Release Printer

This control function lets the terminal accept printer commands from both sessions. See Chapter 14 for details on session management.

CSI ? 19 i

PRINTING VISUAL ATTRIBUTES

This section describes how the terminal sends visual attributes to a local printer, such as bold or underlining. To send visual attributes, the **Printed Data Type** feature in the Printer Set-Up screen must be set to one of the following three modes.

national and line drawing
multinational
print all characters

See Chapter 11 of *Installing and Using the VT330/VT340 Video Terminal* for details.

The VT300 can send two types of visual attributes, line attributes and visual character attributes.

Sending Line Attributes

The terminal sends line attributes to a printer by (1) sending the appropriate line attribute control function, followed by (2) the characters in the current line. There are four line attribute control functions.

Single-width line	ESC # 5
Double-width line	ESC # 6
Double-width/double-height line	
Top half	ESC # 3
Bottom half	ESC # 4

Sending Visual Character Attributes

The terminal initializes character attributes at the beginning of each print line or print page operation by sending the following SGR sequence to the printer (Chapter 7).

ESC [0 m

This sequence sets all character attributes to the normal rendition.

To send a visual character attribute to a printer, the VT300 (1) sends the appropriate SGR sequence for that attribute, followed by (2) the current character. The SGR sequence is as follows.

ESC [0; Ps; Ps; ... Ps m

where

Ps indicates a character attribute sent.

Ps	**Attribute**
0	Normal (all attributes off)
1	Bold
2	Underline
5	Blink
7	Invisible

NOTE: The terminal sends characters with the invisible attribute as spaces.

After each print line or print page operation, the terminal clears all attributes by sending the following sequence.

ESC [0 m.

SCREEN DISPLAY CONTROL FUNCTIONS

This section describes control functions that affect how the terminal displays data.

Local Echo: Send/Receive Mode (SRM)

This control function turns local echo on or off. When local echo is on, the terminal sends keyboard characters to the screen. The host does not have to send (echo) the characters back to the terminal display. When local echo is off, the terminal only sends characters to the host. It is up to the host to echo characters back to the screen.

Default: No local echo

Mode	Sequence	Action
Set (No local echo)	CSI 1 2 h 9/11 3/1 3/2 6/8	Turns local echo off. The terminal sends keyboard characters to the host only. The host can echo the characters back to the screen.
Reset (Local echo)	CSI 1 2 l 9/11 3/1 3/2 6/12	Turns local echo on. The terminal sends keyboard characters to the host and to the screen. The host does *not* have to echo characters back to the terminal.

Light or Dark Screen: Screen Mode (DECSCNM)

This control function selects a dark or light background on the screen.

Default: Dark background

Mode	Sequence	Action
Set (Light background)	CSI ? 5 h 9/11 3/15 3/5 6/8	Selects reverse video. The screen displays dark characters on a light background.
Reset (Dark background)	CSI ? 5 l 9/11 3/15 3/5 6/12	Selects a normal display. The screen displays light light characters on a dark background.

Notes on DECSCNM

- Screen mode only affects how the data appears on the screen. DECSCNM does not change the data in page memory.

Select Text/Graphics Look-Up Table Mode (DECSTGLT)

The DECSTGLT control function allows the host to select the video color look-up table, which controls the mapping of text renditions to look-up table entries. This function corresponds to the Color Map feature in Global Set-Up screen.

The DECSTGLT control function is:

CSI	Ps	)	}
9/11	3/?	2/9	7/11

Where the values of Ps are:

0	monochrome color map look-up table
1	color-1 color map look-up table (default)
2	color-2 color map look-up table (Negative image text (reverse video) uses color map entry 8.)

Scrolling Mode (DECSCLM)

This control function selects the way the terminal scrolls lines. You can select one of two scroll settings, smooth or jump.

Default: Smooth scroll

Mode	**Sequence**				**Action**
Set (Smooth)	CSI 9/11	? 3/15	4 3/4	h 6/8	Selects smooth scroll at a rate of 6 lines per second. You can select a smooth scroll speed of 3 or 12 lines per second in Display Set-Up. See *Installing and Using the VT330/VT340 Video Terminal*, Chapter 5.
Reset (Jump)	CSI 9/11	? 3/15	4 3/4	l 6/12	Selects jump scroll. The terminal can add lines to the screen as fast as it receives them.

Notes on DECSCLM

- If "no scroll" is selected in Display Set-Up, the terminal ignores DECSCLM.

Selecting the Indicator or Host-Writable Status Line

The twenty-fifth line at the bottom of the screen is reserved for the status line. The terminal lets you use the status line in two ways — as an indicator of the terminal's current state, or as a window the host can use to display application-specific messages.

The *indicator status line* displays information about the current state of the terminal. This status line is enabled by default. It appears in reverse video (negative image) on the twenty-fifth screen line. This status line always appears in set-up.

The indicator status line displays the following information about the terminal.

- Active session number (1 or 2)
- Page number
- Text cursor position (line, column) or ReGIS graphics input position (pixel row, pixel column)
- Edit mode setting (in edit mode only)
- Insert/replace mode setting (in set-up and edit mode only)
- Printer status
- Modem status

The *host-writable status line* can display specific information from the host. That is, you can program this status line to display any information you want. In a dual session environment, each session has its own host-writable status line. See Chapter 14 for more information on dual sessions.

Printing the Status Display - During a print screen operation, if the **Status Display** feature in the Display Set-Up screen is set to "none", the status line is not printed. If **Status Display** is set to "indicator" or "host writable", the status line is printed.

NOTE: When the status display is set to "host writable", the contents of the status line are sent to the printer port, if the terminal is in auto-print mode.

You can send data to the status line and select the type of status line with the following control sequences.

Select Active Status Display (DECSASD) - This control function selects whether the terminal sends data to the main display or the status line. The main display is the first 24 lines on the screen. The status line is the twenty-fifth line.

Available in: VT300 mode only

Default: Main display

CSI	**Ps**	**$**	**}**
9/11	3/?	2/4	7/13

where

Ps represents the display the terminal sends data to, as follows.

Ps	**Action**
0 (default)	Selects the main display. The terminal sends data to the main display only.
1	Selects the status line. The terminal sends data to the status line only.

Select Status Line Type (DECSSDT) - This control function lets the host select the type of status line displayed on line 25 of the screen.

Available in: VT300 mode only

Default: Indicator status line

CSI	Ps	$	~
9/11	3/?	2/4	7/14

where

Ps indicates which status line the host selects, as follows.

Ps	Status Line Selected
0	No status line (The 25th line is blank.)
1 (default)	Indicator status line
2	Host-writable status line

Notes on DECSSDT

- If you change from an indicator to a host-writable status line, the new host-writable status line is empty.
- When you select the host-writable status line, most of the control functions that affect the main display also affect the status line. The following list describes the exceptions to the above rule.

Control Function	Action
Select character set (SCS)	Both the main display and status line use the same character set.
Cursor position controls	Only the column parameters in cursor positioning commands operate in the status line.
ANSI mode (DECANM)	Ignored if received in the status line.
Set conformance level (DECSCL)	Exits status line.
Scrolling mode (DECSCLM)	Affects the main display and the status line.
Soft terminal reset (DECSTR)	Exits status line.
Insert/replace mode (IRM)	Affects the main display and the status line.

Hard terminal reset (RIS)	Erases and exits the status line.
Tab stops	Affect main display and status line.
Auto wrap mode (DECAWM)	Affects main display and status line.

- DECSSDT does not affect the status line type displayed in set-up. In set-up, the terminal always uses the indicator status line.

SUMMARY

Tables 11-1 through 11-4 list the control sequences described in this chapter.

Table 11-1 Keyboard Control Sequences

Mode	Mnemonic	Sequence	
		Set	Reset
Keyboard action mode	KAM	CSI 2 h Locked.	CSI 2 l Unlocked. (D)
Backarrow key mode	DECBKM	CSI ? 67 h Backspace.	CSI ? 67 l Delete. (D)
Line feed/ new line mode	LNM	CSI 20 h New line.	CSI 20 l Line feed. (D)
Autorepeat mode	DECARM	CSI ? 8 h Repeat. (D)	CSI ? 8 l No repeat.
Autowrap mode	DECAWM	CSI ? 7 h Autowrap.	CSI ? 7 l No autowrap. (D)
Cursor keys mode	DECCKM	CSI ? 1 h Application.	CSI ? 1 l Cursor. (D)
Keypad application/ numeric modes	DECKPAM DECKPNM	ESC = Application.	ESC > Numeric. (D)
Numeric keypad mode	DECNKM	CSI ? 66 h Application.	CSI ? 66 l Numeric. (D)
Keyboard usage mode	DECKBUM	CSI ? 68 h Data processing.	CSI ? 68 l Typewriter. (D)

(D) = default.

Table 11-2 Programming UDKs

Definable Keys

F6 through F14	Help (F16)
Do (F15)	F17 through F20

DECUDK Device Control String Format

DCS Pc ; Pl | Ky1/St1;...Kyn/Stn ST

Pc is the *clear parameter.*

0 or none = Clear all keys before loading new values (default)
1 = Clear one key at a time, before loading a new value.

Pl is the *lock parameter.*

0 or none = Lock the keys.
1 = Do not lock the keys (default).

Ky1/St1;...Kyn/Stn are the *key definition strings.*

The key selector number (**Kyn**) indicates which key you are defining.

Key	Value	Key	Value	Key	Value
F6	17	F11	23	Do	29
F7	18	F12	24	F17	31
F8	19	F13	25	F18	32
F9	20	F14	26	F19	33
F10	21	Help	28	F20	34

The string parameters (**Stn**) are the key definitions, encoded as pairs of hex codes.

3/0 through 3/9 (0 through 9)
4/1 through 4/6 (A through F)
6/1 through 6/6 (a through f)

Table 11-3 Printing Control Sequences

Name	Mnemonic	Sequence
Printer extent mode	DECPEX	Set: CSI ? 19 h Page. (D) Reset: CSI ? 19 l Scrolling region.
Print form feed mode	DECPFF	Set: CSI ? 18 h Form feed. Reset: CSI ? 18 l No form feed. (D)
Auto print mode	MC	On: CSI ? 5 i Off: CSI ? 4 i
Printer controller mode	MC	On: CSI 5 i Off: CSI 4 i
Print page	MC	CSI i or CSI 0 i
Print composed main display	MC	CSI ? 10 i
Print all pages	MC	CSI ? 11 i
Print cursor line	MC	CSI ? 1 i
Start printer-to-host session	MC	CSI ? 9 i
Stop printer-to-host session	MC	CSI ? 8 i
Assign printer to active session	MC	CSI ? 18 i
Release printer	MC	CSI ? 19 i

(D) = default.

Table 11-4 Screen Display Control Sequences

Name	Mnemonic	Sequence
Send/receive mode	SRM	Set: **CSI 12 h** Local echo off. (D) Reset: **CSI 12 l** Local echo on.
Screen mode	DECSCNM	Set: **CSI ? 5 h** Light background. Reset: **CSI ? 5 l** Dark background. (D)
Scrolling mode	DECSCLM	Set: **CSI ? 4 h** Smooth scroll. (D) Reset: **CSI ? 4 l** Jump scroll.
Select active status display*	DECSASD	**CSI Ps $ }** Ps = 0, main display. Ps = 1, status line.
Select status line type*	DECSSDT	**CSI Ps $ -** Ps = 0, none. Ps = 1, indicator. (D) Ps = 2, host-writable.

(D) = default.

* Available in VT300 mode only.

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The VT300 sends reports in response to requests from the host computer. These reports provide the host with the following information about the terminal.

identification (type of terminal)
cursor state
operating status
operating level (VT100 or VT300)
almost all terminal states that software can set

The host can use the reports to adjust the computing environment to match the terminal.

DEVICE ATTRIBUTES (DA)

The terminal and host computer exchange DA sequences to provide the host with the following information.

conformance level (1, 2, or 3) and extensions
basic features
identification code
firmware version level
hardware options

Based on this information, the host can

- Use the information it receives to make the best use of the terminal's features.
- Select the correct application software for the terminal.
- Determine the cause of certain communication errors.

There are two types of DA exchanges between the host and the terminal, primary DA and secondary DA. The host can request a primary DA or secondary DA report, depending on the information the host needs.

Primary DA

In this DA exchange, the host asks for the terminal's service class code and basic attributes.

Host Request
The host uses the following sequence to send this request.

CSI	**c**	or	**CSI**	**0**	**c**
9/11	6/3		9/11	3/0	6/3

Terminal Response
The terminal responds by sending its service code and basic attributes to the host. This response depends on the terminal's current operating level (VT100 or VT300).

CSI	**?**	**Psc**	**;**	**Psl**	**;**	**...**	**Psn**	**c**
9/11	3/15	3/?	3/11	3/?	3/11	...	3/?	6/3

where

Psc indicates the terminal's maximum operating level, regardless of the current operating level.

Psc	Operating Level
63	Level 3 (VT200 or VT300 family)

To determine the current operating level, use the DECRQSS control function described in Chapter 12 of this manual.

Psl...Psn indicate which of the following extensions the terminal supports.

Ps	Meaning
1	132 columns
2	Printer port
3	ReGIS graphics
4	Sixel graphics
6	Selective erase
7	Soft character set (DRCS)
8	User-defined keys
9	National replacement character sets

Ps	Meaning
13	Local editing mode
15	Technical character set
16	Locator device port
18	Windowing capability
19	Dual sessions

Primary DA Example
Here is a typical primary DA exchange.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI c or CSI 0 c	The host asks for the terminal's service code, conformance level, and supported extensions.
Response (VT300 to host)	CSI ? 63; 1; 2; 3; 4; 6; 7; 8; 9; 13; 15; 16; 18; 19c	The terminal is a service class 3 device (63) and supports the following extensions. • 132 columns (1) • printer port (2) • ReGIS graphics (3) • Sixel graphics (4) • selective erase (6) • DRCS (7) • UDKs (8) • NRC sets (9) • local editing mode (13) • technical character set (15) • Locator device port (16) • windowing (18) • dual sessions (19)

Table 12-1 lists all the primary DA alias responses that the VT300 can send to the host. The terminal uses an *alias response* to identify itself to the host as some other type of terminal. Each response corresponds to a certain operating level.

Table 12-1 Alias Primary DA Responses From the VT300*

Terminal	Identification Sequence	Meaning
VT100 DA	ESC [? 1; 2 c	VT100 terminal
VT101 DA	ESC [? 1; 0 c	VT101 terminal
VT102 DA	ESC [? 6 c	VT102 terminal
VT125 DA	ESC [? 12; 7; 1; 10; 102 c	VT125 terminal
VT131 DA	ESC [? 7 c	VT131 terminal
VT220 DA	CSI ? 62; 1; 2; 6; 7; 8; 9 c	VT220 terminal
VT240 DA	CSI ? 62; 1; 2; 3; 4; 6; 7; 8; 9 c	VT240 terminal

* To change these alias responses, you must use the General Set-Up screen. See Chapter 5 of *Installing and Using the VT330/VT340 Terminal.*

Secondary DA

In this DA exchange, the host requests the terminal's identification code, firmware version level, and hardware options.

Host Request
The host uses the following sequence to send this request.

CSI	>	c	or	CSI	>	0	c
9/11	3/14	6/3		9/11	3/14	3/0	6/3

Terminal Response
The terminal uses the following sequence to respond.

CSI	>	Pp	;	Pv	;	Po	;	Pc	c
9/11	3/14	3/?	3/11	3/?	3/11	3/?	3/11	3/?	6/3

where

Po indicates any hardware options attached to the terminal. The default setting for this parameter is 0.

Pp indicates the identification code for the terminal as follows.

Pp	Meaning
18	VT330 terminal
19	VT340 terminal

Pv indicates the firmware version level of the terminal. *Firmware* is the software implementation of all the terminal's functions (for example, the editing functions). For the VT300, all firmware is on the ROM cartridge installed in the rear of the terminal.

Examples

Pv	Version
7	X0.7 (prereleased version 0.7)
10	V1.0 (released version 1.0)

Pc indicates the ROM cartridge registration number. Pc is set to 0 in the VT300.

Secondary DA Example
Here is a typical secondary DA exchange.

Exchange	Sequence	Meaning
Request (Host to VT300)	**CSI >** c or **CSI > 0 c**	The host asks for the terminal's identification, firmware version, current hardware options.
Response (VT300 to host)	**CSI >** 18; 14; **0 c**	The terminal identifies itself as a VT330 that uses version 1.4 firmware.

TERMINAL IDENTIFICATION (DECID)

This control function is similar to a primary device attributes (DA) request from the host. See the previous "Device Attributes" section.

NOTE: Digital does not recommend using DECID. DECID may not be supported in Digital terminals. You should use the primary device attributes request for this purpose. In VT300 mode, the terminal ignores DECID.

Host DECID Request

ESC	**Z**
1/11	5/10

Terminal Response
The terminal uses the same response as for a primary DA request. The terminal uses this response for all operating levels (1, 2, or 3).

DEVICE STATUS REPORTS (DSR)

The host computer and terminal exchange DSR sequences to provide the host with the operating status of the following seven features.

VT300 operating status
Cursor position
Cursor position with page
Printer port
User-defined keys
Keyboard dialect
Locator device port

DSR requests and reports follow one of two formats, ANSI standard or DEC private. The format for each is as follows.

ANSI standard	**CSI**	**Ps**	n	
	9/11	3/?	6/14	
DEC private	**CSI**	?	**Ps**	n
	9/11	3/15	3/?	6/14

where

Ps indicates the type of DSR requested.

There is a different DSR request for each feature. The following sections describe the possible DSR reports. If the terminal is in printer controller mode (Chapter 11), the printer receives the DSR request.

DSR — VT300 Operating Status

The host requests the terminal's operating status.

Exchange	**Sequence**	**Meaning**
Request (Host to VT300)	**CSI 5 n**	The host requests the terminal's operating status. The host asks if the terminal is in good operating condition.
Responses (VT300 to host)	**CSI 0 n**	The terminal indicates that it is in good operating condition.
	or	
	CSI 3 n	The terminal indicates that it has a malfunction.

DSR — Cursor Position Report (CPR)

The host asks the terminal for a cursor position report.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI 6 n	The host asks for a cursor position report (CPR).
CPR response (VT300 to host)	CSI P1; Pc R	The terminal indicates that the cursor is currently at line Pl, column Pc.

DSR — Extended Cursor Position Report (DECXCPR)

The host asks the terminal for the current cursor position, including the current page number.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI ? 6 n	The host asks for an extended cursor position report (DECXCPR).
DECXCPR response (VT300 to host)	CSI Pl; Pc; Pp R	The terminal indicates that the cursor is currently at line Pl, column Pc, on page Pp.

DSR — Printer Port

The host asks for the status of the terminal's printer.

NOTE: Host software should check the printer status before entering any print mode or starting any printing function.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI ? 15 n	The host asks for the current printer status.
Possible responses (VT300 to host)	CSI ? 13 n	No printer. The data terminal ready (DTR) signal has not been asserted on the printer port since the last power-up or reset.
	CSI ? 10 n	Printer ready. DTR is asserted on the printer port.

	CSI ? 11 n	Printer not ready. DTR is not currently asserted on the printer port.
	CSI ? 18 n	Printer busy. DTR is asserted on the printer port, but the other session is using the printer (Chapter 14). In VT100 mode, the terminal sends the "Printer not ready" sequence above.
	CSI ? 19 n	Printer assigned to other session. DTR is asserted on the printer port, but the printer is assigned to the other session. The printer is not available to this session (Chapter 14). In VT100 mode, the terminal sends the "No printer" sequence above.

DSR — User-Defined Keys (VT300 Mode Only)

The host asks if the user-defined keys (UDKs) are locked or unlocked.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI ? 25 n	The host asks if UDKs are locked or unlocked.
Possible responses (VT300 to host)	CSI ? 20 n	UDKs are unlocked.
	CSI ? 21 n	UDKs are locked.

DSR — Keyboard Dialect

The host asks for the current keyboard dialect and the keyboard's operating status.

Exchange	Sequence	Meaning
Request (Host to VT300)	CSI ? 26 n	The host asks for the keyboard dialect and status.

Response (VT300 to host)	**CSI ? 27; Pla; Pst n**	The keyboard dialect is **Pla**, and the keyboard status is **Pst**.

where

Pla	=	**Dialect**
1	=	North American
2	=	British
3	=	Flemish
4	=	Canadian (French)
5	=	Danish
6	=	Finnish
7	=	German
8	=	Dutch
9	=	Italian
10	=	Swiss (French)
11	=	Swiss (German)
12	=	Swedish
13	=	Norwegian
14	=	French/Belgian
15	=	Spanish
16	=	Portuguese

Pst	=	**Keyboard Status***
0	=	Keyboard ready. The terminal sends typed characters to the current session (Chapter 14).
3	=	No keyboard. The terminal does not detect the keyboard.
8	=	Keyboard busy. The other session is currently using the keyboard (Chapter 14).

---

* The terminal only sends Pst in VT300 mode.

DSR — Locator Device Port (VT300 Mode Only)

The host can ask for the status or identification of the locator device. You can connect devices such as a mouse or graphics tablet to the locator port of a VT300.

Exchange	**Sequence**	**Meaning**
Status request (Host to VT300)	**CSI ? 55 n**	The host asks for the status of the locator device port.
Possible responses (VT300 to host)	**CSI ? 53 n**	No locator device. The terminal cannot detect a locator device.
	CSI ? 50 n	Locator device ready. The terminal detects a locator device.

	CSI ? 58 n	Locator device busy. The other session is currently using the locator device (Chapter 14).
Identification request (Host to VT300)	CSI ? 56 n	The host asks what kind of locator device is connected to the locator device port.
Possible responses (VT300 to host)	CSI ? 57 ; 0 n	Cannot identify the locator device. There is no locator device connected, or the device connected is not Digital's optional mouse or tablet. Applications that receive this response should request the locator status before reporting a problem to the user.
	CSI ? 57 ; 1 n	The terminal identifies the device as Digital's optional mouse.
	CSI ? 57 ; 2 n	The terminal identifies the device as Digital's optional tablet.

TERMINAL STATE REPORTS (VT300 MODE ONLY)

The host can request the terminal's current operating state. In response to this request, the terminal returns a terminal state report. The host can use the information in the report to save the current terminal state. Later, the host can restore the terminal to the saved state.

This operation is useful for applications that need to temporarily change the terminal's operating state. When the application is finished, it can restore the terminal to the previous operating state.

A terminal state report is a device control string. The report indicates the settings of most of the terminal's features. The terminal sends the report in response to a request terminal state report (DECRQTSR) sequence from the host.

There are two terminal state reports.

Terminal state report (DECTSR)
Color table report (DECCTR)

Request Terminal State Report (DECRQTSR) — Host To VT300

The host sends this control function to request a terminal state report (DECTSR) or color table report (DECCTR). The terminal responds by sending a report indicating the settings of many device attributes.

CSI	Ps	$	u
9/11	3/?	2/4	7/5

where

Ps indicates the type of report the host requests from the terminal.

Ps	Report Requested
0 or none	Ignored. No report sent.
1	Terminal state report (DECTSR)
2	Color table report (DECCTR)

PROGRAMMING TIP: For the VT330, applications cannot use the DECRQTSR command to request a color table report. If an application requests a color table report from the VT330, it returns the following response.

DCS	0	$	s	ST
9/0	3/0	2/4	7/3	9/12

The 0 after the DCS character indicates that the VT330 cannot respond to the request for a color table report.

Request Color Table Report - When you use DECRQTSR to request a color table report, you can include an additional parameter, Ps2. Ps2 selects which color coordinate system the terminal uses to report the color map, HLS (hue/ lightness/saturation) or RGB (red/green/blue). Use the following format to request a color table report.

CSI	2	;	Ps2	$	u
9/11	3/2	3/11	3/?	2/4	7/5

where

Ps2 indicates the color coordinate system the terminal uses to send the report.

Ps2	**Color Coordinate System**
0 or none	HLS (default)
1	HLS
2	RGB

Terminal State Report (DECTSR) — VT300 to Host

The terminal sends this sequence in response to a request terminal state report (DECRQTSR) sequence. DECTSR informs the host of the entire state of the terminal, except for user defined key definitions and the current soft character set.

PROGRAMMING TIP: Applications can use the information in the terminal state report to save the current terminal state. Later, the application can restore the terminal to the saved state.

This operation is useful for applications that need to temporarily change the terminal's operating state. When the application is finished, it can restore the terminal to the previous operating state. You use the restore terminal state (DECRSTS) function to restore the terminal state. DECRSTS is described later in this chapter.

The DECTSR format is as follows.

DCS	**1**	**$**	**s**	**D1...D196**	**<checksum1>**	**<checksum2>**	**ST**
9/0	3/1	2/4	7/3	. . . .			9/12

where

D1...D196 is a data string indicating the status of most of the terminal's features. There are 196 bytes in the data string (D1...D196). D1...D196 are in the range 4/0 to 4/15 in the code table (Chapter 2). Bit 6 of each Dn is always on, bits 4, 5, and 7 of Dn are always off.

Notes on DECTSR

- Software should *not* expect the format of DECTSR to be the same for all members of the VT300 family, or for different revisions within each member of the family.

Color Table Report (DECCTR) — VT300 to Host

The terminal sends this sequence in response to a request terminal state report (DECRQTSR) sequence from the host. DECCTR informs the host of the terminal's current color settings.

PROGRAMMING TIP: Applications can use the information in the color table report to save the current color map. Later, the application can restore the saved color map.

For the VT330, *applications* cannot *use the DECRSTS command to restore a color table. The VT330 ignores any attempt to restore a color table.*

This operation is useful for applications that need to temporarily change the terminal's color map. When the application is finished, it can restore the color map that was in effect before the application changed it. You use the restore terminal state (DECRSTS) function to restore the color map. DECRSTS is described in the next section.

DCS	**2**	**$**	**s**	**D...D**	**ST**
9/0	3/2	2/4	7/3	...	9/12

where

D...D is the data string containing the color table information. The data string is divided into groups of five values, as follows.

Pc; Pu; Px; Py; Pz / Pc; Pu; Px; Py; Pz / ...

where

Pc is the color number (0 through 255).

; (semicolon, 3/11) separates the parameters.

Pu indicates the universal coordinate system used.

Pu	Coordinate System
1	HLS (hue, lightness, saturation)
2	RGB (red, green, blue)

Px; Py; Pz are color coordinates in the specified coordinate system.

Parameter	HLS Values	RGB Values
Px	0 to 360 (hue angle)	0 to 100 (red intensity)
Py	0 to 100 (lightness)	0 to 100 (green intensity)
Pz	0 to 100 (saturation)	0 to 100 (blue intensity)

Restore Terminal State (DECRSTS) — VT300 Mode Only

This sequence restores the terminal to a previous state specified in a terminal state report (DECTSR). There are two terminal state reports.

Terminal state report (DECTSR)
Color table report (DECCTR)

PROGRAMMING TIP: Applications can use DECRSTS to restore the terminal to a previous operating state specified in a terminal state report. See the "Terminal State Report (DECTSR)" and "Color Table Report (DECCTR)" sections in this chapter.

For the VT330, *applications* cannot *use the DECRSTS command to restore a color table. The VT330 ignores any attempt to restore a color table.*

Available in: VT300 mode

DCS	Ps	$	p	D...D	ST
9/0	3/?	2/4	7/0	...	9/12

where

Ps indicates the format of the data string (D...D). You can use one of the two following formats for the the data string. These formats correspond to the formats used by the two terminal state reports (DECTSR). Make sure you use the format used by the report you are restoring.

Ps	**Data String Format**
0	Error, restore ignored.
1	Selects the format of the terminal state report (DECTSR).
2	Selects the format of the color table report (DECCTR).

D...D is a data string that contains the restored information. This string is identical to the data string used by the report you are restoring.

Notes on DECRSTS

- If there is an invalid value in the DECRSTS sequence, the terminal ignores the rest of the sequence. This action may leave the terminal in a partially restored state.
- Software should not expect the format of the terminal state report (DECTSR) to be the same for all VT300 family members.

PRESENTATION STATE REPORTS (VT300 MODE ONLY)

The terminal can send two presentation state reports.

Cursor information report (DECCIR)	Reports on the cursor position, including its visual attributes and character protection attributes. Also reports on origin mode (DECOM), and the current active character sets.
Tab stop report (DECTABSR)	Reports the current tab stop settings.

The host can request the terminal's current presentation state. In response to this request, the terminal returns a presentation state report. The host can use the information in the report to save the current presentation state. Later, the host can restore the terminal to the saved state.

This operation is useful for applications that need to temporarily change the terminal's presentation state. When the application is finished, it can restore the terminal to the previous presentation state.

A presentation state report is a device control string. The terminal sends the report in response to a request presentation state report (DECRQPSR) sequence from the host.

Request Presentation State Report (DECRQPSR) — Host To VT300

The host sends this sequence to request a cursor information report (DECCIR) or a tabulation stop report (DECTABSR).

CSI	Ps	$	w
9/11	3/?	2/4	7/7

where

Ps indicates which report the host requests.

Ps	Report Requested
0	Error, request ignored
1	Cursor information report (DECCIR)
2	Tab stop report (DECTABSR)

Cursor Information Report (DECCIR) — VT300 to Host

The terminal sends this sequence in response to a request presentation state report (DECRQPSR) sequence. DECCIR reports the status of the cursor position, including visual attributes and character protection attributes. DECCIR also reports the status of of origin mode (DECOM) and the current active character sets.

PROGRAMMING TIP: Applications can use the information in the cursor information report to save the current presentation state. Later, the application can restore the terminal to the saved state.

This operation is useful for applications that need to temporarily change the terminal's presentation state. When the application is finished, it can restore the terminal to the previous presentation state. You use the restore presentation state (DECRSPS) function to restore the presentation state. DECRSPS is described later in this chapter.

DCS	1	$	u	D...D	ST
9/0	3/1	2/4	7/5	...	9/12

where

D...D is the data string containing the cursor information. The format for this data string is as follows.

Pr; Pc; Pp; Srend; Satt; Sflag; Pgl; Pgr; Scss; Sdesig

where

Pr is the number of the line the cursor is on.

Pc is number of the column the cursor is at.

Pp is the number of the current page.

Srend is one or more characters indicating the visual attributes (such as bold and blinking) currently set for writing (Chapter 7).

To find out what attributes are set, you must convert the character to an 8-bit binary number. You can use the code table in Chapter 2 to convert characters. After you convert a character, you can find the meaning of its 8-digit binary number in the following table. The table lists the most significant bit (8) to least significant bit (1).

Bit	Attribute	Bit Value
8	—	Always 0 (off).
7	—	Always 1 (on).
6	Extension indicator	1 = another character (byte) of attribute data follows this one. 0 = no more attribute data.
5	Invisible	0 = off. 1 = on.
4	Negative image	0 = off. 1 = on.
3	Blinking	0 = off. 1 = on.
2	Underline	0 = off. 1 = on.
1	Bold	0 = off. 1 = on.

Example
If the bold and underline attributes are on for the current writing rendition, Srend is the ASCII uppercase C character (binary 01000011).

Satt is one or more characters indicating whether the selective erase attribute (DECSCA, Chapter 8) is currently on for writing.

To find if the attribute is set, you must convert each character to an 8-bit binary number. Use the same method you used to convert the Srend parameter above. Then use the following table to find the meaning of the 8-bit binary number.

Bit	Attribute	Bit Value
8	—	Always 0 (off).
7	—	Always 1 (on).
6	Extension indicator	1 = another character (byte) of selective erase data follows this one. 0 = no more protection data.
5	—	0 — Reserved for future use.
4	—	0 — Reserved for future use.
3	—	0 — Reserved for future use.
2	—	0 — Reserved for future use.
1	Selective erase	0 = off. 1 = on.

Example
If the selective erase attribute is currently on for writing, then Satt is the ASCII uppercase A character (binary 01000001).

Sflag is one or more characters that indicate several flags and modes the terminal must save.

To see the current state of the flags and modes, you must convert each character to an 8-bit binary number. Use the same method you used to convert the Srend and Satt parameters above. Then use the following table to find the meaning of the 8-bit binary number.

Bit	Attribute	Bit Value
8	—	Always 0 (off).
7	—	Always 1 (on).

6	Extension indicator	1 = another character (byte) of flag data follows this one. 0 = no more flag data.
5	—	0 — Reserved for future use.
4	Auto wrap	1 = auto wrap pending 0 = auto wrap not pending
3	Single shift 3 (SS3) setting	1 = G3 is mapped into GL for the next typed character only. 0 = single shift 3 is off.
2	Single shift 2 (SS2) setting	1 = G2 is mapped into GL for the next typed character only. 0 = single shift 2 is off.
1	Origin mode	1 = origin mode set 0 = origin mode reset

Example
If origin mode is set, auto wrap is pending, and a single shift 3 has been received, then Sflag is the ASCII upper case M character (binary 01001101).

Pgl indicates the number of the logical character set (G0 through G3) mapped into GL.

0 = G0 is in GL.
1 = G1 is in GL.
2 = G2 is in GL.
3 = G3 is in GL.

Pgr indicates the number of the logical character set (G0 through G3) mapped into GR.

0 = G0 is in GR.
1 = G1 is in GR.
2 = G2 is in GR.
3 = G3 is in GR.

Scss is a character indicating the size of the character sets in G0 through G3.

To find out what the character means, you must convert it to an 8-bit binary number. Use the same method you used to convert the Srend, Satt, and Sflag parameters. Then use the following table to find the meaning of the 8-bit binary number.

Bit	Indicates	Bit Value
8	—	Always 0 (off)
7	—	Always 1 (on)
6	Extension indicator	1 = another character (byte) of character size data follows this one. 0 = no more size data.
5	—	0 = reserved for future use.
4	G3 set size	0 = 94 characters. 1 = 96 characters.
3	G2 set size	0 = 94 characters. 1 = 96 characters.
2	G1 set size	0 = 94 characters. 1 = 96 characters.
1	G0 set size	0 = 94 characters. 1 = 96 characters.

Example

Suppose the following conditions exist.

- ISO Latin-1 supplemental is designated as G2 and G3.
- ASCII is designated as G0 and G1.

Then Scss is the backslash ASCII \ character (binary 01001100).

Sdesig is a string of intermediate and final characters indicating the character sets designated as G0 through G3. These final characters are the same as those used in select character set (SCS) sequences (Chapter 5).

Example

Suppose the ASCII character set is designated as G0, DEC Special Graphic as G1, and DEC Supplemental Graphic as G2 and G3. The Sdesig string would be **B0%5%5**. Each character corresponds to a final character in an SCS sequence, as follows.

G0	G1	G2	G3
B	**0**	%5	%5

ASCII	DEC Special Graphic	DEC Supplemental Graphic	DEC Supplemental Graphic

Example
The following is an example of a cursor information report.

DCS 1 $ u 1; 1; 1; @; @; @; 0; 2; @; BB%5%5 ST

where

1; 1; 1; indicates that the cursor is at row 1, column 1, on the first page.

@; @; @; indicates that no visual character attributes or protection attributes are on at the cursor position, DECOM is reset, no SS2 pending, no SS3 pending, and no autowrap pending.

0; 2; indicates that G0 is mapped into GL, and G2 is in GR.

@; all character sets have 94 characters.

BB%5%5 indicates that ASCII is in G0 and G1, and that DEC Supplemental Graphic is in G2 and G3

Notes on DECCIR

- The cursor information in a DECCIR sequence is the same information saved through a save cursor (DECSC) command.
- DECCIR does not save active SPA and SSA control functions.

Tab Stop Report (DECTABSR) — VT300 To Host

The terminal sends this sequence to the host in response to a request presentation state report (DECRQPSR) sequence. DECTABSR informs the host of the terminal's current tab settings.

PROGRAMMING TIP: Applications can use the information in the tab stop report to save the current tab stops. Later, the application can restore the saved tab stops.

This operation is useful for applications that need to temporarily change the terminal's tab stops. When the application is finished, it can restore the tab stops that were in effect before the application changed them. You use the restore presentation state (DECRSPS) function to restore tab stops. DECRSPS is described later in this chapter.

DCS	**2**	**$**	**u**	**D...D**	**ST**
9/0	3/2	2/4	7/5	...	9/12

where

D...D is a data string indicating the column number location of each tab stop.

Example
The following is an example of a DECTABSR sequence.

DCS 2 $ u 9/ 17/ 25/ 33/ 41/ 49/ 57/ 65/ 73 ST

where

9, 17, 25, 33, 41, 49, 57, 65, and **73** are the column numbers for tab stops.

Restore Presentation State (DECRSPS) — VT300 Mode Only

This control function restores the terminal to a previous state based on one of the presentation state reports. There are two presentation state reports.

Cursor information report (DECCIR)
Tab stop report (DECTABSR)

A DECRSPS sequence can only restore the information from one report at a time, cursor information or tab stop.

PROGRAMMING TIP: Applications can use DECRSPS to restore the terminal to a previous state specified in a presentation state report. See the previous "Cursor Information Report (DECCIR)" and "Tab Stop Report (DECTABSR)" sections in this chapter.

Available in: VT300 mode

DCS	**Ps**	**$**	**t**	**D...D**	**ST**
9/0	3/?	2/4	7/4	...	9/12

where

Ps indicates the format of the data string (D...D). You can use one of the two following formats for the data string. These formats correspond to the formats used in the two presentation state reports (DECPSR). Make sure you use the format of the report you are restoring.

Ps	**Data String Format**
0	Error, restore ignored.
1	Selects the format of the cursor information report (DECCIR).
2	Selects the format of the tab stop report (DECTABSR).

D...D is a data string that contains the restored information. This string is identical to the data string used in the report you are restoring—the cursor information report (DECCIR) or tab stop report (DECTABSR).

Example
The following DECRSPS sequence restores tab stops according to the tab stop report (DECTABSR).

DCS 2 $ u 9; 17; 25; 33; 41; 49; 57; 65; 73 ST

Note that the data string format above is exactly the same as the format for the tab stop report (DECTABSR).

Notes on DECRSPS

- If there is an invalid value in the DECRSPS sequence, the terminal ignores the rest of the sequence. This action may leave the terminal in a partially restored state.

MODE SETTINGS (VT300 MODE ONLY)

The host can request the current settings of any ANSI or DEC private modes. In response to this request, the terminal returns a report indicating which modes are set and which are reset. The host can use the information in the report to save the current mode settings. Later, the host can restore the mode settings to their saved state.

This operation is useful for applications that need to temporarily change a number of modes. When the application is finished, it can restore the modes to their previous state.

The host requests the setting of a mode with a DECRQM sequence. The terminal responds with a DECRPM sequence. The host can then restore a saved setting with an SM or RM sequence. The following sections describe these sequences.

Request Mode (DECRQM) — Host To VT300

The host sends this control function to find out if a particular mode is set or reset. The terminal responds with a report mode function (DECRPM).

There are two versions of the DECRQM function, for ANSI and DEC private modes.

Requesting ANSI Modes

CSI	Pa	$	p
9/11	3/?	2/4	7/0

where

Pa indicates the ANSI mode that the host is asking about. Table 12-2 lists the values for Pa.

Requesting DEC Private Modes

CSI	?	Pd	$	p
9/11	3/15	3/?	2/4	7/0

where

Pd indicates the DEC private mode the host is asking about. Table 12-3 lists the values for Pd.

Examples

- The following sequences request the setting of some ANSI modes.

Host Request	Meaning
CSI 2 $ p	What is the current state of keyboard action mode (KAM)? (KAM = 2)
CSI 4 $ p	What is the current state of insert/replace mode (IRM)? (IRM = 4)

- The following sequences request the setting of some DEC private modes.

Host Request	Meaning
CSI ? 60 $ p	What is the current state of horizontal cursor coupling mode (DECHCCM)? (HCCM = 60)
CSI ? 6 $ p	What is the current state of origin mode (DECOM)? (DECOM = 6)

Notes on DECRQM

- A DECRQM sequence can only ask about one mode at a time.

Table 12-2 **ANSI Modes for DECRQM, DECRPM, SM, and RM**

Mode	Mnemonic	Pa
Guarded area transfer	GATM	1
Keyboard action	KAM	2
Control representation	CRM*	3
Insert/replace	IRM	4
Erasure	ERM	6
Horizontal editing	HEM†	10
Send/receive	SRM	12
Multiple area transfer	MATM	15
Transmit termination	TTM	16
Selected area transfer	SATM	17
Line feed/new line	LNM	20

* The host cannot change the setting of CRM. You can only change CRM from set-up. If CRM is set, the terminal ignores DECRQM and most other control functions.

† This control function is permanently reset.

Table 12-3 **DEC Private Modes for DECRQM, DECRPM, SM, and RM**

Mode	Mnemonic	Pd
Cursor keys	DECCKM	1
ANSI	DECANM	2
Column	DECCOLM	3
Scrolling	DECSCLM	4
Screen	DECSCNM	5
Origin	DECOM	6
Autowrap	DECAWM	7
Autorepeat	DECARM	8
Edit	DECEDM	10
Line transmit	DECLTM	11
Space compression field delimiter	DECSCFDM	13
Transmit execution	DECTEM	14
Edit key execution	DECEKEM	16
Print form feed	DECPFF	18
Printer extent	DECPEX	19

Table 12-3 DEC Private Modes for DECRQM, DECRPM, SM, and RM (Cont)

Mode	Mnemonic	Pd
Text cursor enable	DECTCEM	25
4010/4014 emulation	DECTEK	35
National replacement character set	DECNRCM	42
Graphics expanded print	DECGEPM	43
Graphics print color	DECGPCM	44
Graphics print color syntax	DECGPCS	45
Graphics print background	DECGPBM	46
Graphics rotated print	DECGRPM	47
VT131 transmit	DEC131TM	53
Horizontal cursor coupling	DECHCCM	60
Vertical cursor coupling	DECVCCM	61
Page cursor coupling	DECPCCM	64
Numeric keypad	DECNKM	66
Backarrow key	DECBKM	67
Keyboard usage	DECKBUM	68
Transmit rate limiting	DECXRLM	73
Sixel display mode	DECSDM	80

Report Mode (DECRPM) — VT300 To Host

The terminal sends this control function in response to a request mode (DECRQM) function. DECRPM informs the host whether a certain mode is set or reset.

PROGRAMMING TIP: Applications can use the information in the DECRPM report to save the current mode settings. Later, the application can restore the saved mode settings.

This operation is useful for applications that need to temporarily change some of the terminal's mode settings. When the application is finished, it can restore the mode settings that were in effect before the application changed them. You use the set mode (SM) and reset mode (RM) functions to restore mode settings. SM and RM are described later in this chapter.

There are two versions of DECRPM, for ANSI and DEC private modes.

Reporting ANSI Modes

CSI	Pa	;	Ps	$	y
9/11	3/?	3/11	3/?	2/4	7/9

where

Pa indicates the ANSI mode the terminal is reporting. Table 12-2 lists the values for Pa.

Ps indicates the setting of the mode, as follows.

Ps	Setting of Mode
0	Mode not recognized.
1	Set.
2	Reset.
3	Permanently set.
4	Permanently reset.

Reporting DEC Private Modes

CSI	?	Pd	;	Ps	$	y
9/11	3/15	3/?	3/11	3/?	2/4	7/9

where

Pd indicates the DEC private mode the terminal is reporting. Table 12-3 lists the values for Pd.

Ps indicates the setting of the mode. The Ps values are the same as for the ANSI version above.

Examples

- The following sequences report the setting of some ANSI modes.

VT300 Report	Meaning
CSI 2 ; 1 $ y	Keyboard action mode (KAM) is currently set. (KAM = 2, set = 1)

CSI 4 ; 2 $ y	Insert/replace mode is currently reset (IRM). (IRM = 4, reset = 2)

- The following sequences report the setting of some DEC private modes.

VT300 Report	**Meaning**
CSI ? 60; 1 $ y	Horizontal cursor coupling mode is currently set. (DECHCCM = 60, set = 1)
CSI ? 6 ; 2 $ y	Origin mode (DECOM) is currently reset. (DECOM = 6, reset = 2)

Notes on DECRPM

- The terminal can only report on one mode at a time.

Restoring Mode Settings (SM and RM)

ANSI and DEC private modes are control functions that have only two settings, set or reset. Soft terminal reset and hard terminal reset affect many control functions, including some ANSI and DEC private modes.

PROGRAMMING TIP: Applications can use the SM and RM functions to restore any number of VT300 modes to a desired state. See the previous "Report Mode (DECRPM)" section in this chapter for details.

Set Mode (SM) - This control function has two versions. You use the ANSI version to set one or more ANSI modes. You use the DEC private version to set one or more DEC private modes. You *cannot* set ANSI and DEC private modes with the same SM sequence.

Setting ANSI Modes

CSI	**Pa**	**;**	**...**	**;**	**Pa**	**h**
9/11	3/?	3/11	...	3/11	3/?	6/8

where

Pa indicates the ANSI mode to set. Table 12-2 lists Pa values for ANSI modes. You can use more than one Pa value in a sequence.

Setting DEC Private Modes

CSI	?	Pd	;	...	;	Pd	h
9/11	3/15	3/?	3/11	...	3/11	3/?	6/8

where

Pd indicates a DEC private mode to set. Table 12-3 lists the Pd values for DEC private modes. You can use more than one Pd value in a sequence.

Examples

- **ANSI Modes**
  The following sequence sets insert/replace mode (IRM) and erasure mode (ERM).

  CSI 4 ; 6 h

  where

  4 indicates insert/replace mode.
  6 indicates erasure mode.

- **DEC Private Modes**
  The following sequence sets scrolling mode (DECSCLM) and horizontal cursor coupling mode (DECHCCM).

  CSI ? 4; 60 h

  where

  4 indicates scrolling mode.
  60 indicates horizontal cursor coupling mode.

Reset Mode (RM) - There are two versions of this control function. You use the ANSI version to reset one or more ANSI modes. You use the DEC private version to reset one or more DEC private modes. You *cannot* reset ANSI and DEC private modes with the same RM sequence.

Resetting ANSI Modes

CSI	Pa	;	...	;	Pa	l
9/11	3/?	3/11	...	3/11	3/?	6/12

where

Pa indicates an ANSI mode to reset. Table 12-2 lists the Pa values for ANSI modes. You can use more than one Pa value in a sequence.

Resetting DEC Private Modes

CSI	**?**	**Pd**	**;**	**...**	**;**	**Pd**	**l**
9/11	3/15	3/?	3/11	...	3/11	3/?	6/12

where

Pd indicates a DEC private mode to reset. Table 12-3 lists the Pd values for DEC private modes. You can use more than one Pd value in a sequence.

Examples

- **ANSI Modes**
  The following sequence resets insert/replace mode (IRM) and erasure mode (ERM).

  CSI 4 ; 6 l

  where

  4 indicates insert/replace mode.
  6 indicates erasure mode.

- **DEC Private Modes**
  The following sequence resets scrolling mode (DECSCLM) and horizontal cursor coupling mode (DECHCCM).

  CSI ? 4; 60 l

  where

  4 indicates scrolling mode.
  60 indicates horizontal cursor coupling mode.

CONTROL FUNCTION SETTINGS (VT300 MODE ONLY)

The host can request the current selection or setting of any control function listed in Table 12-4. In response to this request, the terminal returns a report indicating the current section or setting of the selected control function. The host can use the information in the report to save the current setting. Later, the host can restore the control function to its saved state.

This operation is useful for applications that need to temporarily change a number of control function settings. When the application is finished, it can restore the control functions to their previous state.

The host requests the setting of a control function with a DECRQSS sequence. The terminal responds with a DECRPSS sequence. The host can then restore the control function, based on the DECRPSS report. The following sections describe DECRQSS and DECRPSS.

Table 12-4 Control Functions for DECRQSS Requests

Control Function	Mnemonic	Intermediate and Final Character(s)
Protected fields attributes	DECPRO	}
Select active status display	DECSASD	$ }
Set character attribute	DECSCA	" q
Set conformance level	DECSCL	" p
Set columns per page	DECSCPP	$ |
Set lines per page	DECSLPP	t
Set status line type	DECSSDT	$ ~
Set top and bottom margins	DECSTBM	r
Set transmit termination character	DECTTC	|
Transmit line termination character	DECTLTC	' s
Select graphic rendition	SGR	m

Request Selection or Setting (DECRQSS) — Host To VT300

The host sends this sequence to ask for the setting of a control function. The terminal responds with a report selection or setting (DECRPSS) sequence.

DCS	$	q	D...D	ST
9/0	2/4	7/1	...	9/12

where

D...D indicates the control function the host is asking about. D...D consists of the intermediate and/or final characters of the control function requested. Table 12-4 lists the control functions the host can ask about, with their final characters.

Examples

- The following DECRQSS sequence asks about the select graphic rendition (SGR) function.

  DCS $ q m ST

  where

  m is the final character of the SGR sequence.

- The following sequence asks about the set columns per page (DECSCPP) function.

  DCS $ q $ | ST

  where

  $ | are the intermediate and final characters of the DECSCPP sequence.

Notes on DECRQSS

- A DECRQSS sequence can only ask about one control function at a time.

Report Selection or Setting (DECRPSS) — VT300 To Host

The terminal sends the host this sequence in response to a request selection or setting (DECRQSS) sequence. The terminal sends DECRPSS to report the setting of a particular control function.

PROGRAMMING TIP: Applications can use the information in the DECRPSS report to save the current selections or settings of some control functions. Later, the application can restore the control functions to their saved state.

This operation is useful for applications that need to temporarily change the settings of some of the terminal's control functions. When the application is finished, it can restore the control functions to their previous state.

DCS	Ps	$	r	D...D	ST
9/0	3/?	2/4	7/1	...	9/12

where

Ps indicates whether or not the request from the host is valid.

0 = host's request is valid.
1 = host's request is invalid.

D...D indicates the current setting of a valid control function that the host asked about. D...D consists of all the characters in the control function, except the CSI (9/11) or ESC [(1/11, 5/11) introducer characters.

Examples

- The host requests the setting of the select graphic rendition (SGR) function. If the current graphic rendition is blinking, reverse, and invisible, the terminal responds with the following DECRPSS sequence.

  DCS 0 $ r 0 ; 5 ; 7 ; 8 m ST

  where

  0 ; 5 ; 7 ; 8 m are all the characters in the SGR sequence, except CSI.

- The host requests the setting of the set top and bottom margin function (DECSTBM). If the current top and bottom margins are set to include the complete screen area, the terminal responds with the following DECRPSS sequence.

  DCS 0 $ r 1 ; 24 r ST

  where

  1 ; 24 r are all the characters in the DECSTBM sequence, except CSI.

- The host requests the setting of a function that the terminal does not recognize. The terminal responds with the following DECRPSS sequence.

DCS 1 $ r ST

The terminal does not send a data string (D...D) to the host when the terminal receives an invalid request.

SAVING AND RESTORING THE CURSOR STATE

The save cursor function (DECSC) stores many of the terminal's selections and settings. The restore cursor function (DECRC) restores the terminal to the state saved by DECSC.

PROGRAMMING TIP: Applications can use DECSC to save the current settings of many modes and control functions. Later, the application can use DECRC restore the control functions and modes to their saved state.

This operation is useful for applications that need to temporarily change the settings of some of the terminal's modes and control functions. When the application is finished, it can restore the modes and control functions to their previous state.

Name	Sequence	Action
Save cursor (DECSC)	ESC 7 1/11 3/7	Saves the following in the terminal's memory. • Cursor position • Visual character attributes • Character sets (G0, G1, G2, or G3) currently in GL and GR • Wrap flag (autowrap or no autowrap) • State of origin mode (DECOM) • Selective erase attribute (DECSCA) • Any single shift 2 (SS2) or single shift 3 (SS3) functions sent
Restore cursor (DECRC)	ESC 8 1/11 3/8	Restores the terminal to the state saved by the save cursor (DECSC)

function. If nothing was saved by DECSC, then DECRC performs the following actions.

- Moves the cursor to the home position (upper left of screen).
- Resets origin mode (DECOM).
- Turns all visual character attributes off (normal setting).
- Turns selective erase attribute off.
- Maps the ASCII character set into GL, and the DEC Supplemental Graphic set into GR.

Notes on DECSC and DECRC

- The terminal maintains a separate DECSC buffer for the main display and the status line. This feature lets you save a separate operating state for the main display and the status line.
- DECSC does not save the protection attribute set by start protected area (SPA) and end protected area (EPA).

WINDOW REPORTS (VT300 MODE ONLY)

The host can ask the terminal how much of the current page is displayed on the screen at any time. The terminal responds by reporting how much of the page is on the screen, in terms of lines and columns.

PROGRAMMING TIP: This operation is useful for applications that need to know the size of the current user window.

Request Displayed Extent (DECRQDE)

The host sends this control function to ask how much of the current page is displayed on the screen. The terminal responds with a report displayed extent (DECRPDE) sequence.

CSI	"	v
9/11	2/2	7/6

Report Displayed Extent (DECRPDE)

The terminal sends this control function in response to a request displayed extent (DECRQDE) sequence. DECRPDE indicates how much of the current page is displayed on the screen for the active session.

Remember that the screen can be split into two user windows, one per session. The user can split the screen horizontally or vertically. DECRPDE indicates how much of the screen the active session has to display the current page. See Chapter 8 of *Installing and Using the VT330/VT340 Video Terminal* for details on user windows.

CSI	**Ph**	**;**	**Pw; Pml; Pmt; Pmp**		**"**	**w**
9/11	**	3/11	** ...	**	2/2	7/7

where

Ph is the number of lines of the current page displayed in the active session's window.

Pw is the number of columns of the current page displayed in the active session's window.

Pml is the number of the current page column displayed in the leftmost column of the active session's window.

Pmt is the number of the current page line displayed in the top line of the active session's window.

Pmp is the number of the current page displayed in the active session's window.

USER-PREFERRED SUPPLEMENTAL SET (DECRQUPSS) (VT300 MODE ONLY)

The host can ask for the current user-preferred supplemental set. The terminal responds with the assign user-preferred supplemental set (DECAUPSS) sequence (Chapter 5).

PROGRAMMING TIP: This operation is useful for applications that need to know what supplemental character set the terminal is using.

Host Request (DECRQUPSS)

The host requests the current user-preferred supplemental set by sending the following sequence.

CSI	**&**	**u**
9/11	2/6	7/5

Terminal Response

The terminal uses the DECAUPSS device control string to report the current user-preferred supplemental set (Chapter 5). The terminal sends DECAUPSS in response to a DECRQUPSS sequence. The terminal can send one of the following reports.

DCS 0 ! u % 5 ST	The user-preferred supplemental set is DEC Supplemental Graphic.
DCS 1 ! u A ST	The user-preferred supplemental set is ISO Latin-1 supplemental.

SUMMARY

Table 12-5 lists all the sequences described in this chapter.

Table 12-5 Sequences for VT300 Reports

Name	Mnemonic	Sequence
Primary Device Attributes		
Primary DA request (Host to VT300)	DA	**CSI c or CSI 0 c**
Primary DA response (VT300 to host)	DA	**CSI ? Psc; Ps1; ... Psn c** Psc = operating level. 61 = level 1 (VT100 family). 62,63 = level 3 (VT300 family). Ps1...Psn = extensions. 1 = 132 columns. 2 = printer port. 3 = ReGIS graphics. 4 = sixel graphics. 6 = selective erase. 7 = soft character set. 8 = user-defined keys. 9 = NRC sets. 13 = local editing mode. 15 = DEC technical set. 16 = locator device port. 18 = user windows. 19 = dual sessions. See Table 12-1 for alias responses.

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Secondary Device Attributes		
Secondary DA request (Host to VT300)	DA	**CSI > c or CSI > 0 c**
Secondary DA response (VT300 to host)	DA	**CSI > Pp; Pv; Pc c** Pp = identification code. 18 = VT330 terminal. 19 = VT340 terminal. Pv = firmware version. Pc = ROM cartridge registration.
Device Status Reports		
VT300 Operating Status		
Request (Host to VT300)	DSR	**CSI 5 n**
Report (VT300 to host)	DSR	**CSI 0 n** No malfunction. **CSI 3 n** Malfunction.
Cursor Position Report		
Request (Host to VT300)	DSR	**CSI 6 n**
Report (VT300 to host)	CPR	**CSI Pl; Pc R** Pl = line number. Pc = column number.

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Extended Cursor Position Report		
Request (Host to VT300)	DSR	**CSI ? 6 n**
Report (VT300 to host)	DECXCPR	**CSI Pl; Pc; Pp R** Pl = line number. Pc = column number. Pp = page number.
Printer Status		
Request (Host to VT300)	DSR	**CSI ? 15 n**
Report (VT300 to host)	DSR	**CSI ? 13 n** No printer.
		CSI ? 10 n Printer ready.
		CSI ? 11 n Printer not ready.
		CSI ? 18 n Printer busy.
		CSI ? 19 n Printer assigned to other session.
UDK Status (VT300 Mode Only)		
Request (Host to VT300)	DSR	**CSI ? 25 n**
Report (VT300 to host)	DSR	**CSI ? 20 n** UDKs unlocked.
		CSI ? 21 n UDKs locked.

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Keyboard Dialect		
Request (Host to VT300)	DSR	CSI ? 26 n
Report (VT300 to host)	DSR	CSI ? 27; Pla; Pst n Pla = keyboard dialect. 1 = North American. 2 = British. 3 = Flemish. 4 = French Canadian. 5 = Danish. 6 = Finnish. 7 = German. 8 = Dutch. 9 = Italian. 10 = Swiss French. 11 = Swiss German. 12 = Swedish. 13 = Norwegian. 14 = French/Belgian. 15 = Spanish. 16 = Portuguese. Pst = keyboard status. 0 = keyboard ready. 3 = no keyboard. 8 = keyboard busy.
Locator Device Status (VT300 Mode Only)		
Request (Host to VT300)	DSR	CSI ? 55 n
Report (VT300 to host)	DSR	CSI ? 53 n No locator device. CSI ? 50 n Locator device ready. CSI ? 58 n Locator device busy.

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Locator Device ID (VT300 Mode Only)		
Request (Host to VT300)	DSR	**CSI ? 56 n**
Report (VT300 to host)	DSR	**CSI ? 57; 0 n** Unknown device. **CSI ? 57; 1 n** Digital's mouse. **CSI ? 57; 2 n** Digital's tablet.
Terminal State Reports (VT300 Mode Only)		
Request (Host to VT300)	DECRQTSR	**CSI Ps $ u** Ps = report requested. 0 = ignored. 1 = terminal state report. 2 = color table report.
Request color table report	DECRQTSR	**CSI 2; Ps2 $ u** Ps2 = color coordinate system 0 = HLS (default) 1 = HLS 2 = RGB
Terminal state report (VT300 to host)	DECTSR	**DCS 1 $ s D..D <checksums 1 and 2> ST** D...D = report data.
Color table report	DECCTR	**DCS 2 $ s D...D ST** D...D = color data. (See text.)
Restore	DECRSTS	**DCS Ps $ p D...D ST** Ps = data string format. 0 = error. 1 = terminal state report. 2 = color table report. D...D = restored data.

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Presentation State Reports (VT300 Mode Only)		
Request (Host to VT300)	DECRQPSR	**CSI Ps $ w** Ps = report requested. 0 = error. 1 = cursor information report. 2 = tab stop report.
Cursor information report (VT300 to host)	DECCIR	**DCS 1 $ u D...D ST** D..D = data string. See text for description.
Tab stop report (VT300 to host)	DECTABSR	**DCS 2 $ u D...D ST** D...D = tab stops.
Restore	DECRSPS	**DCS Ps $ t D...D ST** Ps = data string format. 0 = error. 1 = cursor information report. 2 = tab stop report. D...D = data string.
Mode Settings (VT300 Mode Only)		
Request mode (Host to VT300)	DECRQM	**CSI Pa $ p** Pa = ANSI mode. (Table 12-2) **CSI ? Pd $ p** Pd = DEC private mode. (Table 12-3)

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Report mode (VT300 to host)	DECRPM	**CSI Pa; Ps $ y** Pa = ANSI mode. (Table 12-2) Ps = mode state. 0 = unknown mode. 1 = set. 2 = reset. 3 = permanently set. 4 = permanently reset.
Set mode	SM	**CSI Pa; ... Pa h** Pa = ANSI mode(s). (Table 12-2) **CSI ? Pd; ... Pd h** Pd = DEC private mode(s). (Table 12-3)
Reset mode	RM	**CSI Pa; ... Pa l** Pa = ANSI mode(s). (Table 12-2) **CSI ? Pd; ... Pd l** Pd = DEC private mode(s). (Table 12-3)
Control Function Settings (VT300 Mode Only)		
Request (Host to VT300)	DECRQSS	**DCS $ q D...D ST** D...D = intermediate and/or final characters of function. (Table 12-4)
Report (VT300 to host)	DECRPSS	**DCS Ps $ r D...D ST** Ps = 0, valid request. Ps = 1, invalid request. D...D = intermediate and/or final characters of function. (Table 12-4)

Table 12-5 Sequences for VT300 Reports (Cont)

Name	Mnemonic	Sequence
Saving and Restoring the Cursor State		
Save cursor state	DECSC	**ESC 7**
Restore cursor state	DECRC	**ESC 8**
Window Report (VT300 Mode Only)		
Request (Host to VT300)	DECRQDE	**CSI " v**
Report (VT300 to host)	DECRPDE	**CSI Ph; Pw; Pml; Pmt; Pmp " w** Ph = number of lines. Pw = number of columns. Pml = first column at left. Pmt = top line. Pmp = page number.
User-Preferred Supplemental Set (VT300 Mode)		
Request (Host to VT300)	DECRQUPSS	**CSI & u**
Report (VT300 to host)	DECAUPSS	**DCS 0 ! u % 5 ST** DEC Supplemental Graphic **DCS 1 ! u A ST** ISO Latin-1 supplemental

RESETTING THE TERMINAL 13

Soft Terminal Reset (DECSTR), 242
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This chapter describes how to reset the settings of many VT300 control functions at the same time.

You can also reset your VT300 by using set-up. See Chapter 5 of *Installing and Using the VT330/VT340 Video Terminal* for information on using set-up.

There are three control functions you can use to reset the terminal.

Soft terminal reset (DECSTR)	Selects most of the power-up factory default settings.
Hard terminal reset (RIS)	Selects the settings stored in NVR memory.
Tab clear (TBC)	Clears tab stops.

Soft terminal resets and hard terminal resets affect many control functions, including some ANSI and DEC private modes. ANSI and DEC private modes are control functions that have only two settings, set or reset.

SOFT TERMINAL RESET (DECSTR)

This control function changes most the terminal's current settings to the power-up default settings listed in Table 13-1.

Available in: VT300 mode only

CSI	!	p
9/11	2/1	7/0

You can also perform a soft terminal reset by selecting **Reset Session** in the Set-Up Directory screen. See Chapter 5 of *Installing and Using the VT330/ VT340 Video Terminal.*

Notes on DECSTR

- DECSTR affects only those functions listed in Table 13-1.
- National replacement character set mode (DECNRCM) is not reset when you select **Reset Session** in set-up.

Table 13-1 Soft Terminal Reset (DECSTR) States

Mode	Mnemonic	State After DECSTR
Text cursor enable	DECTCEM	Cursor enabled.
Insert/replace	IRM	Replace.
Origin	DECOM	Absolute (cursor origin at upper-left of screen).
Autowrap	DECAWM	No autowrap.
National replacement character set	DECNRCM	Multinational set.
Keyboard action	KAM	Unlocked.
Numeric keypad	DECNKM	Numeric characters.
Cursor keys	DECCKM	Normal (arrow keys).

Table 13-1 Soft Terminal Reset (DECSTR) States (Cont)

Mode	Mnemonic	State After DECSTR
Edit	DECEDM	Interactive.
Edit key execution	DECEKEM	Immediate.
Transmit execution	DECTEM	Immediate.
Erasure	ERM	All characters.
Guarded area transfer	GATM	All characters.
Multiple area transfer	MATM	All selected areas.
Selected area transfer	SATM	All areas.
VT131 transmit	DEC131TM	On (VT131).
Line transmit	DECLTM	Off (page or partial page).
Transmit termination	TTM	Scrolling region.
Other Control Functions		
Set top and bottom margins	DECSTBM	Top margin = 1. Bottom margin = page length.
All character sets	G0, G1, G2, G3, GL, GR	VT300 default settings. (DECSTR works only in VT300 mode.)
Select graphic rendition	SGR	Normal rendition.
Select character attribute	DECSCA	Normal (erasable by DECSEL and DECSED).
Start selected area End selected area	SSA ESA	Cleared. Cleared.
Start protected area End protected area	SPA EPA	Cleared. Cleared.
Save cursor state	DECSC	Home position with VT300 defaults.
Assign user-preferred supplemental set	DECAUPSS	Set selected in set-up.
Select active status display	DECSASD	Main display (first 24 lines).

HARD TERMINAL RESET (RIS)

NOTE: Digital does not recommend using RIS to reset the terminal. You should use a soft terminal reset (DECSTR) instead. RIS usually causes a communication line disconnect and may change the current baud rate settings. The terminal waits a few seconds before it performs a received RIS function.

This control function causes a nonvolatile memory (NVR) recall to occur. RIS replaces all set-up features with their saved settings. You can find out what the current saved settings are by looking at the **Saved Settings** column on the terminal's different set-up screens. See Chapter 5 of *Installing and Using the VT330/VT340 Video Terminal.*

When the RIS is complete, the terminal sends XON to resume communication.

The terminal stores these saved settings in NVR memory. The saved setting for a feature is the same as the factory-default setting, unless you saved a new setting.

You can also perform a hard reset from the Set-Up Directory screen, by selecting **Recall Saved Settings**.

The RIS sequence is as follows.

ESC	**c**
1/11	6/3

RIS Actions

- Sets all features listed on set-up screens to their saved settings.
- Causes a communication line disconnect.
- Clears user-defined keys for both sessions. (See Chapter 14 for details on session management.)
- Clears the soft character set.
- Clears page memory. All data stored in page memory is lost.
- Clears the screen.
- Returns the cursor to the upper-left corner of the screen.
- Sets the select graphic rendition (SGR) function to normal rendition.

- Sets the independent protection attribute to not protected.
- Selects the default character sets (ASCII in GL, and DEC Supplemental Graphic in GR).

Using RIS with SSU Sessions

If you use use Digital's Session Support Utility (Chapter 14) to manage sessions, RIS does *not* disconnect communications. If SSU is enabled and at least one session is open, RIS does the following.

- Erases the screen.
- Moves the cursor to the home position.
- Performs a soft terminal reset (DECSTR).
- Resets the current session.

TAB CLEAR (TBC)

This control function clears tab stops.

CSI	**Ps**	**g**
9/11	3/?	6/7

where

Ps indicates the tab stops to clear. Ps has only two values, 0 and 3. Default: Ps = 0.

0 or none	The terminal only clears the tab stop at the cursor.
3	The terminal clears all tab stops.

SUMMARY

Table 13-2 lists all the control functions described in this chapter.

Table 13-2 VT300 Reset Sequences

Name	Mnemonic	Sequence
Soft terminal reset*	DECSTR	**CSI ! p**
Hard terminal reset	RIS	**ESC c** Not recommended.
Tabulation clear	TBC	**CSI 0 g** Clear tab at cursor position. **CSI 3 g** Clear all tabs.

* Available in VT300 mode only.

PART 4
DUAL SESSIONS

SESSION MANAGEMENT 14

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DUAL SESSIONS

A session is an electronic connection between the terminal and a host system. The VT300 lets you run two sessions at the same time. Each time you establish a connection with your host system from the terminal, you open a *session* on the terminal.

Dual sessions let you process and view information from two sources at the same time. You can easily move back and forth between these sessions. You do not have to end one session before you begin another. You can run the two sessions on separate host systems or on the same system.

The VT300 maintains a separate *context* for each session. What you do in one session does not affect the other session.

TWO WAYS TO MANAGE SESSIONS

When you run two sessions at the same time, you need some way to manage the flow of data to and from each session. For example, suppose a user wants to switch from session 1 to session 2. The terminal must be able to inform the host system of the switch, without affecting the normal data flow.

You can use one of two ways to manage sessions on a VT300.

Multiple system communications (MSC)
Session Support Utility

Multiple system communications uses two communication lines between the terminal and host to run two sessions. Each session uses a separate line. You can connect the lines to the same host (or terminal server) or two separate hosts (or terminal servers). Figure 14-1 shows some typical MSC environments.

MSC is basically a hardware solution for session management. MSC is the same type of system used by terminals that can run only one session. MSC does not require special programming commands. MSC session management is transparent to the host. The terminal manages each session locally.

The *Session Support Utility* uses only one communication line to run two sessions. Usually, you use SSU software to run two sessions on the same host computer or terminal server. Figure 14-2 shows a typical SSU environment.

SSU software uses a protocol of system-level commands to maintain dual sessions. You can use the commands that best suit your needs.

SSU software differs from MSC in the following ways.

SSU Software	MSC
Uses one communication line for dual sessions.	Requires two communication lines, one for each session.
Uses a set of commands to control both sessions.	Does not use commands.
Requires that the host and terminal recognize SSU commands.	Is transparent to the host, since there are no commands to recognize.

NOTE: Make sure your system supports SSU software before you use this protocol. Your host system must be able to interpret and send SSU commands.

The next section describes how the VT300 divides its resources between two sessions. The rest of the chapter describes the two methods of session management, MSC and SSU software.

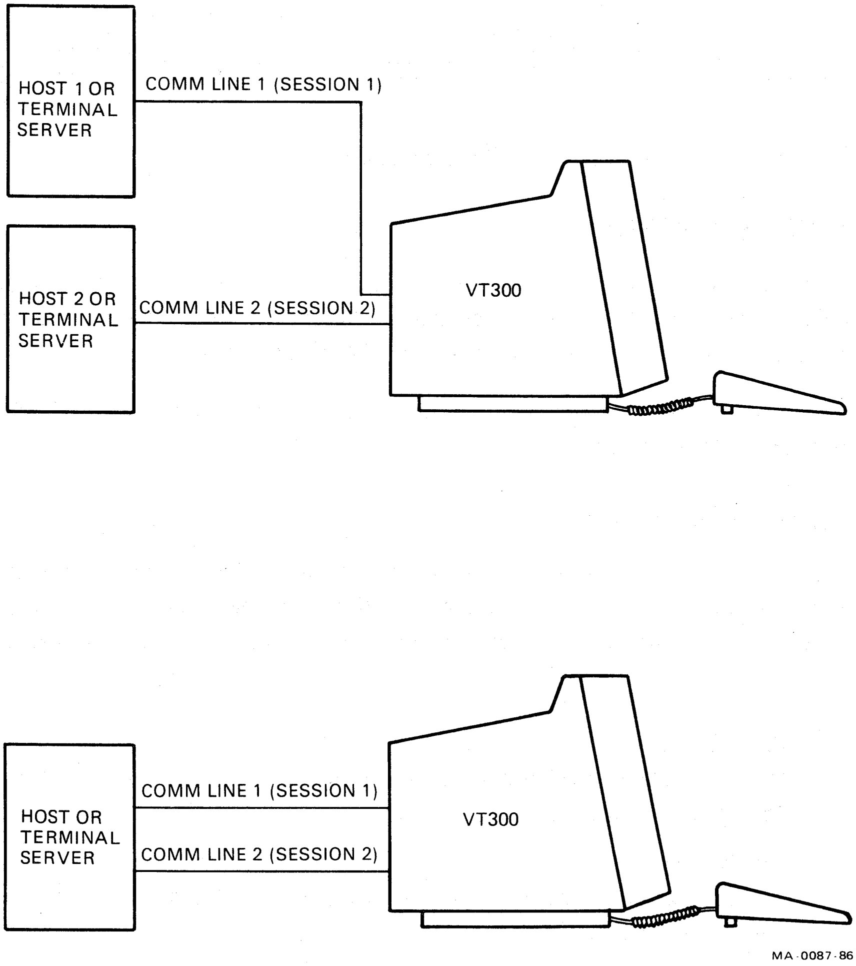
HOST 1 OR TERMINAL SERVER
COMM LINE 1 (SESSION 1)
HOST 2 OR TERMINAL SERVER
COMM LINE 2 (SESSION 2)
VT300
HOST OR TERMINAL SERVER
COMM LINE 1 (SESSION 1)
COMM LINE 2 (SESSION 2)
VT300
MA-0087-86

Figure 14-1 Typical MSC Environments

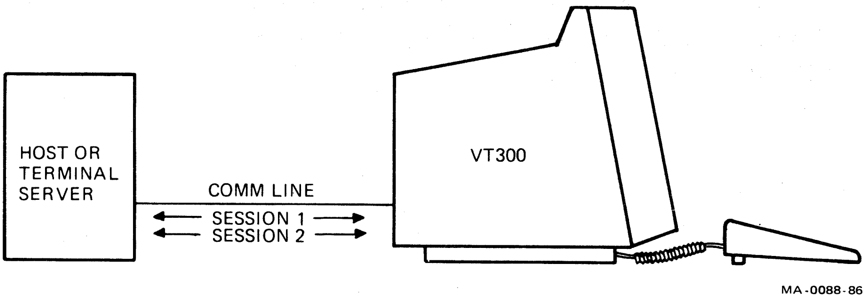

Figure 14-2 Typical SSU Environment

SESSION RESOURCES

When you run dual sessions on the terminal, you interact with one session at a time. This active session has primary access to the terminal's features and resources. The inactive session must wait to use some resources.

This section describes which resources each session can use independently and which resources they must share.

Independent Resources

The terminal maintains two sets of some features, so each session can use those features independently. For example, the terminal has two sets of page memory, one for each session. The terminal has two sets of the following features.

- **Page memory**
  When you run dual sessions, each session has 72 lines by 80 or 132 columns of page memory.
- **ANSI text state**
  Each session maintains a record of current character sets, text attributes, and pages.
- **Status lines**
  Each session has a status line.

- **Set-Up**
  Each session has its own set-up feature settings.

- **Down-line-loadable character set**
  You can design and load a soft character set for each session.

- **User-defined keys (UDKs)**
  Each session can have a set of UDK definitions. However, the terminal can only store one set of definitions at a time. You can save the UDK definitions for the current session by using the UDK Set-Up screen. If you do not save the definitions, they are lost when you turn off the terminal.

- **Communication lines**
  In an MSC environment, each session has a communication line.

- **Graphics page memory**
  Each session has a single page (800 × 480 pixels) for drawing images.

- **ReGIS state**
  Each session maintains a record of the current ReGIS graphics state.

- **Tektronix 4010/4014 state**
  Each session maintains a record of the current 4010/4014 state.

- **Color map (VT340)**
  Each session has its own virtual color map. However, the terminal can only use the active session's color map.

  NOTE: If you change the active session's color map. the appearance of the inactive session's color is unpredictable.

Shared Resources

Only one session can use the following features at a time. If session 1 is using the resource, session 2 must wait until session 1 is finished.

- **Screen**
  You can divide the screen to display data from two sessions at the same time. However, both sessions must compete for time to update the screen. See Chapter 8 of *Installing and Using the VT330/VT340 Video Terminal* for details on dividing the screen into two windows.

- **Keyboard**
  Only the active session can use the keyboard.

- **Printer port**
  Only one session at a time can use the printer port. If session 1 is using the printer, session 2 must wait until session 1 is finished.

  You can assign the printer to a particular session by using set-up, or by using a print control function (Chapter 11). When you assign the printer port to a session, you restrict the use of the printer to that session.

- **Locator device port**
  Only the active session can use the locator device (mouse or graphics tablet) to enter data.

MULTIPLE SYSTEM COMMUNICATIONS (MSC)

Multiple system communications lets you run two sessions without software support from the host. MSC uses both communication ports on the rear of the terminal, one port for each session. Each session has a dedicated physical link to the host.

You can select MSC by using set-up. See Chapter 3 of *Installing and Using The VT330/T340 Video Terminal.* You *cannot* use MSC and SSU software at the same time.

Unlike SSU software, MSC does not use a system-level protocol to maintain two sessions. MSC uses two hardwire links to the host.

SESSION SUPPORT UTILITY

SSU software lets the terminal run two sessions over a single communication line. That is, each session shares the same communication line. SSU is a set of system-level commands that the terminal and host use to maintain sessions.

NOTE: Make sure your system supports SSU software before you use this protocol. Your host system must be able to interpret and send SSU commands.

SSU Environment

The VT300 and the host system exchange different types of data at different levels, called *layers.* When you use SSU software, there are three basic layers of data exchange between the terminal and host. These layers have an order of priority, as follows.

ANSI/ReGIS/Tektronix/VT52 layer
SSU layer
XON/XOFF flow control

ANSI/ReGIS/Tektronix/VT52 Layer - This layer includes all alphanumeric characters as well as text and graphics functions the terminal uses. The alphanumeric characters include all characters in the character sets that the terminal supports. Text functions include such tasks as selecting page format, character sets, and character attributes (for example, bold, underline, and protected attributes). Graphics functions include the drawing and coloring of images.

SSU Layer - At this layer, the terminal and host exchange SSU commands to maintain the session environment. This layer connects the terminal to the host, and controls how the terminal and host switch from session to session. SSU software can also control the flow of data between the terminal and host at the session level. However, SSU data flow control is secondary to the XON/XOFF data flow control.

XON/XOFF Data Flow Control - This layer controls the flow of data between the terminal and the host. When the terminal's receive buffer is full, this layer tells the host to stop sending data to the terminal. When the terminal's receive buffer can accept more data, this layer tells the host resume sending data to the terminal.

This layer affects both sessions, because it controls the link between the terminal proper and the host. Appendix B describes XON/XOFF flow control in detail.

Using SSU Software

See Chapter 8 of *Installing and Using The VT330/VT340 Video Terminal* for details on using SSU session management.

SELECTING SESSIONS (MSC OR SSU SOFTWARE)

You can select the active session by using the **Switch Session** key or the enable session control function.

If session 1 is the active session and you press **Switch Session**, session 2 becomes the active session. Session 1 becomes the inactive session. If your host system also requires you to log in, you can log in to the second session.

The enable session command works like the Switch Session key. If session 1 is the active session and the terminal receives the enable session command, session 2 becomes the active session. Session 1 becomes the inactive session.

Enable Session Command

This command works with MCS or SSU sessions.

CSI	&	x
9/11	2/6	7/8

The session receiving the enable session command becomes the active session. The other session becomes the inactive session.

VT52 MODE CONTROL CODES A

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The VT52 mode lets the VT300 terminal operate like a VT52 terminal. You use VT52 mode with applications designed for the VT52.

NOTE: VT52 mode may not be included in future Digital terminals. Programmers should only write new software for the ANSI operating mode. Software should avoid switching indiscriminately between ANSI and VT52 modes. In VT52 mode, the terminal ignores many features and settings used in the ANSI environment. To avoid confusion, write all new software for the ANSI operating mode.

Entering VT52 Mode

You use the DECANM control function to change the terminal to the VT52 mode of operation. In VT52 mode, the VT300 acts like a VT52 terminal. This mode lets you use applications designed for a VT52 terminal.

CSI	?	2	l
9/11	3/15	3/2	6/12

Table A-1 lists and describes all the escape sequences you can use when the terminal is in VT52 mode.

Notes on DECANM

- ANSI private control functions are not available.
- The DEC Supplemental Graphic, ISO Latin-1 supplemental, and NRC sets are not available.

- C1 control characters are not available.
- The ASCII character set defaults to G0.

Exiting VT52 Mode

You can exit VT52 mode by using the following escape sequence.

ESC <
1/11 3/12

When you you exit VT52 mode, the terminal returns to the mode it was in before entering VT52 mode.

Table A-1 VT52 Escape Sequences

Sequence	Action
ESC A	Cursor up.
ESC B	Cursor down.
ESC C	Cursor right.
ESC D	Cursor left.
ESC F	Enter graphics mode.
ESC G	Exit graphics mode.
ESC H	Cursor to home position.
ESC I	Reverse line feed.
ESC J	Erase from cursor to end of screen.
ESC K	Erase from cursor to end of line.
ESC Y Pn	Move cursor to column Pn.
ESC Z	Identify. (host to terminal)
ESC / Z	Report. (terminal to host)
ESC =	Enter alternate keypad mode.
ESC >	Exit alternate keypad mode.
ESC <	Exit VT52 mode. (Enter VT100 mode.)
ESC ^	Enter autoprint mode.
ESC _	Exit autoprint mode.
ESC W	Enter printer controller mode.
ESC X	Exit printer controller mode.
ESC]	Print screen.
ESC V	Print the line with the cursor.

COMMUNICATION B

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This appendix describes how the VT300 communicates with a host computer, modem, or printer. The appendix lists the cables and modems you can use for different system configurations. The VT300 uses full-duplex, asychronous lines only. This appendix is important for users with special communication requirements, particularly those having non-Digital systems.

CHARACTER FORMAT

The VT300 can send and receive characters in a 7-bit or 8-bit format. The asynchronous character format consists of a start bit (space), the data bits (1 = mark, 0 = space), the parity bit (if present) and 1 or 2 stop bits (mark). The data bits represent a character, with the least significant bits leading.

You can set the parity bit to none, odd, even, space, or mark, using the **Character Format** feature in the Communications Set-Up screen.

For more information on the asynchronous character format, see ANSI X3.15-1976, "American National Standard for bit sequencing of the American National Standard Code for Information Interchange in Serial-By-Bit Data Transmission".

MAKING CONNECTIONS

You can order EIA cables from Digital in a variety of lengths, for flexible system configuration and expansion. Digital cables provide a minimum shielding effectiveness of 30db in the 30 through 200 MHz range. You can use these EIA cables for traditional null modem, modem, and 25-conductor EIA applications. You can also use EIA cables

- with Digital's DHU11, DHV11, DMZ32, DMF32, and DZS11 interface devices.

- with terminals and modems.
- as part of the FCC upgrading process for traditional products, such as Digital's DZ11 and DMR11 modules.

Modem Cables

The BC22E modem cable uses 16 conductors. The cable has a 25-pin plug on one end and a 25-pin socket on the other. You can use the BC22E cable as

- a connection between the 25-pin RS232 port on the VT300 and any of Digital's modems (such as the DF03 and DF224).
- a serial line extension cord.
- a direct connection between the VT300 and many of Digital's communication options.

The BC22E cable is available in the following lengths.

BC22E-10/AB	10 feet	BC-22E-100/AB	100 feet
BC-22E-25/AB	25 feet	BC-22E-200/AB	200 feet
BC-22E-50/AB	50 feet	BC-22E-250/AB	250 feet

When style is an issue, you can use the BCC14 cable.

BCC14-10/AB	10 feet
BCC14-25/AB	25 feet
BCC14-50/AB	50 feet

Null Modem Cables

The BC22D null modem cable has 16 conductors, and a 25-pin socket on both ends. This cable is available in the following lengths.

BC22D-10/AB	10 feet	BC22D-100/AB	100 feet
BC22D-25/AB	25 feet	BC22D-200/AB	200 feet
BC22D-50/AB	50 feet	BC22D-250/AB	250 feet

DECconnect Cabling for 6-Pin DEC-423 Connectors

The VT300 has 6-pin DEC-423 connectors to take advantage of DECconnect terminal cabling. Based on the RS423 standard, DEC-423 cabling lets you run your terminal at higher speeds and over longer distances than the RS232 standards. Where RS232 signaling limits cable runs to 50 feet, DEC-423 lets you use cable runs of up to 1000 feet from the terminal to the host system.

DEC-423 provides enhanced electrical overstress (EOS) and electrostatic discharge (ESD) protection that reduces computer equipment damage from static discharge, lightning, or ac power impulse.

Adapters and converters are available that let you use DEC-423 and the new DECconnect office cabling with older terminals, personal computers, and printers.

The DECconnect office cable is a 6-conductor flat cable used to connect the VT300 to the DECconnect wallplate. Each end of the office cable has Digital's proprietary MMP (modified modular plug). The plug is similar to the modular plugs used in telephone equipment, but is modified to prevent accidental connection of the DEC-423 cable into the phone jack.

The following DECconnect cables, adapters and converters are available.

BC16E-10/DA	10 foot DECconnect office cable
BC16E-25/DA	25 foot DECconnect office cable
BC16E-50/DA	50 foot DECconnect office cable
H8572	Extender with MMJ on both ends
H8571-A	MMJ to DB-25S adapter
H8571-B	MMJ to DB-9S adapter
H3105	Active converter — RS232 to DEC-423

To extend your DECconnect connection, you can use the following configuration.

[TERMINAL]<—-BC16E—->[H8572]<—-BC16E—->[HOST SYSTEM]

Connecting the VT300 to Other Digital Products

Table B-1 lists the cables to use when connecting the VT300 to a terminal server, modem, or statistical multiplexer. Table B-2 lists the cables and adapters to use when connecting the VT300 to a printer.

Locator Devices

The VT300 has a 7-pin locator device connector on the rear of the terminal. The connector supports a locator device (mouse or graphics tablet). The VT300 supports the following Digital locator devices.

VSXXX-AA mouse

VSXXX-AB graphics tablet

Table B-1 Cables to Terminal Servers, Modems, and Statistical Multiplexers

To Connect the VT300 to...	Use This Cable...
Terminal Servers DECSA (LAT-11) DSRVA-AA/DA (DECserver 100)	BC22D
Statistical Multiplexers DFM04-AA/AB DFM08-AA/AB DFM12-AA/AB DFM16-AA/AB	BC22E, BCC04, or BCC14
VAX Systems DMF32 DMZ32-M/AB DZ32	BC22D
PDP-11 Unibus Systems DHU11 DZ11 DL11	BC22D
PDP-11 Q-bus Systems DHV11 DZQ11 DLVE1 DLVJ1 DZV11	BC22D
Modems DF112-AA DF124-AA DF224-AA	BC22E

Table B-2 Cables to Digital Printers

Printer	Cable/Adapter	Description
LA12 LA50 LA210	BC16E-10/DA H8571-A	10 foot DECconnect office cable MMJ to DB-25S adapter
LA75	BC16E-10/DA	10 foot DECconnect office cable
LN03 series	BC16E-10/DA H8571-A	10 foot DECconnect office cable MMJ to DB-25S adapter
LQP series	BC16E-10/DA H8571-A	10 foot DECconnect office cable MMJ to DB-25S adapter

COMMUNICATING WITH NON-DIGITAL SYSTEMS

This section describes how to use the VT300 with non-Digital environments.

The most conservative approach to communicating with a non-Digital system is to use the 25-pin RS232 serial port with a suitable cable and recall the factory-default settings from set-up. Then set the following features in set-up.

Set-Up Screen	Feature	Setting
Global Set-Up	On-Line/Local	on-line
General Set-Up	Terminal Mode	VT100
	Device Attributes Response	VT100
Display Set-Up	Scrolling	jump
Communications Set-Up	Transmit Speed	(Match your host.)
	Receive Speed	receive=transmit
	Receive XOFF Point	(Match your host.)
	Transmit Flow Control	disabled
	Character Format	(Match your host.)
	Stop Bits	(Match your host.)
	Disconnect Delay	no disconnect
	Local Echo	disabled
Keyboard Set-Up	Compose	disabled

You select the **Character Format** in the Communications Set-Up screen. Digital recommends that you try the 7-bit settings first, starting with "7 bits, mark parity". For speeds above 110 bits per second, select 1 stop bit. For a speed of 110 or lower, select 2 stop bits.

Direct-Wired Connections

Follow these basic rules to make a direct-wired connection to a non-Digital host.

1. Match the terminal's baud rate to that of your host. If you are unsure, try 9600 baud first and work down.
2. Match the terminal's character format to that of your host. If you are unsure, try "7-bits, mark parity".

Connecting Through A Modem

Follow these basic rules to connect to a non-Digital host via a modem.

1. Match the terminal's baud rate with that of your modem. If you are unsure, try 300 baud first and work up.

2. Match the terminal's character format with that of your modem.
3. Set the **Transmit Flow Control** feature in the Communications Set-Up screen to "disabled".
4. Set the **Receive XOFF Point** feature in the Communications Set-Up screen to "never".

Steps 3 and 4 ensure that the VT300 receives some characters without halting after receiving an XOFF from the host. Character processing in the VT300 occurs at about 9400 bits per second. To prevent data loss, set the terminal's transmit and receive rates lower than 9400 bits per second to prevent data loss. With this configuration, you cannot use the **Hold Session** or **Local Print** functions.

Communicating with IBM Systems

Some IBM systems do not echo characters back to the terminal screen. These systems generally operate in half-duplex environments. If the characters that you type do not appear on the screen, check to make sure the host is operating correctly. If it is, set the **Local Echo** feature in the Global Set-Up screen to "enabled".

The VT300 communicates asynchronously and generally conforms to ANSI X3.64 environments only. It does not support IBM traits such as 3270 emulation, SNA, Bisync, SDLC, or HDLC.

VT300 COMMUNICATION PORTS

The VT300 has two communication ports, Comm1 and Comm2. The Comm1 port has two connectors, a 25-pin RS232 connector and a 6-pin DEC-423 connector. The Comm2 port has one 6-pin DEC-423 connector. Only one port is active at a time. You use the Global Set-Up screen to select which port is active.

25-Pin RS232 Connector

This DB25 serial port accepts a variety of modems meeting national and international standards. Table B-3 lists the signals for the 25-pin RS232 connector. The voltages acceptable at this port comply with EIA standard RS423, "Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits".

Table B-3 EIA Interface Signals for the 25-Pin RS232 Connector

Pin	Source	Name	Function	Circuit CCITT/EIA/DIN
1	Not used			
2	VT300	TXD	Transmitted data	103/BA/D1
3	Modem	RXD	Received data	104/BB/D2
4	VT300	RTS	Request to send	105/CA/S2
5	Mode	CTS	Clear to send	106/CB/M2
6	Modem	DSR	Data set ready	107/CC/M1
7	—	SGND	Signal ground	102/AB/E2
8	Modem	RLSD	Receive line signal detector	109/CF/M5
9 to 11	Not used			
12	Modem	SPDI	Speed mode indicator	112/CI
13 to 19	Not used			
20	VT300	DTR	Data terminal ready	108.2/CD/S1.2
21 to 22	Not used			
23	VT300	SPDS	Speed select	111/CH/S4
24 to 25	Not used			

25-Pin Signal Descriptions

Transmitted Data — TXD (Pin 2 BA/103/D1)
Data on this circuit represents the serially encoded characters that the VT300 transmits. This circuit is at mark state (-) during stop bits between characters, and when data is not being transmitted. This signal is also supported on the 6-pin DEC-423 connectors.

Received Data — RXD (Pin 3 BB/104/D2)
Data on this circuit represents the serially encoded characters the VT300 receives. This signal is supported on the 25-pin RS232 and 6-pin DEC-423 connectors.

In modem control mode 1 (Communications Set-Up), the terminal ignores received characters if RLSD is unasserted. This is an implementation of mark carrier clamping.

In modem control mode 2, the terminal receives characters even if RLSD is unasserted. This implementation permits use of V.25 bis compatible autodial modems in modem control mode 2. You do not have to set modem control mode to "disabled" to access the autodial functions.

When mode control mode is disabled (data leads only), the terminal processes received data regardless of the state of the control lines.

Request To Send — RTS (Pin 4 CA/105/S2)
Asserting RTS may put the modem in the transmit mode. In transmit mode, the modem asserts CTS. When the terminal is in local mode, RTS is deasserted. This signal is not supported on the 6-pin DEC-423 connectors.

NOTE: On full-duplex modems without RTS inputs, CTS is asserted by the modem whenever it is ready for transmission.

Clear To Send — CTS (Pin 5 CB/106/M2)
The modem asserts CTS when it is ready to receive data. This signal is not supported on the 6-pin DEC-423 connectors.

The data can be in one of two forms: a command to the modem if off-line (DSR deasserted), or transmitted data to the host if on-line (DSR asserted).

Data Terminal Ready — DTR (Pin 20 CD/108.2/S1.2)
The VT300 asserts DTR whenever it is ready to send or receive on the active port. Asserting DTR allows a modem to connect and maintain the connection. Deasserting DTR prevents the modem from completing a started call, and causes an already established call to disconnect. A deassertion of 50ms causes a disconnect to occur. This signal is also supported on the 6-pin DEC-423 connectors.

With auto-answer modems, the terminal must assert DTR before the modem can answer a call. If DTR is deasserted, the modem does not answer the call. If a connection exists, DTR remains asserted whether the terminal is on-line, local, or making the transition. Switching between on-line and local modes does not cause a disconnect.

The VT300 drops DTR when one of the following functions is performed.

Recall Saved Settings (Set-Up Directory)
Recall Factory Default Settings (Set-Up Directory)
Shift-Break
Power-up self-test
Hard terminal reset (RIS)

Data Set Ready — DSR (Pin 6 CC/107/M1)
Asserting DSR indicates

- the modem is in data mode and connected to the communications channel;
- the answer tone is finished, and you are being charged by the PTT;
- the modem is ready to exchange control signals in order to begin data transmission and reception.

This signal is also supported the 6-pin DEC-423 connectors.

If DSR becomes unasserted before DTR during a call, the terminal disconnects the call. The terminal considers any new assertion of DSR a new call. If (1) the VT300 is connected to a modem that is off, or (2) DSR becomes an open circuit, then the terminal interprets the condition as a deassertion. You can check the state of the DSR input on the indicator status line.

If DSR is deasserted 220 ms after DTR is deasserted, the VT300 does nothing because the modem has already disconnected.

If DSR is still asserted 220 ms after DTR is deasserted, DTR from the VT300 remains deasserted for at least 2 seconds to assure that the modem is disconnected.

When DSR is unasserted and modem control mode 2 is selected, an off-line state exists. (See "Modem Control Mode 2" in this appendix.) In this state, you can interact with an intelligent modem for such actions as entering phone numbers and changing modem set-up.

When DSR is asserted in modem control mode 2, the modem, terminal, and host system are ready for communication to a remote host.

Receive Line Signal Detector — RLSD (Pin 8 CF/109/M5)
This signal is also called carrier detect. The modem asserts RLSD when the received signal is of sufficient amplitude. This signal is not supported on the 6-pin DEC-423 connectors.

The unasserted condition of RLSD indicates (1) there is no received signal, or (2) the signal is unsuitable for demodulation.

Speed Indicator — SPDI (Pin 12 CI/112/M4)
This signal comes from the modem. SPDI lets modems control the terminal's transmit and receive rates. This signal is not supported on the 6-pin RS423 connector.

If modem control mode 1 or 2 is enabled (Communications Set-Up)
If SPDI is unasserted, the terminal's transmit and receive speeds are set to the current **Modem Low Speed** setting in Communications Set-Up.

If SPDI is asserted, the transmit and receive speeds are set to the current **Modem High Speed** setting in Communications Set-Up.

Table B-4 shows common settings for a wide variety of modems.

Table B-4 Common Speed Settings for Modems

	SPDI Asserted	**SPDI Unasserted**
AT&T 212	1200	300
AT&T 103	300	n/a or 110
V.22	1200	600
V.22 bis	2400	1200
V.26 ter	2400	1200
V.32	4800	2400
V.32	9600	4800

Speed Select — SPDS (Pin 23 CH/111/S4)
SPDS comes from the terminal. If the VT300's baud rate is greater than or equal to 1200, the speed select rate is high. If the baud rate is less than 1200, the speed select rate is low.

When this signal is enabled at the modem, the terminal can select modem speed by controlling EIA pin 23.

NOTE: The DF224 modem is factory-set to ignore this pin and make the terminal receive speed information from the speed indicator signal (SPDI 12/CI/112/M4).

DECconnect (DEC-423) 6-Pin Connectors

The 6-pin connectors for Comm1 and Comm2 provide limited modem support. The DTR output and DSR input are supported on this connector. Transmit ground for transmit data and DTR is isolated from receive ground used for receive data and DSR.

Using Modems on DEC-423 Connectors
The DEC-423 connector does not support the following signals: RTS, CTS, RLSD, SPDI, and SPDS. Because these signals are not supported, you cannot use the modem control modes (Communications Set-Up). When running a modem on the 6-pin connector, set modem control mode to "disabled".

DEC-423 Signals

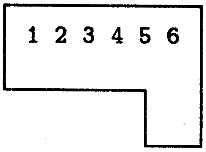
Pin	Signal Name	Mnemonic
1	Data terminal ready*	DTR (ready out)
2	Transmitted data*	TXD (TX +)
3	Transmitted data return	(TX -)
4	Received data return	(RX -)
5	Received data*	RXD (RX +)
6	Data set ready*	DSR (ready in)

---

* See the signal description for the 25-pin RS232 connector.

Pin 6 is on the right end of the connector, above the locking tab.

6-Pin Connector (tab facing down)



Comm 1 Port

The host 1 port has a 25-pin RS232 connector and a 6-pin DEC-423 connector. You can connect a communication line to each connector. Then you can use the Comm1 Port feature in Global Set-Up to switch between full modem control support ("RS232" setting) and DECconnect ("DEC-423" setting).

This port supports communication speeds of 75, 110, 150, 300, 600, 1200, 2400, 4800, 9600 (the default), and 19,200 bits per second. You can use different transmit and receive speeds.

If you switch from RS232 (25-pin port) to DEC-423 (DECconnect), the VT300 disconnects the RS232 port. If you switch from DEC-423 to RS232, the VT300 disconnects the DEC-423 connector (deasserting DTR).

Comm 2 Port and Printer Port

These ports work the same as the Comm 1 DEC-423 connector. They support the same communication speeds (9600 default).

Comm 2 lets you transmit and receive at different speeds. The printer port does not. Use only the "Receive=Transmit" setting for the printer port.

MODEMS

The VT300 supports asynchronous, full-duplex modems. The VT300 does not support half-duplex modems or synchronous modems.

Low-Speed Modems (300 to 1200 Baud)

In low-speed communication, 1200 baud is now a more common speed than 300 baud. Digital's DF03 and DF112 modems support 1200 baud communication.

The standard protocols for 1200 baud communication are AT&T 212A in North America, and CCITT V.22 in Europe and Japan. The two protocols are not compatible at the modulation level. The Racal Vadic 3400 protocol is also in use and may be less susceptible to noisy line environments. Most data center modems that use the Racal Vadic protocol also support AT&T 212A. These three protocols are full duplex and work over ordinary phone lines.

The standard protocols for 0 to 300 baud communication are AT&T 103 in North America, and CCITT V.21 in Europe and Japan. These protocols are not compatible at the modulation level.

Medium-Speed Modems (2400 Baud)

The worldwide standard protocol for 2400 baud communication is CCITT V.22 bis. This protocol is full-duplex over dial-up phone lines. It adjusts to both the sending and receiving characteristics of the line conditions at the beginning of communication. The V.22 bis protocol requires much cleaner, noise-free telephone lines than 1200 baud protocols. Many long-distance circuits cannot support communication at 2400 baud using V.22 bis.

V.22 bis modems are supposed to use the 1200 baud V.21 protocol if the line is too noisy, but some units may not. If you want to connect at 1200 baud with a V.22 bis modem, you must determine whether it is set for AT&T 212A or V.22 bis.

High-Speed Modems (Over 2400 Baud)

The CCITT V.26 ter protocol also runs at 2400 baud. This protocol is technically different from V.22 bis and handles noisier phone lines. V.26 ter is also much more expensive, using echo canceling rather than frequency division multiplexing for full-duplex operation. V.26 ter modems are more compatible with the higher speed V.32 4800 and 9600 baud modems and could be a better investment in the long run.

Worldwide Modem Protocols

Table B-5 shows many modem protocols used throughout the world.

Table B-5 Worldwide Modem Protocols

Modem Protocol	Bits/ Second	True Rate	Duplex Full/ Half	Mod	Async/ Sync	Dial-up/ Leased	Area
AT&T							
103	300	300	F	FSK	A	D	North America
201	2400	1200	H	PSK	S	D/L	North America
202	1200	300	H	—	A	D	North America
208	4800	1600	H/F*	PSK	S	D/L	North America
209	9600	2400	H/F*	—	S	L	North America
212A	1200	600	F	PSK	A/S	D	North America
CCITT							
V.21	300	300	F	FSK	A	D	Europe, Japan
V.22	1200	600	F	QAM	A/S	D	Europe, Japan
V.22 bis	2400	600	F	QAM	A/S	D	world
V.23	1200	600	F	PSK	A/S	D	Europe, Japan
V.26 ter	2400	1200	F	—	A/S	D	world
V.29	9600	2400	H/F*	—	S	D/L	world
V.32	4800	2400	F	—	A/S	D	world

* 2/4 wire

COMMUNICATIONS SET-UP SCREEN

Chapter 5 of *Installing and Using the VT330/VT340 Video Terminal* describes the features you can set from the Communications Set-Up screen. The following sections provide more details about some of the features that affect data flow control, character format, and modems.

FLOW CONTROL

The VT300 can operate at transmission speeds of up to 19,200 baud. However, the terminal may not be able to keep up with the incoming data. The terminal stores incoming characters in its 1024 byte receive buffer, and processes them on a first-in/first-out basis.

When the buffer begins to fill, the terminal sends an XOFF (DC3) signal to the host. This signal tells the host to suspend its transmission to the terminal. When the host stops transmitting, the terminal processes most of the characters in of the receive buffer. When the buffer is nearly empty, the terminal sends an XON (DC1) signal to the host to resume transmission.

Receive XOFF Point

Values: 64 (default), 256, 512, never

64 (default), 256, 512
The VT300 sends XOFF to the host when its input buffer contains 64, 256, or 512 bytes. The terminal stores all received characters except NUL, XON, and XOFF in the input buffer before further processing. NUL is discarded.

There are three XOFF points and one XON point.

Never
The VT300 temporarily stores all characters except NUL in the input buffer before further processing. NUL is discarded when received. The host system must prevent overflow of the input buffer.

Operating systems that do not recognize XON/XOFF signals can send fill characters. The only valid fill character is NUL (hexadecimal, decimal, or octal).

Transmit Flow Control

Values: XON/XOFF (default), disabled

When you select XON/XOFF, the VT300 recognizes received XON and XOFF characters from the host. When the terminal receives XOFF, it stops sending any codes except XOFF and XON. The Wait indicator on the keyboard also turns on. The terminal resumes transmission when it receives XON.

If you select the disabled setting, pressing **Ctrl-S** sends XOFF and pressing **Ctrl-Q** sends an XON.

Transmit Rate Limiting

When you enable this feature, the VT300 limits the rate at which it sends data to the host to 150 to 180 characters per second, with even spacing. Some host systems can only keep up with the relatively slow input of keys typed manually from the keyboard. Rate limiting simulates this condition and reduces the interrupt burden on the host.

When disabled, the terminal sends all messages and keystrokes as fast as possible, limited only by the current **Transmit Speed** setting.

DECXRLM Control Function
Software can control the **Transmit Rate Limiting** feature through the DECXRLM control function. DECXRLM has two settings.

Set (limited)	**CSI**	?	7	3	h
	9/11	3/15	3/7	3/3	6/8
Reset (unlimited)	**CSI**	?	7	3	l
	9/11	3/15	3/7	3/3	6/12

CHARACTER FORMAT FEATURES

You can select the character format and number of stop bits in the Communications Set-Up screen.

Character Format

Values:

8 bits, no parity (default)
8 bits, even parity
8 bits, odd parity
8 bits, even, no check
8 bits, odd, no check

7 bits, no parity
7 bits, even parity
7 bits, odd parity
7 bits, mark parity
7 bits, space parity
7 bits, even, no check
7 bits, odd, no check

If you select a "no check" setting, the VT300 ignores the receive parity bit.

If you enable parity error detection, the terminal converts characters with received parity errors to the SUB character. This character appears on the screen as an error indication (backward question mark).

If you select 8 data bits, the eighth bit is 0 when you use 7-bit character sets. In this case, the terminal ignores the 0 bit when received.

Stop Bits

You can specify 1 or 2 stop bits with any of the available baud rates or data bit/parity combinations. This feature is required for asynchronous terminals connected to data networks as specified in CCITT recommendations X.20bis.

As a general rule, use 2 stop bits for baud rates below 300. Otherwise, use 1 stop bit.

MODEM FEATURES

Modem Control

Values: disabled (data leads only, default)
mode 1 (VT220)
mode 2

This feature selects how the VT300 uses modem control signals.

Disabled (Data Leads Only)
The terminal ignores all modem control signals, and communicates using the data leads only.

DTR is always asserted except when you initiate a disconnect sequence. RTS is always asserted. The terminal ignores DSR, CTS, RLSD and SPDI.

Modem Control Mode 1 (VT220)
Included for compatibility with the VT220, this mode requires the handshake exchanges of DTR/DSR, and CTS/RTS before any data transmission or reception begins.

Connection
The VT300 waits for the exchage of DTR/DSR and RTS/CTS.

If the **Auto-Answerback** feature is enabled, the terminal sends the answerback message after the assertion of DSR, CTS, and RLSD. CTS is the last line checked.

After making a connection, the VT300 performs the following operations to ensure that it is ready to send and receive.

1. Unlocks the keyboard, if it is locked.
2. Clears any transmit in progress on the active port.
3. Clears all buffers associated with the active port.
4. Clears the "XOFF sent" and "XOFF received" state of the active port.

After receiving the carrier tone, the modem asserts CD, and data transmission and reception can begin.

Disconnection

A disconnect sequence begins when any of the following events occur.

- You press **Shift-Break**.

  NOTE: You can disable the **Break** *key in the Keyboard Set-Up screen.*
- You select **Recall Saved Settings**, or **Recall Factory Default Settings** from the Set-Up Directory. This disconnects the active session's line.
- You turn off the terminal.
- The VT300 loses the DSR, CTS, or RLSD signal.
- After establishing a connection on the Comm1 25-pin line, the VT300 loses the RLSD for longer than 2 seconds (or 60 ms).

  In modem control mode 2, RLSD (CD) is ignored.
- The VT300 receives a hard terminal reset (RIS).

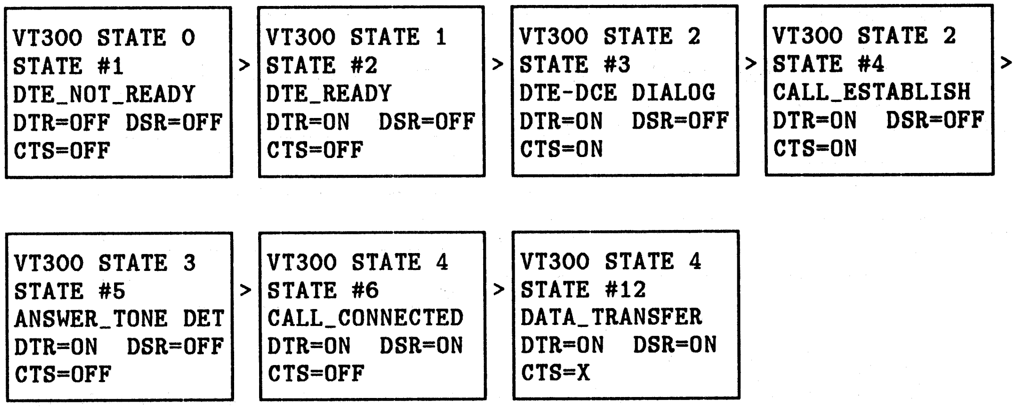
Modem Control Mode 2

In this mode, there are two operating states for the modem, "Off Line" and "On Line". The modem indicates which mode is current on the status line with the DSR indicator. If DSR is unasserted, then the modem is off-line. Otherwise, it is on-line.

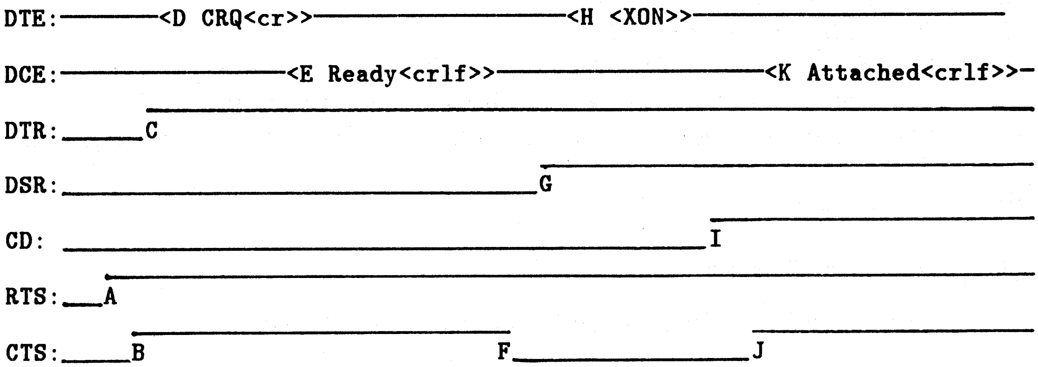
The VT300 only supports the hardware handshaking of the V.25 bis protocol. The VT300 hardware does not support the ring indicator (RI) signal. The terminal does not support those states in which a transition is based on the RI signal.

Also, the VT300 does not parse the commands shown in CCITT Table 3/V.25 bis. The modem must parse these commands.

VT300 V.25 Bis State Diagram

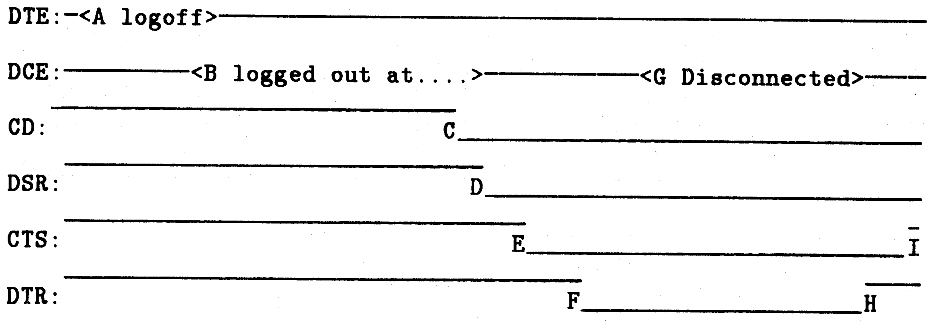

VT300 STATE 0
STATE #1
DTE_NOT_READY
DTR=OFF DSR=OFF
CTS=OFF
>
VT300 STATE 1
STATE #2
DTE_READY
DTR=ON DSR=OFF
CTS=OFF
>
VT300 STATE 2
STATE #3
DTE-DCE DIALOG
DTR=ON DSR=OFF
CTS=ON
>
VT300 STATE 2
STATE #4
CALL_ESTABLISH
DTR=ON DSR=OFF
CTS=ON
>
VT300 STATE 3
STATE #5
ANSWER_TONE DET
DTR=ON DSR=OFF
CTS=OFF
>
VT300 STATE 4
STATE #6
CALL_CONNECTED
DTR=ON DSR=ON
CTS=OFF
>
VT300 STATE 4
STATE #12
DATA_TRANSFER
DTR=ON DSR=ON
CTS=X

VT300 V.25 Bis Connection


DTE:
<D CRQ<cr>>
<H <XON>>
DCE:
<E Ready<crlf>>
<K Attached<crlf>>
DTR:
C
DSR:
G
CD:
I
RTS:
A
CTS:
B
F
J

(A) Power-up. The terminal asserts RTS when power is applied.
(B) The modem asserts CTS.
(C) Self-test has completed. The terminal asserts DTR.
(D) You type CRQ (Call Request) from keyboard, or press a previously loaded UDK.
(E) The modem receives and parses this character string.
(F) The modem deasserts CTS.
(G) The modem asserts DSR.
(H) The modem asserts CD.
(I) The modem asserts CTS.
(J) The terminal sends an XON.

VT300 V.25 Bis Disconnection



(A) You log off the system.
(B) The host sends (and VT300 displays) the log off message. After the log off message, the host starts a disconnect procedure.
(C) The modem deasserts carrier detect. (computer hangs up).
(D) The modem deasserts DSR.
(E) The modem deasserts CTS.
(F) As a result of the modem dropping DSR, the terminal drops DTR.
(G) The modem sends the message "Disconnected" to the terminal.
(H) The minimum DTR deassertion time has been met. The terminal asserts DTR.
(I) The modem asserts CTS.

Modem High Speed

Values: ignore (default), 300,600,1200,2400,4800,9600,19.2K

When you enable modem control, the VT300 can use the speed indicator signal (SI) from the modem to select the communication rate. The **Modem High Speed** feature sets the rate used when the speed indicator line is "on".

If you set this feature to "ignore", the terminal uses its regular transmit and receive speeds.

Modem Low Speed

Values: ignore (default), 300,600,1200,2400,4800,9600,19.2K

This feature is similar to the Modem High Speed feature, but sets the communication rate when the speed indicator line is "off". If you set Modem Low Speed to "ignore", the terminaluses its regular transmit and receive speed.

Modems that use a baud rate slower than 300 cannot use this feature (automatic speed selection).

Disconnect Delay

Values: 2 seconds (default), 60 ms, no disconnect

When you enable modem control, the **Disconnect Delay** feature determines the time the VT300 takes to disconnect communication after losing the received line signal detect (RLSD).

All countries except the United Kingdom should use the "2 seconds" setting. The 60 ms delay is for use in the United Kingdom.

If you select "no disconnect" and the VT300 detects a loss of carrier, the terminal ignores RLSD (CD) after the beginning of the connection.

If you try to disconnect and reconnect the line, the VT300 checks if RLSD is asserted before granting the connection. After it is connected, the terminal ignores the loss of carrier. In this case, the disconnect should be done when the DSR signal goes off.

BREAK

A break condition is the occurrence of a continuous space on a communication line for greater than one character time. A break consists of a 275 ± 25 ms space condition on the transmit data line during transmission. In local mode, the VT300 does not send the break character. The break (space) condition is separated from any later mark-to-space transition by at least 100 ms.

Break Key

The **Break** key has four functions. You can enable or disable the **Break** key in the Keyboard Set-Up screen.

- Pressing **Break** sends a break function to the host.
- Pressing **Shift-Break** causes a disconnect to occur.
- Pressing **Ctrl-Break** sends the answerback message to the host.
- When running dual sessions, the VT300 ignores any breaks it receives. However, one or more error characters (backward question marks) may appear on the screen.

STANDARDS AND CERTIFICATION

Standards

CCITT Recommendation V.25-bis (reference document CCITT AP VIII-43-E) with limitation to hardware handshaking.

EIA STANDARD EIA-232-D Interface Between Data Terminal Equipment and Data Communications Equipment Employing Serial Binary Data Interchange.

V.24 List of Definitions for Interchange Circuits between Data Terminal Equipment and Data Circuit-Terminating Equipment 1984.

V.28 Electrical Characteristics for Unbalanced Double-Current Interchange Circuits 1984.

The VT300 can connect to all modems conforming to the following standards: AT&T 103, 113, and 212A modems or plug compatibles including Digital's DF02, DF03, DF112, DF124, DF224 and DF242 modems.

Certification

United Kingdom (U.K.) attended operation only

GPO, German ZZF V.21, V.22, V.22 bis, V.23, X.20 bis modems and data service units.

COMPATIBILITY WITH OTHER DIGITAL TERMINALS C

This appendix:

- compares the features of the VT300 terminals with other Digital terminals.
- explains the differences between the local editing features of the VT300 and the VT131 terminals.
- explains the differences in some display features of the VT300 and VT240 terminals.

Feature	VT330	VT340	VT220	VT240	VT241	New Software Required
Character Attributes						
Blink	Y	Y	Y	Y	Y	N
Bold	Y	Y	Y	Y	Y	N
Double high	Y	Y	Y	Y	Y	N
Double wide	Y	Y	Y	Y	Y	N
Invisible	Y	Y	N	N	N	Y
Protection	Y	Y	N	N	N	Y
Reverse	Y	Y	Y	Y	Y	N
Transmission	Y	Y	N	N	N	Y
Underline	Y	Y	Y	Y	Y	N

Feature	VT330	VT340	VT220	VT240	VT241	New Software Required
Character Sets						
DEC Multinational	Y	Y	Y	Y	Y	N
DEC Special Graphic	Y	Y	Y	Y	Y	N
Down-line-loadable	Y	Y	Y	Y	Y	N
ISO Latin-1	Y	Y	N	N	N	Y
National replacement sets	Y	Y	Y	Y	Y	N
Color						
Color palette	N/A	4096	N/A	N/A	64	Y
Colors in display	N/A	16	N/A	N/A	4	Y
Shades of gray	4	16	N/A	N/A	4	N
Communication						
Baud rate up to 19.2K	Y	Y	Y	Y	Y	N
Composite video output	N	N	Y	Y	Y	N
Optional integral modem	N	N	Y	Y	Y	N
Printer port						
Bidirectional	Y	Y	N	Y	Y	N
Serial ports						
MMJ	2	2	0	0	0	N
RS232	Y	Y	Y	Y	Y	N
20 milliamp	N	N	Y	Y	Y	N
Compatibility						
VT52	Y	Y	Y	Y	Y	N
VT100	Y	Y	Y	Y	Y	N
VT125	Y	Y	N	N	N	N
VT131	Y	Y	N	N	N	N
VT220	Y	Y	Y	Y	Y	N
VT240	Y	Y	N	Y	Y	N
VT241	N	Y	N	N	Y	N

Feature	VT330	VT340	VT220	VT240	VT241	New Software Required
Components						
Number	2	2	2	3	3	N
Fan	N	N	N	Y	Y	N
Firmware cartridge	Y	Y	N	N	N	N
Display Features						
Character cell						
80 columns	10x20	10x20	10x10	10x10	10x10	N
132 columns	6x20	6x20	6x10	6x10	6x10	N
Display size (inches)	14	13	12	12	13	N
Display type (flat or convex)	F	C	C	C	C	N
Nonglare screen	Etch	Etch	Coat.	Coat.	Coat.	N
Pixel aspect ratio	Square	Square	Rect.	Rect.	Rect.	N
Rear panel cable cover	Y	Y	N	N	N	N
Resolution						
Vertical	500	500	240	240	240	N
Horizontal	800	800	800	800	800	N
Tilt-swivel base	Y	Y	N	N	N	N
Dual Sessions						
2 cables	Y	Y	N	N	N	N
1 cable (SSU)	Y	Y	N	N	N	Y
Graphics						
Cursors						
Rubber band box	Y	Y	N/A	N	N	Y
Rubber band line	Y	Y	N/A	N	N	Y
Cross hair	Y	Y	N/A	Y	Y	N
Performance						
ReGIS	Fast	Fast	N/A	Slow	Slow	N
Sixels	Fast	Fast	N/A	Slow	Slow	N
Tektronix 4010/4014	Fast	Fast	N/A	Slow	Slow	N

Feature	VT330	VT340	VT220	VT240	VT241	New Software Required
Local Editing						
ANSI X3.64 block mode	Y	Y	N	N	N	N
VT131 block mode	Y	Y	N	N	N	N
Off-Screen Memory						Y
132-column lines	144	144	0	0	0	
Characters	19008	19008	0	0	0	
Characters per session	9504	9504	N/A	N/A	N/A	
Multiple page formats	Y	Y	N/A	N/A	N/A	
25th Status Line						
Host	Y	Y	N	N	N	Y
Local	Y	Y	N	N	N	N
Set-Up Features						
Color map editor	Y	Y	N	N	N	N
Full screen set-up mode	Y	Y	N	N	N	N
User-defined key editor	Y	Y	N	N	N	N
Other Features						
Host processing through printer support	Y	Y	Y	Y	Y	N
Mouse/tablet support local processing	Y	Y	N	N	N	Y
Terminal state inquiry	Y	Y	N	N	N	Y

LOCAL EDITING ON THE VT300 AND VT131

This section describes the differences in the local editing features on the VT300 and VT131 terminals. For more information, see Chapter 9 of this manual. Also, see Chapter 9 of *Installing and Using the VT330/VT340 Video Terminal.*

- Before a block transmission, the VT300 sends select character set (SCS) commands to the host device. This operation selects the correct character set(s) on the receiving device.
- The VT131 does not support selected area transfer mode (SATM) or multiple area transfer mode (MATM).
- The VT131 ignores the SSA/ESA and SPA/EPA characters.
- The layout and number of local editing keys on the VT300 keyboard is different from the VT131.
- The VT131 does not support the invisible character attribute. Therefore, the VT131 ignores any DECPRO sequences that use the invisible attribute.
- The VT300 lets you use more end-of-line and end-of-block characters and character strings.
- On the VT300, you can only change the character attribute protection by using the DECPRO control function from the host. On the VT131, you can change the character attribute protection in set-up.

The following table compares the VT300 and VT131 set-up features for local editing. Use this table as a guide to set up a VT300 terminal for a VT131 application.

NOTE: To use any of the local editing features in the VT300 video terminals, you must change the **Edit Mode** *feature of the Local Editing Set-Up screen to a setting other than "unavailable", which is the default. You should save the changed value in nonvolative memory by using the* **Save Current Settings** *field from the Set-Up Directory.*

VT131 Set-Up C				VT300 Local Editing Set-Up	
Switch	Feature	Value		Feature	Setting
A-1	Edit Mode	no equivalent		Edit Mode	unavailable*
		0	Off*		interactive
		1	On		edit
A-2	Edit Key	0	Deferred	Edit Key	deferred
		1	Immediate*	Execution Mode	immediate*
A-3	Guarded Area	0	Unprotected	Guarded Area	unprotected
	Transfer	1	All*	Transfer Mode	all*
A-4	Space	0	Off*	Space	disabled*
	Compression	1	On	Compression Mode	enabled
B-1	Line Transmit	0	Off*	Line Transmit Mode	disabled*
		1	On		enabled
B-2	Transmit Termination	0	PP	Transfer Transmit Mode	disabled
				VT131 Transfer Mode	VT131†
		1	FP*	Transfer Termination Mode	enabled*
B-3	No effect.				
B-4	Transmit	0	Deferred	Transmit	disabled
	Execution	1	Immediate*	Execution Mode	enabled*

* Default setting for the indicated device.

† The VT300 local editing feature supports two types of partial page. Use the **VT131 Transfer Mode** feature to select which type of partial page to use.

VT131 Set-Up C				VT300 Local Editing Set-Up	
Switch	**Feature**	**Value**		**Feature**	**Setting**
C-1	Bold Protected			No corresponding set-up features. On the VT300, you can only select character attribute protection from the host.	
C-2	Underline Protected				
C-3	Blink Protected				
C-4	Reverse Protected				
D-1	Normal Protected				
D-2	Erasure Mode	0	Unprotected*	Erasure Mode	unprotected
		1	All		all*
D-3	End of Line Character Enable	0	Off†	End of Line Characters	(no characters)
		1	On		(any character)†
D-4	End of Line Character	0	CR/CRLF	End of Line Characters	CR*
		1	RS		RS

* Default setting for the indicated device.

† On the VT131, switch D-3 determines whether or not an end of line character is sent. On the VT300, leaving the **End of Line Characters** feature blank is the same as setting the VT131 switch D-3 to 0. The VT300 can support up to six end of line characters.

The VT131 lets you select a turnaround (end of block)/disconnect character in Set-Up B, by pressing **Shift-C**. This VT131 feature corresponds to the VT300 **End of Block Characters** feature. By default, the **End of Block Characters** feature is empty, so no characters are transmitted at the end of a block. Note that the VT300 does not support half duplex communication.

BOLD AND NEGATIVE-IMAGE CHARACTER ATTRIBUTES: VT340 AND VT241

By default, the VT340 displays normal, bold, and negative-image attributes for text by using different shades of white. The VT241 displays different visual attributes in different colors:

- green for normal
- red for bold
- blue for negative image (when color+mono mode is selected)

Applications that depend on red, green, and blue text should use ReGIS color map commands to change color map entries 7, 8, and 15 to green, blue, and red respectively.

NOTE: For negative-image text to use color map entry 8, the **Color Map** *feature in the Global Set-Up screen must be set to "color 2".*

BLINK ATTRIBUTE: VT300 AND VT240

The blink attribute appears different on the VT300 than on the VT240. The VT300 uses different foreground and background shades to display the blink attribute.

GLOSSARY

Active position

The location in page memory where the next typed character will appear. The *cursor* indicates the active position.

Announcer

A control function that prepares the terminal for the type of data used by a certain application. The VT300 supports three *ANSI conformance levels* that select the type of data used. These conformance levels are based on the ANSI standard Dp Ans X3.134.1.

ANSI

American National Standards Institute

ANSI character types

There are two types of ANSI characters, graphic and control.

Graphic characters are alphanumeric characters that you can display on the screen. These characters include letters, numbers, punctuation, and any other characters you can display.

Control characters are characters you do not usually display. They make the terminal perform specific functions in data communication and text processing. Carriage return (CR), form feed (FF), and escape (ESC) are examples of control characters.

ANSI partial page

In local editing mode, all the characters on a page, from the beginning of a selected area to the cursor.

Application

A computer program designed to perform a specific task, such as a word processing. Applications are usually coded using high-level programming languages, such as FORTRAN or Pascal.

Autorepeat

A VT300 feature that makes most keys send their character repeatedly when you hold the key down. You can turn the autorepeat feature on and off by using the Keyboard Set-Up screen or the DECARM control function (Chapter 11).

Auxiliary keypad

A group of keys on the right side of the VT300 keyboard that can send numbers and punctuation marks, or special control functions defined by an application (Chapters 3 and 11).

Baud rate

The speed at which the terminal communicates with the host system or a printer. The baud rate is measured in bits per second.

Bit

Binary digit. The smallest unit of storable information in a digital machine. A bit can assume one of two values, 0 (on) or 1 (off).

Bitmap

Random access memory used to store a bit-encoded representation of an image displayed on the monitor screen. The VT330 uses a 2-plane bitmap, where each pixel on the screen is represented by 2 bits.

Block

In edit mode, a section of edited data the terminal sends from the terminal's page memory to the host system.

Block editing

See *local editing.*

Character cell

The pixel area on the screen that the terminal uses to display a single graphic character. The VT300 uses a 10 × 20 pixel character cell for each graphic character.

Character encoding

All terminals and computers encode information as binary digits, or bits. Older systems use 7 bits to encode each character. Newer systems such as the VT300 use 8 bits, which provide more codes. The newer systems can also use the 7-bit codes.

The VT300 uses an 8-bit character encoding system and a 7-bit code extension technique.

Character coding format

There are two types of character coding formats, 7-bit and 8-bit.

The 7-bit coding format uses 7 bits to store each character in the terminal's memory. The ASCII character set uses a 7-bit coding format.

The 8-bit coding format uses 8 bits to store each character in the terminal's memory. The DEC Supplemental Graphic character set uses an 8-bit format.

Character set

There are two types of character sets, hard and soft.

A hard character set is any one of the terminal's built-in character sets. Hard character sets in the VT300 include the ASCII, DEC Supplemental Graphic, ISO Latin-1 supplemental graphic, DEC Special Graphic, Nation Replacement Character (NRC), and DEC Technical.

A soft character set is any character set that you define using a DECDLD device control string (Chapter 5). Soft character sets are also called down-line-loadable sets and dynamically redefinable sets.

Code table

A list of all characters in a *character set* with their codes. Most standard character sets put similar characters into groups, so they have similar codes. A code table lets you see groups of characters and their relative codes clearly.

Column

A vertical row of character positions on the screen. You can display 80- or 132-column lines.

Compose sequence

A series of keystrokes you can use to display a character that does not appear on any single key. Compose sequences start with the **Compose Character** key. See *Installing and Using the VT330/VT340 Video Terminal for details.*

Context

The operating information for a *session*. For example, the settings of set-up features are part of a session's context. The terminal maintains a separate context for each session.

Control characters

Characters that make the terminal or host system perform specific functions in data communications and text processing. The terminal usually does not display control characters. The VT300 uses two groups of control characters, C0 and C1.

C0 (control zero) and C1 (control one) characters

The VT300 uses the ANSI and ISO definitions for the functions of C0 and C1 controls.

C0 control characters are in postions 0/0 through 0/15 in the left half (GL) of the 8-bit code table. You can use C0 characters directly in a 7- or 8-bit environment.

C1 control characters are in positions 8/0 through 9/15 in the right half (GR) of the 8-bit code table. You can use C1 characters directly in an 8-bit environment. C1 controls can be used in a 7-bit environment as **ESC Final** escape sequences.

Control functions

Commands you use in your applications to make the terminal perform special functions. These functions range from the simple — editing data — to the complex — reporting on the terminal's state. Control functions include control characters, device control strings, control sequences, and escape sequences.

Control sequence

Any control function that begins with the C1 CSI control character.

Coupled cursor

A *cursor* that appears to pull the *user window* through the *page*. When the cursor tries to move beyond the borders of the user window, it pans in that direction to keep the cursor visible. If the user window is the complete screen, the cursor looks like it is connected, or coupled, to the screen.

Cursor

A displayed box or underscore that indicates the *active position* in *page memory.* The default cursor is a blinking box. You can select other cursor characters.

DA

Device attributes. A report the terminal can provide to the host on request. A DA report can provide the host with information about the terminal such as conformance level, basic features, identification code, and firmware version level. The host can use this information to adjust the computing environment and make the best use of the terminal's features.

DA exchange

An exchange between the host and VT300 in which the host requests and the terminal responds with basic information about the terminal, such as the terminal's identification code.

Data flow control

The method used to synchronize communication between the terminal and the host system.

Data processing keys

Keys that have three or four characters on the top of their keycap, rather than the normal two. Every keyboard except the North American keyboard has some data processing keys.

DCS

Introduces *device control strings.* DCS is a C1 control character in position 9/0 of the 8-bit code table. You can use the equivalent 7-bit escape sequence ESC P when coding for a 7-bit environment.

DEC private control functions

Private sequences created by Digital for specific families of products. ANSI sequences and DEC private sequences follow ANSI standards for character codes.

In this manual, private control functions created by Digital have the prefix DEC in their mnemonic name. For example, horizontal cursor coupling mode has the mnemonic DECHCCM. All other control functions are ANSI sequences.

DEC Multinational character set

The factory *default* character set for the VT300. The left half of this set is the the 7-bit ASCII set (with *C0 control characters*), stored in the *GL* table. The right half is the 8-bit DEC Supplemental Graphic set (with *C1 control characters*), stored in the *GR* table.

DEC Special Graphic character set

This 7-bit character set has 94 graphic characters. Most of the graphic characters are also in the ASCII character set. The other graphic characters include special symbols and line segments. Another name for this character set is the VT100 line drawing character set.

DEC Supplemental Graphic character set

This 8-bit character set has 94 graphic characters. The graphic characters include letters with accents and diacritical marks, used in many European languages. There are also special symbols, such as currency signs.

DEC Technical character set

This 7-bit character set has 94 graphic characters. The DEC Technical set has characters and symbols often used in technical applications, such as schematic and logic diagrams.

Default

A standard factory setting for a terminal feature. The VT300 uses default settings for features and control functions, until you change the settings. Many control functions use default values for *parameters*. If you omit a value, the terminal uses the default value.

Designate

Assign a character set to one of the terminal's four logical sets, G0 through G4. This is the first of two steps in selecting a character set for use. The second step is mapping the character set.

Device control string (DCS)

A special form of control function you can use for such operations as down-line-loading character sets or defining user-defined keys. Device control strings begin with the DCS control character.

Diacritical marks

Marks or symbols that indicate a change in the standard pronunciation of a letter. Examples of dicritics are acute accent (´), grave accent (`), and tilde (˜).

On the VT300, you use diacritical marks in two-stroke compose sequences.

Display

The area of the video screen where the terminal can present visible data.

Display controls mode

A special operating mode that lets you display control codes as graphic characters, when you want to debug your applications. In this mode, the terminal does not perform control functions.

Down-line-load

Move data from the *host* system to the terminal. For example, you can down-line-load a *soft character set* into the terminal.

Down-line-loadable (soft) character set

A character set you can load into the VT300 from the host system. The character set can have 96 graphic characters. You can design your own soft character set. You can use the set in the *GL* or *GR* table. The terminal stores soft characters in its DRCS buffer. When you turn off the terminal, the soft characters are lost.

DRCS

Dynamically redefinable character set. See *down-line-loadable character set.*

DSR

Device status report. The host system sends a DSR request to ask the terminal for the operating status of six terminal features, such as VT300 operating status and cursor position.

DTR

Data terminal ready signal. The state of this signal indicates the status of the printer port.

Dual sessions

A mode in which you can run two *sessions* at the same time. If you connect your VT300 to two systems, you can run a session on each system at the same time.

Echo

To display characters on the screen, in addition to sending them to the host. Either the host or the terminal can echo characters.

Edit mode

A mode of operation in which the terminal stores the information you type, rather than sending it immediately to the host system. You decide when to send your edited data to the host system. This mode requires host software support.

Editing keypad

The group of 10 keys (including the arrow keys) to the right of the main keypad. Table 3-1 lists the codes sent by the editing keys, and Table 3-2 lists the codes sent by the arrow keys. Normally, you use the arrow keys to control the cursor on the screen.

Eligible character fields

Areas in page memory that the terminal can send to the host system in *edit mode*. Eligible characters are also called selected characters.

Emulation

A method that lets you use the VT300 like other Digital terminals.

End-of-block character

An optional character sent by the terminal at the end of a *block* transmission, in *edit mode*.

Environment

The coding scheme a system uses to encode characters. Today, most systems use an 8-bit coding scheme, where each character of data is represented by an 8-bit binary code. The VT300 can operate in a 7- or 8-bit environment.

ESC

The escape character. Introduces *escape sequences.*

Escape sequences

Control functions that begin with the C0 ESC character.

Firmware

All commands and control functions that are built into the terminal, such as the editing functions.

Font

A set of graphic characters, all of one size and style.

Full-cell fonts

A font that can individually address all pixels in a cell. Usually, text fonts cannot individually address all pixels.

Graphic left (GL) table

The left half of the terminal's *in-use table.* The GL table can store up to 94 graphic characters for immediate use. You can store characters in the 2/1 through 7/14 range of character positions. You can use GL codes in 7-bit or 8-bit environments.

Graphic right (GR) table

The right half of the terminal's *in-use table.* The GR table can store up to 96 graphic characters for immediate use. You can store characters in the 10/1 through 15/15 range of character positions. Some 8-bit character sets only use 94 of these GR codes. You can use GR codes only in an 8-bit environment.

Graphic characters

Characters you can display on a video screen. Graphic characters include letters, numbers, punctuation, and any other characters you can display.

Graphic rendition

The appearance of a display character, including all of its *visual character attributes.* You use the select graphic rendition (SGR) control function to select visual character attributes.

Graphics

Pictures, graphs, and other images that can appear on the terminal's screen. Graphics are different from text, and the terminal uses a special mode of operation to display graphics.

Hard character set

One of six character sets built into the VT300, such as the ASCII and DEC Supplemental Graphic sets.

Hard reset

A control function that resets many of the terminal's features to a group of saved settings. You can perform a hard reset by selecting **Recall Saved Settings** in the Set-Up Directory.

HLS

The hue, lightness, and saturation color coordinate system. HLS is one of two universal systems for specifying colors. The other one is *RGB.*

Home cursor position

Usually the upper-left corner of the screen. However, home position can also be the upper-left corner of the scrolling region (that is, the area within the margins). See "Origin Mode (DECOM)" in Chapter 6.

Host

The computer or terminal server that the terminal communicates with.

Independent protection

A style of *character protection* that lets you protect areas of page memory, independent of any *visual character attributes.* Compare with *visual attribute protection.*

In-use table

The area in the terminal's memory that stores the character set(s) the terminal is currently using. The in-use table is comprised of the *GL* and *GR* logical tables.

Interactive mode

A mode in which the terminal immediately sends all typed data to the host system. This is the usual mode of operation for the VT300. You can also select *edit mode.*

ISO

International Standards Organization (ISO).

ISO Latin Alphabet Nr 1 supplemental set

This 8-bit character set has 96 graphic characters. The graphic characters are similar to those in the DEC Supplemental Graphic set. The ISO Latin-1 set includes letters with accents and diacritical marks, used in many European languages. It also has other special symbols, not included in the DEC Supplemental Graphic set. The ISO Latin-1 set is specified in the ISO standard ISO 8859.1.

Layers

The different levels of data exchange between the VT300 and the host system. When you use *SSU*, there are three basic layers of data exchange between the terminal and host: ANSI/ReGIS/Tektronix/VT52, SSU, and XON/XOFF flow control.

Line attribute

The visual attributes for a complete display line on the screen.

Local

An operating state where data entered at the keyboard is sent to the screen, but not the host. The terminal stores data received from the host, until you put the terminal back *on-line.*

Locking shift

A control function used to map a designated character set into the terminal's *in-use table* as *GL* or *GR.* When you use a locking shift, the character set remains in GL or GR until you use another locking shift.

Map

Move a designated character set into the terminal's *in-use table* as *GL* or *GR*. Mapping is the second of two steps in selecting a character set for use. The first step is *designating* the character set. After a set is mapped, it is available from the keyboard.

Margins

See *scrolling margins*.

Mnemonic

An abbreviated name for a control character or control function. For example, CR is the mnemonic for the carriage return control character.

MSC

See multiple system communications.

Multiple system communications

A method for managing *sessions*, using a separate communication line for each session. The other method for managing sessions is Digital's *Session Support Utility* (SSU).

National replacement character sets (NRCs)

A general name for a class of 7-bit, 94-character sets created for different languages and dialects. The VT300 has 12 NRC sets for many European languages. The NRC sets are based on ISO standard 646.

NVR

Nonvolatile RAM (random access memory).

On-line

An operating state of the terminal in which the terminal can communicate with a host system. The terminal sends data entered at the keyboard to the host. The terminal displays data received from the host on the screen.

Operating modes

Levels of conformance that the VT300 offers.

The VT300 has two major operating modes, VT300 and VT100. You can select each mode from the keyboard via set-up, or from the host via control codes.

The VT300 uses standard ANSI functions in all operating modes, except VT52 mode. See Chapter 1.

Origin

The *home cursor position* on the screen. You can set the home position at the upper-left of the screen or within the scrolling margins.

Page

A section of the terminal's page memory. Each page has left, right, top, and bottom scrolling margins. You can define the size and layout of a page by using set-up features or control functions.

Page format

The size and number of pages in the terminal's *page memory*. You can arrange page memory into 1, 2, 3, 4, or 6 pages, depending on whether you use single or *dual sessions*. You can also define the margins of a page.

Page memory

A storage area in the VT300 for displayable text. The size of this memory is equal to 144 display lines by 80 or 132 display columns. You can divide this memory into one or more pages. The amount of page memory available depends on whether you use single or *dual sessions*.

Parameter characters

Characters in a control function that define the action and/or limits of that function.

Partial page marker

An invisible marker that defines the position of the last character sent to the host on a *VT131 partial page*. The partial page marker applies only in *edit mode*.

Pixel

Picture element. The smallest unit of display on the video screen. All graphic characters are displayed with pixels.

Port

A connector on the rear of the terminal that lets the VT300 communicate with another device or host computer.

Presentation state report

A VT300 *report* that indicates the settings of the terminal's *character attributes* and *cursor*, or the settings of its tab stops.

Protected characters

Positions in page memory that cannot be changed, erased, or moved with control functions, under certain conditions. There are two styles of character protection available, *independent protection* and *visual attribute protection.*

Report

Operating information that the terminal provides the host system. The VT300 can provide the host with report information such as identification (type of terminal), cursor state, operating status, conformance level (1, 2, or 3), and extensions.

Reset

(1) To change the terminal's operating features to their default or saved settings. (2) To change the setting of an ANSI or DEC private mode to its *reset state.*

Reset state

One of two possible settings for an ANSI or DEC private mode. Modes are control functions that have only two settings.

Restore

To set the terminal to the latest saved operating state. Restoring the terminal is not the same as resetting the terminal. See *reset.*

RIS

Reset to initial state.

RGB

The red, green, and blue color coordinate system. RGB is one of two universal systems for specifying colors. The other one is *HLS.*

ROM cartridge

A read only memory cartridge that stores much of the terminal's *firmware.* The cartridge is installed at the rear of the terminal. The cartridge *must* be installed for the terminal to operate.

Scrolling

Moving data between the *scrolling margins* of a page. Data scrolled past the margins is lost from the terminal's page memory.

Scrolling margins

The top, bottom, left, and right boundaries on a page, beyond which data cannot be written or scrolled.

Selected field

A group of characters defined as eligible to be sent to the host in edit mode.

Session

An electronic connection between between the terminal and host.

Session Support Utility

Digital's software protocol for managing two VT300 *sessions* over one communication line. The other method for managing sessions is *multiple system communications* (MSC).

Set-up

A series of display screens that list the terminal's operating features. Each screen lists a group of features, such as communications or printing. You can examine and change the current settings. For example, you can select the transmit or receive speeds, page size, and type of session management. *Installing and Using the VT330/VT340 Video Terminal* describes how to use set-up.

Single shift

A control character (SS2 or SS3) used to map a designated character set into the terminal's *in-use table* one character only. You use a single shift when you want to display the next character from a different character set. A single shift maps the G2 or G3 set into GL. The character set is active for only one character, then the terminal returns to the previous character set in GL.

Sixel

A column of 6 pixels on the screen. When you load a *soft character set* into the terminal, you use sixel data to code each character.

Soft character sets

See *down-line-loadable (soft) character sets.*

Space compression

A method of sending data in which the terminal omits unused character spaces in *edit mode.*

ST

String terminator character. ST is a C1 control character. You can use the equivalent 7-bit sequence ESC \ (1/11, 5/12) when coding for a 7-bit environment.

Status line

A line of text that appears on line 25 of the screen. There are three possible status line states: indicator (default), host-writable, and none.

The indicator status line displays operating information about the terminal. This indicator status line appears in reverse video. The host-writable status line displays information provided by an application. When set to "none", the status line is black.

Terminal state report

A *report* that indicates the entire state of the terminal except for user-defined key definitions and the current soft character set.

Top-row function keys

The 20 keys (F1 through F20) on the top row of the keyboard. The first five keys — **Hold Session**, **Local Print**, **Set-Up**, **Switch Session**, and **Break** — are predefined function keys. You can define the function of the other 15 keys when they are shifted. See *user-defined keys.*

Typewriter keys

The keys on the main keypad.

User-defined keys

The 15 keys on the top row of the keyboard that you can define to send selected characters or control functions. You can program these keys with a DECUDK device control string, or you can define these keys from set-up. The 15 keys are **F6** through **F14**, **Do**, **Help**, **F17** through **F20**. To use a user-defined key, you must press **Shift**-defined key.

UDKs

User-defined keys.

User-preferred supplemental set

A standby set you use to provide general access to the supplemental set you use most. You can select this set to be ISO Latin-1 supplemental or DEC Supplemental Graphic. You can select the user-preferred set in set-up or with a DECAUPSS control function.

Visual attribute protection

A style of *character protection* for applications that require strict compatibility with the VT131 terminal. Visual attribute protection is only available in edit mode (DECEDM). Visual character protection applies to characters with the same *visual character attribute.*

Visual character attribute

A quality assigned to a graphic character that highlights the way the character appears on the screen, without changing the actual character. For example, the bold character attribute makes a character appear brighter on the screen.

VT131 partial page

In local editing mode, all characters on a page between the *partial page marker* and the cursor.

7-bit code extension technique

A method for expressing 8-bit control characters as 7-bit escape sequences.

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